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This book is a study guide and reference for the anatomy and actions of human skeletal muscles. It is designed for use by students of anatomy, physical education and health-related fields. It also serves as a compact reference for the practicing professional.

The first chapter presents labeled line drawings of the skeleton, which include all structures that are used in describing origins and insertions in the later chapters. A master numbering system is used so that each structure is labeled with the same number in all drawings.

The second chapter describes the various movements of the body.

In chapters 3 through 9 the origin, insertion, action and innervation of the skeletal muscles are described and each muscle is presented on a separate page with a line drawing.

The spinal cord levels of the nerve fibers that innervate each muscle are included in parentheses after the name of each nerve.

Labeled drawings of major muscle groups are presented throughout chapters 3 to 9. Notes and relationships among muscles have been included on many pages.

The drawings include the following important features:

1. Bones and cartilage containing muscle attachment sites are shaded.
2. Adjacent structures are shown.
3. Muscle fibers are drawn by direction.
4. Muscle fibers are shown on the underside of bone and cartilage as dashed lines.
5. Tendons and aponeuroses are shown.
6. Labeled muscle groups are included.

These features aid in visual orientation and understanding of the action of the muscles. We have noticed that many students find it useful to color the illustrations.

Notes have been included on many pages to show how muscles are used. Relationships among many of the muscles have also been indicated where appropriate. Many more of these have been included in the third edition.

Since our primary goal is to describe the muscles moving the skeleton, we have not described the muscles of the perineum, eye, tympanic cavity, tongue, larynx, pharynx, or palate.

We extend our appreciation to Mr. George Boykin, who was for many years the jolly proprietor of the gross anatomy laboratories at the Health Sciences Center of the State University of New York at Stony Brook, for his help and encouragement. We also thank Mr. Vincent Verdisco and Ms. Diane Chandler for their technical advice with the artwork and Ms. Katherine Juner for her secretarial services.

Robert J. Stone
Judith A. Stone
CHAPTER ONE
THE SKELETON
1. Frontal bone
2. Nasal bone
3a. Frontal process (maxilla)
3c. Incisive fossa of maxilla
3d. Canine fossa (maxilla)
4a. Neck of condyle (mandible)
4b. Coronoid process (mandible)
4c. Angle of the mandible
4d. Ramus (mandible)
4e. Oblique line (mandible)
4g. Mental foramen (mandible)
4h. Incisive fossa of mandible
5. Zygomatic bone
6. Lacrimal bone
8a. Greater wing of sphenoid bone
8b. Lateral pterygoid plate
9. Temporal bone
9a. Temporal fossa
9b. Mastoid process (temporal bone)
9d. Styloid process (temporal bone)
9e. Zygomatic process (temporal bone)
10. Parietal bone
10a. Superior temporal line
10b. Inferior temporal line
11. Occipital bone
11a. Superior nuchal line (occipital bone)
11b. Inferior nuchal line (occipital bone)

Note: The zygomatic arch is formed by the zygomatic process of the temporal bone meeting the zygomatic bone.
3f. Tuberosity of maxilla
4. Mandible
12. Galea aponeurotica
13. Helix of ear
14. Articular disk of temporomandibular joint
15. Pterygomandibular raphe
16a. Greater alar cartilage
16b. Nasal cartilage
16c. Ala

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9b. Mastoid process (temporal bone)
10. Parietal bone
11. Occipital bone
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11b. Inferior nuchal line (occipital bone)
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4k. Inferior mental spine (inner surface of mandible)
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33a. Superior border of scapula
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33c. Axillary (lateral) border of scapula
33d. Acromion (scapula)
33e. Coracoid process (scapula)
33h. Infraglenoid tubercle (scapula)
33i. Supraspinous fossa (scapula)
33j. Crest of spine (scapula)
33k. Infraspinous fossa (scapula)
33m. Inferior angle of scapula
33n. Root of spine (scapula)
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36a. Greater tuberosity of humerus
SKULL TO STERNUM—ANTERIOR VIEW
(Mandible and maxilla removed)

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23. Axis
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31b. Second rib
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30b. Body (sternum)
30c. Xiphoid process (sternum)
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31d. Angle of rib
32. Costal cartilage
33d. Acromion (scapula)
33e. Coracoid process (scapula)
33f. Supraglenoid tubercle (scapula)
33l. Subscapular fossa (scapula)
36a. Greater tuberosity (tubercle) of humerus
36b. Lesser tuberosity of humerus
36c. Intertubercular (bicipital) groove (humerus)
36d. Deltoid tuberosity (humerus)
37a. Radial tuberosity (radius)
38a. Ulnar tuberosity (ulna)
38b. Coronoid process (ulna)
92. Lateral lumbocostal arch (lateral arcuate ligament)*
93. Medial lumbocostal arch (medial arcuate ligament)

*See p. 89.
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(Enlargement of lumbar vertebrae)

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20b. Spinous process of vertebra
20c. Mamillary process of vertebra
20d. Accessory process of vertebra
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25. Supraspinous ligaments
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26b. Sacral foramina
26c. Medial sacral crest
29. Clavicle
31c. Tubercle of rib
31d. Angle of rib
33. Scapula
33d. Acromion (scapula)
36. Humerus
37. Radius
38. Ulna
38c. Olecranon process (ulna)
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52b. Iliac crest
34. Radial collateral ligament
35. Annular ligament
36. Humerus
36e. Lateral supracondylar ridge (humerus)
36f. Lateral epicondyle (humerus)
37. Radius
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37d. Styloid process (radius)
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38c. Olecranon process (ulna)
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40. Scaphoid (navicular)
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44. Trapezoid
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49b. Middle phalanges
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35. Annular ligament
36. Humerus
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36h. Medial epicondyle (humerus)
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38. Ulna
38b. Coronoid process (ulna)
38c. Olecranon process (ulna)
38d. Supinator crest (ulna)
39. Intersosseous membrane
40a. Tubercle of scaphoid (navicular)
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44. Trapezoid
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46a. Hook of hamate
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54b. Inferior ramus of pubis
54c. Pubic crest
54d. Pubic symphysis
54e. Pubic tubercle
55. Greater sciatic notch
56. Sacrotuberous ligament
57. Obturator foramen
59. Inguinal ligament
60. Superior pubic ligament
61. Iliolumbar ligament
62. Rectus sheath
65. Linea alba
68. Femur
68a. Greater trochanter (femur)
68b. Trochanteric fossa (femur)
68c. Lesser trochanter (femur)
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THORACIC TO PELVIC REGION—LATERAL VIEW  
(Arm and leg removed)

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33g. Glenoid cavity (scapula)  
52d. Anterior iliac crest  
59. Inguinal ligament  
63. Acetabulum  
64. Thoracolumbar fascia  
66. Abdominal aponeurosis

52b. Iliac crest  
52c. Iliac tubercle  
52e. Anterior superior iliac spine  
52f. Anterior inferior iliac spine  
67. Iliotibial tract  
68. Femur  
70. Patella  
72. Synovial membrane of knee joint  
74c. Lateral condyle of tibia
PELVIC GIRDLE—POSTERIOR VIEW

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53b. Ischial tuberosity
53c. Spine of ischium
54g. Body of pubis
57. Obturator foramen
58. Obturator membrane
68a. Greater trochanter (femur)
68c. Lesser trochanter (femur)
68d. Intertrochanteric crest (femur)
68f. Quadrat line (femur)

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27. Aponeurosis of erector spinae
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52k. Middle (anterior) gluteal line (ilium)
52l. Inferior gluteal line (ilium)
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55. Greater sciatic notch
56. Sacrotuberous ligament
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68g. Gluteal tuberosity (femur)
68h. Linea aspera (femur)
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52f. Anterior inferior iliac spine
54b. Inferior ramus of pubis
54f. Pectineal line (pubis)
54g. Body of pubis
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68a. Greater trochanter (femur)
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68e. Intertrochanteric line (femur)
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69. Quadriceps tendon
70. Patella
71. Patellar ligament
74. Tibia
74a. Tuberosity of tibia
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53a. Ramus of ischium
53b. Ischial tuberosity
54b. Inferior ramus of pubis
54g. Body of pubis
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68a. Greater trochanter (femur)
68c. Lesser trochanter (femur)
68g. Gluteal tuberosity (femur)
68h. Linea aspera (femur)
68l. Lateral supracondylar line (femur)
68k. Adductor tubercle (femur)
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74c. Lateral condyle of tibia
75a. Head of fibula
68. Femur
74. Tibia
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75. Fibula
76. Interosseous membrane
77. Lateral talocalcaneal ligament
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83. Talus
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88. Lateral cuneiform
89. Cuboid
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90b. Second metatarsal
90c. Third metatarsal
90d. Fourth metatarsal
90e. Fifth metatarsal
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91b. Middle phalanges
91c. Distal phalanges
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68l. Popliteal surface (femur)
68m. Medial condyle (femur)
68n. Lateral condyle (femur)
73. Oblique popliteal ligament
74. Tibia
74d. Soleal line (tibia)
75. Fibula
76. Intersosseous membrane
84. Calcaneus
84a. Sustentaculum tali of calcaneus
85a. Tuberosity of navicular
86. Medial cuneiform
87. Intermediate cuneiform
88. Lateral cuneiform
89. Cuboid
RIGHT FOOT—PLANTAR VIEW

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81. Plantar metatarsophalangeal ligaments
82. Transverse metatarsal ligaments
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84b. Tuberosity of calcaneus
84c. Medial border of calcaneus
84d. Lateral border of calcaneus

85a. Tuberosity of navicular
86. Medial cuneiform
87. Intermediate cuneiform
88. Lateral cuneiform
89. Cuboid
90. Metatarsal bones
91a. Proximal phalanges
91b. Middle phalanges
91c. Distal phalanges
CHAPTER TWO
MOVEMENTS OF THE BODY
Anatomical position—A subject in the anatomical position is standing erect with the head, eyes, and toes facing forward and the arms hanging straight at the sides with the palms of the hands facing forward.

**Figure 2.1**
Median or midsagittal plane—Passes vertically through the body from anterior (front) to posterior (back). It divides the body into right and left sides. Other sagittal planes are parallel to this plane.

**Figure 2.2**
Coronal (frontal) planes—Pass vertically through the body from side to side. They divide the body from front to back.

**Figure 2.3**
Transverse planes (cross sections)—Pass horizontally through the body parallel to the ground.
Figure 2.4
Flexion—The left arm, forearm, and right thigh are drawn forward in sagittal planes. The right knee is also flexed. Extension—The left thigh and knee are extended. Hyperextension—The right arm is hyperextended at the shoulder.

Figure 2.5
Lateral flexion—The torso (or head) bends laterally in the coronal plane.

Figure 2.6
Abduction—The right arm is drawn laterally in the coronal plane. Adduction—The left arm is returned from abduction to the anatomical position.

Figure 2.7
Medial rotation—The anterior of the arm (or thigh) is moved toward the median plane. Lateral rotation—The anterior of the arm (or thigh) is moved away from the median plane.
**MOVEMENTS OF THE SCAPULA**

*Figure 2.8*
Elevation—The right scapula of this figure is drawn superiorly.

*Figure 2.9*
Depression—The right scapula of this figure is pushing the arm inferiorly.

*Figure 2.10*
Protraction—The scapula pushes the arm forward in a sagittal plane.

*Figure 2.11*
Retraction—The scapula is pulled back from protraction in a sagittal plane. Since the scapula slides around the ribs toward the median plane, it becomes adduction.

*Figure 2.12*
Rotation—For abduction of the arm to continue above the height of the shoulder, the scapula must rotate on its axis so that the glenoid fossa turns upward.
**MOVEMENTS OF THE HAND AND FOREARM**

**Figure 2.13**
Pronation—The forearm is rotated away from the anatomical position so that the palm turns medially then posteriorly. If the forearm is flexed at the elbow, then the palm turns inferiorly.
Supination—The forearm is rotated so that the palm turns anteriorly (or superiorly if the forearm is flexed).

**Figure 2.14**
Abduction—The fingers are moved away from the midline of the hand.

**Figure 2.15**
Radial flexion (abduction)—The hand, at the wrist, is drawn away from the body in a coronal plane.
Ulnar flexion (adduction)—The hand, at the wrist, is drawn toward the body in a coronal plane.

**Figure 2.16**
Adduction—The fingers are moved toward the midline of the hand.

**Figure 2.17**
Opposition—The thumb is rotated so its anterior pad can touch the anterior pads of the four fingers.
MOVEMENTS OF THE FOOT

Figure 2.18
Dorsiflexion—The ankle flexes, moving the foot superiorly. Plantar Flexion—The ankle extends, moving the foot inferiorly.

Figure 2.19
Eversion—The front of the foot moves laterally away from the midline (abduction), and the sole turns outward.

Figure 2.20
Inversion—The front of the foot moves medially toward the midline (adduction), and the sole turns inward.
CHAPTER THREE
MUSCLES OF THE FACE AND HEAD
EPICRANIUS

Skull—lateral view

<table>
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<th>Frontal belly (frontalis)</th>
</tr>
</thead>
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<td><strong>Origin</strong></td>
<td>Galea aponeurotica</td>
</tr>
<tr>
<td>Lateral two-thirds of superior nuchal line of occipital bone, mastoid process of temporal bone</td>
<td>Fascia of facial muscles and skin above nose and eyes</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td>Draw back scalp, wrinkles forehead, raises eyebrows</td>
</tr>
<tr>
<td>Galea aponeurotica (an intermediate tendon leading to frontal belly)</td>
<td></td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Nerve</td>
</tr>
<tr>
<td>Draws back scalp, aids frontal belly to wrinkle forehead and raise eyebrows</td>
<td>Temporal branches of facial nerve</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td></td>
</tr>
<tr>
<td>Posterior auricular branch of facial nerve</td>
<td></td>
</tr>
</tbody>
</table>
TEMPOROPARIETALIS

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Fascia over ear</th>
<th>Action</th>
<th>Raises ears, tightens scalp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Lateral border of galea aponeurotica</td>
<td>Nerve</td>
<td>Temporal branch of facial nerve</td>
</tr>
</tbody>
</table>

MUSCLES OF THE FACE AND HEAD
**AURICULARIS ANTERIOR, SUPERIOR, POSTERIOR**

**Skull—lateral view**

<table>
<thead>
<tr>
<th><strong>Auricularis anterior</strong></th>
<th><strong>Auricularis posterior</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>Mastoid area of temporal bone</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td>Posterior part of ear</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Draws ear upward in some individuals*</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td>Posterior auricular branch of facial nerve</td>
</tr>
</tbody>
</table>

*This muscle is nonfunctional in most people.*

**Auricularis superior**

| **Origin**               | Fascia in temporal region |
| **Insertion**            | Superior part of ear |
| **Action**               | Draws ear upward in some individuals, moves scalp* |
| **Nerve**                | Temporal branch of facial nerve |
ORBICULARIS OCULI

**ORBITAL AND PALPEBRAL PARTS**

**LACRIMAL PART**

**Skull—three-quarter anterior view**

<table>
<thead>
<tr>
<th>Orbital part</th>
<th>Lacrimal part</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>(behind medial palpebral ligament and lacrimal sac)</td>
</tr>
<tr>
<td>Frontal bone, maxilla (medial margin of orbit)</td>
<td>Lacrimal bone</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td>Lateral palpebral raphe</td>
</tr>
<tr>
<td>Continues around orbit and returns to origin</td>
<td>Draws lacrimal canals onto surface of eye</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Nerve</td>
</tr>
<tr>
<td>Strong closure of eyelids</td>
<td>Temporal and zygomatic branches of facial nerve</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td>Nerve</td>
</tr>
<tr>
<td>Temporal and zygomatic branches of facial nerve</td>
<td>Nerve</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Palpebral part</th>
<th>(in eyelids)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>Lacrimal bone</td>
</tr>
<tr>
<td>Medial palpebral ligament</td>
<td>Lateral palpebral raphe</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td>Draws lacrimal canals onto surface of eye</td>
</tr>
<tr>
<td>Lateral palpebral ligament into zygomatic bone</td>
<td>Nerve</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Temporal and zygomatic branches of facial nerve</td>
</tr>
<tr>
<td>Gentle closure of eyelids</td>
<td>Nerve</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td>Nerve</td>
</tr>
<tr>
<td>Temporal and zygomatic branches of facial nerve</td>
<td>Nerve</td>
</tr>
</tbody>
</table>
LEVATOR PALPEBRAE SUPERIORIS

Origin: Inferior surface of lesser wing of sphenoid
Insertion: Skin of upper eyelid
Action: Raises upper eyelid
Nerve: Oculomotor nerve

Skull—three-quarter anterior view

Skull—lateral view
CORRUGATOR SUPERCIILII

Skull—anterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medial end of superciliary arch</td>
<td>Deep surface of skin under medial portion of eyebrows</td>
<td>Draws eyebrows downward and medially</td>
<td>Temporal branch of facial nerve</td>
</tr>
</tbody>
</table>
PROCERUS

Skull—anterior view

**Origin**  Fascia over nasal bone and lateral nasal cartilage

**Insertion**  Skin between eyebrows

**Action**  Draws down medial part of eyebrows, wrinkles nose

**Nerve**  Buccal branches of facial nerve
NASALIS

Skull—anterior view

<table>
<thead>
<tr>
<th>Transverse part</th>
<th>Alar part</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>Greater alar cartilage, skin on nose</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td>Skin at point of nose</td>
</tr>
<tr>
<td>Middle of maxilla</td>
<td>Both parts maintain opening of external nares</td>
</tr>
<tr>
<td>Muscle of opposite</td>
<td>during forceful inspiration</td>
</tr>
<tr>
<td>side over bridge of</td>
<td></td>
</tr>
<tr>
<td>nose</td>
<td></td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Buccal branches of facial nerve</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td></td>
</tr>
</tbody>
</table>
DEPRESSOR SEPTI

Skull—anterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incisive fossa of maxilla</td>
<td>Constricts nares</td>
<td>Buccal branches of facial nerve</td>
</tr>
<tr>
<td>Nasal septum and ala</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**ORBICULARIS ORIS**

**Skull—lateral view**

**Origin**
- Lateral band—alveolar border of maxilla
- Medial band—septum of nose
- Inferior portion—lateral to midline of mandible

**Insertion**
- Becomes continuous with other muscles at angle of mouth

**Action**
- Closure and protrusion of lips

**Nerve**
- Buccal and mandibular branches of facial nerve
LEVATOR LABII SUPERIORIS

Skull—lateral view

<table>
<thead>
<tr>
<th>Angular head</th>
<th>Infraorbital head</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td><strong>Origin</strong></td>
</tr>
<tr>
<td>Frontal process of maxilla and zygomatic bone</td>
<td>Lower margin of orbit</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td><strong>Insertion</strong></td>
</tr>
<tr>
<td>Greater alar cartilage and skin of nose, upper lip</td>
<td>Muscles of upper lip</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td><strong>Action</strong></td>
</tr>
<tr>
<td>Elevates upper lip, dilates nares, forms nasolabial furrow</td>
<td>Elevates upper lip</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td><strong>Nerve</strong></td>
</tr>
<tr>
<td>Buccal branches of facial nerve</td>
<td>Buccal branches of facial nerve</td>
</tr>
</tbody>
</table>
LEVATOR ANGULI ORIS

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canine fossa of maxilla</td>
<td>Elevates corner (angle) of mouth</td>
<td>Buccal branches of facial nerve</td>
</tr>
<tr>
<td>Angle of mouth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Origin
Insertion
ZYGOMATICUS MAJOR

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Zygomatic bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Angle of mouth</td>
</tr>
</tbody>
</table>

**Action**
Draws angle of mouth upward and backward (laughing)

**Nerve**
Buccal branches of facial nerve
ZYGOMATICUS MINOR

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zygomatic bone</td>
<td>Upper lip lateral to levator labii superioris</td>
<td>Forms nasolabial furrow</td>
<td>Buccal branches of facial nerve</td>
</tr>
</tbody>
</table>
RISORIUS

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Fascia over masseter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Skin at angle of mouth</td>
</tr>
</tbody>
</table>

**Action**: Retracts angle of mouth, as in grinning

**Nerve**: Buccal branches of facial nerve
DEPRESSOR LABII INFERIORIS

Skull—lateral view

**Origin**  
Mandible, between symphysis and mental foramen

**Insertion**  
Skin of lower lip

**Action**  
Draws lower lip downward and laterally

**Nerve**  
Mandibular branch of facial nerve
**DEPRESSOR ANGULI ORIS**

**Skull—lateral view**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oblique line of the mandible</td>
<td>Angle of the mouth</td>
<td>Depresses angle of mouth, as in frowning</td>
<td>Mandibular branch of facial nerve</td>
</tr>
</tbody>
</table>
MENTALIS

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Incisive fossa of mandible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Skin of chin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raises and protrudes lower lip, wrinkles skin of chin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandibular branch of facial nerve</td>
</tr>
</tbody>
</table>
BUCCINATOR

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer surface of alveolar processes of maxilla and mandible over molars and along pterygomandibular raphe</td>
<td>Compresses cheek</td>
<td>Buccal branches of facial nerve</td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep part of muscles of lips</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEMPORALIS

Skull—lateral view

Origin
Temporal fossa including frontal, parietal, and temporal bones

Insertion
Coronoid process and anterior border of ramus of mandible

Action
Closes lower jaw, clenches teeth

Nerve
Mandibular division of trigeminal nerve
MASSETER

Skull—lateral view

**Origin**  
Zygomatic process of maxilla, medial and inferior surfaces of zygomatic arch

**Insertion**  
Angle and ramus of mandible, lateral surface of coronoid process of mandible

**Action**  
Closes lower jaw, clenches teeth

**Nerve**  
Mandibular division of trigeminal nerve

Note: Superficial fibers slightly protract jaw (see lateral pterygoid).
PTERYGOIDEUS MEDIALIS
(Medial Pterygoid)

Skull—lateral view
(Part of mandible cut away)

**Origin**  
Medial surface of lateral pterygoid plate of sphenoid bone, palatine bone, and tuberosity of maxilla

**Insertion**  
Medial surface of ramus and angle of mandible

**Action**  
Closes lower jaw, clenches teeth

**Nerve**  
Mandibular division of trigeminal nerve
PTERYGOIDEUS LATERALIS*

(Lateral Pterygoid)

Skull—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior head*</td>
<td>Opens jaws, protrudes mandible, moves mandible sideways</td>
<td>Mandibular division of trigeminal nerve</td>
</tr>
<tr>
<td>Inferior head</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lateral surface of greater wing of sphenoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lateral pterygoid plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td>Note: This sideward movement, aided by superficial fibers of masseter, causes chewing movements.</td>
</tr>
<tr>
<td>Condyle of mandible, temporomandibular joint</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Stern calls this a separate muscle: superior pterygoid.

CHAPTER FOUR
MUSCLES OF THE NECK
STERNOCLEIDOMASTOIDEUS

Three-quarter frontal view

**Origin**
- Sternal head—manubrium of sternum
- Clavicular head—medial part of clavicle

**Insertion**
- Mastoid process of temporal bone, lateral half of superior nuchal line of occipital bone

**Action**
- One side—bends neck laterally, rotates head to opposite side
- Both sides together—flexes neck, draws head ventrally and elevates chin, draws sternum superiorly in deep inspiration

**Nerve**
- Spinal part of accessory nerve (C2, C3)
PLATYSMA

Three-quarter frontal view

| Origin | Subcutaneous fascia of upper one-fourth of chest |
| Insertion | Subcutaneous fascia and muscles of chin and jaw, mandible |
| Action | Depresses and draws lower lip laterally, draws up skin of chest |
| Nerve | Cervical branch of facial nerve |
**DIGASTRICUS**

**Lateral view**

**Origin**  
Posterior belly—mastoid notch of temporal bone  
Anterior belly—inner side of inferior border of mandible near symphysis

**Insertion**  
Intermediate tendon attached to hyoid bone

**Action**  
 Raises hyoid bone, assists in opening jaws, moves hyoid forward or backward

**Nerve**  
Anterior belly—mandibular division of trigeminal  
Posterior belly—facial nerve
STYLOHYOIDEUS

### Lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Styloid process of temporal bone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Hyoid bone</td>
</tr>
</tbody>
</table>

**Action**
- Draws hyoid bone backward, elevates tongue

**Nerve**
- Facial nerve
MYLOHYOIDEUS

Lateral view

Origin  Insertion  Action  Nerve
Inside surface of mandible from symphysis to molars (mylohyoid line)  Hyoid bone  Elevates hyoid bone, raises floor of mouth and tongue  Mandibular division of trigeminal nerve
GENIOHYOIDEUS

Lateral view

**Origin**  Inferior mental spine on interior medial surface of mandible
**Insertion**  Body of hyoid bone

**Action**  Protrudes hyoid bone and tongue
**Nerve**  Branch of C1 through hypoglossal nerve
STERNOHYOIDEUS

Frontal view

Origin: Medial end of clavicle, manubrium of sternum
Insertion: Body of hyoid bone
Action: Depresses hyoid bone
Nerve: Ansa cervicalis (C1–C3)

Lateral view
STERNOTHYROIDEUS

Frontal view

Origin: Dorsal surface of manubrium of sternum
Insertion: Lamina of thyroid cartilage
Action: Depresses thyroid cartilage
Nerve: Ansa cervicalis (C1–C3)

Lateral view
<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Lamina of thyroid cartilage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Greater cornu of hyoid bone</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Action</strong></th>
<th>Depresses hyoid or raises thyroid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nerve</strong></td>
<td>C1 through hypoglossal nerve</td>
</tr>
</tbody>
</table>
OMOHYOIDEUS

Lateral view

**Origin**
- Superior border of scapula
- Interior belly—bound to clavicle by central tendon
- Superior belly—continues to body of hyoid bone

**Action**
Depresses hyoid bone

**Nerve**
Ansa cervicalis (C2, C3)
### Superior oblique part

<table>
<thead>
<tr>
<th>Origin</th>
<th>Vertical part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse processes of third, fourth, and fifth cervical vertebrae</td>
<td>Anterior surfaces of bodies of upper three thoracic and lower three cervical vertebrae</td>
</tr>
</tbody>
</table>

| Insertion               | Anterior arch of atlas            |

### Inferior oblique part

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior surface of bodies of first two or three thoracic vertebrae</td>
<td>All three parts flex cervical vertebrae</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insertion</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse processes of fifth and sixth cervical vertebrae</td>
<td>C2–C7</td>
</tr>
</tbody>
</table>
LONGUS CAPITIS

Frontal view
(Mandible and part of maxilla removed)

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse processes of third through sixth cervical vertebrae</td>
<td>Flexes head</td>
<td>C1–C3</td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occipital bone anterior to foramen magnum</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RECTUS CAPITIS ANTERIOR

Frontal view
(Mandible and part of maxilla removed)

**Origin**  Anterior base of transverse process of atlas
**Insertion** Occipital bone anterior to foramen magnum

**Action** Flexes head
**Nerve** C2, C3
RECTUS CAPITIS LATERALIS

Frontal view
(Mandible and part of maxilla removed)

<table>
<thead>
<tr>
<th>Origin</th>
<th>Transverse process of atlas</th>
<th>Action</th>
<th>Bends head laterally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Jugular process of occipital bone</td>
<td>Nerve</td>
<td>C2, C3</td>
</tr>
</tbody>
</table>
### Three-quarter frontal view
*Mandible and part of maxilla removed*

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse processes of third</td>
<td>Raises first rib (respiratory inspiration); acting together, they flex neck; acting on one side, they laterally flex, rotate neck</td>
<td>Ventral rami of cervical nerves</td>
</tr>
<tr>
<td>through sixth cervical vertebrae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner border of first rib (scalene tubercle)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SCALENUS MEDIUS

Three-quarter frontal view
(Mandible and part of maxilla removed)

**Origin**  
Transverse processes of lower six cervical vertebrae (C2–C7)

**Insertion**  
Upper surface of first rib

**Action**  
Raises first rib (respiratory inspiration); acting together, they flex neck; acting on one side, they laterally flex, rotate neck

**Nerve**  
Ventral rami of cervical nerves
SCALENUS POSTERIOR

Three-quarter frontal view
(Mandible and part of maxilla removed)

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse processes of lower two or three cervical vertebrae (C5-C7)</td>
<td>Raises second rib (respiratory inspiration); acting together, they flex neck; acting on one side, they laterally flex, rotate neck</td>
</tr>
<tr>
<td>Insertion</td>
<td>Nerve</td>
</tr>
<tr>
<td>Outer surface of second rib</td>
<td>Ventral rami of lower cervical nerves</td>
</tr>
</tbody>
</table>
RECTUS CAPITIS POSTERIOR MAJOR

Posterior skull and cervical vertebrae

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinous process of axis</td>
<td>Lateral portion of inferior nuchal line of occipital bone</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extends and rotates head</td>
<td>Suboccipital nerve</td>
</tr>
</tbody>
</table>
RECTUS CAPITIS POSTERIOR MINOR

Posterior skull and cervical vertebrae

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior arch</td>
<td>Medial portion of inferior nuchal</td>
<td>Extends</td>
<td>Suboccipital nerve</td>
</tr>
<tr>
<td>of atlas</td>
<td>line of occipital bone</td>
<td>head</td>
<td></td>
</tr>
</tbody>
</table>
OBLIQUUS CAPITIS SUPERIOR

Posterior skull and cervical vertebrae

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse process of atlas</td>
<td>Occipital bone between inferior and superior nuchal lines</td>
<td>Extends and bends head laterally</td>
<td>Suboccipital nerve</td>
</tr>
</tbody>
</table>
CHAPTER FIVE
MUSCLES OF THE TRUNK
**SPLENIUS CAPITIS**

**Posterior skull, neck, and back**

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Lower part of ligamentum nuchae, spinous processes of seventh cervical vertebra (C7) and upper three or four thoracic vertebrae (T1–T4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Mastoid process of temporal bone and lateral part of superior nuchal line</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Action</strong></th>
<th>Acting together, they extend, hyperextend head, neck; acting on one side, they laterally flex, rotate head, neck</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nerve</strong></td>
<td>Lateral branches of dorsal primary divisions of middle and lower cervical nerves</td>
</tr>
</tbody>
</table>
**Splenius Cervicis**

**Origin**
Spinous processes of third through sixth thoracic vertebrae (T3–T6)

**Insertion**
Transverse processes of upper two or three cervical vertebrae (C1–C3)

**Action**
Acting together, they extend, hyperextend head, neck; acting on one side, they laterally flex, rotate head, neck

**Nerve**
Lateral branches of dorsal primary divisions of middle and lower cervical nerves

**Posterior skull, neck, and back**
ERECTOR SPINAEP

ILIOCO CSTALIS LUMBORUM

Origin  Medial and lateral sacral crests and medial part of iliac crests
Insertion Angles of lower six ribs
Action Extension, lateral flexion of vertebral column, rotates ribs for forceful inspiration
Nerve Dorsal primary divisions of spinal nerves

ILIOCO CSTALIS THORACIS

Origin  Angles of lower six ribs medial to iliocostalis lumborum
Insertion Angles of upper six ribs and transverse process of seventh cervical vertebra
Action Extension, lateral flexion of vertebral column, rotates ribs for forceful inspiration
Nerve Dorsal primary divisions of spinal nerves

ILIOCO CSTALIS CERVICIS

Origin  Angles of third through sixth ribs
Insertion Transverse processes of fourth, fifth, and sixth cervical vertebrae
Action Extension, lateral flexion of vertebral column
Nerve Dorsal primary divisions of spinal nerves

*The erector spinae (sacrospinalis) is a complex of three sets of muscles: iliocostalis, longissimus, and spinalis. The origin of this group is the medial and lateral sacral crests, the medial part of iliac crests, and the spinous processes and supraspinous ligament of lumbar and eleventh and twelfth thoracic vertebrae.

Trunk—dorsal view
ERECTOR SPINAE

LONGISSIMUS THORACIS

Origin  Medial and lateral sacral crests, spinous processes and supraspinal ligament of lumbar and eleventh and twelfth thoracic vertebrae, and medial part of iliac crests
Insertion  Transverse processes of all thoracic vertebrae, between tubercles and angles of lower nine or ten ribs
Action  Extension, lateral flexion of vertebral column, rotates ribs for forceful inspiration
Nerve  Dorsal primary divisions of spinal nerves

LONGISSIMUS CERVICIS

Origin  Transverse processes of upper four or five thoracic vertebrae (T1–T5)
Insertion  Transverse processes of second through sixth cervical vertebrae
Action  Extension, lateral flexion of vertebral column
Nerve  Dorsal primary divisions of spinal nerves

LONGISSIMUS CAPITIS

Origin  Transverse processes of upper five thoracic vertebrae (T1–T5), articular processes of lower three cervical vertebrae (C5–C7)
Insertion  Posterior part of mastoid process of temporal bone
Action  Extends and rotates head
Nerve  Dorsal primary divisions of middle and lower cervical nerves
ERECTOR SPINAES

SPINALIS THORACIS

Origin: Spinous processes of lower two thoracic (T11, T12) and upper two lumbar (L1, L2) vertebrae
Insertion: Spinous processes of upper thoracic vertebrae (T1-T8)
Action: Extends vertebral column
Nerve: Dorsal primary divisions of spinal nerves

SPINALIS CERVICIS

Origin: Ligamentum nuchae, spinous process of seventh cervical vertebra
Insertion: Spinous process of axis
Action: Extends vertebral column
Nerve: Dorsal primary divisions of spinal nerves

SPINALIS CAPITIS

(Medial part of semispinalis capitis)

Trunk—dorsal view
TRANSVERSOSPINALIS*

SEMISPINALIS THORACIS
Origin Transverse processes of the sixth through tenth thoracic vertebrae (T6–T10)
Insertion Spinous processes of the lower two cervical (C6, C7) and upper four thoracic (T1–T4) vertebrae
Action Extends and rotates vertebral column
Nerve Dorsal primary divisions of spinal nerves

SEMISPINALIS CERVICIS
Origin Transverse processes of upper five or six thoracic vertebrae (T1–T6)
Insertion Spinous processes of second to fifth cervical vertebrae (C2–C5)
Action Extends and rotates vertebral column
Nerve Dorsal primary divisions of spinal nerves

SEMISPINALIS CAPITIS
(Medial part is semispinalis capitis)
Origin Transverse processes of lower four cervical (C4–C7) and upper six or seven thoracic (T1–T7) vertebrae
Insertion Between superior and inferior nuchal lines of occipital bone
Action Extends and rotates head
Nerve Dorsal primary divisions of spinal nerves

*The transversospinalis is composed of groups of small muscles generally extending upward from transverse processes to spinous processes of higher vertebrae. They are deep to erector spinae. They include semispinalis, multifidi, and rotatores.
MULTIFIDIS*

**Origin**
Sacral region—along sacral foramina up to posterior superior iliac spine
Lumbar region—mamillary processes\(^1\) of vertebrae
Thoracic region—transverse processes
Cervical region—articular processes of lower four vertebrae (C4–C7)

**Insertion**
Spinous process two to four vertebrae superior to origin

**Action**
Extend and rotate vertebral column

**Nerve**
Dorsal primary division of spinal nerves

*Part of transversospinalis.
\(^1\)Posterior border of superior articular process.
ROTATORES*

Origin: Transverse process of each vertebra
Insertion: Base of spinous process of next vertebra above
Action: Extend and rotate vertebral column
Nerve: Dorsal primary division of spinal nerves

*Part of transversospinalis.

Trunk—dorsal view
INTERSPINALES
(Paired on either side of interspinal ligament)

**Origin**
- Cervical region—spinous processes of third to seventh cervical vertebrae (C3–C7)
- Thoracic region—spinous processes of second to twelfth thoracic vertebrae (T2–T12)
- Lumbar region—spinous processes of second to fifth lumbar vertebrae (L2–L5)

**Insertion**
Spinous process of next vertebra superior to origin

**Action**
Extend vertebral column

**Nerve**
Dorsal primary division of spinal nerves

Trunk—dorsal view
INTERTRANSVERSARII

Cervical region

INTERTRANSVERSARII ANTERIORES

Origin: Anterior tubercle of transverse processes of vertebrae from first thoracic to axis
Insertion: Anterior tubercle of next superior vertebra
Action: Lateral flexion of vertebral column
Nerve: Ventral primary division of spinal nerves

INTERTRANSVERSARII POSTERIORES

Origin: Posterior tubercle of transverse processes of vertebrae from first thoracic to axis
Insertion: Posterior tubercle of next superior vertebra

Thoracic region

Origin: Transverse processes of first lumbar to eleventh thoracic vertebrae
Insertion: Transverse processes of next superior vertebra

Lumbar region

INTERTRANSVERSARII LATERALES

Origin: Transverse processes of lumbar vertebrae
Insertion: Transverse process of next superior vertebra
Action: Lateral flexion of vertebral column
Nerve: Ventral primary division of spinal nerves

INTERTRANSVERSARII MEDIALES

Origin: Mamillary process† of each lumbar vertebra
Insertion: Accessory process of the next superior lumbar vertebra
Action: Lateral flexion of vertebral column
Nerve: Dorsal primary division of spinal nerves

†Posterior border of superior articular process.
INTERCOSTALES EXTERNI
(External Intercostal)

Trunk—anterior view

**Origin**
Lower margin of upper eleven ribs
Superior border of rib below (each muscle fiber runs obliquely and inserts toward the costal cartilage)

**Insertion**

**Action**
Draw ventral part of ribs upward, increasing the volume of the thoracic cavity for inspiration

**Nerve**
Intercostal nerves
INTERCOSTALES INTERNI

(Internal Intercostal)

Trunk—anterior view

**Origin**  
From the cartilages to the angles of the upper eleven ribs

**Insertion**  
Superior border of the rib below (each muscle fiber runs obliquely and inserts away from the costal cartilage)

**Action**  
Draw ventral part of ribs downward, decreasing the volume of the thoracic cavity for expiration

**Nerve**  
Intercostal nerves
Subcostales

**Trunk—dorsal view**

**Origin**
- Inner surface of each rib near its angle

**Insertion**
- Medially on the inner surface of second or third rib below

**Action**
- Draw ventral part of ribs downward, decreasing the volume of the thoracic cavity for forceful expiration

**Nerve**
- Intercostal nerves

Note: These muscles are deep to the internal intercostals. They continue distally between single ribs, where they are known as innermost intercostal muscles.
**TRANSVERSUS THORACIS**

Trunk—anterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner surface of lower portion of sternum and adjacent costal cartilages</td>
<td>Draws ventral part of ribs downward, decreasing the volume of the thoracic cavity for forceful expiration</td>
<td>Intercostal nerves</td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td>Note: These muscles are deep to the internal intercostal muscles.</td>
</tr>
<tr>
<td>Inner surfaces of costal cartilages of the second through sixth ribs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Origin
Transverse processes of the seventh cervical and the upper eleven thoracic vertebrae

Insertion
Laterally to outer surface of next lower rib (lower muscles may cross over one rib)

Action
Raises ribs; extends, laterally flexes, and rotates vertebral column

Nerve
Intercostal nerves
SERRATUS POSTERIOR SUPERIOR

Trunk—dorsal view

**Origin**
Ligamentum nuchae, spinous processes of seventh cervical and first few thoracic vertebrae

**Insertion**
Upper borders of the second through fifth ribs lateral to their angles

**Action**
Raises ribs in inspiration

**Nerve**
T1–T4
SERRATUS POSTERIOR INFERIOR

Trunk—dorsal view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinous processes of the lower two thoracic and the upper two or three lumbar vertebrae</td>
<td>Pulls ribs down, resisting pull of diaphragm</td>
<td>T9–T12</td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower borders of bottom four ribs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Trunk—anterior view**
*(Lower costal cartilages removed)*

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternal part—inner part of xiphoid process</td>
<td>Fibers converge and meet on a central tendon</td>
</tr>
<tr>
<td>Costal part—inner surfaces of lower six ribs and their cartilages</td>
<td>Draws central tendon inferiorly</td>
</tr>
<tr>
<td>Lumbar part—upper two or three lumbar vertebrae and lateral and medial lumbocostal arches*</td>
<td>Phrenic nerve (C3–C5)</td>
</tr>
</tbody>
</table>

**Action**

Draws central tendon inferiorly

**Nerve**

Phrenic nerve (C3–C5)

*Note: This muscle inserts upon itself. Its action is to change the volume of the thoracic and abdominal cavities.*

*These tendinous structures, also known as the medial and lateral arcuate ligaments, allow the diaphragm to bridge the upper parts of the psoas major and quadratus lumborum muscles.*
OBLIQUUS EXTERNUS ABDOMINIS

(External Oblique)

Trunk—lateral view

**Origin**
Lower eight ribs

**Insertion**
Anterior part of iliac crest, abdominal aponeurosis to linea alba

**Action**
Compresses abdominal contents, laterally flexes and rotates vertebral column

**Nerve**
Eighth to twelfth intercostal, iliohypogastric, ilioinguinal nerves

**Relationships**
Most superficial of the three lateral abdominal muscles

Note: Important in forced expiration, coughing, sneezing.
**OBLIQUUS INTERNUS ABDOMINIS**  
*(Internal Oblique)*

**Trunk—lateral view**

**Origin**  
Lateral half of inguinal ligament, iliac crest, thoracolumbar fascia

**Insertion**  
Cartilage of bottom three or four ribs, abdominal aponeurosis to linea alba

**Action**  
Compresses abdominal contents, laterally flexes and rotates vertebral column

**Nerve**  
Eighth to twelfth intercostal, iliohypogastric, ilioinguinal nerves

**Relationships**  
Middle layer of the three lateral abdominal muscles

**Note:** Important in forced expiration, coughing, sneezing.
CREMASTER

Trunk—anterior view

**Origin**
- Inguinal ligament
- Pubic tubercle, crest of pubis, sheath of rectus abdominis

**Insertion**

**Action**
Pulls testes toward body

**Nerve**
Genital branch of genitofemoral nerve

Note: The cremaster regulates the temperature of the testes, which is important for spermatogenesis.
**Transversus Abdominis**

**Trunk—lateral view**

**Origin**
Lateral part of inguinal ligament, iliac crest, thoracolumbar fascia, cartilage of lower six ribs

**Insertion**
Abdominal aponeurosis to linea alba

**Action**
Compresses abdomen

**Nerve**
Seventh to twelfth intercostal, iliohypogastric, ilioinguinal nerves

**Relationships**
Deepest of the three lateral abdominal muscles

Note: Important in forced expiration, coughing, sneezing.
RECTUS ABDOMINIS*

**Origin**  
Crest of pubis, pubic symphysis

**Insertion**  
Cartilage of fifth, sixth, and seventh ribs, xiphoid process

**Action**  
Flexes vertebral column, compresses abdomen

**Nerve**  
Seventh through twelfth intercostal nerves

*Tendinous bands divide each rectus into three or four bellies. Each rectus is sheathed in aponeurotic fibers from the lateral abdominal muscles. These fibers meet centrally to form the linea alba.

Note: The pyramidalis is a small, unimportant muscle that extends from the ventral surface of the pubis to the lower part of the linea alba. It is frequently absent.

Trunk—anterior view
ABDOMINAL MUSCLES

Trunk—anterior and cross-sectional views

1. Obliquus externus abdominis
2. Obliquus internus abdominis
3. Transversus abdominis
4. Rectus abdominis
5. Linea alba

Note: The aponeuroses (tendons) of the three lateral abdominal muscles join to form the fascial sheath surrounding the rectus abdominis.
QUADRATUS LUMBORUM

Lower trunk—anterior view

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Iliolumbar ligament, iliac crest</th>
<th><strong>Action</strong></th>
<th>Laterally flexes vertebral column, fixes ribs for forced expiration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Twelfth rib, transverse processes of upper four lumbar vertebrae</td>
<td><strong>Nerve</strong></td>
<td>T12, L1</td>
</tr>
</tbody>
</table>

Note: Fixation of the ribs may provide a stable attachment of the diaphragm for voice control in singers.
PECTORALIS MAJOR

Anterior view

Origin
Clavicular part—medial half of the clavicle
Sternocostal part—sternum, upper six costal cartilages, aponeurosis of external oblique

Insertion
Lateral lip of intertubercular (bicipital) groove of humerus, crest below greater tubercle of the humerus

Action
Both parts adduct, medially rotate arm; clavicular part flexes arm from full extension; sternocostal part extends the flexed arm

Nerve
Medial and lateral pectoral nerves (C5–C8, T1)
**PECTORALIS MINOR**

### Anterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Nerve</th>
<th>Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>External surfaces of the third, fourth, and fifth ribs</td>
<td>Medial pectoral nerve (C8, T1)</td>
<td>Deep to pectoralis major</td>
</tr>
<tr>
<td>Coreacoid process of the scapula</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draws scapula forward and downward, raises ribs* in forced inspiration</td>
<td>*Raising the ribs requires stabilization of the scapula by the rhomboids and trapezius.</td>
<td></td>
</tr>
</tbody>
</table>
SUBCLAVIUS

Anterior view

**Origin**
Junction of the first rib with its costal cartilage

**Insertion**
Groove on the inferior (lower) surface of the clavicle

**Action**
Depresses clavicle, draws shoulder forward and downward, steadies clavicle during movements of shoulder girdle

**Nerve**
C5, C6
CORACOBRACHIALIS

Anterior view

**Origin**  
Tip (apex) of the coracoid process of scapula

**Insertion**  
Middle third of the medial surface and border of the humerus

**Action**  
Weakly adducts arm (flexion unsubstantiated), aids in stabilizing humerus

**Nerve**  
Musculocutaneous nerve (C6, C7)

**Relationships**  
Deep to short head of biceps
BICEPS BRACHII

Anterior view

**Origin**
- Long head—supraglenoid tubercle of scapula
- Short head—coracoid process of scapula

**Insertion**
- Tuberosity of radius, bicipital aponeurosis into deep fascia on medial part of forearm

**Action**
- Supinates forearm, flexes forearm, weakly flexes arm at shoulder

**Nerve**
- Musculocutaneous nerve (C5, C6)

**Relationships**
- Long head passes through intertubercular (bicipital) groove, then inside glenohumeral joint capsule
**BRACHIALIS**

**Anterior view**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior of lower half of humerus</td>
<td>Flexes forearm</td>
</tr>
<tr>
<td>Coronoid process of ulna, tuberosity of ulna</td>
<td>Musculocutaneous nerve (C5, C6)</td>
</tr>
</tbody>
</table>

**Nerve**

Musculocutaneous nerve (C5, C6)

**Relationships**

Deep to biceps brachii
MUSCLES OF THE ANTERIOR CHEST AND ARM

Shoulder—anteri or view

1. Pectoralis major (cut)
2. Pectoralis minor
3. Coracobrachialis
4. Biceps brachii
5. Brachialis
TRAPEZIUS

Posterior view

**Origin**
Medial third of superior nuchal line, external occipital protuberance, ligamentum nuchae, spinous processes and supraspinous ligaments of seventh cervical and all thoracic vertebrae

**Insertion**
Upper part—lateral third of clavicle
Middle part—acromion and crest of spine of scapula
Lower part—medial portion of crest of spine of scapula (tubercle)

**Action**
Upper part elevates scapula,* middle part retracts (adducts) scapula, lower part depresses scapula, upper and lower parts together rotate scapula (important in elevating arm)

**Nerve**
Accessory (eleventh cranial), C3, C4

**Relationships**
Most superficial muscle of back

*Upper part stabilizes scapula against downward rotation, as when weight is carried in the hand.*
### LATISSIMUS DORSI

**Posterior view**

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Spinous processes of the lower six thoracic vertebrae, lumbar vertebrae, sacral vertebrae, supraspinal ligament, and posterior part of the iliac crest through the lumbar (thoracolumbar) fascia, lower three or four ribs, inferior angle of the scapula</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Floor (bottom) of the bicipital groove of humerus</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Extends, adducts, and medially rotates the arm, draws the shoulder downward and backward, keeps inferior angle of scapula against the chest wall, accessory muscle of respiration</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td>Thoracodorsal nerve (C6–C8)</td>
</tr>
</tbody>
</table>

Note: This muscle is used for the crawl stroke in swimming.
LEVATOR SCAPULAE

Posterior view

**Origin**
Posterior tubercles of the transverse processes of the first four cervical vertebrae

**Insertion**
Vertebral (medial) border of the scapula at and above the spine

**Action**
Elevates medial border of scapula, rotates scapula to lower the lateral angle, acts with trapezius and rhomboids to pull scapula medially and upward, bends neck laterally

**Nerve**
Dorsal scapular nerve (C5)
RHOMBOIDEUS MAJOR

Posterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Spines of the second to fifth thoracic vertebrae, supraspinous ligament</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Medial border of the scapula below the spine</td>
</tr>
<tr>
<td>Action</td>
<td>Retracts and stabilizes scapula, elevates the medial border of the scapula causing downward rotation, assists in adduction of arm</td>
</tr>
<tr>
<td>Nerve</td>
<td>Dorsal scapular nerve (C5)</td>
</tr>
</tbody>
</table>
RHOMBOIDEUS MINOR

Posterior view

**Origin**
Spines of the seventh cervical and first thoracic vertebrae, lower part of the ligamentum nuchae

**Insertion**
Medial border of the scapula at the root of the spine

**Action**
Retracts and stabilizes scapula, elevates the medial border of the scapula, rotates the scapula to depress the lateral angle (assists in adduction of arm)

**Nerve**
Dorsal scapular nerve (C5)
SERRATUS ANTERIOR

**Origin**
Outer surfaces and superior borders of first eight or nine ribs, and fascia covering first intercostal space

**Insertion**
Anterior surface (costal surface) of the medial border of the scapula

**Action**
Rotates scapula for abduction and flexion of arm, protracts scapula

**Nerve**
Long thoracic nerve (C5–C7)

**Relationships**
Serratus anterior and rhomboids both insert on the medial border of scapula; they are antagonists causing protraction and retraction

Lateral view
**DELTOIDEUS**

**Origin**
- Anterior portion—anterior border and superior surface of the lateral third of the clavicle
- Middle portion—lateral border of the acromion process
- Posterior portion—lower border of the crest of the spine of the scapula

**Insertion**
- Deltoid tuberosity, on the middle of the lateral surface of the shaft of the humerus

**Action**
- Anterior portion—flexes and medially rotates arm
- Middle portion—abducts arm
- Posterior portion—extends and laterally rotates arm

**Nerve**
- Axillary nerve (C5, C6)

*Lateral view*
SUPRASPINATUS
(Rotator cuff*)

**Origin**
Supraspinous fossa of scapula

**Insertion**
Upper part of the greater tuberosity of the humerus, capsule of the shoulder joint

**Action**
Aids deltoid in abduction of arm, draws humerus toward glenoid fossa preventing deltoid from forcing humerus up against acromion, weakly flexes arm

**Nerve**
Suprascapular nerve (C5)

*Supraspinatus, infraspinatus, teres minor, and subscapularis together are called the rotator cuff. They prevent the larger muscles from dislocating the humerus during their actions.*
INFRASPINATUS
(Rotator cuff)

<table>
<thead>
<tr>
<th>Origin</th>
<th>Infraspinous fossa of the scapula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Middle facet of the greater tuberosity of the humerus, capsule of the shoulder joint</td>
</tr>
<tr>
<td>Action</td>
<td>Draws humerus toward glenoid fossa thus resisting posterior dislocation of arm, as in crawling; laterally rotates; abducts arm</td>
</tr>
<tr>
<td>Nerve</td>
<td>Suprascapular nerve (C5, C6)</td>
</tr>
</tbody>
</table>

Lateral view
TERES MINOR
(Rotator cuff)

**Origin**
Upper two-thirds of the dorsal surface of the axillary border of the scapula

**Insertion**
The capsule of the shoulder joint, the lower facet of the greater tuberosity of the humerus

**Action**
Laterally rotates arm, weakly adducts arm, draws humerus toward glenoid fossa

**Nerve**
Axillary nerve (C5)
SUBSCAPULARIS
(Rotator cuff)

Anterior view
(Upper ribs cut away)

**Origin**  
Subscapular fossa on the anterior surface of scapula

**Insertion**  
Lesser tuberosity of the humerus, ventral part of the capsule of the shoulder joint

**Action**  
Medially rotates arm, stabilizes glenohumeral joint

**Nerve**  
Upper and lower subscapular nerves (C5, C6)
**TERES MAJOR**

**Posterior view**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Lower third of the posterior surface of the lateral border of the scapula, near the inferior angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Medial lip of the bicipital groove of the humerus</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Medially rotates arm, adducts arm, extends arm</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td>Lower subscapular nerve (C5, C6)</td>
</tr>
</tbody>
</table>
TRICEPS BRACHII

Posterior view

**Origin**
- Long head—infrafraglenoid tubercle of the scapula
- Lateral head—upper half of the posterior surface of the shaft of the humerus
- Medial head—posterior surface of the lower half of the shaft of the humerus

**Insertion**
- Posterior part of olecranon process of the ulna

**Action**
- Extends forearm, long head aids in adduction if arm is abducted

**Nerve**
- Radial nerve (C7, C8)

*Note:* The radial nerve comes from the axilla (armpit) and passes along the humerus between the medial and lateral heads. Because of its position, it is the most commonly injured peripheral nerve.
**ANCONEUS**

**Posterior view of arm**

**Origin**  
Posterior part of lateral epicondyle of the humerus

**Insertion**  
Lateral surface of the olecranon process and posterior surface of ulna

**Action**  
Extends forearm (assists triceps)

**Nerve**  
Radial nerve (C7, C8)
POSTERIOR BACK, SHOULDER, AND ARM MUSCLES

Trunk—dorsal view

Superficial layer

1. Trapezius
2. Latissimus dorsi

Deep layer

3. Levator scapulae
4. Rhomboideus minor
5. Rhomboideus major
6. Supraspinatus (rotator cuff)
7. Infraspinatus (rotator cuff)
8. Teres minor (rotator cuff)
9. Teres major
10. Serratus anterior

Posterior arm

11. Triceps brachii
CHAPTER SEVEN
MUSCLES OF THE FOREARM AND HAND
PRONATOR TERES
(Superficial group)

Origin
Humeral head—medial
supracondylar ridge and medial
epicondyle of the humerus
Ulnar head—medial border of the
coronoid process of the ulna

Insertion
Middle of lateral surface of the radius
(pronator tuberosity)

Action
Pronates and flexes forearm

Nerve
Median nerve (C6, C7)
FLEXOR CARPI RADIALIS
(Superficial group)

**Origin**
Medial epicondyle of the humerus through the common tendon

**Insertion**
Front of the bases of the second and third metacarpal bones

**Action**
Flexes hand, synergist in abduction with extensor carpi radialis longus and brevis

**Nerve**
Median nerve (C6, C7)

Forearm—anterior view
PALMARIS LONGUS
(Superficial group)

**Origin**
Medial epicondyle of the humerus through the common tendon

**Insertion**
Front (central part) of the flexor retinaculum and apex of the palmar aponeurosis

**Action**
Flexes the hand

**Nerve**
Median nerve (C6, C7)

Note: This muscle is absent in about 14% of limbs.

Williams & Wilkins, Baltimore, 1991.
**FLEXOR CARPI ULNARIS**

*(Superficial group)*

**Origin**  
Humeral head—medial epicondyle of the humerus through the common tendon  
Ulnar head—medial margin of olecranon process of ulna, dorsal border of shaft of the ulna

**Insertion**  
Pisiform bone, hook of the hamate, and base of the fifth metacarpal bone

**Action**  
Flexes hand, synergist in adduction of hand with extensor carpi ulnaris

**Nerve**  
Ulnar nerve (C8, T1)

Forearm—anterior view
MUSCLES OF THE WRIST

1. Pronator teres
2. Flexor carpi radialis
3. Palmaris longus
4. Flexor carpi ulnaris
5. Flexor retinaculum
6. Palmar aponeurosis

Forearm—anterior view
FLEXOR DIGITORUM SUPERFICIALIS

Origin
Humeroulnar head—medial epicondyle of the humerus through common tendon,* medial margin of the coronoid process of ulna
Radial head—anterior surface of shaft of radius

Insertion
Four tendons divide into two slips each, slips insert into the sides (margins of the anterior surfaces) of the middle phalanges of four fingers

Action
Flexes the middle phalanges of the fingers

Nerve
Median nerve (C7, C8, T1)

Relationships
Deep to superficial flexors

*See superficial flexors.
**FLEXOR DIGITORUM PROFUNDUS**

**Origin**
Upper three-fourths of anterior and medial surfaces of shaft of ulna and medial side of the coronoid process, interosseous membrane

**Insertion**
Front of base of distal phalanges of fingers

**Action**
- Flexes distal phalanges

**Nerve**
- Ulnar nerve supplies the medial half of the muscle (going to the little and ring fingers) (C8, T1)
- Anterior interosseous branch of median nerve supplies lateral half (going to index and middle fingers) (C8, T1)

**Relationships**
Deep to flexor digitorum superficialis

Note: Both flexor digitorum muscles and the median nerve pass under the flexor retinaculum (page 10) in the wrist. When irritated, the synovial sheaths of these muscles can compress the median nerve, causing the sensory and motor deficits known as carpal tunnel syndrome.

Forearm—anterior view
**FLEXOR POLLICIS LONGUS**

**Origin**
Middle of anterior surface of shaft of radius, interosseous membrane, medial epicondyle of humerus, and often coronoid process of ulna

**Insertion**
Palmar aspect of base of the distal phalanx of thumb

**Action**
Flexes the thumb

**Nerve**
Anterior interosseous branch of median nerve (C8, T1)

**Forearm—anterior view**
FLEXORS OF THE FINGERS

1. Flexor digitorum superficialis (cut)
2. Flexor digitorum profundus
3. Flexor pollicis longus

Note: The tendons of flexor digitorum superficialis split and attach to the middle phalanx. The tendons of flexor digitorum profundus pass through this split and continue to the distal phalanx.
**PRONATOR QUADRATUS**

**Origin**  
Anterior surface of distal part of shaft of ulna

**Insertion**  
Lower portion of anterior surface of shaft of radius, distal part of lateral border of radius

**Action**  
Pronates forearm and hand

**Nerve**  
Anterior interosseous branch of median nerve (C8, T1)

**Relationships**  
Deepest forearm muscle

*Forearm—anterior view*
BRACHIORADIALIS

Forearm—dorsal view

Origin
Upper two-thirds of lateral supracondylar ridge of humerus

Insertion
Base of styloid process and lateral surface of radius

Action
Flexes forearm

Nerve
Radial nerve (C5, C6)
EXTENSOR CARPI RADIALIS LONGUS

Forearm—dorsal view

**Origin**
Lower third of lateral supracondylar ridge of humerus

**Insertion**
Dorsal surface of the base of the second metacarpal bone

**Action**
Extends hand, synergist in abduction of hand with flexor carpi radialis

**Nerve**
Radial nerve (C6, C7)
EXTENSOR CARPI RADIALIS BREVIS

Forearm—dorsal view

**Origin**
Lateral epicondyle of humerus
Dorsal surface of third metacarpal bone

**Action**
Extends hand, synergist in abduction of hand with flexor carpi radialis

**Nerve**
Radial nerve (C6, C7)
**EXTENSOR DIGITORUM COMMUNIS**

**Forearm and hand—dorsal view**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Nerve</th>
<th>Relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common tendon attached to lateral epicondyle of humerus</td>
<td>Deep branch of radial nerve (C6–C8)</td>
<td>Tends to hyperextend the metacarpophalangeal joint causing &quot;claw hand&quot;; its action is balanced by the lumbricales and interossei</td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral and dorsal surfaces of all the phalanges of the four fingers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extends the fingers and wrist</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Forearm and hand—dorsal view

**Action**
Extends fifth finger

**Nerve**
Radial nerve (C6-C8)

**Origin**
Common tendon attached to lateral epicondyle of humerus

**Insertion**
Dorsal surface of base of first phalanx of fifth finger
**EXTENSOR CARPI ULNARIS**

Forearm and hand—dorsal view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common tendon attached to lateral epicondyle of humerus</td>
<td>Extends hand, synergist in adduction of hand with flexor carpi ulnaris</td>
<td>Radial nerve (C6–C8)</td>
</tr>
<tr>
<td>Dorsal surface of base of fifth metacarpal bone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SUPINATOR

Origin
Lateral epicondyle of humerus,
lateral ligament (radial collateral) of
earbow, annular ligament of superior
radioulnar joint, supinator crest of
ulna

Insertion
Dorsal and lateral surfaces of upper
third of radius

Action
Supinates forearm

Nerve
Radial nerve (C6)

Forearm and hand—
anterior view
ABDUCTOR POLLICIS LONGUS

Forearm and hand—dorsal view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posterior (dorsal) surface of shaft of radius, ulna, interosseous membrane</td>
<td>Abducts, laterally rotates, and extends thumb; abducts wrist</td>
<td>Radial nerve (C6, C7)</td>
</tr>
<tr>
<td>Dorsal surface of base of first metacarpal bone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EXTENSOR POLLICIS BREVIS

Forearm and hand—dorsal view

In

Dorsal surface of radius, adjacent part of interosseous membrane

Action

Extends thumb, abducts hand

Nerve

Radial nerve (C6, C7)
EXTENSOR POLLICIS LONGUS

Forearm and hand—dorsal view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Middle third of dorsal surface of ulna, interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Base of distal phalanx of thumb</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>Extends thumb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nerve</td>
<td>Radial nerve (C6–C8)</td>
</tr>
</tbody>
</table>
EXTENSORS OF THE THUMB

Forearm—posterior view

1. Abductor pollicis longus
2. Extensor pollicis brevis
3. Extensor pollicis longus
EXTENSOR INDICIS

Forearm and hand—dorsal view

**Origin**  Posterior surface of ulna and adjacent part of interosseous membrane

**Insertion**  Extensor expansion on dorsal surface of proximal phalanx of index finger

**Action**  Extends index finger

**Nerve**  Radial nerve (C6–C8)
Hand—palmar view

**Origin**
- Flexor retinaculum, palmar aponeurosis

**Insertion**
- Skin of the palm

**Action**
- Corrugates skin of palm

**Nerve**
- Ulnar nerve (C8)
ABDUCTOR POLLICIS BREVIS

(Thenar eminence)

Hand—palmar view

**Origin**
- Tubercle of scaphoid, tubercle of trapezium, flexor retinaculum

**Insertion**
- Base of proximal phalanx of thumb

**Action**
- Abducts thumb and moves it anteriorly, acts together with other muscles of thenar eminence to oppose thumb to other fingers

**Nerve**
- Median (C6, C7)

Note: The abductor pollicis brevis, flexor pollicis brevis, and opponens pollicis form the thenar eminence at the base of the thumb.
FLEXOR POLLICIS BREVIS
(Thenar eminence)

Hand—palmar view

Origin: Flexor retinaculum and trapezium, and first metacarpal bone
Insertion: Base of proximal phalanx of thumb

Action: Flexes metacarpophalangeal joint of thumb, assists in abduction and rotation of thumb, acts together with other muscles of thenar eminence to oppose thumb to other fingers

Nerve: Lateral portion—median nerve (C6, C7)
Medical portion—ulnar nerve (C8, T1)
OPPONENS POLLICIS
(Thenar eminence)

Hand—palmar view

**Origin**
Flexor retinaculum, tubercle of trapezium

**Insertion**
Lateral border of first metacarpal bone

**Action**
Rotates thumb into opposition with fingers, acts together with other muscles of thenar eminence to oppose thumb to other fingers

**Nerve**
Median nerve (C6, C7)
ADDUCTOR POLLICIS

Hand—palmar view

**Origin**
- Oblique head—anterior surfaces of second and third metacarpals, capitate, trapezoid
- Transverse head—anterior surface of third metacarpal bone

**Insertion**
- Medial side of base of proximal phalanx of the thumb

**Action**
- Adducts thumb

**Nerve**
- Ulnar nerve (C8, T1)
ABDUCTOR DIGITI MINIMI

(Hypothenar eminence)

Hand—palmar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pisiform bone, tendon of flexor carpi ulnaris</td>
<td>Abducts fifth finger</td>
<td>Ulnar nerve (C8, T1)</td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td>Note: The hypothenar eminence is less prominent than the thenar eminence, and the fifth finger obviously cannot oppose the other digits.</td>
</tr>
</tbody>
</table>
FLEXOR DIGITI MINIMI BREVIS
(Hypothenar eminence)

Hand—palmar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior surface of flexor</td>
<td>Flexes fifth finger at metacarpophalangeal</td>
<td>Ulnar nerve (C8, T1)</td>
</tr>
<tr>
<td>retinaculum, hook of hamate</td>
<td>joint</td>
<td></td>
</tr>
<tr>
<td>insertion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medial side of base of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>proximal phalanx of fifth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>finger</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OPPONENTS DIGITI MINIMI

(Hypothenar eminence)

Hand—palmar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior surface of flexor retinaculum, hook of hamate</td>
<td>Rotates fifth metacarpal bone, draws fifth metacarpal bone forward, assists flexor digiti minimi brevis in flexing carpometacarpal joint of fifth finger</td>
<td>Ulnar nerve (C8, T1)</td>
</tr>
<tr>
<td>Whole length of medial border of fifth metacarpal bone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LUMBRICALES*

(Four muscles)

Hand—palmar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendons of flexor digitorum profundus in palm</td>
<td>Lateral lumbricals (first and second)—median nerve (C6, C7)</td>
</tr>
<tr>
<td>Insertion</td>
<td>Medial lumbricals (third and fourth)—ulnar nerve (C8)</td>
</tr>
<tr>
<td>Lateral side of corresponding tendon of extensor digitorum on fingers</td>
<td>Relationships</td>
</tr>
<tr>
<td>Action</td>
<td></td>
</tr>
<tr>
<td>Extend fingers at interphalangeal joints, weakly flex fingers at metacarpophalangeal joints</td>
<td></td>
</tr>
</tbody>
</table>

*Associated with the tendons of flexor digitorum profundus.
## PALMAR INTEROSSEI

**Hand—palmar view**

| **Origin** | First—medial side of base of first metacarpal bone  
Second, third, and fourth—anterior surfaces of second, fourth, and fifth metacarpal bones |
|------------|---------------------------------------------------------------------|
| **Insertion** | First—medial side of base of proximal phalanx of thumb  
Second—medial side of base of proximal phalanx of index finger  
Third and fourth—lateral side of proximal phalanges of ring finger and fifth finger |
| **Action** | Adduct fingers toward center of third finger at metacarpophalangeal joints, assist in flexion of fingers at metacarpophalangeal joints |
| **Nerve** | Ulnar nerve (C8, T1) |

Note: The palmar interosseus of the thumb, called the palmar interosseus of Henle, is usually absent.
DORSAL INTEROSSEI

Hand—palmar view

**Origin**
By two heads from adjacent sides of first and second, second and third, third and fourth, and fourth and fifth metacarpal bones

**Insertion**
First—lateral side of base of proximal phalanx of index finger
Second—lateral side of base of proximal phalanx of middle finger

**Action**
Third—medial side of base of proximal phalanx of middle finger
Fourth—medial side of base of proximal phalanx of ring finger
Abduct fingers away from center of third finger at metacarpophalangeal joints, assist in flexion of fingers at metacarpophalangeal joints

**Nerve**
Ulnar nerve (C8, T1)
**Psoas Major**

*Part of iliopsoas*

**Lumbar region, hip, and thigh—anterior view**

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th><strong>Action</strong></th>
<th><strong>Nerve</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bases of transverse processes of all lumbar vertebrae, bodies of twelfth thoracic and all lumbar vertebrae, intervertebral disks above each lumbar vertebra</td>
<td>Flexes thigh at hip joint, flexes vertebral column</td>
<td>Branches from lumbar plexus (L2, L3) and sometimes L1 or L4</td>
</tr>
</tbody>
</table>

Note: Some upper fibers insert onto the hip bone from the arcuate line to the iliopubic eminence to form the psoas minor. This muscle has little function and is frequently absent.
**ILIACUS**

*(Part of iliopsoas)*

---

**Lumbar region, hip, and thigh—anterior view**

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Upper two-thirds of iliac fossa, ala of sacrum and adjacent ligaments, anterior inferior iliac spine</th>
</tr>
</thead>
</table>

| **Insertion** | Onto tendon of psoas major, which continues into lesser trochanter of femur (together the two muscles form the iliopsoas) |

| **Action** | Flexes thigh at hip joint |

| **Nerve** | Femoral nerve (L2, L3) |

*Note: The iliacus brings swinging leg forward in walking or running.*
HIP AND THIGH—ANTERIOR VIEW

**Origin**
Internal surface of sacrum, sacrotuberous ligament

**Insertion**
Upper border of greater trochanter

**Action**
Laterally rotates thigh at hip joint, abducts thigh

**Nerve**
Anterior rami of first and second sacral nerves

Note: The common peroneal part of the sciatic nerve may emerge through the belly of the piriformis instead of below its inferior border along with the tibial part.
OBTURATOR INTERNUS

Hip—posterior view

**Origin**
Pelvic surface of obturator membrane and surrounding bones (ilium, ischium, pubis)

**Insertion**
Common tendon with superior and inferior gemelli to medial surface of greater trochanter

**Action**
Laterally rotates thigh at hip joint

**Nerve**
Nerve from sacral plexus (L₅, S₁–S₃)
**GEMELLUS SUPERIOR**

**Hip—posterior view**

**Origin**
Spine of ischium

**Insertion**
With tendon of obturator internus into upper border of greater trochanter

**Action**
Laterally rotates thigh at hip joint

**Nerve**
Branch of nerve to obturator internus from sacral plexus
GEMELLUS INFERIOR

Hip—posterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper margin of ischial tuberosity</td>
<td>With tendon of obturator internus into upper border of greater trochanter</td>
<td>Laterally rotates thigh at hip joint</td>
<td>Branch of nerve to quadratus femoris from sacral plexus</td>
</tr>
</tbody>
</table>
**OBTURATOR EXTERNUS**

**Hip and thigh—anterior view**

**Origin**
Outer surface of superior and inferior rami of pubis and ramus of ischium surrounding obturator foramen

**Insertion**
Trochanteric fossa of femur

**Action**
Laterally rotates thigh

**Nerve**
Obturator nerve (L3, L4)

Note: Part of this muscle can be seen posteriorly by separating the gemellus inferior and quadratus femoris. It is deep within this cleft.
QUADRATUS FEMORIS

Hip and thigh—posterior view

**Origin**
Lateral border of ischial tuberosity
Below intertrochanteric crest
(quadrat line)

**Insertion**

**Action**
Laterally rotates thigh at hip joint

**Nerve**
Branch from sacral plexus (L5, S1)
**GLUTEUS MAXIMUS**

**Hip and thigh—lateral view**

- **Origin**: Outer surface of ilium behind posterior gluteal line, adjacent posterior surface of sacrum and coccyx, sacrotuberous ligament, aponeurosis of erector spinae (sacrospinalis)
- **Action**: Upper part—abducts, laterally rotates thigh
  Lower part—extends, laterally rotates thigh, extends trunk, assists in adduction of thigh
- **Nerve**: Inferior gluteal nerve (L5, S1, S2)

Note: This is not a postural muscle; it is not used in walking but only in forceful extension, as in running, climbing, or rising from a seated position.
# Hip and thigh—lateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer surface of ilium</td>
<td>Abducts femur at hip joint and</td>
<td>Superior gluteal nerve (L4, L5, S1)</td>
</tr>
<tr>
<td>inferior to iliac</td>
<td>rotates thigh medially</td>
<td></td>
</tr>
<tr>
<td>crest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral surface of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>greater trochanter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: In locomotion, this muscle (along with the gluteus minimus) prevents the pelvis from dropping (adduction of thigh) toward the opposite swinging leg.
GLUTEUS MINIMUS

Hip and thigh—lateral view

**Origin**
Outer surface of ilium between middle (anterior) and inferior gluteal lines

**Action**
Abducts femur at hip joint and rotates thigh medially

**Nerve**
Superior gluteal nerve (L4, L5, S1)

Note: See note on gluteus medius.
MUSCLES OF THE HIP

1. Gluteus maximus (cut)
2. Gluteus medius
3. Piriformis
4. Gemellus superior
5. Obturator internus
6. Gemellus inferior
7. Obturator externus
8. Quadratus femoris
9. Sciatic nerver

Note: Gemellus inferior and quadratus femoris have been shown separated to expose the deeply placed obturator externus.
TENSOR FASCIAE LATAE

**Origin**
Outer edge of iliac crest between anterior superior iliac spine and iliac tubercle

**Insertion**
Iliotibial tract on upper part of thigh

**Action**
Flexes, abducts thigh

**Nerve**
Superior gluteal nerve (L4, L5, S1)

*Note:* This muscle, along with gluteus maximus, draws the fascia lata upward, stabilizing the knee.

**Hip and thigh—lateral view**
SARTORIUS

**Origin**  
Anterior superior iliac spine and area immediately below it

**Insertion**  
Upper part of medial surface of shaft of tibia

**Action**  
Flexes, abducts, and laterally rotates thigh at hip joint, flexes and slightly medially rotates leg at knee joint after flexion

**Nerve**  
Femoral nerve (L2, L3)

**Relationships**  
Insertions of sartorius, gracilis, and semitendinosus fuse on the medial tibia; these tendons, called the pes anserinus (goose foot), give medial support to the knee

Note: This muscle is used to bring swinging leg forward in walking and running.
RECTUS FEMORIS
(One of quadriceps femoris)

Origin
- Anterior head—anterior inferior iliac spine
- Posterior head—ilium above acetabulum

Insertion
- Patella, then by patellar ligament to tuberosity of the tibia

Action
- Extends leg at knee joint, flexes thigh at hip joint

Nerve
- Femoral nerve (L2–L4)

Note: This muscle is used when thigh flexion and leg extension are needed together, such as in kicking a football. In walking, the quadriceps prevent the knee from flexing during heel strike and early support phase.
VASTUS LATERALIS
(One of quadriceps femoris)

Origin
Intertrochanteric line, inferior border of greater trochanter, gluteal tuberosity, lateral lip of linea aspera of femur

Insertion
Lateral margin of patella, then by patellar ligament to tuberosity of tibia

Action
Extends leg at knee joint

Nerve
Femoral nerve (L2–L4)

Hip, thigh, and leg—anterior view
VASTUS MEDIALIS
(One of quadriceps femoris)

Origin
Intertrochanteric line, medial lip of linea aspera of femur, medial intermuscular septum, medial supracondylar line

Insertion
Medial border of the patella, then by patellar ligament into tibial tuberosity, medial condyle of tibia

Action
Extends leg at knee joint

Nerve
Femoral nerve (L2–L4)

Hip, thigh, and leg—anterior view
VASTUS INTERMEDIUS
(One of quadriceps femoris)

Origin: Anterior and lateral surfaces of upper two-thirds of femur, lateral intermuscular septum, linea aspera, lateral supracondylar line

Insertion: Deep aspect of quadriceps tendon, then through patella to tibial tuberosity

Action: Extends leg at knee joint

Nerve: Femoral nerve (L2–L4)

Note: A few bundles of fibers from this muscle insert onto the upper part of the joint capsule of the knee. They probably draw the capsule superiorly during extension of the leg, preventing it from binding in the joint. They are called articularis genus.

Hip, thigh, and leg—anterior view
MUSCLES OF THE ANTERIOR THIGH

1. Tensor fasciae latae
2. Iliotibial tract
3. Vastus lateralis (quadriceps femoris)
4. Vastus intermedius (quadriceps femoris)
5. Rectus femoris (cut) (quadriceps femoris)
6. Sartorius
7. Vastus medialis (quadriceps femoris)

Hip and thigh—anterior view
BICEPS FEMORIS
(Part of hamstrings)

Hip and thigh—posterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long head—ischial tuberosity, sacrotuberous ligament</td>
<td>Long head—tibial part of sciatic nerve (S1–S3)</td>
</tr>
<tr>
<td>Short head—linea aspera, lateral supracondylar ridge, lateral intermuscular septum</td>
<td>Short head—common peroneal part of sciatic nerve (L5, S1, S2)</td>
</tr>
</tbody>
</table>

Insertion: Lateral side of head of fibula and lateral condyle of tibia
Action: Flexes leg at knee joint, long head also extends thigh at hip joint

Note: During walking or running, the hamstrings are used to slow down the leg at the end of its swing and prevent the trunk from flexing at the hip. They are susceptible to being strained by resisting the momentum of these body parts.
SEMINTENDINOSUS
(Part of hamstrings)

Hip and thigh—posterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Ischial tuberosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Medial surface of shaft of tibia</td>
</tr>
<tr>
<td>Action</td>
<td>Flexes and slightly medially rotates leg at knee joint after flexion, extends thigh at hip joint</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Tibial portion of sciatic nerve (L5, S1, S2)</th>
</tr>
</thead>
</table>

Note: See note on biceps femoris and Relationships section on sartorius.
SEMIMEMBRANOSUS

*Part of hamstrings*

**Hip and thigh—posterior view**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Ischial tuberosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Posterior part of medial condyle of tibia</td>
</tr>
<tr>
<td>Action</td>
<td>Flexes and slightly medially rotates leg at knee joint after flexion, extends thigh at hip joint</td>
</tr>
</tbody>
</table>

**Nerve**

Tibial portion of sciatic nerve (L5, S1, S2)

Note: See note on biceps femoris.
HAMSTRING MUSCLES

1. Sciatic nerve
2. Quadratus femoris
3. Biceps femoris
4. Semimembranosus
5. Semitendinosus
6. Tibial nerve
7. Common peroneal nerve

Note: The common peroneal nerve is exposed to compression and damage as it passes over the head of the fibula. The quadratus femoris, a lateral rotator, is included for reference.
GRACILIS

Origin          Lower margin of body and inferior ramus of pubis
Insertion      Upper part of medial surface of shaft of tibia
Action          Adducts thigh at hip joint and flexes leg at knee joint; with leg flexed, assists in medial rotation
Nerve           Obturator nerve (L3, L4)

Note: See Relationships section on sartorius.

Hip and thigh—anterior view
PECTINEUS

Origin  Pectineal line on superior ramus of pubis
Insertion  From lesser trochanter to linea aspera of femur
Action  Flexes thigh, assists in adduction when hip is flexed
Nerve  Femoral nerve (L2–L4), (sometimes a branch of obturator nerve)

Note: The rotating function of this and other hip muscles is controversial and probably depends on whether the hip is flexed or extended and adducted or abducted.
ADDUCTOR LONGUS

Hip and thigh—posterior view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior of body of pubis</td>
<td>Medial lip of linea aspera</td>
<td>Adducts, flexes thigh, assists in medial rotation</td>
<td>Obturator nerve (L3, L4)</td>
</tr>
</tbody>
</table>
ADDUCTOR BREVIS

Hip and thigh—posterior view

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Outer surface of inferior ramus of pubis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>From below lesser trochanter to linea aspera and into proximal part of linea aspera</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Adducts thigh, assists in flexion, medial rotation</td>
</tr>
<tr>
<td><strong>Nerve</strong></td>
<td>Obturator nerve (L3, L4)</td>
</tr>
</tbody>
</table>
**ADDUCTOR MAGNUS**

![Adductor Magnus Diagram](image)

**Hip and thigh—posterior view**

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inferior ramus of pubis, and ramus and lower part of tuberosity of ischium</td>
<td>Adducts, extends thigh, lower portion (adductor tubercle insertion) assists in medial rotation</td>
<td>Obturator nerve (L3, L4), sciatic nerve</td>
</tr>
<tr>
<td>Linea aspera, adductor tubercle of femur</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The linea aspera insertion may assist in lateral rotation.
HIP FLEXORS AND ADDUCTORS

- Psoas major
- Iliacus
- Inguinal ligament
- Femoral nerve, vein, artery
- Pectineus
- Adductor brevis
- Adductor longus (cut)
- Adductor magnus
- Gracilis

Hip and thigh—anterior view
CHAPTER NINE
MUSCLES OF THE LEG AND FOOT
TIBIALIS ANTERIOR

Origin
Lateral condyle of tibia, upper half of lateral surface of tibia, interosseous membrane

Insertion
Medial side and plantar surface of medial cuneiform bone, and base of first metatarsal bone

Action
Dorsiflexes foot at ankle joint, inverts (supinates) foot

Nerve
Deep peroneal nerve (L4, L5, S1)

Leg—anterolateral view
EXTENSOR HALLUCIS LONGUS

**Origin**
Middle half of anterior surface of fibula and interosseous membrane

**Insertion**
Base of distal phalanx of great toe

**Action**
Extends, hyperextends great toe, dorsiflexes and inverts (supinates) foot

**Nerve**
Deep peroneal nerve (L4, L5, S1)

Leg—anterolateral view
EXTENSOR DIGITORUM LONGUS

Foot—anterolateral view

Origin
Upper two-thirds of anterior surface of fibula, interosseous membrane, lateral condyle of tibia

Insertion
Along dorsal surface of four lateral toes, and then to bases of middle and distal phalanges

Action
Extends toes, dorsiflexes foot at ankle, everts foot

Nerve
Deep peroneal nerve (L4, L5, S1)

Note: The lower lateral part of this muscle makes a separate insertion onto the dorsal surface of the fifth metatarsal and is called peroneus tertius.

Leg—anterolateral view
PERONEUS TERTIUS
(Lower lateral part of extensor digitorum longus)

<table>
<thead>
<tr>
<th>Origin</th>
<th>Lower third of anterior surface of fibula and interosseous membrane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Dorsal surface of base of fifth metatarsal bone</td>
</tr>
<tr>
<td>Action</td>
<td>Dorsiflexes and everts foot</td>
</tr>
<tr>
<td>Nerve</td>
<td>Deep peroneal nerve (L4, L5, S1)</td>
</tr>
</tbody>
</table>

Leg—anterolateral view
ANTERIOR AND LATERAL LEG MUSCLES

1. Peroneus longus
2. Peroneus brevis
3. Peroneus tertius
4. Tibialis anterior
5. Extensor retinaculum
6. Extensor hallucis longus
7. Extensor digitorum longus
8. Extensor digitorum brevis

Leg—anterolateral view
GASTROCNEMIUS

(Part of triceps surae)

**Origin**
Lateral head—lateral condyle and posterior surface of femur
Medial head—popliteal surface of femur above medial condyle

**Insertion**
Posterior surface of the calcaneus

**Action**
Plantar flexes foot, flexes leg at knee

**Nerve**
Tibial nerve (S1, S2)

Leg—posterior view
SOLEUS

( Part of triceps surae )

Origin  Posterior surface of the tibia (soleal line), upper third of posterior surface of fibula, fibrous arch between tibia and fibula

Insertion  Posterior surface of the calcaneus

Action  Plantar flexes foot

Nerve  Tibial nerve (S1, S2)

Leg—posterior view
PLANTARIS

Origin  Lateral supracondylar ridge of femur, oblique popliteal ligament
Insertion  Posterior surface of the calcaneus
Action  Plantar flexes foot, flexes leg
Nerve  Tibial nerve (L4, L5, S1)

Leg—posterior view
MUSCLES OF THE CALF

1. Soleus
2. Plantaris
3. Gastrocnemius (cut)

Leg—posterior view
POPLITEUS

**Origin**
Lateral surface of lateral condyle of femur

**Insertion**
Upper part of posterior surface of tibia

**Action**
Rotates leg medially, flexes leg

**Nerve**
Tibial nerve (L4, L5, S1)

Note: Stern contends that this muscle stabilizes the knee by preventing lateral rotation of the tibia during medial rotation of the thigh while the foot is planted.

Reference:
FLEXOR HALLUCIS LONGUS

**Origin**
Lower two-thirds of posterior surface of shaft of fibula, posterior intermuscular septum, interosseous membrane

**Insertion**
Base of distal phalanx of great toe

**Action**
Flexes distal phalanx of great toe, assists in plantar flexing foot, inverts foot

**Nerve**
Tibial nerve (L5, S1, S2)

Note: This muscle is important in pushing off the surface in walking, running, jumping.

*Leg—posterior view*
FLEXOR DIGITORUM LONGUS

Leg—posterior view

Foot—plantar view

**Origin**
Medial part of posterior surface of tibia

**Insertion**
Bases of distal phalanges of second, third, fourth, and fifth toes

**Action**
Flexes distal phalanges of lateral four toes, assists in plantar flexing foot, inverts foot

**Nerve**
Tibial nerve (L5, S1)
TIBIALIS POSTERIOR

**Foot—plantar view**

**Origin**
Lateral part of posterior surface of tibia, interosseous membrane, proximal half of posterior surface of fibula

**Insertion**
Tuberosity of navicular bone, cuboid, cuneiforms, second, third, and fourth metatarsals, sustentaculum tali of calcaneus

**Action**
Plantar flexes, inverts foot

**Nerve**
Tibial nerve (L5, S1)

**Leg—posterior view**
DEEP POSTERIOR LEG MUSCLES

1. Popliteus
2. Tibialis posterior
2a. Tendon of tibialis posterior
3. Flexor hallucis longus (cut)
4. Flexor digitorum longus (cut)
5. Medial malleolus

Leg—posterior view
PERONEUS LONGUS

Foot—plantar view

Origin
Upper two-thirds of lateral surface of fibula

Insertion
Lateral side of medial cuneiform, base of first metatarsal

Action
Plantar flexes, everts foot

Nerve
Superficial peroneal nerve (L4, L5, S1)

Leg—anterolateral view
PERONEUS BREVIS

**Origin**  
Lower two-thirds of lateral surface of fibula

**Insertion**  
Lateral side of base of fifth metatarsal bone

**Action**  
Everts, plantar flexes foot

**Nerve**  
Superficial peroneal nerve (L4, L5, S1)

Leg—anterolateral view
EXTENSOR DIGITORUM BREVIS

Foot—anterolateral view

**Origin**
Anterior and lateral surfaces of calcaneus, lateral talocalcaneal ligament, inferior extensor retinaculum

**Insertion**
Into base of proximal phalanx of great toe, into lateral sides of tendons of extensor digitorum longus of second, third, and fourth toes

**Action**
Extends the four toes

**Nerve**
Deep peroneal nerve (L5, S1)
ABDUCTOR HALLUCIS
(First layer)

Foot—plantar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Tuberosity of calcaneus, flexor retinaculum, plantar aponeurosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Medial side of base of proximal phalanx of great toe</td>
</tr>
<tr>
<td>Action</td>
<td>Abducts great toe</td>
</tr>
<tr>
<td>Nerve</td>
<td>Medial plantar nerve (L4, L5)</td>
</tr>
</tbody>
</table>

Note: The muscles of the sole of the foot can be divided into four layers (from superficial to deep):
First layer—abductor hallucis, flexor digitorum brevis, abductor digiti minimi
Second layer—quadriatus plantae, lumbricales (tendons of flexor hallucis longus and flexor digitorum longus pass through this layer)
Third layer—flexor hallucis brevis, adductor hallucis, flexor digiti minimi brevis
Fourth layer—interossei (tendons of tibialis posterior and peroneus longus pass through this layer)
FLEXOR DIGITORUM BREVIS
(First layer)

Foot—plantar view

**Origin**
Tuberosity of calcaneus, plantar aponeurosis

**Insertion**
Sides of middle phalanges of second to fifth toes

**Action**
Flexes proximal phalanges and extends distal phalanges of second through fifth toes

**Nerve**
Medial plantar nerve (L4, L5)
ABDUCTOR DIGITI MINIMI
(First layer)

Foot—plantar view

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th><strong>Action</strong></th>
<th><strong>Nerve</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberosity of calcaneus, plantar aponeurosis</td>
<td>Abducts fifth toe</td>
<td>Lateral plantar nerve (S1, S2)</td>
</tr>
<tr>
<td>Insertion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral side of proximal phalanx of fifth toe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
QUADRATUS PLANTAE
(Second layer)

Foot—plantar view

**Origin**
- Medial head—medial surface of calcaneus
- Lateral head—lateral border of inferior surface of calcaneus

**Action**
Flexes terminal phalanges of second through fifth toes

**Nerve**
Lateral plantar nerve (S1, S2)

**Insertion**
Lateral margin of tendon of flexor digitorum longus
LUMBRICALES
(Second layer)

Foot—plantar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tendons of flexor digitorum longus</td>
<td>Dorsal surfaces of proximal phalanges</td>
<td>Flex proximal phalanges of second through fifth toes</td>
<td>First lumbricalis—medial plantar nerve (L4, L5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Second through fifth lumbricales—lateral plantar nerve (S1, S2)</td>
</tr>
</tbody>
</table>
FLEXOR HALLUCIS BREVIS
(Third layer)

Foot—plantar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuboid bone, lateral cuneiform bone</td>
<td>Flexes proximal phalanx of great toe</td>
<td>Medial plantar nerve (L4, L5, S1)</td>
</tr>
<tr>
<td>Medial part—medial side of base of proximal phalanx of great toe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral part—lateral side of base of proximal phalanx of great toe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ADDUCTOR HALLUCIS
(Third layer)

Foot—plantar view

**Origin**
- Oblique head—second, third, and fourth metatarsal bones, and sheath of peroneus longus tendon
- Transverse head—plantar metatarsophalangeal ligaments of third, fourth, and fifth toes, and transverse metatarsal ligaments

**Insertion**
- Lateral side of base of proximal phalanx of great toe

**Action**
- Adducts great toe

**Nerve**
- Lateral plantar nerve (S1, S2)
**FLEXOR DIGITI MINIMI BREVIS**

*(Third layer)*

Foot—plantar view

- **Origin**: Base of fifth metatarsal, sheath of peroneus longus tendon
- **Insertion**: Lateral side of base of proximal phalanx of fifth toe
- **Action**: Flexes proximal phalanx of fifth toe
- **Nerve**: Lateral plantar nerve (S1, S2)
DORSAL INTEROSSEI

(Fourth layer; four muscles)

Foot—anterolateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent sides of metatarsal bones</td>
<td>Abduct toes, flex proximal phalanges</td>
<td>Lateral plantar nerve (S1, S2)</td>
</tr>
<tr>
<td>Bases of proximal phalanges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First—medial side of proximal phalanx of second toe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second, third, fourth—lateral sides of proximal phalanges of second, third, and fourth toes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PLANTAR INTEROSSEI

(Fourth layer; three muscles)

Foot—plantar view

<table>
<thead>
<tr>
<th></th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>Bases and medial sides of third, fourth, and fifth metatarsal bones</td>
</tr>
<tr>
<td>Insertion</td>
<td>Medial sides of bases of proximal phalanges of same toes</td>
</tr>
</tbody>
</table>

Nerve: Adduct toes, flex proximal phalanges
       Lateral plantar nerve (S1, S2)
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CHAPTER NINE
MUSCLES OF THE LEG AND FOOT
TIBIALIS ANTERIOR

**Origin**
Lateral condyle of tibia, upper half of lateral surface of tibia, interosseous membrane

**Insertion**
Medial side and plantar surface of medial cuneiform bone, and base of first metatarsal bone

**Action**
Dorsiflexes foot at ankle joint, inverts (supinates) foot

**Nerve**
Deep peroneal nerve (L4, L5, S1)

Leg—anterolateral view
EXTENSOR HALLUCIS LONGUS

**Origin**
Middle half of anterior surface of fibula and interosseous membrane

**Insertion**
Base of distal phalanx of great toe

**Action**
Extends, hyperextends great toe, dorsiflexes and inverts (supinates) foot

**Nerve**
Deep peroneal nerve (L4, L5, S1)

*Leg—anterolateral view*
EXTENSOR DIGITORUM LONGUS

**Foot—anterolateral view**

**Origin**
Upper two-thirds of anterior surface of fibula, interosseous membrane, lateral condyle of tibia

**Insertion**
Along dorsal surface of four lateral toes, and then to bases of middle and distal phalanges

**Action**
Extends toes, dorsiflexes foot at ankle, everts foot

**Nerve**
Deep peroneal nerve (L4, L5, S1)

Note: The lower lateral part of this muscle makes a separate insertion onto the dorsal surface of the fifth metatarsal and is called *peroneus tertius.*

**Leg—anterolateral view**
PERONEUS TERTIUS
(Lower lateral part of extensor digitorum longus)

**Origin**
Lower third of anterior surface of fibula and interosseous membrane

**Insertion**
Dorsal surface of base of fifth metatarsal bone

**Action**
Dorsiflexes and everts foot

**Nerve**
Deep peroneal nerve (L4, L5, S1)

Leg—anterolateral view
ANTERIOR AND LATERAL LEG MUSCLES

1. Peroneus longus
2. Peroneus brevis
3. Peroneus tertius
4. Tibialis anterior
5. Extensor retinaculum
6. Extensor hallucis longus
7. Extensor digitorum longus
8. Extensor digitorum brevis

Leg—anterolateral view
GASTROCNEMIUS

(Part of triceps surae)

**Origin**
- Lateral head—lateral condyle and posterior surface of femur
- Medial head—popliteal surface of femur above medial condyle

**Insertion**
- Posterior surface of the calcaneus

**Action**
- Plantar flexes foot, flexes leg at knee

**Nerve**
- Tibial nerve (S1, S2)

Leg—posterior view
SOLEUS
(Part of triceps surae)

Origin
Posterior surface of the tibia (soleal line), upper third of posterior surface of fibula, fibrous arch between tibia and fibula

Insertion
Posterior surface of the calcaneus

Action
Plantar flexes foot

Nerve
Tibial nerve (S1, S2)
PLANTARIS

- **Origin**: Lateral supracondylar ridge of femur, oblique popliteal ligament
- **Insertion**: Posterior surface of the calcaneus
- **Action**: Plantar flexes foot, flexes leg
- **Nerve**: Tibial nerve (L4, L5, S1)

Leg—posterior view
MUSCLES OF THE CALF

1. Soleus
2. Plantaris
3. Gastrocnemius (cut)

Leg—posterior view
**POPLITEUS**

**Origin**  
Lateral surface of lateral condyle of femur

**Insertion**  
Upper part of posterior surface of tibia

**Action**  
Rotates leg medially, flexes leg

**Nerve**  
Tibial nerve (L4, L5, S1)

Note: Stern contends that this muscle stabilizes the knee by preventing lateral rotation of the tibia during medial rotation of the thigh while the foot is planted.

Reference:  

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**Leg—posterior view**
FLEXOR HALLUCIS LONGUS

**Origin**
Lower two-thirds of posterior surface of shaft of fibula, posterior intermuscular septum, interosseous membrane

**Insertion**
Base of distal phalanx of great toe

**Action**
Flexes distal phalanx of great toe, assists in plantar flexing foot, inverts foot

**Nerve**
Tibial nerve (L5, S1, S2)

Note: This muscle is important in pushing off the surface in walking, running, jumping.
FLEXOR DIGITORUM LONGUS

**Foot—plantar view**

**Origin**
Medial part of posterior surface of tibia

**Insertion**
Bases of distal phalanges of second, third, fourth, and fifth toes

**Action**
Flexes distal phalanges of lateral four toes, assists in plantar flexing foot, inverts foot

**Nerve**
Tibial nerve (L5, S1)

**Leg—posterior view**
TIBIALIS POSTERIOR

Foot—plantar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Lateral part of posterior surface of tibia, interosseous membrane, proximal half of posterior surface of fibula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Tuberosity of navicular bone, cuboid, cuneiforms, second, third, and fourth metatarsals, sustentaculum tali of calcaneus</td>
</tr>
<tr>
<td>Action</td>
<td>Plantar flexes, inverts foot</td>
</tr>
<tr>
<td>Nerve</td>
<td>Tibial nerve (L5, S1)</td>
</tr>
</tbody>
</table>

Leg—posterior view
DEEP POSTERIOR LEG MUSCLES

1. Popliteus
2. Tibialis posterior
2a. Tendon of tibialis posterior
3. Flexor hallucis longus (cut)
4. Flexor digitorum longus (cut)
5. Medial malleolus

Leg—posterior view
PERONEUS LONGUS

Foot—plantar view

Origin: Upper two-thirds of lateral surface of fibula
Insertion: Lateral side of medial cuneiform, base of first metatarsal
Action: Plantar flexes, everts foot
Nerve: Superficial peroneal nerve (L4, L5, S1)

Leg—anterolateral view
PERONEUS BREVIS

**Origin**
Lower two-thirds of lateral surface of fibula

**Insertion**
Lateral side of base of fifth metatarsal bone

**Action**
Everts, plantar flexes foot

**Nerve**
Superficial peroneal nerve (L4, L5, S1)

Leg—anterolateral view
EXTENSOR DIGITORUM BREVIS

Foot—anterolateral view

Origin
Anterior and lateral surfaces of calcaneus, lateral talocalcaneal ligament, inferior extensor retinaculum

Insertion
Into base of proximal phalanx of great toe, into lateral sides of tendons of extensor digitorum longus of second, third, and fourth toes

Action
Extends the four toes

Nerve
Deep peroneal nerve (L5, S1)
ABDUCTOR HALLUCIS

(First layer)

Foot—plantar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Tuberosity of calcaneus, flexor retinaculum, plantar aponeurosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Medial side of base of proximal phalanx of great toe</td>
</tr>
<tr>
<td>Action</td>
<td>Abducts great toe</td>
</tr>
<tr>
<td>Nerve</td>
<td>Medial plantar nerve (L4, L5)</td>
</tr>
</tbody>
</table>

Note: The muscles of the sole of the foot can be divided into four layers (from superficial to deep):
First layer—abductor hallucis, flexor digitorum brevis, abductor digiti minimi
Second layer—quadratus plantae, lumbricales (tendons of flexor hallucis longus and flexor digitorum longus pass through this layer)
Third layer—flexor hallucis brevis, adductor hallucis, flexor digiti minimi brevis
Fourth layer—interossei (tendons of tibialis posterior and peroneus longus pass through this layer)
FLEXOR DIGITORUM BREVIS
(First layer)

Foot—plantar view

Origin
Tuberosity of calcaneus, plantar aponeurosis

Insertion
Sides of middle phalanges of second to fifth toes

Action
Flexes proximal phalanges and extends distal phalanges of second through fifth toes

Nerve
Medial plantar nerve (L4, L5)
ABDUCTOR DIGITI MINIMI
(First layer)

Foot—plantar view

**Origin**  
Tuberosity of calcaneus, plantar aponeurosis

**Insertion**  
Lateral side of proximal phalanx of fifth toe

**Action**  
Abducts fifth toe

**Nerve**  
Lateral plantar nerve (S1, S2)
QUADRATUS PLANTAE
(Second layer)

Foot—plantar view

Origin
- Medial head—medial surface of calcaneus
- Lateral head—lateral border of inferior surface of calcaneus

Action
- Flexes terminal phalanges of second through fifth toes

Nerve
- Lateral plantar nerve (S1, S2)

Insertion
- Lateral margin of tendon of flexor digitorum longus
LUMBRICALES

(Second layer)

Foot—plantar view

**Origin**
Tendons of flexor digitorum longus

**Insertion**
Dorsal surfaces of proximal phalanges

**Action**
Flex proximal phalanges of second through fifth toes

**Nerve**
First lumbricalis—medial plantar nerve (L4, L5)
Second through fifth lumbricales—lateral plantar nerve (S1, S2)
FLEXOR HALLUCIS BREVIS
(Third layer)

Foot—plantar view

**Origin**
- Cuboid bone, lateral cuneiform bone
- Medial part—medial side of base of proximal phalanx of great toe
- Lateral part—lateral side of base of proximal phalanx of great toe

**Insertion**
- Medial plantar nerve (L4, L5, S1)

**Action**
- Flexes proximal phalanx of great toe
**ADDUCTOR HALLUCIS**

*(Third layer)*

**Foot—plantar view**

**Origin**
- Oblique head—second, third, and fourth metatarsal bones, and sheath of peroneus longus tendon
- Transverse head—plantar metatarsophalangeal ligaments of third, fourth, and fifth toes, and transverse metatarsal ligaments

**Insertion**
- Lateral side of base of proximal phalanx of great toe

**Action**
- Adducts great toe

**Nerve**
- Lateral plantar nerve (S1, S2)
FLEXOR DIGITI MINIMI BREVIS

(Third layer)

Foot—plantar view

Origin
Base of fifth metatarsal, sheath of peroneus longus tendon

Lateral side of base of proximal phalanx of fifth toe

Action
Flexes proximal phalanx of fifth toe

Nerve
Lateral plantar nerve (S1, S2)
DORSAL INTEROSSEI

(Fourth layer; four muscles)

Foot—anterolateral view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Action</th>
<th>Nerve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent sides of metatarsal bones</td>
<td>Abduct toes, flex proximal phalanges</td>
<td>Lateral plantar nerve (S1, S2)</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>First—medial side of proximal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>phalanx of second toe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second, third, fourth—lateral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sides of proximal phalanges of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>second, third, and fourth toes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PLANTAR INTEROSSEI

(Fourth layer; three muscles)

Foot—plantar view

<table>
<thead>
<tr>
<th>Origin</th>
<th>Insertion</th>
<th>Action</th>
<th>Nerve</th>
</tr>
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<td>Medial sides of bases of proximal phalanges of same toes</td>
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