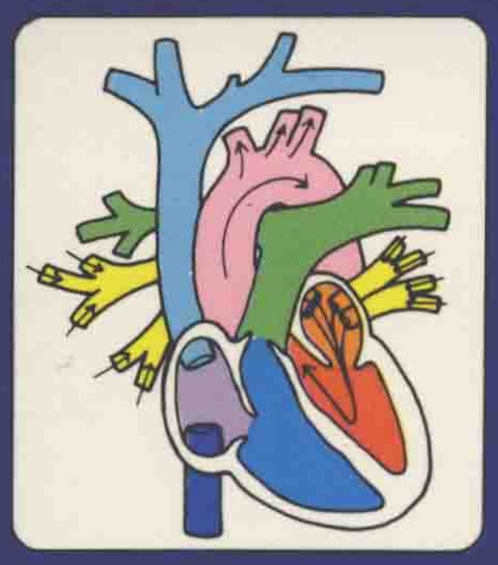
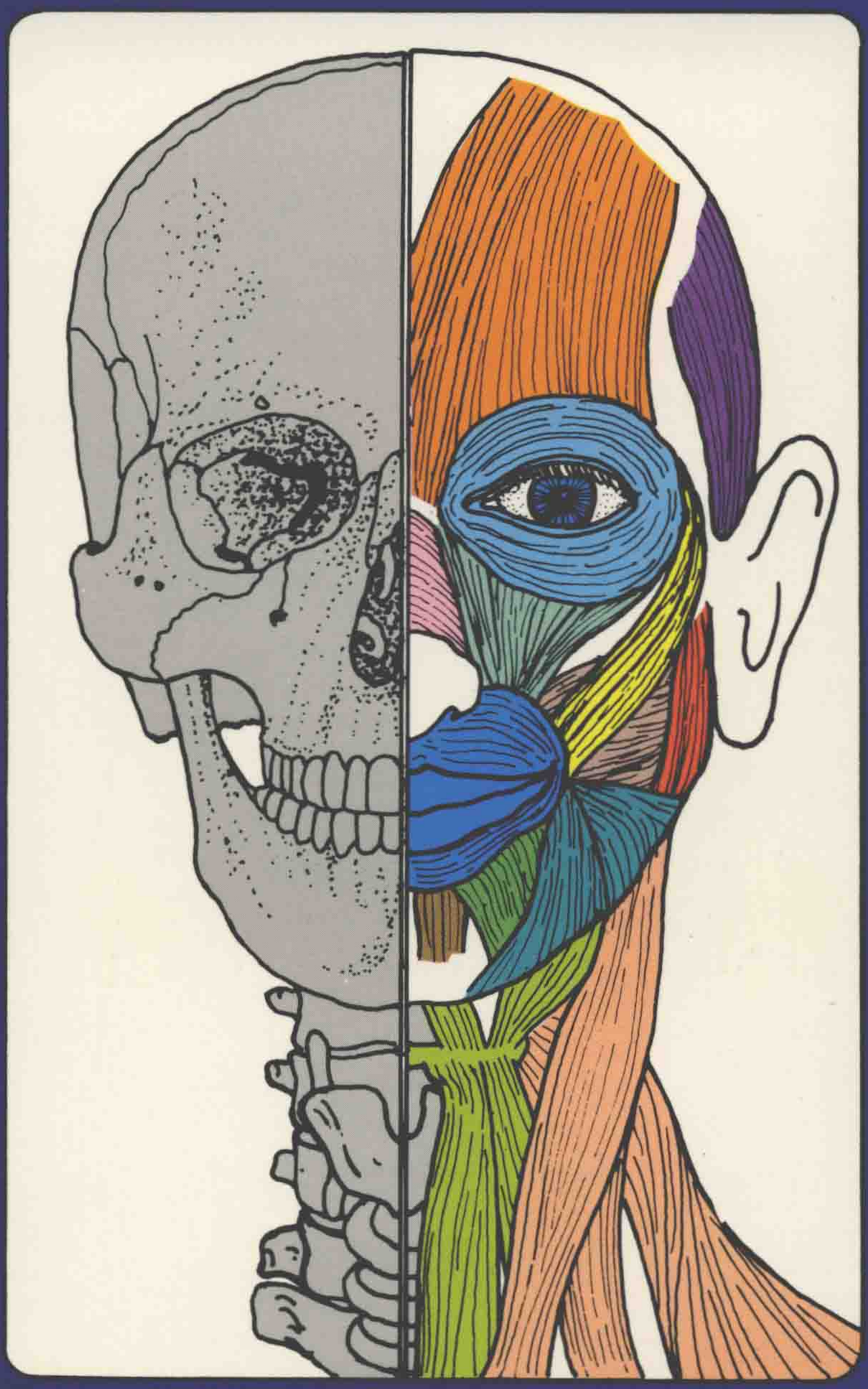
Dover Coloring Book

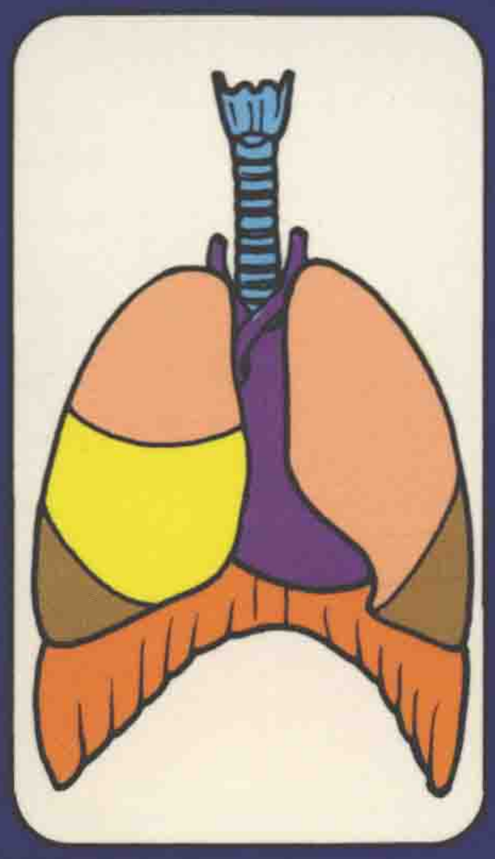
Margaret Matt

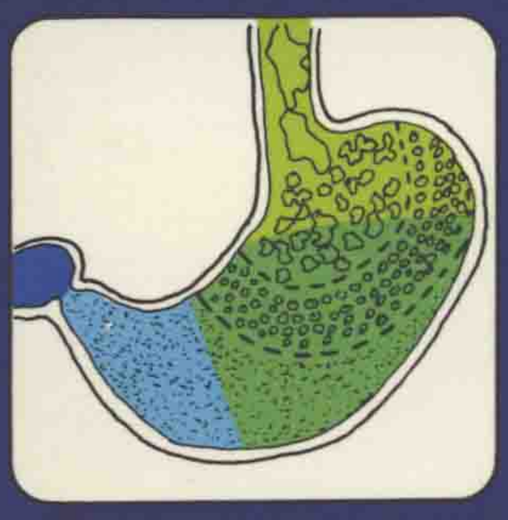
HUMAN ANATOMY Coloring Book

Text by Joe Ziemian

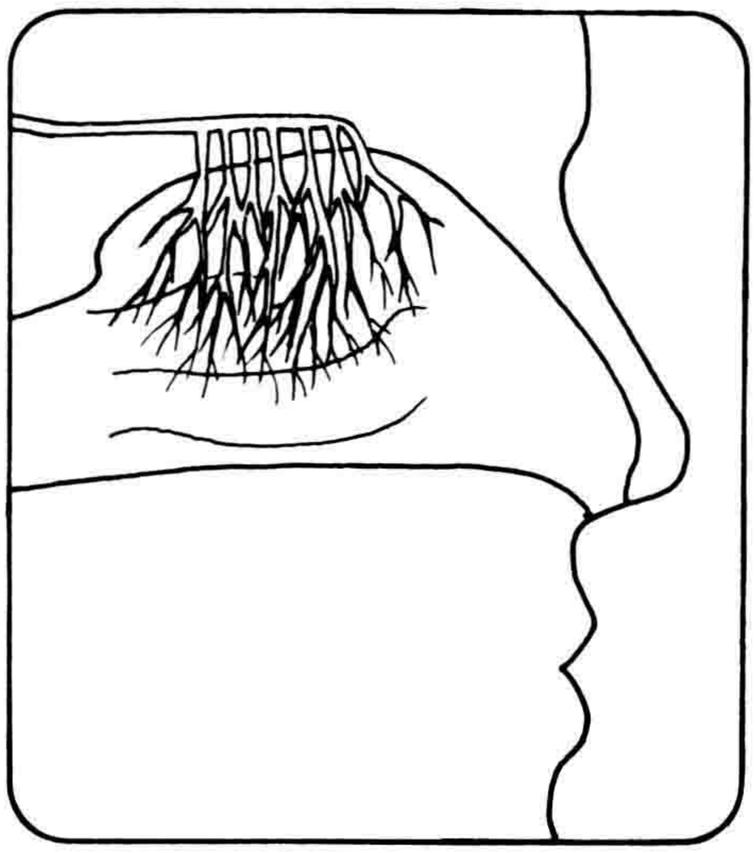








An entertaining and instructive guide to the human body–
bones, muscles, blood, nerves, and how they work.



HUMAN ANATOMY COLORING BOOK

MARGARET MATT

TEXT BY JOE ZIEMIAN

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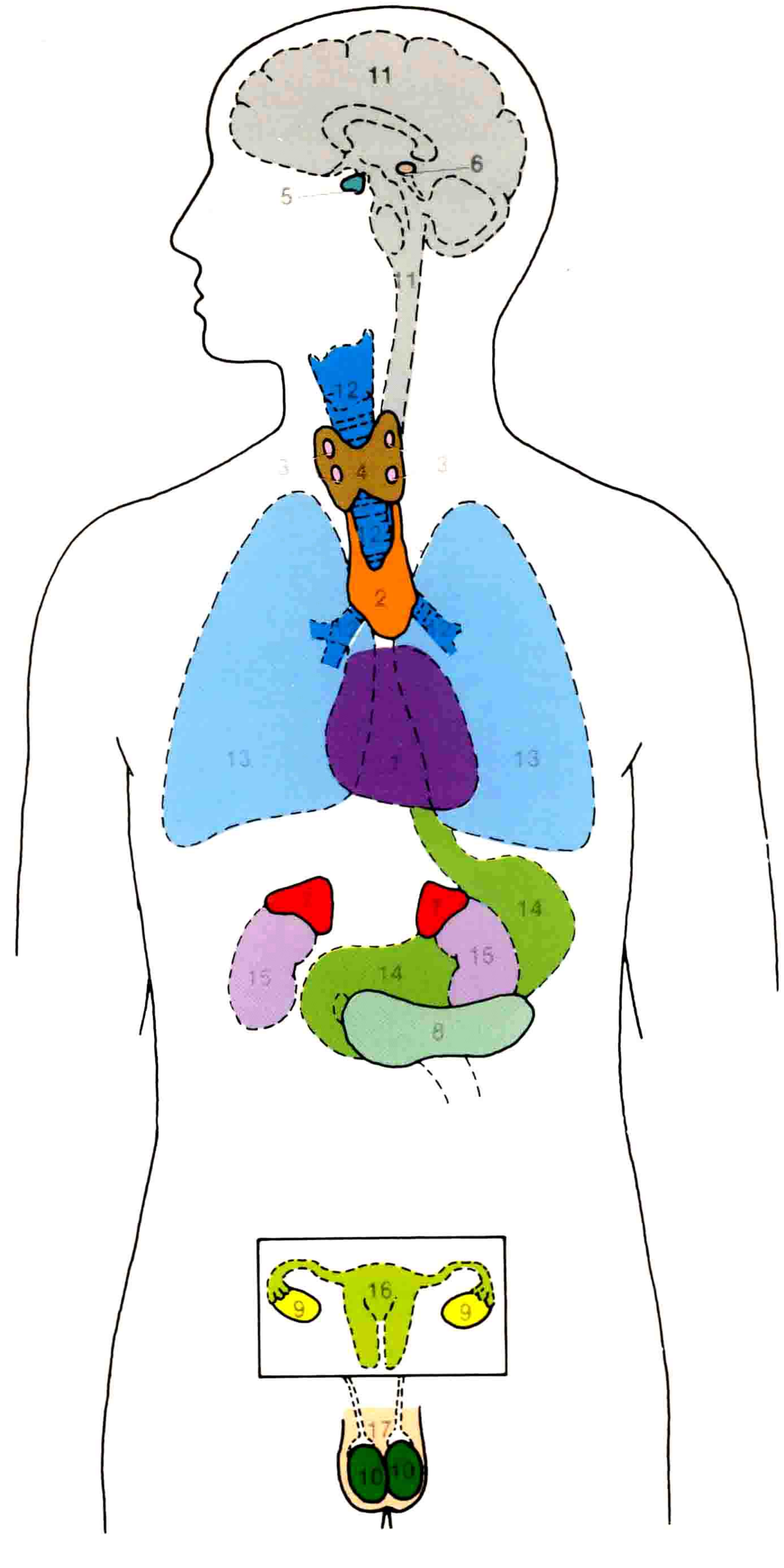
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PUBLISHER'S NOTE

Anatomy is the study of the structures of the body. Not surprisingly, an accurate, scientific anatomy did not develop until relatively late in history, with Andreas Vesalius (1514–1564), and even then only against great opposition and religious persecution. Vesalius himself was sentenced to death by a court of the Inquisition; he had the good fortune of having his sentence commuted into a journey to the Holy Sepulcher, but the bad fortune of dying in a shipwreck on his return. Prior to Vesalius there had been several prominent people (Leonardo da Vinci among them) who had contributed to advancing our knowledge of the human body, but by and large anatomy suffered from a dogmatic allegiance to the ancient teachings of Galen (c.130–c.200). Galen's work, to a twentieth-century observer, appears to have suffered from its author's dedication to certain abstract metaphysical principles that, among other things, led Galen to describe parts of the body that did not exist. Vesalius's careful empirical research and rigorous dissection of cadavers served to repudiate Galen and prepared the way for the advent of scientific physiology with William Harvey (1578–1657), who made the very important discovery of the circulatory system and foresaw many of the microscope's anatomical insights.

With the work of Charles Darwin (1809–1882) biology gained a comprehensive framework, and anatomy benefitted greatly, for Darwin's discovery of the mechanism of natural selection grew in part out of his study of anatomical relationships among plants and animals. There is an essential unity and common ancestry for all organisms, Darwin showed, and the evolution of a species involves progressive anatomical changes. You may glean some of human evolutionary history when you read and color Plate 35 and contemplate our obsolete appendix.

The twentieth century has seen a new emphasis in anatomy on living rather than dead animals; X rays now perform some of the investigations formerly accomplished only with the dissector's scalpel. Indeed the very term *anatomy,* which derives from the Greek word meaning "to dissect," is now somewhat out of date. The new emphasis on living tissues is very important because, besides the fact that it is the living and not the dead we care most about anyway, some organs change size, shape, and location immediately after death. To the anatomist interested in the living man, a cadaver is but a shadow of its former self.

Since the body's structures cannot be understood independently of what they do, in the drawings, text, and coloring guides of the *Human Anatomy Coloring Book,* Margaret Matt and Joe Ziemian have occasionally forayed into physiology, the study of the body's functions. The forty-three plates, all of which have been reviewed by a specialist, are divided into the body's systems; hence a reader and colorist will be able to learn about the body's functions one at a time, while working through the entire book will give the fundamental groundwork for more sophisticated studies of human anatomy. The drawings are designed to provide true anatomical detail at the same time that they render organs and other structures clearly, with an eye toward the drawings' usefulness for instruction and coloration. The coloring keys provided are not intended to be naturalistic; rather, wherever possible, they have been developed with the functional relationships of the body in mind.

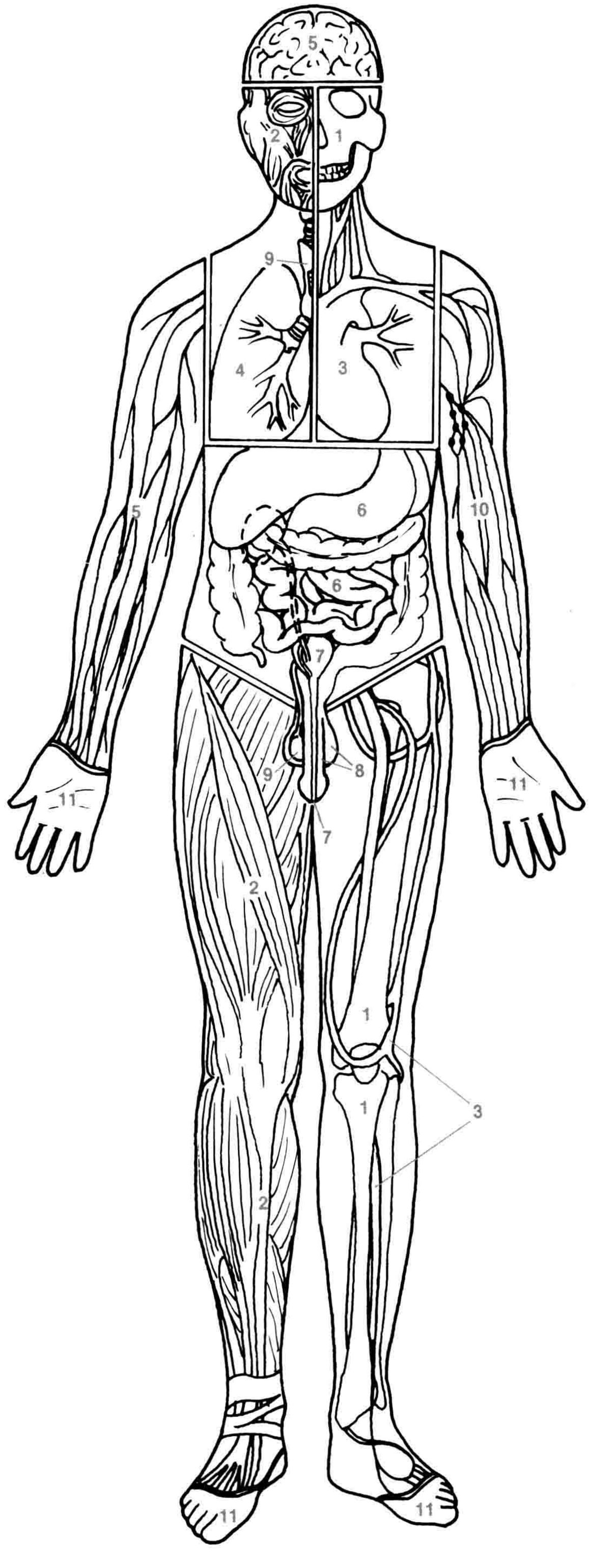
There is no better time to learn about human anatomy than now, when we are constantly bombarded by new developments in the burgeoning health field, and there is no better way to learn than with the *Human Anatomy Coloring Book,* a useful, accurate introduction to the human body for children and adults, and an enjoyable coloring book as well.

CONTENTS

SYSTEMS OF THE HUMAN BODY

The human body is marvelously complex, and the greatest wonder is, complex as it is, how well it works most of the time. For purposes of study, we can divide the body into systems, though we should not forget that each system is itself highly complex and the dividing line between systems may not be distinct. All of the systems have specialized functions, but they are also closely related to one another; indeed their successful interaction is absolutely necessary for our survival.

The *skeletal system* refers chiefly to the bones that support and protect the body. All the muscles that push and pull the skeleton make up the *muscular system*. The *circulatory system* consists of the heart and the tubes—arteries and veins—that transport blood. We breathe with our *respiratory system*, which supplies oxygen to the body's tissues and removes some wastes. The *nervous system*, whose primary components are the brain and the spinal cord, is our "master control," regulating all of our internal functions and providing us with information about the environment. We process food and eliminate some wastes with the *digestive system*. The *urinary system* is responsible for the elimination of most of the body's liquid chemical wastes. The *reproductive system* consists of those organs that characterize the sexes and enables us to conceive, bear, and give birth to offspring. The secretion of hormones, which regulate the body's functions chemically, is the job of the *endocrine system*. The *lymphatic system* works with the veins in draining fluid from tissues and helps defend the body against infection. The *skin*, the body's largest organ, encloses and protects all the body's systems.



CHOOSE YOUR OWN COLORS

1. SKELETAL
2. MUSCULAR
3. CIRCULATORY
4. RESPIRATORY
5. NERVOUS
6. DIGESTIVE
7. URINARY
8. REPRODUCTIVE
9. ENDOCRINE
10. LYMPHATIC
11. SKIN

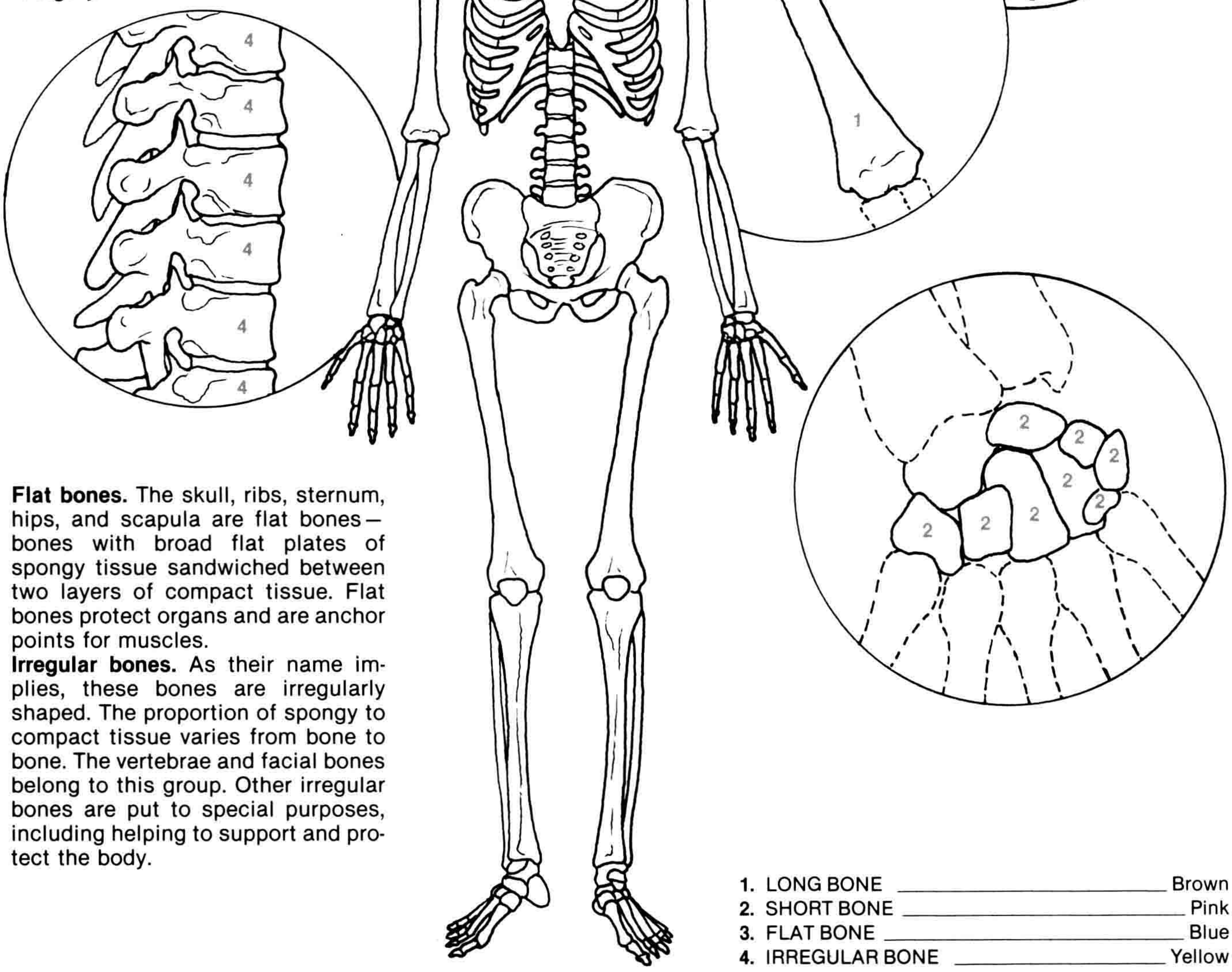
SKELETAL SYSTEM

The skeletal system in the adult consists of 206 *bones* and the strong elastic tissue that forms *ligaments, tendons,* and *cartilages*, which tie bones together and form the nose, larynx, trachea, bronchial tubes, and the outer ear. The skeleton provides a strong framework for the body, gives it its basic shape, and permits us to stand upright. The skeletal system also supports and restrains soft internal organs and shields fragile organs such as the brain and lungs. Certain bones, connected by flexible joints, form a combination of levers that allow coordinated movement. Bones also provide a firm anchor for skeletal muscles and produce red blood cells in their marrow cavities.

BONE CLASSIFICATION

Long Bones. These bones, such as those in the legs, arms, toes, and fingers, are strong shafts made of compact bone tissue. Their ends are large and consist of spongy tissue covered with compact tissue. They are slightly curved, enabling them to absorb shock.

Short bones. Shaped like irregular cubes, the short bones are spongy with a covering of compact tissue. The kneecap and the bones of the wrist and ankle belong to this category.



Flat bones. The skull, ribs, sternum, hips, and scapula are flat bones—bones with broad flat plates of spongy tissue sandwiched between two layers of compact tissue. Flat bones protect organs and are anchor points for muscles.

Irregular bones. As their name implies, these bones are irregularly shaped. The proportion of spongy to compact tissue varies from bone to bone. The vertebrae and facial bones belong to this group. Other irregular bones are put to special purposes, including helping to support and protect the body.

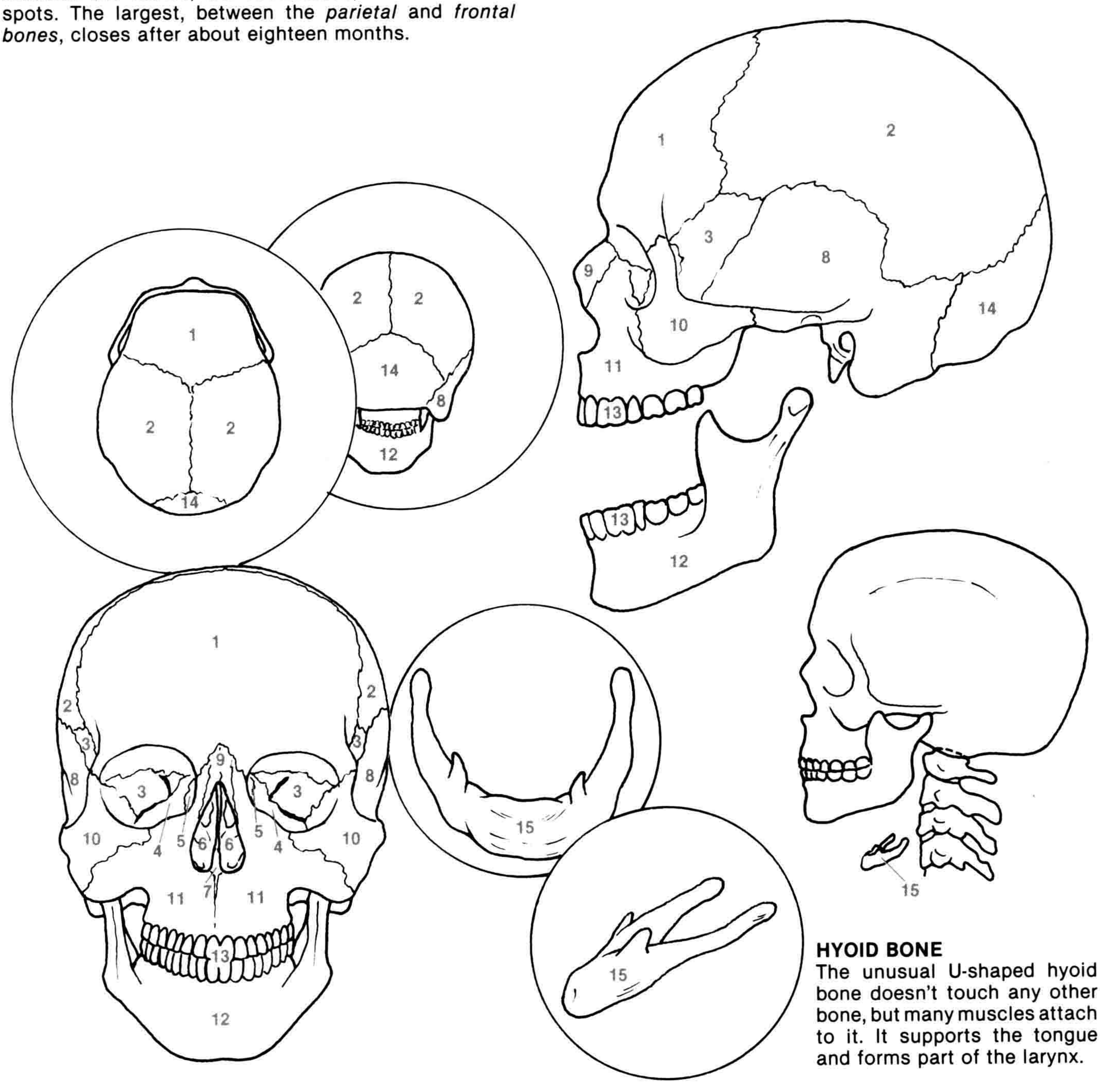
1. LONG BONE _____ Brown
2. SHORT BONE _____ Pink
3. FLAT BONE _____ Blue
4. IRREGULAR BONE _____ Yellow

SKULL

The skull is the protective case for the brain and the organs of sight, taste, smell, hearing, and balance. It rests and pivots on the upper or superior end of the vertebral column. The skull has two main parts: the *cranium* or brain case and the *facial bones*. The base of the skull is much thicker and stronger than the sides and top and has many openings for nerves, blood vessels, and tubes to pass through. The facial bones enclose the front of the brain and form the openings for the eyes and the nasal and oral cavities. The *mandible* or jawbone is the only movable bone of the skull.

As the fetus develops, the cartilaginous membranes of the cranium *ossify* or turn into bone. At birth the ossification is not complete and membrane-filled spaces between the bones, the *fontanelles*, remain as soft spots. The largest, between the *parietal* and *frontal bones*, closes after about eighteen months.

1. FRONTAL BONE _____ Pink
2. PARIETAL BONE _____ Turquoise
3. SPHENOID BONE _____ Gray
4. ETHMOID BONE _____ Brown
5. LACRIMAL BONE _____ Green
6. NASAL TURBINATES _____ Red
7. VOMER _____ Light Blue
8. TEMPORAL BONE _____ Blue
9. NASAL BONE _____ Light Purple
10. ZYGOMATIC BONE _____ Orange
11. MAXILLA _____ Yellow-Green
12. MANDIBLE _____ Gray
13. TEETH _____ Yellow
14. OCCIPITAL BONE _____ Light Green
15. HYOID BONE _____ Light Brown

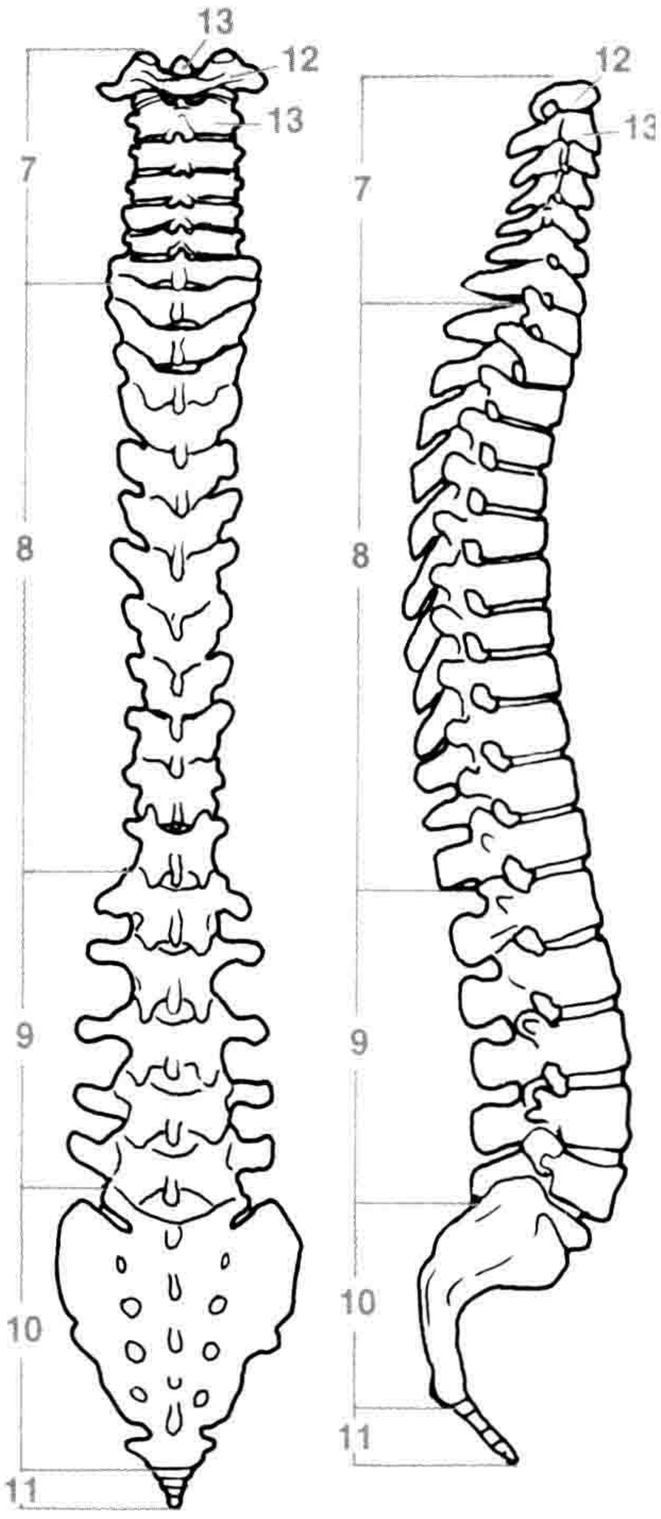


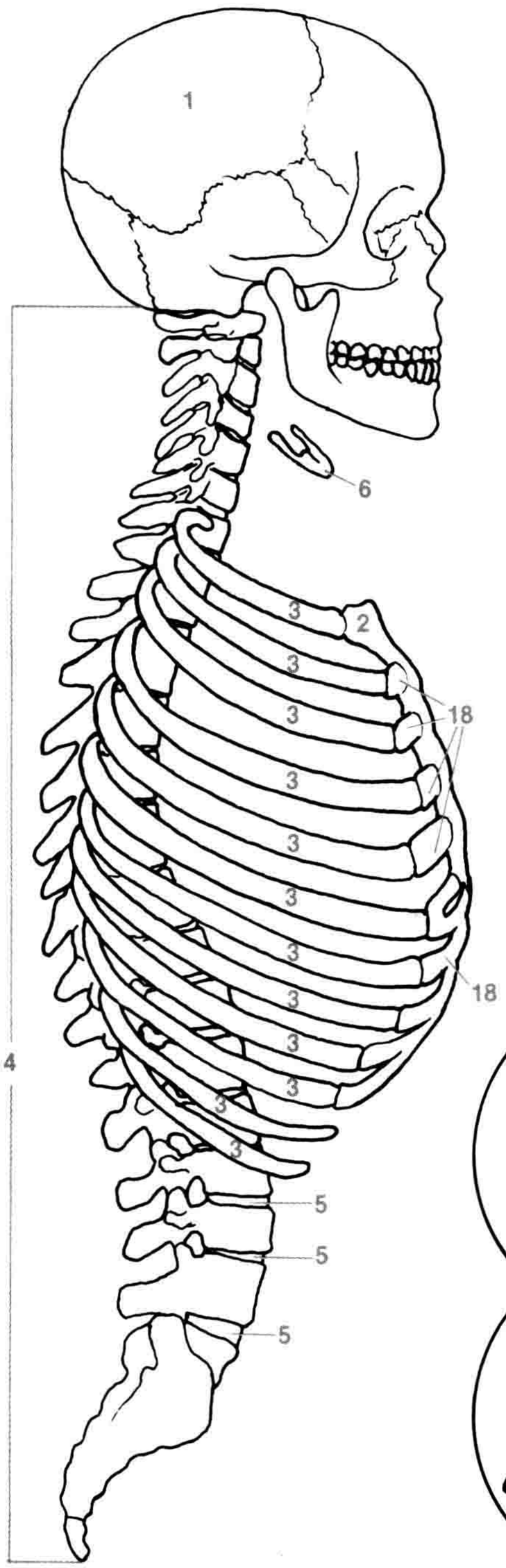
HYOID BONE
The unusual U-shaped hyoid bone doesn't touch any other bone, but many muscles attach to it. It supports the tongue and forms part of the larynx.

VERTEBRAL COLUMN — SPINE

A stack of 26 irregular *vertebrae* or bones, all tied tightly together by ligaments, forms the strong, flexible column known as the spine. It can be divided into five regions. The *cervical* area forms the neck and supports the skull. The *thoracic* region, together with the ribs, forms the *thorax* or chest. The *lumbar* section makes up the lower back. The *sacrum* consists of five vertebrae fused into one triangular bone and forms part of the hip. The bottom four vertebrae, a remnant of the tail humans lost in evolutionary history, comprise the *coccyx.*

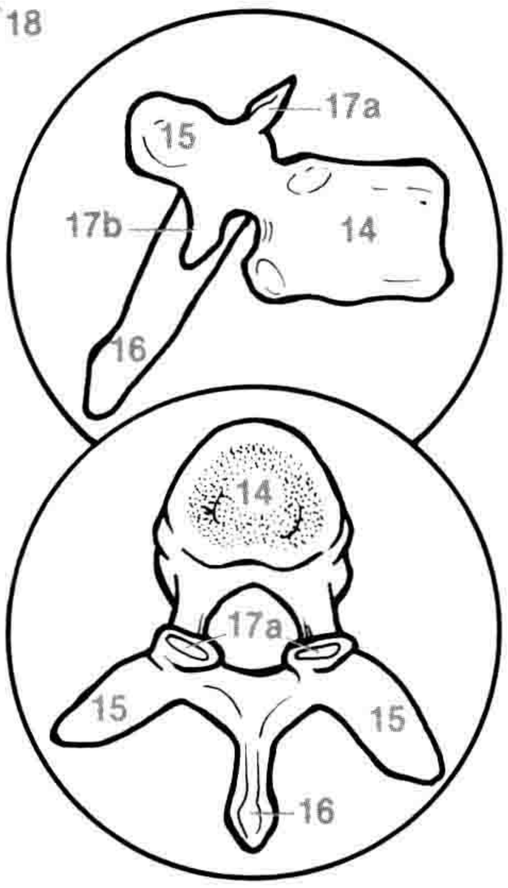
The lumbar vertebrae are the largest and thickest; the cervical are the smallest. All vertebrae have a thick body to bear weight and two wing-like *lamina* that join and form a ring, the *vertebral arch*. The ring opening is called the *vertebral foramen.* The openings are placed together to form an armored tube for the spinal cord, the *vertebral* or *spinal canal*. Each vertebra has seven *processes* or fingers that serve as anchors for muscles, contact points for vertebrae above and below, and overlapping shields to protect the spinal cord.

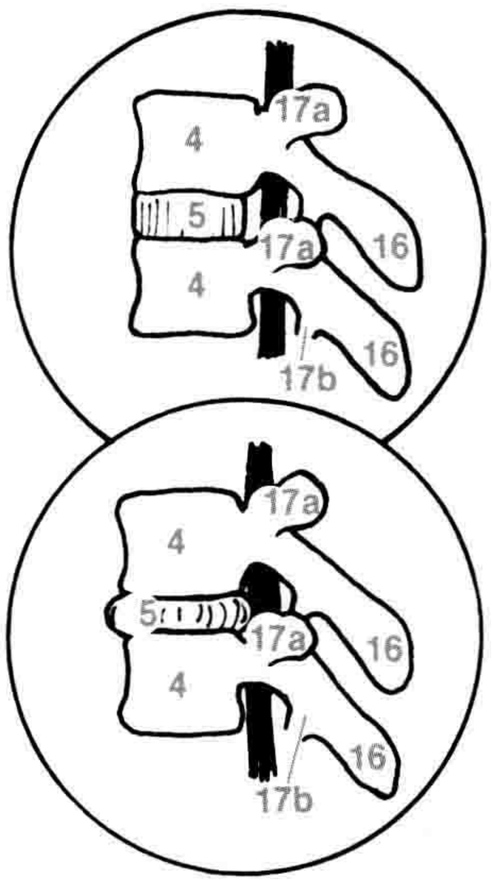


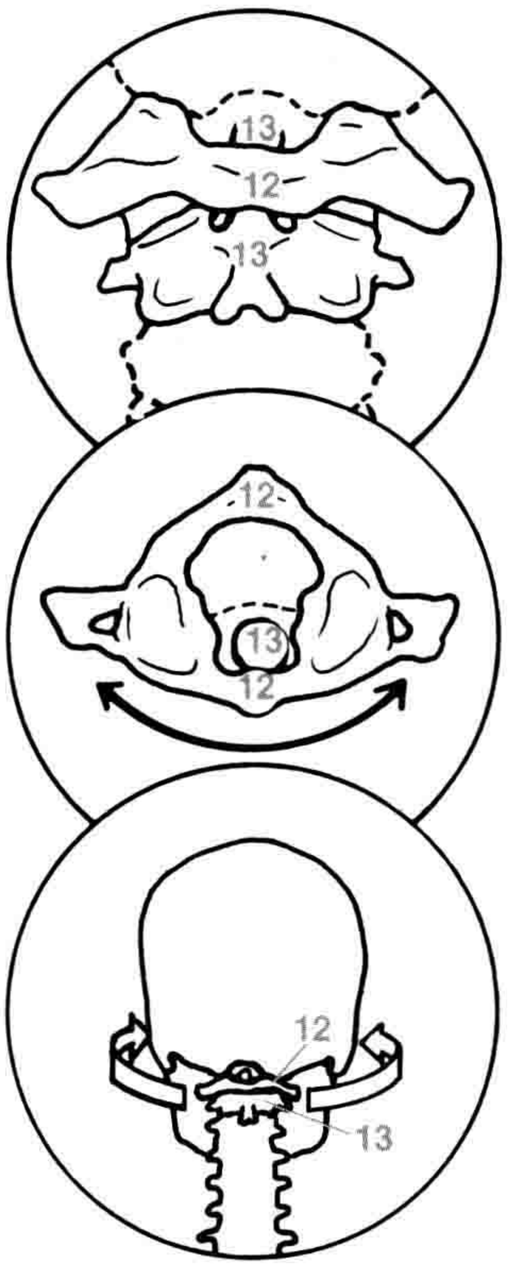


As a child grows, curves develop in the spine that give it strength and spring. These curves, together with the *disks* or cartilage pads between the vertebrae, protect the vertebral column by absorbing shock and concussion. The painful or numbing condition known as a *pinched nerve* occurs (usually in the lower back and occasionally in the neck) when a disk is crushed or ruptured in an accident or from lifting a heavy weight. The flattened or ruptured disk presses against or "pinches" nerves where they branch off from the spinal cord.

1. SKULL _____ Gray
2. STERNUM _____ Green
3. RIBS _____ Yellow
4. VERTEBRAL COLUMN _____ Light Purple
5. INTERVERTEBRAL DISKS _____ Flesh
6. HYOID BONE _____ Light Brown
7. CERVICAL VERTEBRAE _____ Light Blue
8. THORACIC VERTEBRAE _____ Purple
9. LUMBAR VERTEBRAE _____ Pink
10. SACRUM _____ Red
11. COCCYX _____ Orange
12. ATLAS _____ Blue
13. AXIS _____ Dark Blue
14. VERTEBRA BODY _____ Light Orange
15. TRANSVERSE PROCESS _____ Yellow-Green
16. SPINOUS PROCESS _____ Light Green
17. **a.** SUPERIOR and **b.** INFERIOR ARTICULAR PROCESS _____ Turquoise
18. COSTAL CARTILAGE _____ Brown



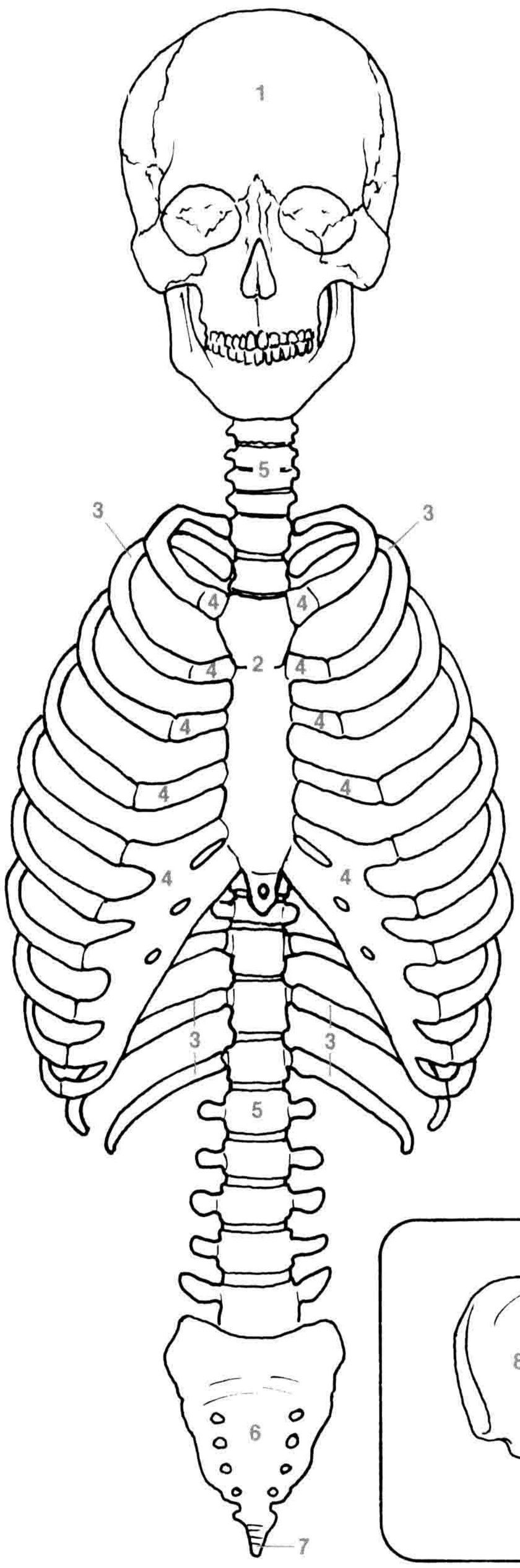




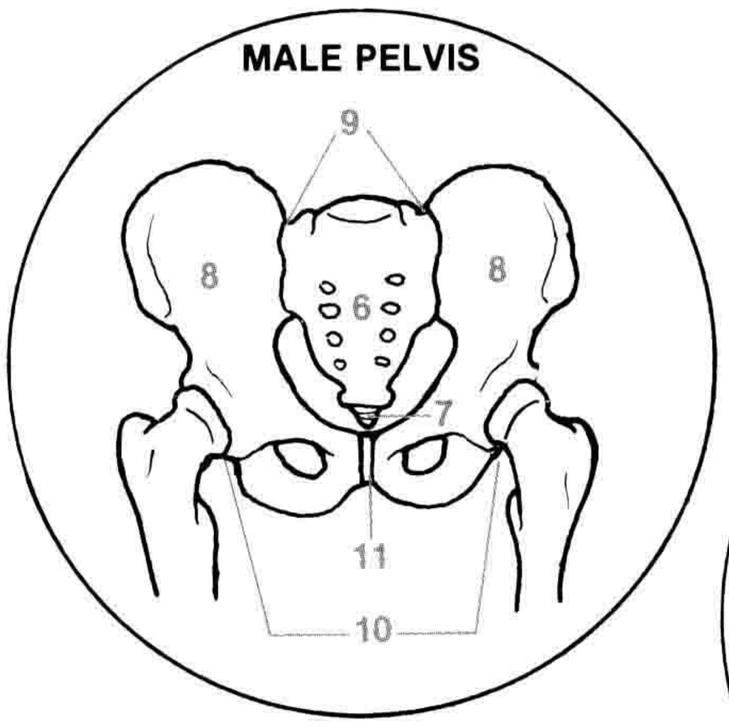
AXIAL SKELETON

The axial skeleton consists of the *skull*, the *vertebral column,* the *sternum*, and the *thorax* or rib cage and serves to hold the body erect. It also protects most of the body's vital organs such as the heart, lungs, and liver, which the thorax encloses. The thorax is a bony and somewhat flexible cage made up of twelve pairs of thin, curved ribs, the head of each of which joins or articulates with one or two vertebrae. The first seven pairs of ribs, the "true" ribs, are directly attached to the sternum by a strip of costal cartilage. The other five pairs, the "false" ribs, consist of the eighth, ninth, and tenth pairs, which are attached to each other and the seventh pair by cartilage, and the "floating" ribs (pairs eleven and twelve), which are not tied to the sternum at all but to the muscles of the abdominal wall. The elasticity of the cartilage and the flexible joints at the spine allow the ribs to flex in and out, reducing or enlarging the volume of the thorax.

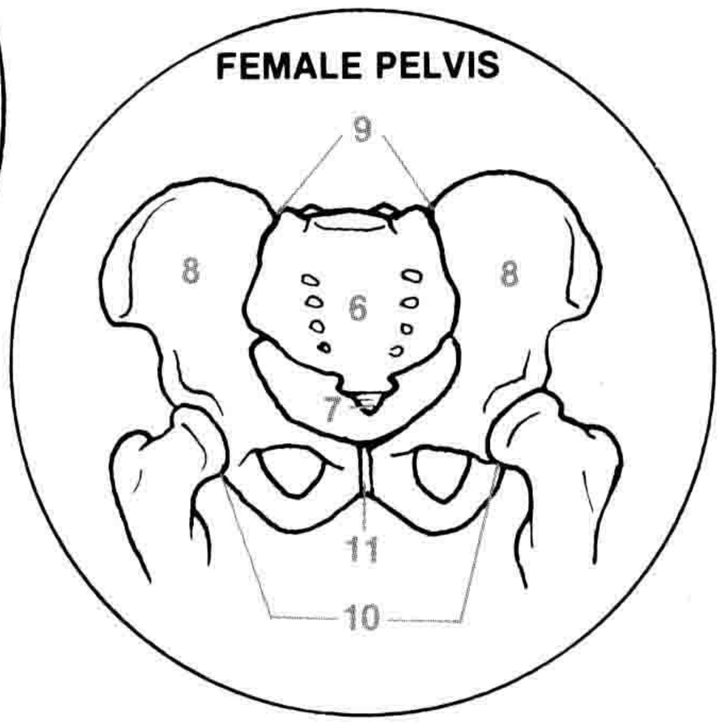
The sternum develops in the child as three separate bones, but the three fuse into one in the adult around age 25. Pushing down on the lower third of the sternum compresses the heart and creates a pumping action that is the basis of cardiopulmonary resuscitation.



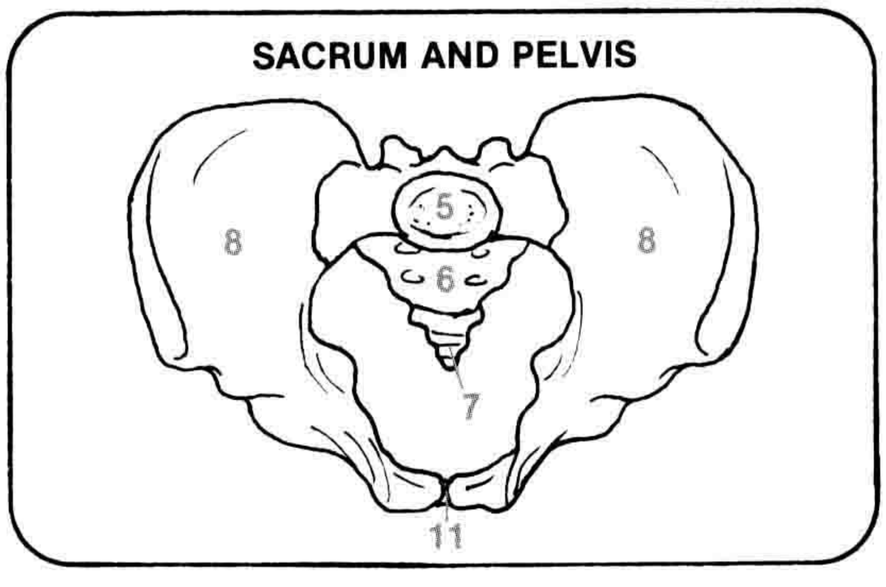
1. SKULL _____ Gray
2. STERNUM _____ Green
3. RIBS _____ Yellow
4. COSTAL CARTILAGE _____ Brown
5. VERTEBRAE _____ Light Purple
6. SACRUM _____ Red
7. COCCYX _____ Orange
8. HIP BONE _____ Pink
9. SACROILIAC JOINT
10. ACETABULUM (hip joint)
11. PUBIS SYMPHYSIS (interpubic joint)



MALE PELVIS
Heart shaped and narrow, the male pelvis is stronger and heavier than the female's. The pubic angle is less than 90°.

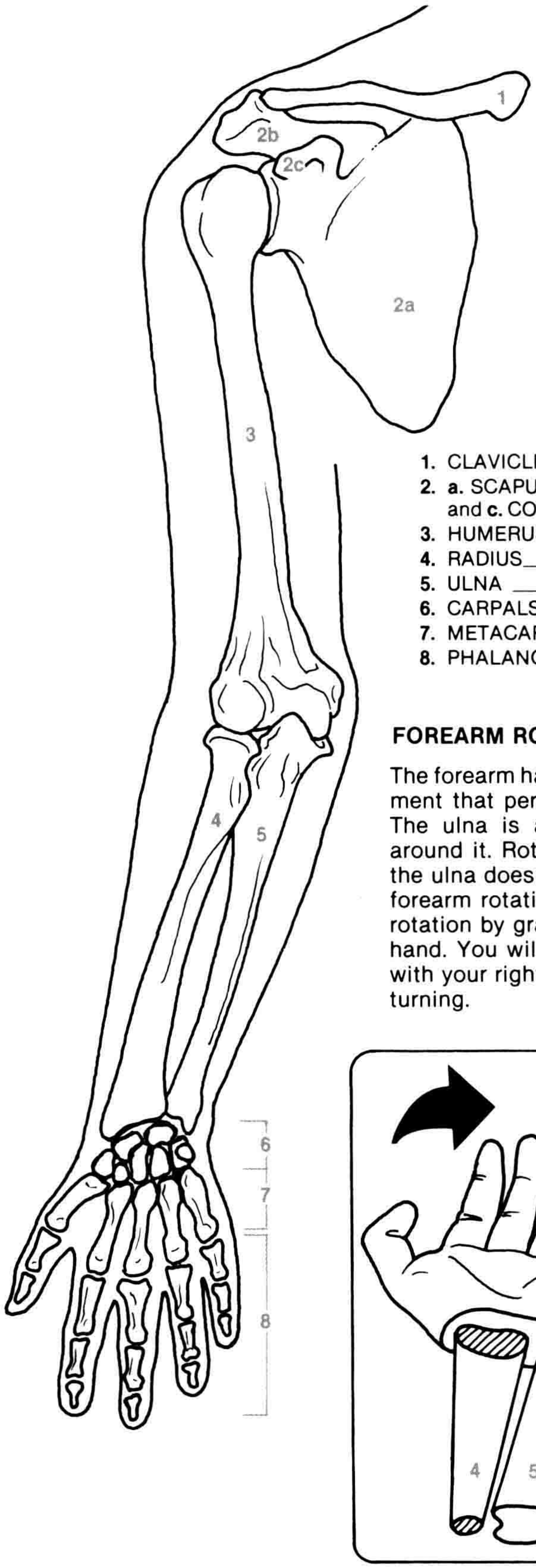


FEMALE PELVIS
Wider, smoother, and more bowl-like than the male's in order to accommodate the fetus during pregnancy and childbirth, the female pelvis is also smaller and structurally weaker than the male's. The pubic angle is greater than 90°.



SACRUM AND PELVIS
The sacrum forms a strong, interlocking keystone for the pelvis, which is subject to more stress than any other structure in the body.

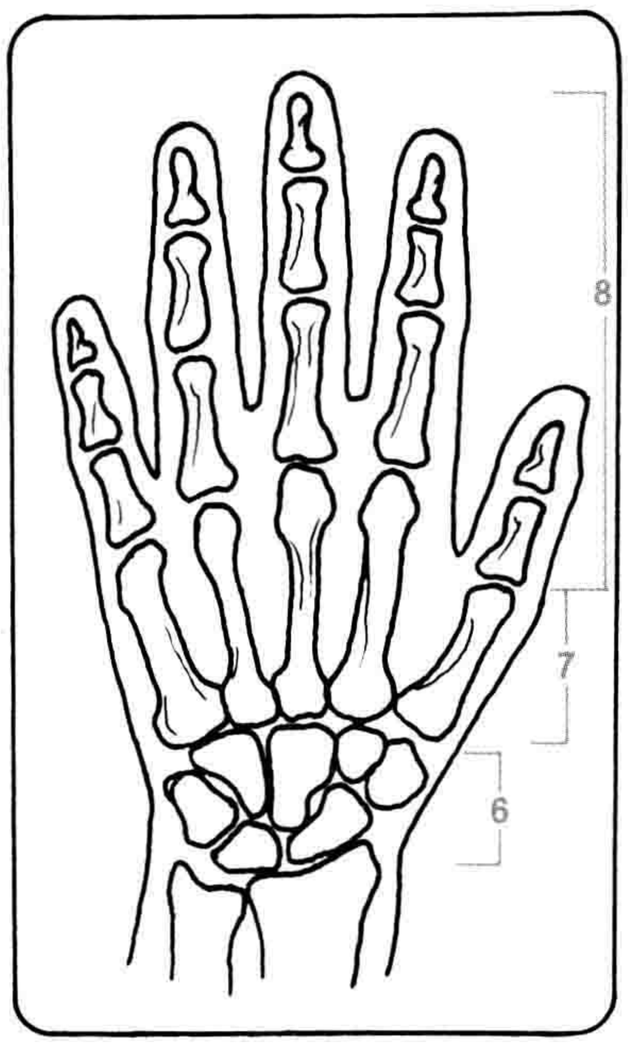
APPENDICULAR SKELETON — UPPER EXTREMITIES



The combination of simple joints and levers that make up the arm and hand produce an astounding range of movements—baseball pitchers and jewelers both employ the complex arm and hand for very different purposes. The arm is supported by the *pectoral girdle*, which consists of the *scapula* or shoulder blade and the *clavicle* or collar bone. The scapula is held in place only by muscles; hence it is free floating and capable of considerable movement.

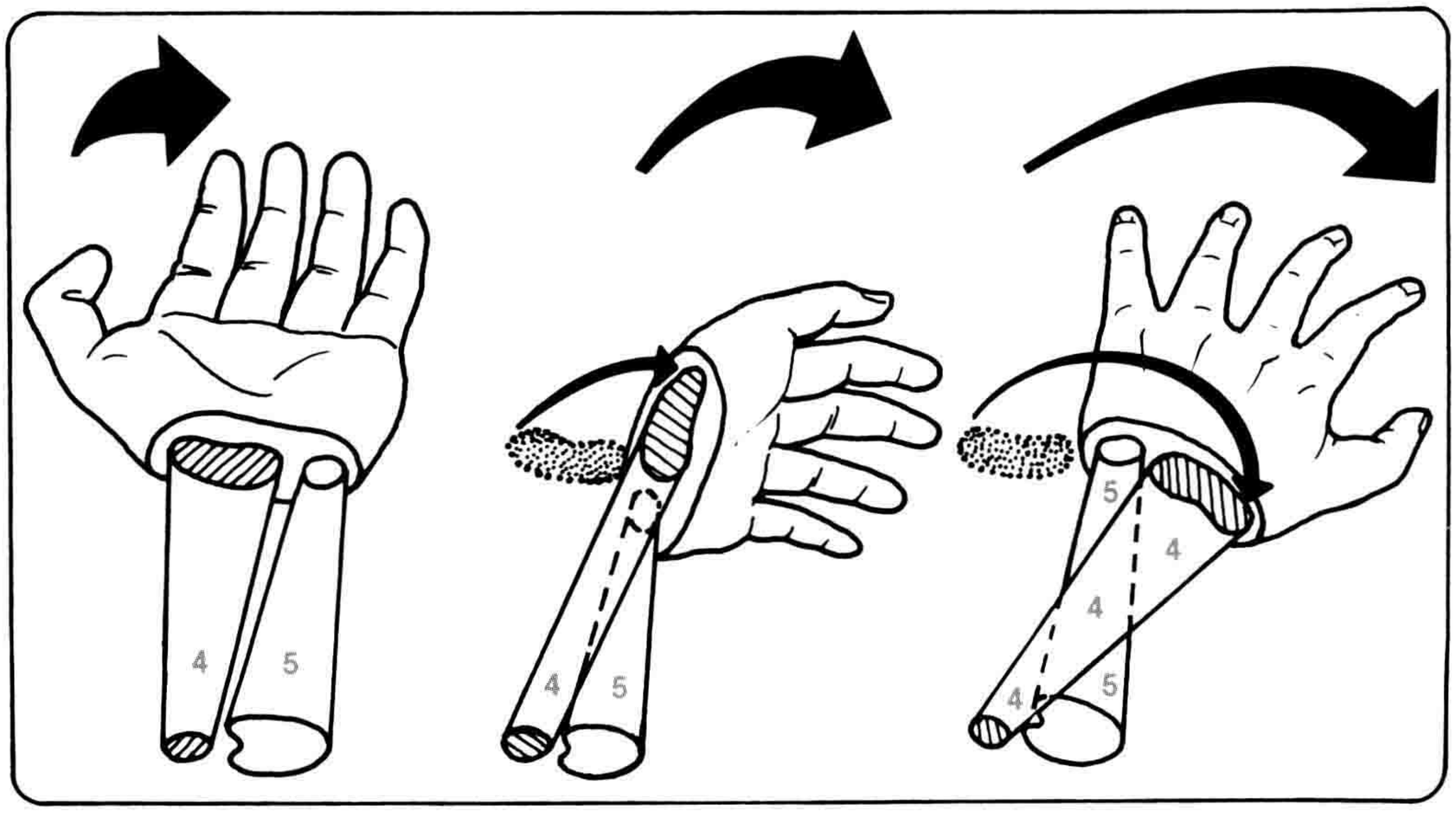
There is a ball at the top of the upper arm bone or *humerus* that rotates in a socket in the scapula. The forearm consists of the *ulna* and *radius*, which join the hand at the eight wrist bones or *carpals; intercarpal ligaments* tie the carpals together. The *metacarpals*, the five long bones that form the palm of the hand, join with the carpals. Beginning with the thumb, the metacarpals are numbered 1 to 5. The *knuckles* are the *heads* of the metacarpals. The finger bones or *phalanges* articulate with the metacarpals. Each finger has three bones, except for the thumb, which has two.

1. CLAVICLE _____ Green
2. **a.** SCAPULA, **b.** ACROMIAL PROCESS, and **c.** CORACOID PROCESS _____ Pink
3. HUMERUS _____ Purple
4. RADIUS _____ Turquoise
5. ULNA _____ Gray
6. CARPALS _____ Yellow
7. METACARPALS _____ Brown
8. PHALANGES _____ Blue

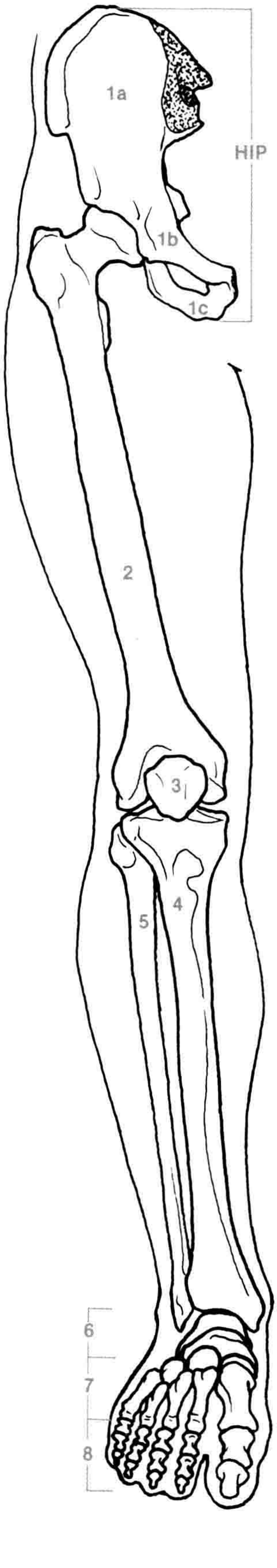


FOREARM ROTATION

The forearm has an interesting mechanical arrangement that permits it to rotate and gives it power. The ulna is a stationary axle; the radius turns around it. Rotate your hand and you will see that the ulna doesn't move. To appreciate the power of forearm rotation, all you need do is try to prevent rotation by grasping your left wrist with your right hand. You will have to exert a great deal of force with your right hand to stop your left forearm from turning.



APPENDICULAR SKELETON — LOWER EXTREMITIES

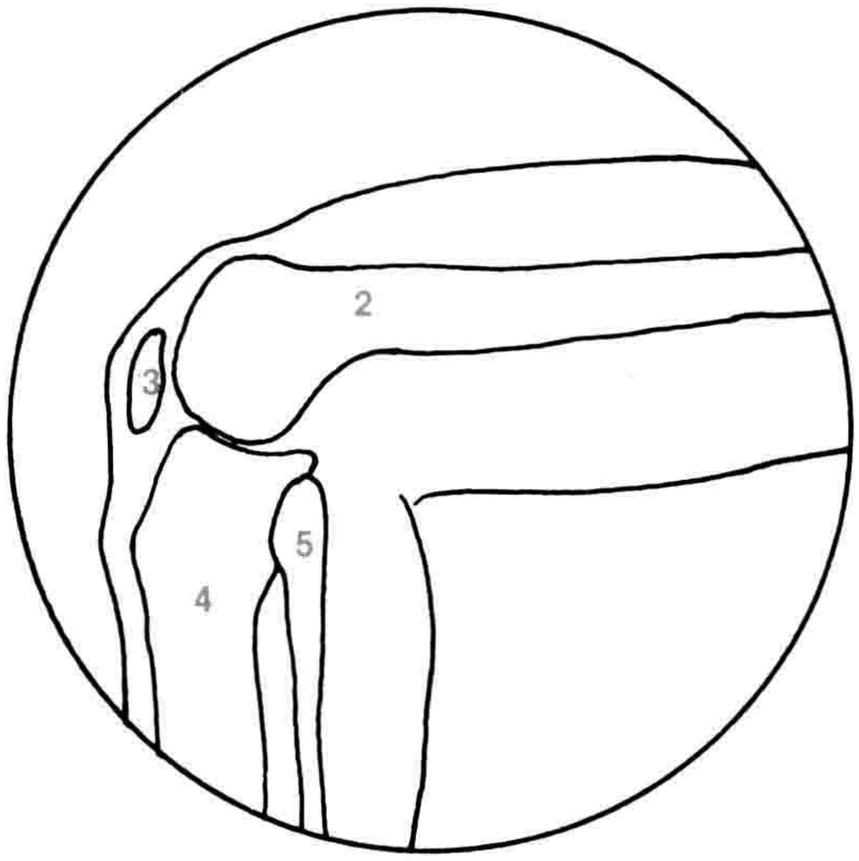


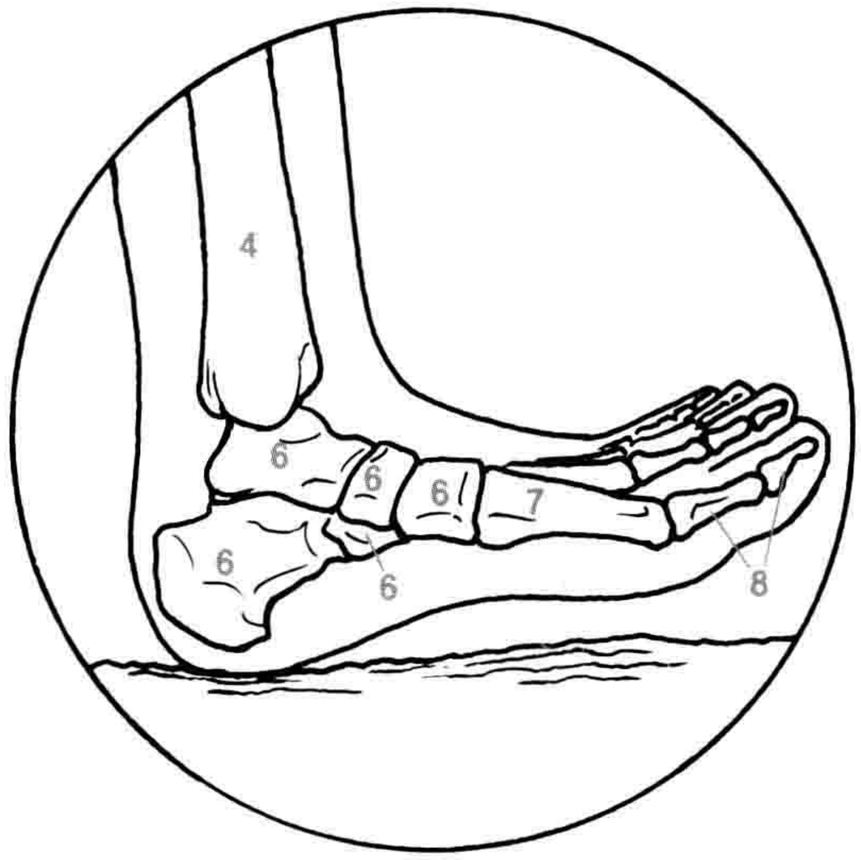
The bones of the lower and upper extremities are similar in many respects, but they serve different functions and, hence, have some structural differences. The leg bones must support the body's weight and are thus more solid than the arm bones, but the leg bones have a smaller range of movement.

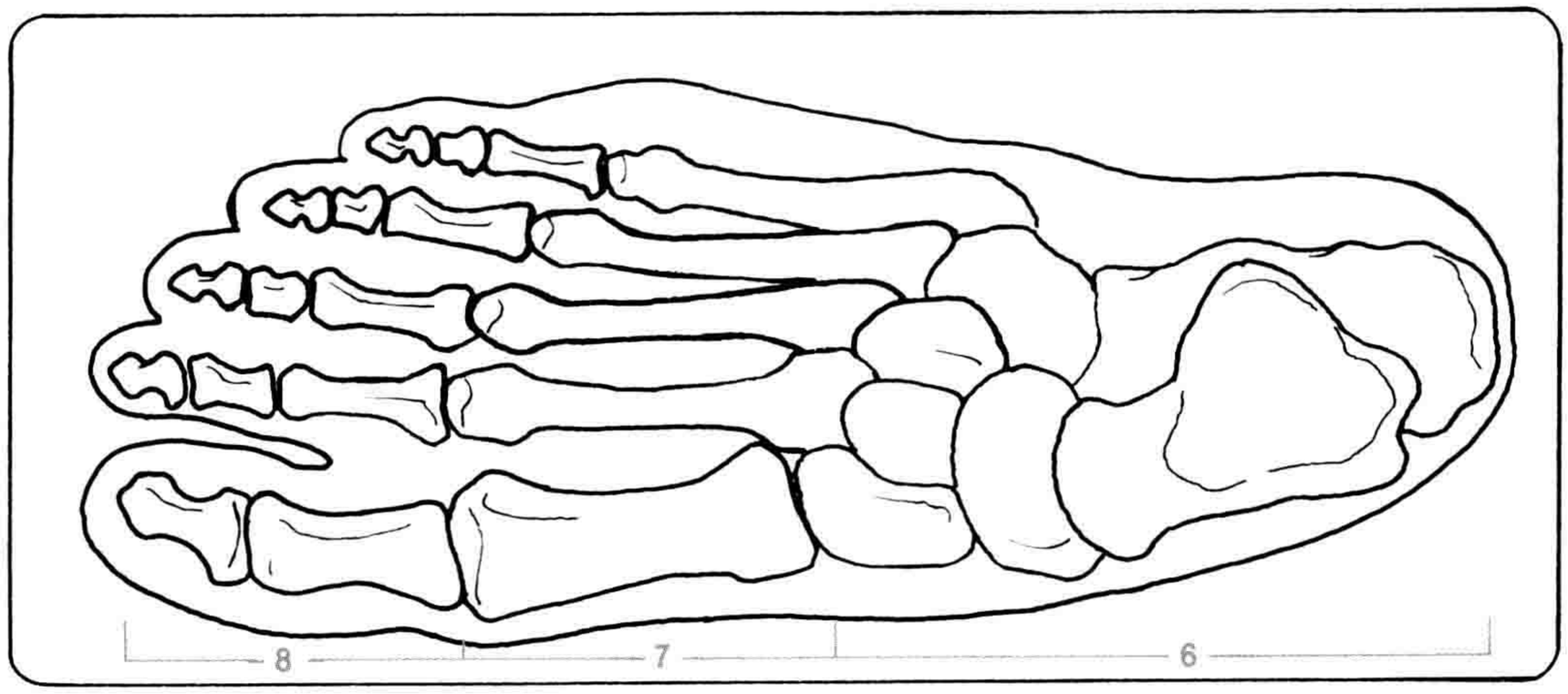
At birth the hip has three bones — the *ilium, pubis,* and *ischium* — which later unite into a single bone, the *os coxa*. The left and right coxae join in the front at the *symphysis pubis* and with the *sacrum* in the back to form the bowl-shaped *pelvis*. The hip bone is connected to the thigh bone or *femur*, which has a ball-like head that rotates in the hip socket and a slight inward curve that aligns the body vertically with the knees and ankles. This alignment is important for the body to maintain its center of gravity. The lower femur and the *tibia* or shin form the knee. The small bone called the *patella* protects the knee; it is held in place by a tendon and surrounded by a *bursa*, a sac filled with fluid. Parallel to and outside of the tibia is the *fibula* or calf bone, whose lower end forms the outer ankle bone or *lateral malleolus*. The tibia and fibula articulate with the *talus*, the uppermost of the seven *tarsal bones*. The tarsals and the five *metatarsals* (numbered 1 to 5, beginning with the big toe) form two arches that act as a spring, distributing weight and helping to balance the body. The *phalanges* of the foot are similar to those of the hand in number and arrangement — two phalanges for the big toe, three for each of the other toes.

The condition known as fallen arches or "flat feet" results from the weakening of the ligaments and tendons that hold up the arches.

1. HIP: **a.** ILIUM, **b.** PUBIS, and **c.** ISCHIUM _____ Pink
2. FEMUR _____ Purple
3. PATELLA _____ Orange
4. TIBIA _____ Gray
5. FIBULA _____ Turquoise
6. TARSALS _____ Yellow
7. METATARSALS _____ Brown
8. PHALANGES _____ Blue

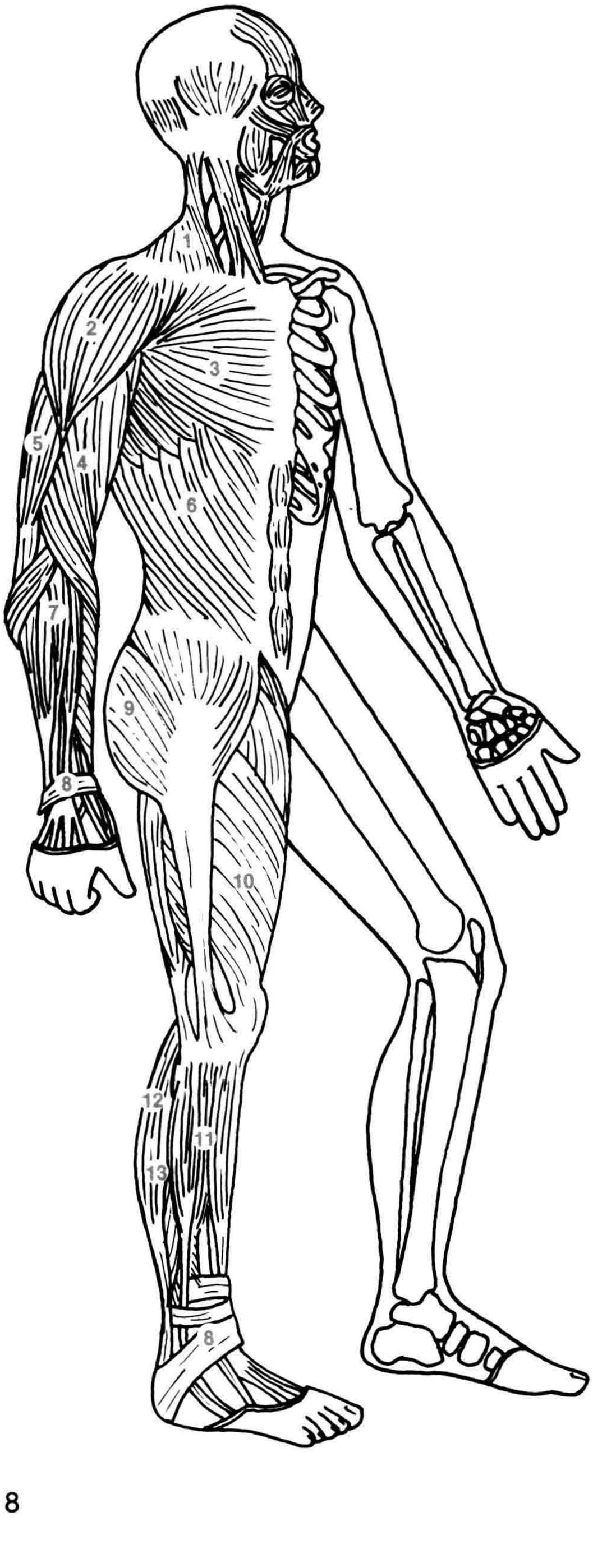






MUSCULAR SYSTEM

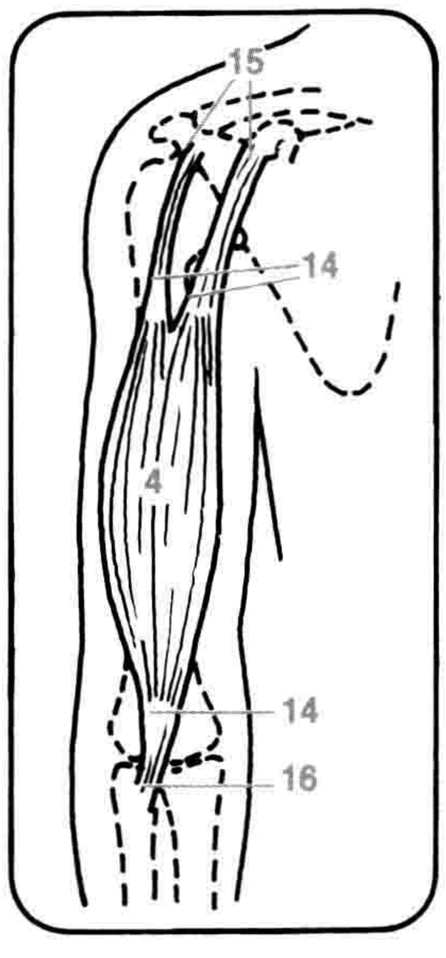
Muscles are tissues that contract, and the human body has almost seven hundred of them, which are divided into three kinds. *Skeletal muscles* are responsible for the voluntary movement of the bones. *Smooth muscles* are involuntary; they include blood vessels, intestines, and the lungs. There is only one *cardiac muscle*—the heart.

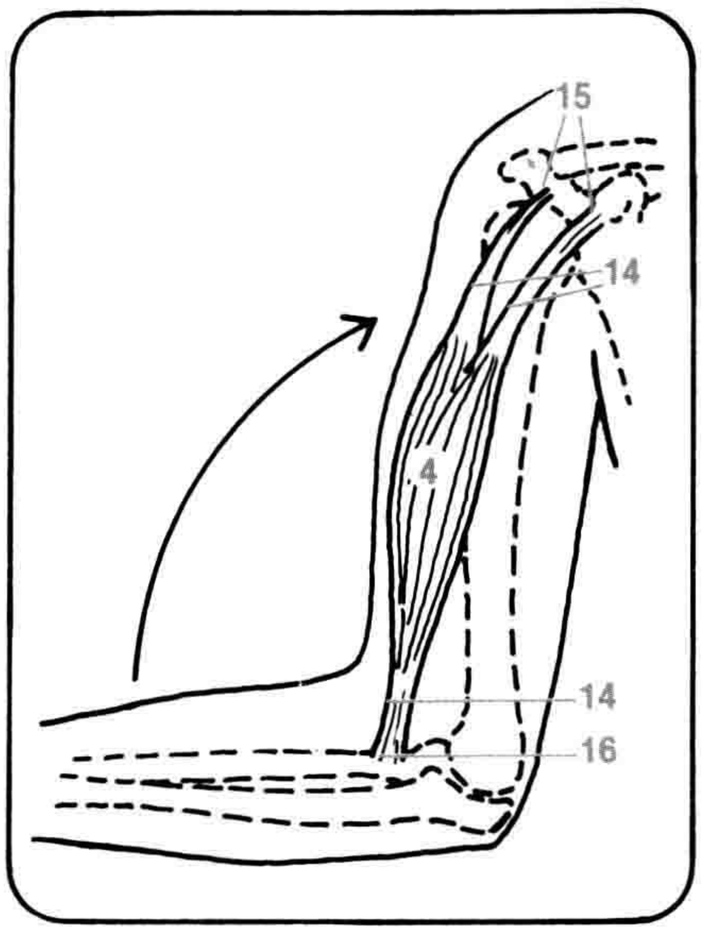


The term *muscular system* is used only for the skeletal muscles, which are the long, slender fibers arranged in parallel bundles that give our arms, legs, torso, neck, and face much of their shape. The large part of the muscle is called the *belly*. The ends of the skeletal muscles are attached by ligaments to two different bones, only one of which moves when the muscle contracts. The *origin* is where the muscle meets the bone that doesn't move. The origin is always closer to the torso than the *insertion*, where the muscle meets the bone that does move. Muscles that bend joints and pull limbs toward the body are called *flexors*. Muscles that straighten joints are *extensors*.

Movement usually involves the coordinated action of several muscles. The muscle that initiates the action is the *agonist* or *prime mover*. As the agonist contracts, another muscle, the *antagonist*, relaxes or yields to it. Other muscles, *synergists* or *fixators*, help the prime mover by dampening unwanted movement or holding a limb or joint steady during the action.

1. TRAPEZIUS _____ Pink
2. DELTOID _____ Orange
3. PECTORALIS _____ Light Blue
4. BICEPS _____ Green
5. TRICEPS _____ Turquoise
6. EXTERNAL OBLIQUE _____ Light Brown
7. EXTENSORS _____ Yellow
8. ANNULAR LIGAMENT _____ Gray
9. GLUTEUS MAXIMUS _____ Purple
10. QUADRICEPS _____ Red
11. PERONEUS _____ Blue
12. GASTROCNEMIUS _____ Pink
13. SOLEUS _____ Yellow-Green
14. TENDON _____ Flesh
15. ORIGIN OF MUSCLE
16. INSERTION OF MUSCLE

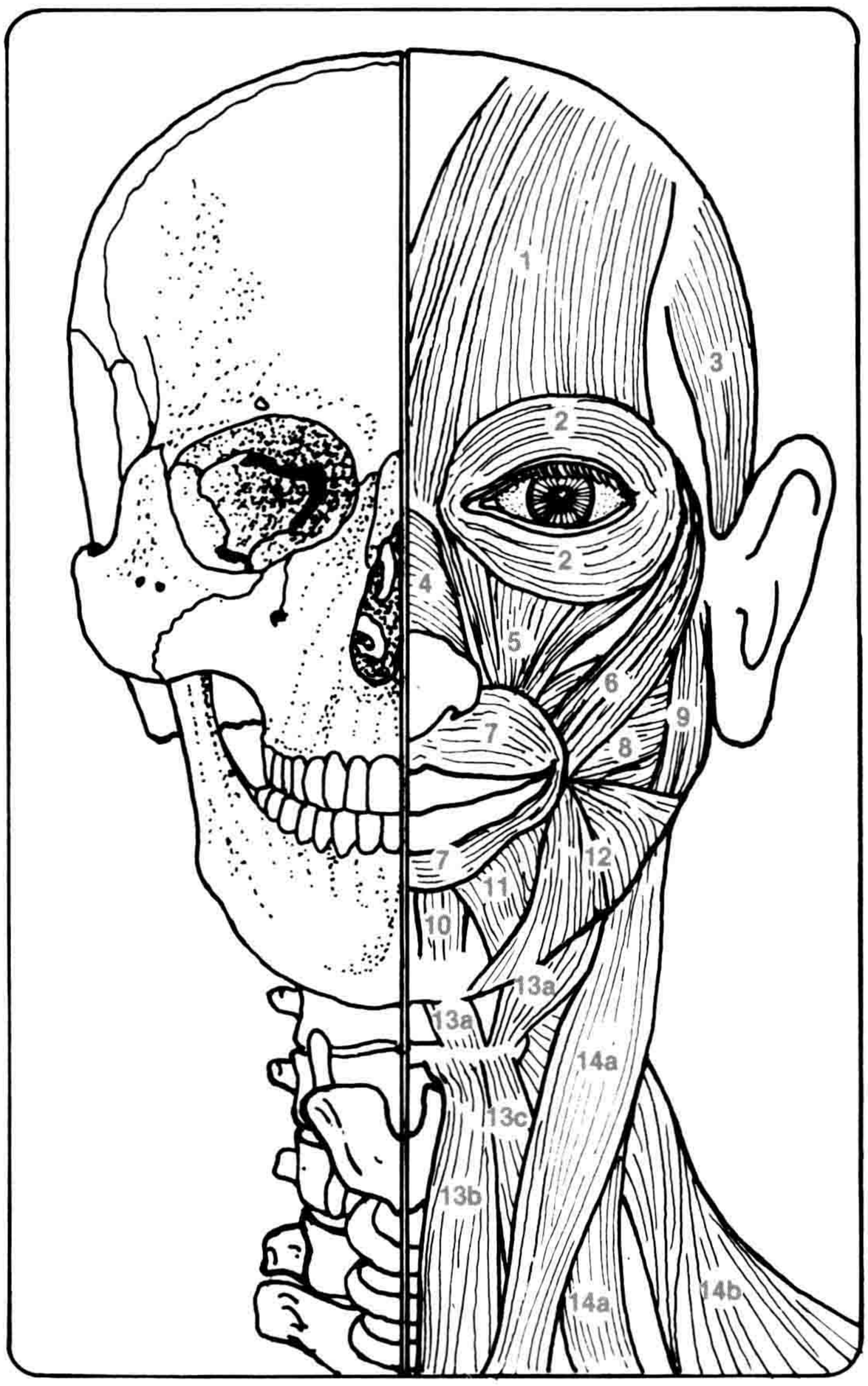


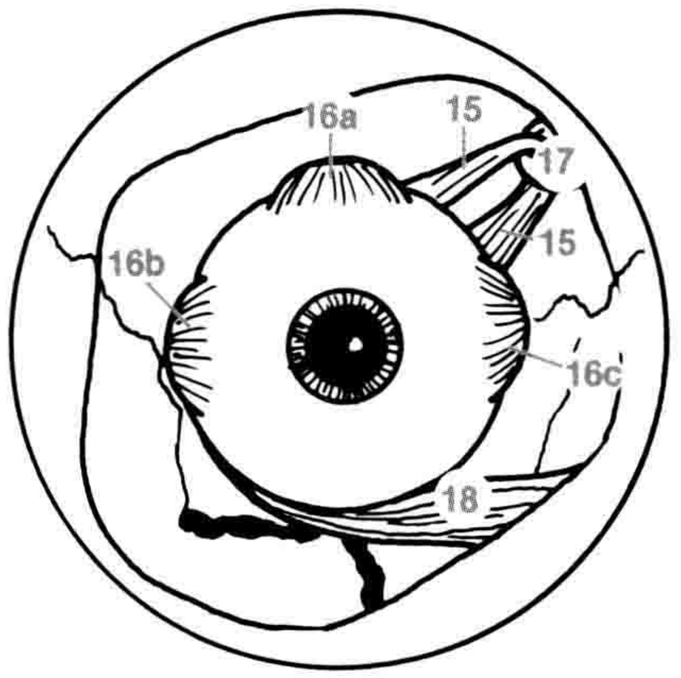


MUSCLES OF THE FACE, HEAD, AND NECK

The complex muscles of the head and neck are capable of rotation and powerful movement as well as the minute coordinated actions that express slight emotional changes in the face. Unlike most skeletal muscles, the face and head muscles are not attached to a moving limb. Instead they insert either into the flat bones of the skull or face or into head tissue such as the lip or skin of the chin. The *muscles of facial expression*, located near the skin (superficial muscles), register emotion and also help you chew and speak. The *muscles of mastication* move the lower jaw primarily for chewing, but they also are necessary for speaking. The *muscles of the tongue* help with chewing and swallowing and are extremely important for making the complex movements required for human speech. Some of the tongue muscles have both their origin and insertion at the hyoid bone; others insert into the tongue. The *muscles of the neck* arise primarily from the sternum and clavicle and as far down as the sixth vertebra. Neck muscles permit you to rotate and extend your head.

1. FRONTALIS _____ Orange
2. ORBICULARIS OCULI _____ Light Blue
3. TEMPORALIS _____ Purple
4. COMPRESSOR NARIS _____ Pink
5. LEVATOR LABII SUPERIORIS _____ Light Green
6. ZYGOMATICUS _____ Yellow
7. ORBICULARIS ORIS _____ Blue
8. BUCCINATOR _____ Light Brown
9. MASSETER _____ Red
10. MENTALIS _____ Brown
11. DEPRESSOR LABII INFERIORIS _____ Green
12. TRIANGULARIS _____ Turquoise
13. **a.** DIGASTRICUS, **b.** STERNOHYOIDEUS, and **c.** OMOHYOIDEUS _____ Yellow Green
14. **a.** STERNOCLEIDOMASTOIDEUS and **b.** TRAPEZIUS _____ Light Orange
15. SUPERIOR OBLIQUE _____ Gray
16. **a.** SUPERIOR, **b.** LATERAL, and **c.** MEDIAL RECTUS _____ Light Purple
17. TROCHLEA (pulley) _____ Dark Blue
18. INFERIOR OBLIQUE _____ Flesh

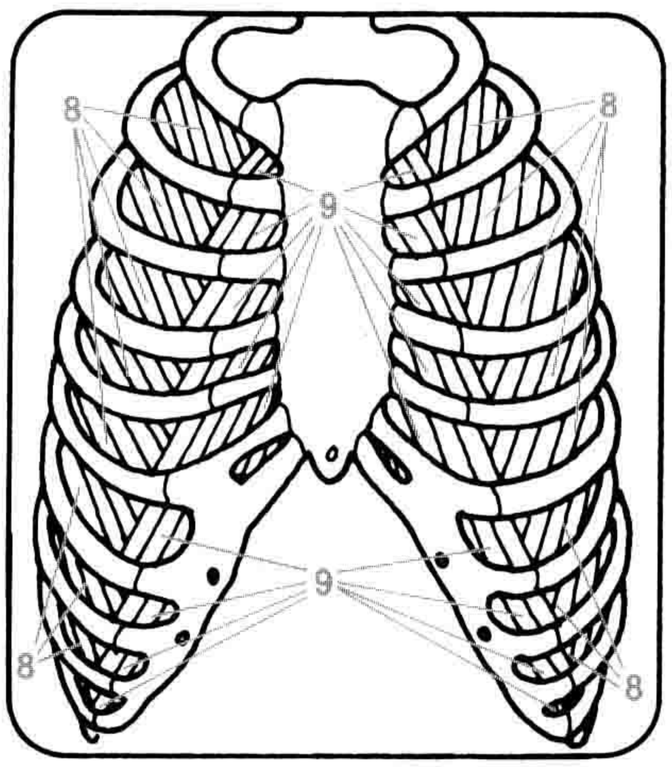


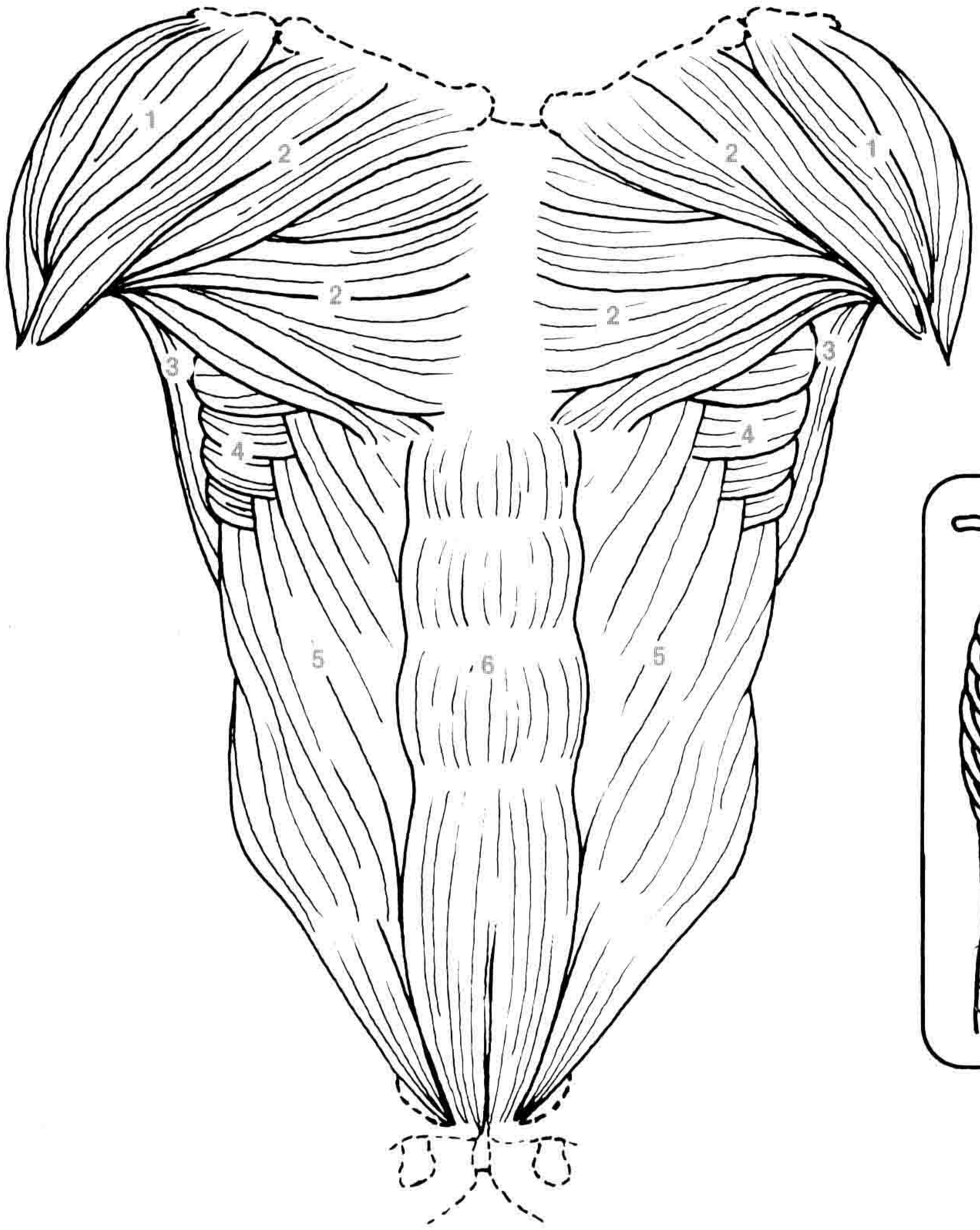


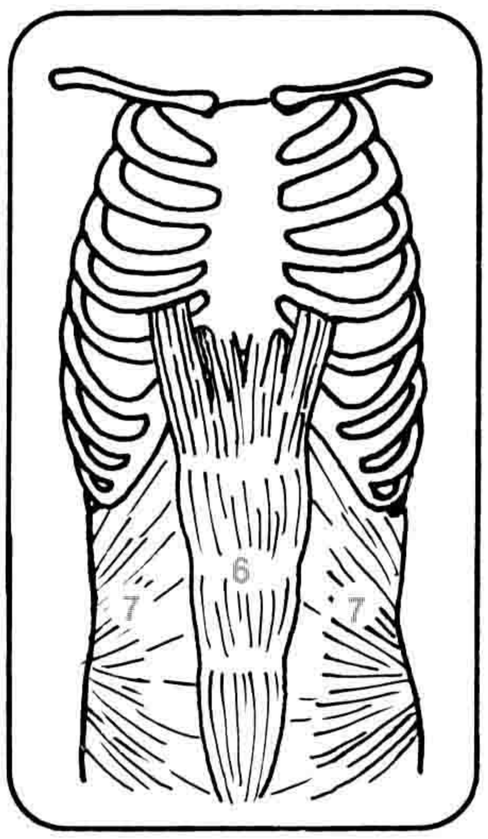
MUSCLES OF THE TORSO

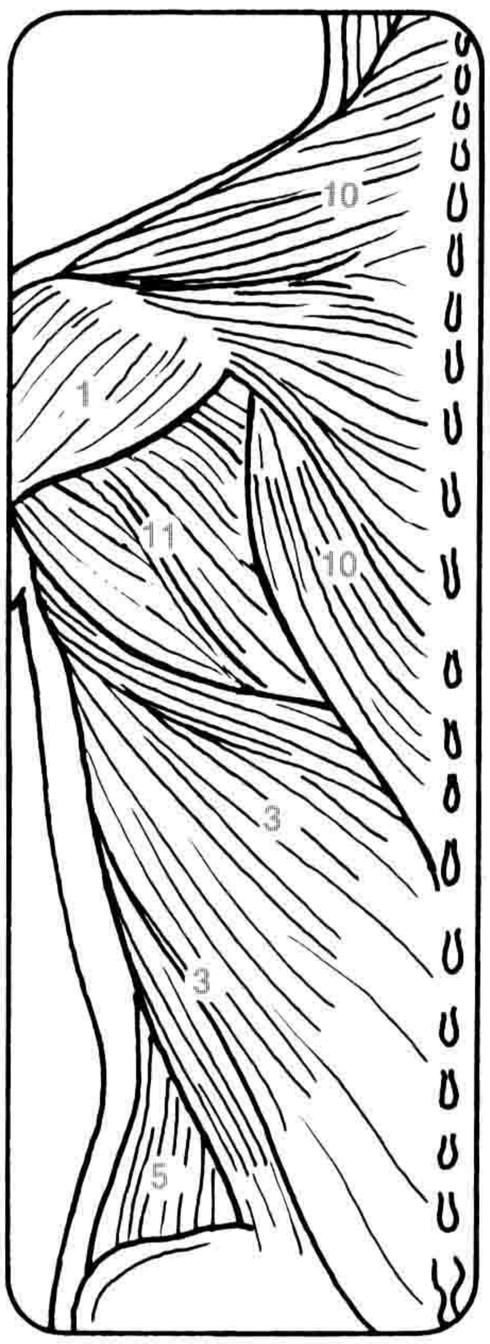
The muscles that encase the torso hold the body erect, allow it to flex, assist in breathing, and restrain the intestines. The *back muscles* that control the torso's forward and backward movement originate primarily along the upper crest of the hip, the sacrum, and the lumbar vertebrae and rise vertically and diagonally into the ribs and vertebrae at various levels. Although the lumbar vertebrae can flex freely in all directions, the movement of the thoracic vertebrae and their correspondent ribs is very limited, which insures that the lungs are not compressed and have room to expand during breathing. A web of large muscles that restrains the abdominal contents, bends the spine, and assists in breathing passes vertically, horizontally, and diagonally across the abdominal cavity. For example, *obliquus externus* (external oblique) compresses the abdominal cavity during forced exhalation. If the external oblique muscle on only one side of the body contracts, the spine bends sideward. The muscles used in breathing enlarge and reduce the size of the thoracic cavity, which decreases and increases in turn the air pressure in the lungs. The *diaphragm,* which forms the floor of the thoracic cavity, contracts downward to increase the length and therefore the volume of the thorax. Two sets of *intercostal muscles* placed side by side fill the spaces between the ribs. The external or outer intercostals, which raise the ribs and enlarge the cavity during inspiration, angle downward and forward away from the spine. The internal or inner set are cast down and back toward the spine and serve to draw the ribs down to reduce the volume of the thoracic cavity for exhalation.

1. DELTOID _____ Orange
2. PECTORALIS MAJOR _____ Light Blue
3. LATISSIMUS DORSI _____ Red
4. SERRATUS ANTERIOR _____ Gray
5. EXTERNAL OBLIQUE _____ Light Brown
6. RECTUS ABDOMINIS _____ Turquoise
7. INTERNAL OBLIQUE _____ Brown
8. EXTERNAL INTERCOSTAL _____ Yellow
9. INTERNAL INTERCOSTAL _____ Green
10. TRAPEZIUS _____ Pink
11. TERES MAJOR _____ Yellow-Green



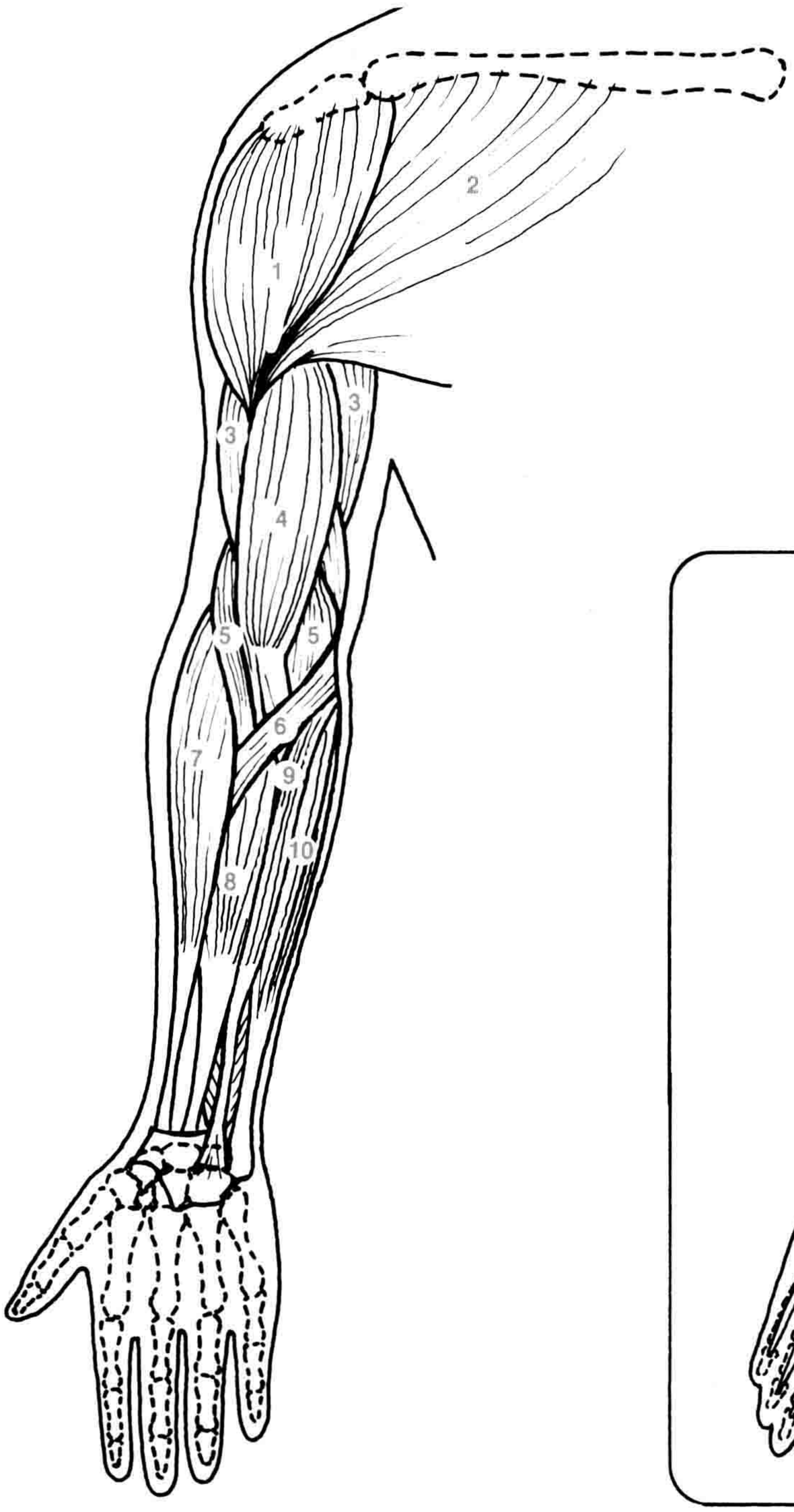






MUSCLES OF THE UPPER LIMBS

A complex group of strong opposing muscles move the arm. These muscles, which arise from the scapula, clavicle, sternum, ribs, lower vertebrae, and hips, form the only attachment between the arm and shoulder and the axial skeleton and hold the humerus in its socket. By contracting and relaxing in combination, the shoulder muscles are able to rotate, extend, and flex the arm at the shoulder. The *brachialis, biceps brachi* (which has two *heads* or origins), and *triceps brachi* (three heads), all muscles of the upper arm, flex the elbow joint and move the forearm. The two rotating actions, *supination* (as when you turn a key) and *pronation* (as in turning the palm down) are generated by muscles that arise in the humerus and wrap around the radius and ulna like a window shade around its roller. The forearm and lower humerus are the origin for the primary muscles of the wrist, hand, and fingers. The fingers are connected by long tendons, which you can see in the back of your hand, that run from the forearm muscles. Muscles on the underside of the forearm bend the fingers; muscles on the upper side extend them. The hand has small muscles that spread the fingers and perform the complex and very important apposable thumb action, which man alone among primates is capable of.



1. DELTOID _____ Orange
2. PECTORALIS MAJOR _____ Light Blue
3. TRICEPS _____ Pink
4. BICEPS _____ Green
5. BRACHIALIS _____ Light Brown
6. PRONATOR TERES _____ Gray
7. BRACHIORADIALIS _____ Light Purple
8. FLEXOR CARPI RADIALIS _____ Yellow
9. PALMARIS LONGUS _____ Turquoise
10. FLEXOR CARPI ULNARIS _____ Red
11. FLEXOR DIGITORUM SUPERFICIALIS _____ Light Green
12. EXTENSOR DIGITORUM and INDICIS _____ Light Orange