The nature of this book demands that we explore specific, individual structures and regions on our journey. However, before we set out into the hills and valleys of the body, some preparation is in order. This chapter will familiarize you with important mapping and navigational terms. It will also show you the "big picture" of the body’s systems highlighted in the text. This way, when the trail guide leads you in a certain direction, you will know which way to go!

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1.1 Anatomical position
Planes of Movement

When the body is in the standard anatomical position, standing erect with the palms facing forward (p. 19), it can be divided into three imaginary planes (1.4). These planes help clarify and specify movements.

The sagittal plane divides the body into left and right halves. The descriptive terms medial and lateral correlate to the sagittal plane; the actions of flexion and extension occur along this plane. The midline (or midsagittal plane) runs down the center of the body, dividing the sagittal plane into two symmetrical halves.

The frontal (or coronal) plane divides the body into front and back portions. The terms anterior and posterior relate to the frontal plane; the actions of adduction and abduction happen along this plane.

Dividing the body into upper and lower parts is the transverse plane. The terms superior and inferior refer to the transverse plane; rotation happens within this plane.

Directions and Positions

Specific terms are used to help communicate location, direction and position of body structures. These terms replace more general references like "up there" or "north of here," which are less precise and can be confusing. Each direction is paired up with its complementary direction.

Superior refers to a structure closer to the head. Inferior means closer to the feet. "The shoulders are superior to the knees." "The knees are inferior to the shoulders." (1.5)

The terms cranial (closer to the head) and caudal (closer to the buttocks) are used when referring to structures on the trunk (1.6). For example,"The umbilicus is caudal to the clavicles." "The clavicles are cranial to the umbilicus."
**Posterior** pertains to a structure further toward the back of the body than another structure. **Anterior** refers to a structure further in front. “The sternum is anterior to the spine.” (1.7) These directions are also referred to as dorsal (posterior) and ventral (anterior).

**Medial** pertains to a structure closer to the midline (or center) of the body. **Lateral** refers to a structure further away from the midline. “The nose is medial to the ears.” “The ears are lateral to the nose.” (1.8)

**Proximal** means a structure further away from the trunk or the body's midline. **Distal** designates a structure closer to the trunk. These directions are used only when referring to the arms and legs. “The elbow is proximal to the wrist.” “The ankle is distal to the knee.” (1.9)

**Superficial** describes a structure closer to the body's surface. **Deep** refers to a structure deeper in the body. “The pectoralis major muscle is superficial to the ribs.” “The ribs are deep to the pectoralis major.” (1.10)
Movements of the Body

Movement of the body occurs at the joints, where bones articulate (or connect). Although movement affects the placement of bones, the terminology of movement always refers to joints. Bending your knee is called “flexion of the knee.” “Flexion of the leg” would require an ambulance. See pages 26-31 for a description of movement at specific joints.

Extension (1.11) is movement that straightens or opens a joint. In anatomical position, most joints are extended. When a joint can extend beyond its normal range of motion it is called hyperextension. Flexion (1.12) is movement that bends a joint or brings the bones closer together. In a fetal position most joints are in a flexed position (1.17). Both flexion and extension take place along the sagittal plane.

Adduction (1.13) of a joint brings a limb medially toward the body’s midline (“adding to the body”). Abduction (1.14) moves a limb laterally away from the midline (“abduct or carry away”). These actions happen along the frontal plane and pertain only to the appendages. To adduct the fingers or toes is to bring them together; to abduct is to spread them apart.

Medial rotation (1.15) and lateral rotation (1.16) (sometimes referred to as internal and external rotation) occur at the shoulder and hip joints. When the joint medially rotates, the limb turns in toward the midline. Lateral rotation swings the limb away from the midline.

Rotation (1.18) pertains only to the axial skeleton (p. 32), specifically the head and vertebral column. Rotation of the head and neck occurs as a driver turns to check whether a car is coming from behind in the next lane. These movements happen along the transverse plane.
Circumduction (1.19) is possible only at the shoulder and hip joints. It involves a combination of flexion, extension, adduction and abduction; together these actions create a cone-shaped movement. Swimming the backstroke requires circumduction at the shoulder joint.

Lateral flexion (1.20) occurs only at the axial skeleton—for example, when the neck or vertebral column bends laterally to the side.

Elevation (1.21) and depression (1.22) refer to the movement of the scapula and jaw. Elevation is movement superiorly. Depression is movement inferiorly.

Supination (1.23) and pronation (1.24) describe the pivoting action of the forearm. Supination (“carrying a bowl of soup”) occurs when the radius and ulna lie parallel to one another. Pronation (“prone to spill it”) takes place when the radius crosses over the ulna, turning the palm down. Supination and pronation also occur at the feet.

The names of many bones, bony landmarks and muscles may initially look and sound foreign. They are—most anatomical terms are Latin or Greek. However, the source or story behind the terms can help to clarify their meaning. Take the phrase “infraspinous fossa of the scapula.” The scapula is a flat bone of the shoulder. In Latin, scapula means “shoulder blade”—its common name. Fossa translates as “shallow depression.” Infraspinous is a directional term (like north or southwest). It means inferior (infra-) to the spine of the scapula (spinous). Put this all together and the “infraspinous fossa of the scapula” translates as “the shallow depression located below the spine of the shoulder blade.” Keep an eye peeled for translations and phonetic descriptions at the bottom of pages.
Depending on the structure being palpated, Trail Guide will ask you to position your partner in a few different ways.

**Supine** ("on your spine") is to lie face up. A bolster behind the knees might be nice for your partner. For **side lying**, consider a bolster between the knees and a pillow under the head.

**Prone** is to lie on the table face down. A bolster behind the ankles is nice in this position.

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**Inversion** (1.25) and **eversion** (1.26) occur as a combination of movements of several joints of the feet. Inversion ("turn in") elevates the foot’s medial side and brings the sole of the foot medially. Eversion ("turn out") elevates the foot’s lateral side and moves the sole laterally.

**Plantar flexion** (1.27) and **dorsiflexion** (1.28) only refer to movement at the ankle. Plantar flexion is performed by moving the ankle to point your foot into the earth or stepping on a car’s gas pedal. Dorsiflexion is the opposite movement, such as moving the ankle to let off the gas pedal.

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**Protraction** (1.29) and **retraction** (1.30) pertain to the scapula, clavicle, head and jaw. Protraction ("protrude") occurs when one of these structures moves anteriorly. Retraction ("retreat") is movement posteriorly.

**Deviation** (1.31) means to wander from the usual course. Lateral deviation occurs at the mandible during talking or chewing.

**Opposition** (1.32) happens only at the carpometacarpal joint of the thumb. It occurs when the thumbpad crosses the palm toward the last (pinkie) finger.
Movements of the Body

Spine and Thorax
(vertebral column)

- Flexion
- Rotation
- Extension
- Lateral flexion

Neck
(cervical spine)

- Flexion
- Rotation
- Extension
- Lateral flexion

Ribs/Thorax

- Elevation/expansion (inhalation)
- Depression/collapse (exhalation)
Elbow and Forearm
(humeroulnar and humeroradial joints—elbow, proximal and distal radioulnar joints—forearm)

Flexion of the elbow

Extension of the elbow

Supination of the forearm

Pronation of the forearm

Wrist
(radiocarpal joint)

Flexion

Abduction
(radial deviation)

Extension

Adduction
(ulnar deviation)
Thumb
(first carpometacarpal and metacarpophalangeal joints)

Flexion  Extension  Opposition  Adduction  Abduction

Fingers
(metacarpophalangeal, proximal and distal interphalangeal joints)

Flexion  Extension  Adduction  Abduction

Mandible
(temporomandibular joint)

Elevation  Depression  Protraction  Retraction  Lateral deviation
Pelvis

Anterior tilt
(downward rotation)

Posterior tilt
(upward rotation)

Lateral tilt
(elevation)

Hip
(coxal joint)

Flexion

Abduction

Medial rotation
(internal rotation)

Adduction

Extension

Lateral rotation
(external rotation)
Knee
(tibiofemoral joint)

Flexion

Lateral rotation of flexed knee (right knee)

Extension

Medial rotation of flexed knee (right knee)

Ankle, Foot and Toes
(talocrural, talotarsal, midtarsal, tarsometatarsal, metatarsophalangeal and interphalangeal joints)

Inversion of foot

Dorsiflexion of ankle

Flexion of toes

Plantar flexion of ankle

Eversion of foot

Extension of toes