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Knowledge of anatomical structures is a basic tool used by a health professional. A cadaveric dissection course gives the student the opportunity to gain the anatomical knowledge essential for evaluating and treating a patient, and to develop the attitudes, behaviors, and judgment necessary in clinical practice. Participation in a dissection course is a very special privilege for both the student and the instructor.

Dr. Claudia Senesac and Dr. Mark Bishop have developed an innovative dissection text to aid and support the student through the dissection experience. They have produced an interactive step-by-step instruction book using digital components as well as anatomical text. A DVD is included, which parallels the procedures in the book. Digital still images are complemented by digital movie clips of the procedures, and in addition, line drawings are presented. All regions of the body are included as well as a comprehensive description for the dissection of joints, the pelvis, and the spine.

These authors recognize the inherent value of the study of anatomy employing cadaveric dissection. They have demonstrated in their teaching careers an appreciation for the multiple opportunities during laboratory classes to discuss and share with the students those skills essential for becoming a health care professional. These acquirements include: the student developing a clear visual picture of an anatomical area and the texture of the structures within, the student comprehending the damage to structures resulting from a pathological condition, and the student learning to exercise the mature judgment required in matters of confidentiality.

A cadaveric study of musculoskeletal anatomy and joint structures imprints on the student’s mind a visual picture of muscle attachments to bone and the relationship of the muscle attachments to ligaments around the joint as well as the joint axes. Dissection of joints allows the student an opportunity to stress certain ligaments to better understand the stability the ligament affords the joint. The functional problem resulting from a tear of a ligament can be appreciated by cutting through a ligament and observing the instability created by such an injury. The site where a nerve enters the muscle and innervation within the muscle can also be studied. The direction of the muscle fibers which influences the action the muscle accomplishes can be observed as the student experiments with moving the limbs.

A dissection experience allows the student to become familiar with the genuine texture of anatomical structures. The student develops a sense of the “feel” of a variety of structures. For example, tendons have a distinctive feel from muscle, a ligament can be discerned from a tendon, and nerves are perceived differently from blood vessels. Repeated handling of these cadaveric structures throughout a course firmly establishes the special feel of the structures and is essential for developing palpation skills on a patient.

In addition to joint and musculoskeletal problems, an understanding of generalized medical conditions is essential for treating many patients. The anatomical knowledge gained from dissection of thoracic, abdominal, and pelvic viscera leads to a greater appreciation of pathological conditions encountered in patients. To feel the walls of an artery with atherosclerosis, to observe enlargement of air spaces in the substance of a lung with emphysema, to view hypertrophy of the left ventricle of a heart, and to see tumor invasion in a liver affords a unique opportunity for a student to observe firsthand the impact of disease on tissue and its function.

Vital to cadaveric dissection courses is the cultivation of respect for the human body and recognition of the responsibility for confidentiality. As the instructor requires confidentiality
of what is performed and observed in the lab, the student begins to develop a sense of the strict confidentiality they will have to maintain when treating patients. A decision concerning what is appropriate information that may or may not be shared about the cadaver lab with a person who is not in the class helps the student to develop judgment in maintaining patient confidentiality.

A dissection course is exciting for the student who is seeing the “real thing” for the first time and the instructor who shares and stimulates the student’s wonderment. These courses lay the groundwork for the development of these attributes which are essential for a successful career as a health professional.

In 1974, I authored a manual that was a guide for the beginning student directing them through the process of dissection. It incorporated black and white illustrations and followed a step-by-step procedure for each anatomical area. This manual was used for a number of years in the Department of Physical Therapy at the University of Florida. Upon my retirement from the University of Florida in 2002, this manual and syllabus was handed over to Claudia Senesac, PT, PhD, PCS, who was my successor. Dr. Senesac had assisted in the teaching of this course for many years before joining the faculty. She now teaches the entry-level cadaver dissection course as well as pediatrics. Mark Bishop, PT, PhD teaches in the areas of functional musculoskeletal anatomy in the entry-level physical therapy program and advanced joint dissection in the sports medicine and orthopaedic physical therapy residency programs. He has assisted with the editing of this book and has written the introductory chapter and preface. Drs. Senesac and Bishop have developed an innovative anatomy text which incorporates some of the basic dissection approaches in the original syllabus. This interactive dissection guide will lead students in building a foundation of anatomical knowledge, giving a framework upon which the student can continue to build their clinical knowledge as they mature in their chosen health profession.

Claudette Finley, MS, PT
Associate Professor Emeritus
Why write this book? And why write it now? These are good questions, for there are certainly other manuals that describe the sequential dissection of the human body. Perhaps a better question might be “why record it now?” Maryanne Wolf wonders, “Can the essence of a word, a thing, or a concept retain importance when so much learning occurs in thirty second segments on a moving screen?” While her sentiment was particularly directed toward the acquisition of reading, I think that it applies equally to the acquisition of other skills. Can students learn the art and science of dissection by watching?

Some authors have suggested that students born after 1980 are so immersed in digital technology that they are different in their manner of thinking not only from previous generations of students but their teachers as well. Prensky is credited with coining the term “digital native” to describe this group of students, and “digital immigrants” to describe the rest of us born before 1980. As an immigrant to the digital world, then, I have an “accent” that often shows; I don’t text message well, I print papers out to read them and my seven-year-old son can out-bowl me on the Wii. Many have claimed that the observations are mainly anecdotal. Well, my anecdote is that the students who are arriving every fall are very much techno-savvy. Also, when we found that we were repeating demonstration after demonstration, the decision was made to generate some training videos. Next thing you know, there were hours of digital footage and images. The next logical step was to add those images to the dissector’s guide, and here we are.

So, back to “Can students learn the art and science of dissection by watching?” To be effective as a teacher of how to learn, an educator should consider presenting material using a variety of methods. This is independent of which version of the learning and teaching style literature you favor, or whether you prefer David Kolb’s Experiential Learning or Zull’s extension thereof. To learn dissection and the anatomy relationships within it, students will still need to read or watch, reflect, do, and then reflect again on their efforts. So I think from that perspective we have added the extra dimension to the experience.

But really, why write this book? What was the personal motivation? The foremost reason for me was Ms. Finley herself. In 1995 I sat in a classroom ready to take an advanced joint dissection class about which I heard much from several professional colleagues. Punctually at 5:00pm, in walked a petite, precisely dressed lady. She moved to the front of the classroom and turned toward us. “Welcome class,” she said. “My name is Claudette Finley. You may call me Ms. Finley.” So began my academic career. Ms. Finley was a fantastic anatomist and a great role model. Thanks Ms. Finley.

Mark Bishop

In 1977, I began my professional academic quest to become a Physical Therapist and was introduced to the anatomy laboratory first semester. I had dreamed of taking a course like this since high school biology. I was enthralled by the opportunity to learn visually and sensorally about the body and to translate that into rehabilitation. My instructor was Claudette Finley. She was precise, exact, motivating, and thoroughly engrossed in the course material. She had authored a small spiral notebook that was to be our guide for the course. When I graduated, I immediately volunteered to be her anatomy assistant and remained so until she retired (18 years). She joked with me that she had given me her brain when she retired and I know I was optimistic that she had done so. Anatomy dissection is not a glamorous task or glamorous job.
but a discovery such as a private investigator unearths clues to an exceptional case. Every semester is unique and each body, although structurally similar, provides a glimpse of the individual’s life journey. As technology has advanced forward and written words and illustrations are not quite enough to satisfy the palate of those learning new skills and new foundations, it became obvious that filming the text would complement the process and prepare the student for the experience that lay before them. Claudette had provided a template to do just that.

It is with great admiration that I thank Claudette Finley for the opportunity to assist, teach, grow, and learn about the body. Without her continued guidance and encouragement my career would be very different. I have always been proud to have been one of her students and colleagues.

Claudia R. Senesac

REFERENCES

ANATOMY . . . IS THE VESTIBULE OF THE TEMPLE OF MEDICAL SCIENCE. 
—DE LINT, 1926

The ability to perform dissection provides a unique opportunity to observe the intricate interplay of human structure. This is especially true if the student is able to participate in an anatomy laboratory in which several (or many) different cadavers are located. A consistent theme in the treatises of early anatomists is awe and wonder at the incredible complexity and variety of the human organism.

This unique and special opportunity was not always available to aspiring students. Imagine the difficulty of performing studious dissection before the development of effective embalming or refrigeration, for example. Anatomists traveled from town to town to study from “fresh” bodies that had not yet begun to decay. To compound matters, dissection of human bodies sometimes happened in secret, in closed rooms and furtively at night.

For more than 4000 years, we have sought to determine the structure and function of the human body. Chinese writings and drawings from about 2500 BCE describe circulation, breathing, and many internal organs. Around 1600 BCE, Egyptians recorded that the blood vessels were known to come from the heart, and these early anatomists recognized the liver, spleen, kidneys, uterus, and bladder. Hindu medicine dating from 600 BCE contains references to the skeleton and advanced surgical procedures.

In the third and fourth centuries BCE, Hippocrates, Aristotle, and their followers compiled observations about the musculoskeletal system and organs. Most of these were made by combining external observation with conjecture based on the dissection of nonhuman animals. Herophilus and Erasistratus, working as surgeons in Alexandria in approximately 300 BCE, made systematic studies designed to discover the workings of human anatomy.

However, the most influential anatomist of ancient times was, perhaps, Galen. As a physician to the gladiators, Galen likely studied many different types of wounds. He also compiled much of the work of previous writers and studied internal organs by performing vivisection on animals. Although he was able to examine human skeletons from remains found in tombs, his drawings were based mostly on dogs, apes, and pigs. Despite this limitation, Galen’s works became the standard anatomy textbook for 1500 years.

After Galen, the study of anatomy progressed little in Europe. However, it flourished in the Islamic world. Arabic philosopher–physicians studied medicine from the wide Persian Empire, including Indian, Greek, and Egyptian sources. An unattributed saying goes, “Medicine is born; Hippocrates created it. It was dead; Galen revived it. It was scattered; Rhazes reassembled it. It was imperfect; Avicenna perfected it.” Rhazes was a prolific writer and compiler of medical knowledge; however, Avicenna contributed to more than the science of anatomy, presenting a classification of the organs and their function. Avicenna expanded the Galenic teachings on anatomy in The Canon of Medicine (ca. 1000 CE), which became the standard text used throughout the Islamic world and Christian Europe.

The physicians Ibn Zuhr and Ibn Jumay performed human dissections and postmortem autopsy, recording their findings. This work was extended by the Arabian physician Ibn al-Nafis. In 1242, he described the pulmonary and coronary circulation of the blood. He also developed new systems of anatomy and physiology to replace the Avicennian and Galenic doctrines followed in The Canon of Medicine.

In Christian Europe, advancement of anatomy coincides with the rise of the university, especially in Italy. Dissection of a human body occurred annually at centers that had medical
Dissection transpired rapidly over a course of days and nights in a viewing hall. During this period, Leonardo da Vinci drew a series of anatomical figures based on dissection of human corpses, many of them at a mortuary in Rome, until he was ordered to stop by the pope of the time. His drawings included pictures of bone structures, muscles, internal organs, the brain, and a fetus in the womb. Others, such as Jacopo Berengario da Carpi, Mondino de Liuzzi, and Alessandro Achillini, also dissected cadavers and contributed to the accurate description of organs and their functions.

In the 16th century, Vesalius was the first to significantly challenge Galen’s descriptions of anatomy. As a medical student, he had attended anatomy lectures in which the instructor was unable to find the organ as described by Galen. This prompted Vesalius to dissect corpses himself and describe what he found. His drawings demonstrated the discrepancies between dogs, apes, and humans, and he was able to show that in many cases Galen’s observations were correct for the dog and ape, but had little relation to humans.

A succession of researchers proceeded to refine the body of anatomical knowledge, giving their names to a number of anatomical structures along the way. However, only certified anatomists were allowed to perform dissections, and sometimes then only yearly.

During the 19th century, the discipline advanced knowledge in histology and developmental biology, not only of humans but also of animals. An important 19th century milestone occurred in 1832 when England passed the Anatomy Act to prevent body snatching, grave robbing, and murdering as means of finding cadavers. This legislation resulted in an adequate and legitimate supply of bodies for study and provided a suitable environment for Gray’s Anatomy, which soon became the foremost anatomical reference text.

Since then, anatomical research continues to take advantage of technological developments. Disciplines such as microbiology and endocrinology have explained the purpose of glands that anatomists previously could not explain, and imaging technology such as magnetic resonance imaging and computerized tomography enable the study of the body in cross-section. Subsequently, macroscopic (gross) anatomy has been very well described, and microscopy anatomy continues to progress.

The study of anatomy over the centuries has provided the focus for sculpture, diagram, and illustration of the body and continues to be the base and foundational training for medical and health-related professions throughout the world. With the curiosity of anatomists and pioneers in this area of study from days long ago, we continue to advance our knowledge of the body through exploration identified as dissection.

GETTING STARTED

Study of the human body using cadavers is a privilege and a unique opportunity in your training. Dissection is to be done with respect for those who have graciously donated their bodies so that we may learn how to help those who are living. We can maintain this privilege only if the highest standards of conduct in both work and personal behavior are upheld in the lab. This next section will discuss many suggestions for study and professional conduct in the anatomy laboratory. Many of those listed are general to all facilities in which dissection is performed. However, states and institutions will have a formal set of regulations that govern behavior where you are studying. You are encouraged to acquaint yourself with those rules so as not to run afoul of them.

CARE OF THE ANATOMY LABORATORY

1. Visitors are not allowed in the lab. As a student of anatomy, you are asked to help monitor who enters this lab and views these cadavers. Please report all violations to the instructor. Each State Anatomical Board will have rules and regulations that govern
the viewing and dissection of cadavers. Breaking these rules is a serious breach of conduct warranting action at the instructor’s discretion. Anatomy rooms are often monitored by security systems that record who enters the room and when.

2. Tables are to be kept clean and free from bits of tissue. A small aluminum or plastic container should be placed on the table for collecting tissue while dissecting. Clean up your table and bits of tissue with a paper towel at the end of each lab period. There should be NO loose tissue left on the table or in the bag unless still attached to the cadaver at the completion of your lab period. Skin flaps should be kept to cover the body part dissected.

3. Tissue to be discarded must be placed ONLY in the containers marked for tissue disposal. Paper towels, gloves, and other trash must be placed in the containers labeled for regular garbage in your laboratory!

4. If there is a bucket under the table, it is for collection of embalming fluid and drainage from the body. It is not for refuse. It will need emptying occasionally by someone at your table. This is emptied into a tissue sink. It will be necessary to flush the tissue sink once the fluid from the bucket is disposed of.

5. Sinks are for washing. They are not receptacles for paper towels, body tissue, chewing gum, etc. If you see these items in the sink, please take the initiative to remove them and prevent the sink from overflowing. Be sure to flush the tissue sink to keep it from becoming clogged.

6. The floor must be kept clean at all times. If tissue falls on the floor, pick it up immediately before it is stepped on. The tissue will be very greasy, and a person can slip easily on a small piece left on the floor. Spilled embalming fluid is also very greasy and should be mopped up quickly. Please report all spills to the instructor before leaving the lab.

7. Please return chairs or stools to the side of the tables neatly when you have finished dissecting. This is part of cleaning up at the end of your lab period.

**CARE OF THE CADAVER**

1. Keep the cadaver moistened between dissection periods. Extra care should be given to the face, forearm, hands, and feet, which tend to dry quickly. It is your responsibility to cover the hands and feet with white socks to preserve these structures. Expose only the area being dissected in order to prevent drying.

2. Wet down your cadaver with preserving fluid supplied by the laboratory at least twice weekly and more often if you know the cadaver has been used for long periods of time for studying. A small spray bottle is often used by students and kept at the table. Spraying of the skin will NOT protect the tissue lying underneath. Preserving fluid is not absorbed by the skin.

3. If there is a bag covering the cadaver, it SHOULD NOT TOUCH the floor. It will pick up dust and spores, causing mold. If mold or flying insects are sighted, tell the instructor immediately so that proper measures can be taken to prevent spreading.

4. The following suggestions will help improve your care of the cadaver:
   a. Dissect with blunt instruments (probe) and with the fingers whenever possible.
   b. Locate major nerves and arteries before cutting into a block of tissue to avoid damaging delicate structures. This often requires that you progress slowly through the dissection.
c. Keep tendons intact, cutting only when necessary to get at underlying structures. When tendons are cut, return the cut tendons to their original position at the end of the dissection period.

d. Place the point of the forceps or a probe under a tendon or ligament that needs to be cut, and make the incision along the surface of the forceps or probe. This will isolate the structure to be severed.

e. When it is necessary to cut through the belly of a muscle to explore deeper areas, dissect a few muscle fibers at a time rather than making one deep incision.

CARE OF THE DISSECTOR

1. Small cuts should be washed under running water for a few minutes.

2. A first aid kit should be available in the lab to treat minor cuts. If cuts are larger, you may need to go to the student infirmary or the emergency room of your facility.

3. Most State Anatomical Boards require that all persons handling cadaveric materials must wear gloves. Masks may be used, particularly if embalming fluid is irritating to your skin or nose. Masks may be purchased at a drugstore. Gloves are sold at the medical bookstores, drugstores, and medical supply stores. Molded masks work well, and exam gloves are better than the large, thick rubber gloves.

4. Fluids can soak through lab coats and stain clothes. Scrubs are a good alternative to wear under your lab coat. Think twice before wearing an expensive dress or suit to lab even if you use a lab coat. Wool tends to absorb odors.

5. Lab coats must be clean. You may be able to wear a lab coat for about a week before washing, depending on the area you are studying. Remember that odors in lab coats will penetrate your clothing, then your closet, then your living quarters!

6. Lab coats should not be left in the lab. They may “disappear.” Be sure to put your name in your lab coat.

7. You must wear closed-toe shoes in the laboratory. NO open-toe shoes may be worn in the lab.

8. Work quietly. Conform to professional conduct at all times.

9. No smoking. No eating or drinking in the lab. (This is usually not a problem!)

CARE OF INSTRUCTIONAL MATERIALS

1. Mounted skeletons or plastic models are difficult to prepare, fragile, and EXPENSIVE. They are for study and reference. Push or pull the skeleton stand with care. Do not force the scapula on the rib cage or handle the skeleton with roughness, which could break a bone or disarticulate a joint. Do not position the skeleton with disrespect.

2. The disarticulated skeletons are equally valuable and should receive the same care and precautions. Most State Anatomical Boards forbid any bones or cadaver material from leaving the laboratory. This is considered to be unauthorized possession of human remains. Do not even think about it! You can get into legal trouble with the State Anatomical Board of your state.

3. Special atlases and dissections may occasionally be placed in the lab for your study. Ensure that your hands are clean and dry before using them. DO NOT wear gloves to handle the models.
4. It is suggested that a pencil eraser be used to turn pages in your atlas when dissecting, since your hands will be very greasy.

TOOLS OF THE TRADE

1. A dissection kit is REQUIRED. Most kits include:
   a. Scalpel and blades:
      i. You will need approximately 20–30 blades (#10) for a semester.
      ii. Do NOT use your fingers to change the scalpel blade. Refer to the DVD for a demonstration of inserting and removing a scalpel blade.
   b. Angle tip probe.
   c. Hemostat forceps.
   d. Tissue forceps (without teeth).
   e. Check with your anatomy instructor for other tools that may be used in your laboratory. These other tools include scissors and forceps with teeth.

2. Be sure to put your name on each instrument. Marks made with fingernail polish are resistant to most preserving fluids.

3. At the end of dissection, be sure to clean and dry your instruments. There should be no tissue left in your dissection kit.

Figure 0.1

“To tools of the trade.” Each of these dissection tools has a separate function. For example, not all dissection should be done with a scalpel. Refer to your dissection manual for specific instructions about when to use each one.

a—Scalpel handle and blade (this image shows a #3 handle and #10 blade)
b—Surgical forceps (hemostats)
c—Sharp point scissors (note the nail polish markings on Ms. Finley’s scissors)
d—Blunt nose scissors
e—Tissue forceps without teeth
f—Angle probe
g—Dissection pin
**TECHNIQUES**

The techniques of dissection can be developed only through practice. Those that we describe throughout the text are demonstrated for you on the videos accompanying this guide. Read this section and watch the DVD. When in doubt, consult this guide, the DVD, or your instructors.

Once you begin to read and follow through this guide, you will notice that the majority of the instructions follow a regional rather than systemic pattern. Grant and Cates (1940) indicate, “Unless each step in the dissection is carried out, and in the given order, confusion will result. This, of course, is true of any guide; but the point needs emphasizing, for our experience is that a great many difficulties the student encounters result from failure to meet this very fundamental obligation.”4 This can be reworded as “Consult your atlas and read the guide before you begin each section.” Most problems can be avoided by reading before you cut.

Also as you read, you will encounter terms used to describe location and terms related to movement of the body. The majority of these terms relate to “the anatomical position,” which is shown in **Figure 0.2**, and described below.

- **Regions of the body:**
  1. Sagittal plane—median plane—a plane dividing the body into right and left halves  
     a. Medial—toward the midline or median plane  
     b. Lateral—away from the midline or median plane  
  2. Frontal or coronal plane—plane dividing the front from the back  
     a. Anterior (ventral)—toward the front of the body  
     b. Posterior (dorsal)—toward the back  
  3. Horizontal or transverse plane—divides the body at right angles to both sagittal and coronal planes  
     a. Superior—above a horizontal plane (toward the head)  
     b. Inferior—below a horizontal plane (toward the feet)

- **Movements relative to the body:**
  4. Proximal—nearest to a point of reference; direction toward a point of attachment to the body (shoulder is proximal to the elbow)  
  5. Distal—away from a point of reference; direction away from a point of attachment to the body (wrist is distal to the elbow)  
  6. Superficial—toward the surface of the body part  
  7. Deep—away from the surface of the body part  
  8. Internal—toward the inside of the body  
  9. External—toward the outside of the body  
  10. Ipsilateral—same side of the body; affecting the same side of the body  
  11. Contralateral—originating in or affecting the opposite side of the body  
  12. Palmar (volar)—palm of hand  
  13. Plantar—sole of foot  
  14. Cranial (cephalic)—head or superior aspect; toward the head
15. Caudal—inferior aspect; toward the tail
16. Anterior (volar)—front
17. Posterior (dorsal)—back

• Parts of the body:
18. Arm—from the shoulder to the elbow (brachium)
19. Forearm—from the elbow to the wrist (antebrachium)
20. Thigh—from the hip to the knee
21. Leg—from the knee to the ankle

• Positions of the body:
22. Supine—lying on the back with the face upward
23. Prone—lying horizontal with the face downward

TERMS OF MOTION

• Monoplanar motions:
  1. Sagittal plane
     a. Flexion—occurs when the angle between two bones is decreased
     b. Extension—occurs when the angle between two bones is increased
2. Frontal plane
   a. Abduction—movement away from the midline of the body
   b. Adduction—movement toward the midline of the body

3. Transverse plane
   a. Rotation—motion around a central axis without undergoing any displacement from this axis

• Multiplanar motions or those that can occur in any plane:
  1. Circumduction—when a bone is made to circumscribe a conical sphere
     a. Orderly combination of flexion, abduction, extension, and adduction in sequence
  2. Pronation—triplanar motion of the forearm, wrist, or joints of the foot
     a. Turning the palm down, for example
  3. Supination—triplanar motion of the forearm, wrist, or joints of the foot
     a. Turning the palm up, for example
  4. Elevation—to raise a point of reference
  5. Depression—to lower a point of reference
  6. Protraction—to move forward or away from the midline
  7. Retraction—to move backward or toward the midline

REFERENCES
To Ms. Finley: thank you for teaching me the art of dissection and giving me the opportunity and gift of teaching others.

To my past, present, and future students; may you all become private investigators as you discover the wonders of anatomy and learn the science of healing.

To Bob and Emily:
With love and much appreciation for your ability to endure, encourage, and provide an unmatched sense of humor that has carried us through the years.

In loving memory of our daughter Ashley O’Mara who is greatly missed.

A day never goes by that I am not thankful for my family, friends, colleagues, and students that have provided me with the continued experience of life long learning.

Each day you enter the lab is a privilege and honor that a generous person has given you in their hope that you will learn to treat the living. May you do just that.

Claudia R. Senesac

I would like to dedicate this book to two anatomy teachers—Nikolai Bogduk (BSc(Med), MB BS, PhD, FAFRM) for making anatomy fun to learn the first time around, and Claudette Finley, PT, MS for making me want to learn it really well.

Mark Bishop
PROCEDURE: Place the cadaver prone.

This section describes dissection of the superficial back muscles and the posterior axilla. The deeper layers of the back muscles and the posterior neck are presented in Chapter 13.

1. Prior to beginning dissection, place a block under the chest of the cadaver so that the head falls into flexion. This will allow you access to the posterior neck region.

   Palpate the following on the cadaver:
   a. external occipital protuberance (inion)
   b. mastoid process of the temporal bone
   c. acromion
   d. spine of the scapula
   e. medial border of the scapula
   f. inferior angle of the scapula
   g. spinous processes of thoracic vertebrae
   h. crest of the ilium

2. Make a skin incision superficial to the spinous processes of the vertebrae from the external occipital protuberance (inion) to the level of the crest of the ilium. Continue the incision laterally along the iliac crest to the midaxillary line.

3. A second incision should be made from the external occipital protuberance to the mastoid process of the temporal bone. Figure 1.1b.

4. Beginning at the spinous process of the seventh cervical vertebra, make an incision to the acromion and then along the lateral border of the shoulder and arm to the level of the axilla. Continue the incision medially until the axilla is encountered Figure 1.1c.

5. A fourth incision should be made from the spinous processes in the midthoracic area to the midaxillary line. This will facilitate handling of the skin flaps Figure 1.1d.

6. Using hemostat forceps, lift a corner at a site where two of these incision lines meet. Pull the skin so it is taut. With a scalpel held at an angle, slowly work through the superficial fascia until muscle fibers are encountered. This step will aid in judging the depth of dissection necessary for skin removal.
7. Remove the skin from the back laterally to the midaxillary line. The skin on the lateral side of the trunk should be left **connected** to the skin from the ventral surface of the trunk. The entire skin flap can then be used to cover the dissected area when work is completed. This will help retain moisture.

8. Remove remaining superficial fascia until the muscles can be viewed clearly. Clean fat off the muscles in the direction the muscle fibers travel. Cleaning off fat dulls the blade quickly; it may be necessary to change your blade multiple times while cleaning the superficial back. Preserve several cutaneous branches of dorsal rami of spinal nerves as they emerge through the superficial fascia and muscle. **Refer to the DVD for identification.** Be sure to keep the thoracolumbar fascia intact; it will appear white and shiny in the lumbar region.

9. Identify:
   a. trapezius
   b. latissimus dorsi
   c. deltoid
   d. teres major
   e. thoracolumbar fascia
   f. ligamentum nuchae

10. Study the direction of muscle fibers of the upper, middle, and lower trapezius. Review the actions accomplished by each portion of this muscle as well as the muscle acting as a whole.

11. Make an incision through the trapezius from the external occipital protuberance to the level of the 12th thoracic vertebra. The incision line should be approximately \( \frac{1}{2} \) inch lateral to the spinous processes of the vertebrae. This cut allows for the trapezius to be turned back on each side of the cadaver.

12. Continue to release the trapezius by cutting along its attachments on the spine of the scapula, the acromion, and the clavicle (Figure 1.2).

13. **Turn the trapezius toward the head** to view the structures deep to this muscle. The spinal accessory nerve and transverse cervical (colli) artery enter the trapezius on its anterior border. First, locate several of the branches of this nerve and artery on the costal surface of the trapezius; using a probe, trace these branches to the major nerve and artery as they enter the muscle. **Refer to the DVD for the proper technique to use in this area. DO NOT use your scalpel in this area.** Once the nerve and artery have been identified, remove the veins in the area for clearer study of these structures.


15. Study the insertion of the levator scapulae on the superior angle of the scapula, and study the scapular movements accomplished when this muscle contracts.

16. Study the direction of the muscle fibers of the rhomboid major and minor. Review the actions of these muscles upon the scapula by pulling gently on the muscle fibers.

17. Release the rhomboid major and minor from their vertebral attachments staying close to the spinous processes. **Avoid cutting the muscle deep to the rhomboids.**

18. Reflect the rhomboids laterally to find the dorsal scapular nerve. This nerve emerges from the costal surface of the levator scapulae and enters the superior border of rhomboid minor near the superior angle of the scapula. The dorsal scapular nerve then courses through fascia on the costal surface of the rhomboids. Locate this nerve.
Superficial Back and Posterior Axilla

as it passes through fascia at the superior angle of the scapula between levator scapulae and rhomboid minor. Refer to the DVD for its location.

**NOTE TO THE DISSECTOR** The serratus posterior superior muscle may adhere to the costal surface of the rhomboids and will need to be separated from them. This muscle is very thin and is easily overlooked.

19. Continue to remove skin and fascia in the posterior axilla until the teres major and minor, the posterior deltoid, and the proximal portions of the long and lateral heads of the triceps brachii are in view. Cutaneous branches of the axillary nerve to the skin are superficial to the deltoid and may be found emerging at the posterior border of the deltoid.

20. Study the direction of the muscle fibers of the posterior and middle portions of the deltoid. Demonstrate on the cadaver the movements of the humerus accomplished by the posterior portion of the deltoid and by the middle portion of the deltoid.

21. Release the deltoid from its proximal attachment to the spine of the scapula and the acromion **Figure 1.4** and reflect the deltoid distally.

22. Find the axillary nerve and posterior humeral circumflex artery **Figure 1.5**. These structures course around the surgical neck of the humerus between the deltoid and
CHAPTER 1

Figure 1.4
Posterior deltoid.

Cut along acromion and spine of the scapula

Figure 1.5
Posterior aspect of the scapula and arm.

Supraspinatus
Infraspinatus
Teres minor
Teres major
Long head triceps
Lateral head triceps
Axillary nerve
Posterior humeral circumflex
Deep brachial artery
Radial nerve
the humerus. The proximal long head and lateral head of the triceps brachii may need to be separated with a probe to make viewing of these structures easier.

23. Identify branches of the axillary nerve innervating the teres minor and deltoid. Note in Figure 1.5 the location of the branch to the teres minor. It is found in the fascia at the inferior border of this muscle.

24. Locate the supraspinatus and infraspinatus muscles.

25. A thick layer of fascia covers the superficial surface of the infraspinatus. Remove this fascia to view the muscle. Lift the fascia with your forceps (away from the underlying muscle) and open it with your scalpel to remove it from the muscle.

26. The muscle attachments of the supraspinatus, infraspinatus, and teres minor can now be studied. Study the direction of muscle fibers and how this relates to their actions.

27. Starting medially, move a finger along the superior border of the scapula toward the base of the coracoid process until a sharp ligament is encountered. This is the transverse scapular ligament that bridges the suprascapular notch. The suprascapular nerve passes below and the suprascapular artery above the transverse scapular ligament through the opening of the suprascapular notch before entering the supraspinous fossa. The suprascapular artery and nerve will be viewed in step 28 and step 29 when the infraspinatus is dissected.

The suprascapular artery, transverse cervical artery, and circumflex scapular branch of the subscapular artery form an extensive arterial anastomosis in the posterior scapular region.

28. An incision should be made through the muscle belly of the infraspinatus as shown in Figure 1.6. This muscle is thick and should be cut lateral to the suprascapular notch. Use your probe to lift the muscle as you cut through it so as not to cut the structures below. Reflect the cut portions of this muscle to locate the continuation of the suprascapular artery and nerve as they enter the infraspinous fossa deep to the infraspinatus.

The supraspinatus may also be reflected back to expose the suprascapular notch, transverse ligament, nerve, and artery. Remove fascia overlying the muscle to view the supraspinatus. Lift the fascia with your forceps (away from the underlying muscle) and open it with your scalpel to remove it from the muscle.

29. Make an incision just lateral to the suprascapular notch. Use your probe to lift the muscle as you cut through it so as not to cut the structures below. Lift the cut portions of this muscle to locate the nerve and artery as they course through the opening in the scapula to enter the infraspinous fossa (Figure 1.6).

30. Review and carefully observe the attachments of the following muscles:

   a. trapezius
   b. latissimus dorsi (humeral attachment to be viewed later)
   c. deltoid (posterior portion)
   d. teres major (humeral attachment to be viewed later)
   e. rhomboid major and minor
   f. levator scapulae (vertebral attachments to be viewed later)
   g. supraspinatus
h. infraspinatus
i. serratus anterior (costal attachments to be viewed later)

31. Review innervation for each of the following muscles by tracing each nerve to the muscle(s) innervated:
   a. trapezius: spinal accessory nerve
   b. deltoid: axillary nerve
   c. rhomboid major and minor: dorsal scapular nerve
   d. supraspinatus: suprascapular nerve (If dissected, this nerve will lie in the suprascapular fossa. Study a picture in the atlas; this muscle lies under the suprascapular fascia in the suprascapular fossa.)
   e. infraspinatus: suprascapular nerve
   f. teres minor: axillary nerve

32. Nerve supply to other muscles already studied on the cadaver will be viewed after further dissection.
PROCEDURE: Place the cadaver supine.

The upper extremity should be moved into abduction gently and progressively so that muscle tissue is not torn and the humerus not broken. It may take several days to get the extremity out sufficiently. Do not apply excessive force. Rope should be furnished by the instructor for holding the extremity in abduction. (The rope should be at least 5 feet in length.) See Figure 2.1.

1. Prior to beginning dissection, palpate on the cadaver:
   a. jugular notch
   b. clavicle
   c. manubrium sterni
   d. body of the sternum
   e. xiphoid process of the sternum
   f. ribs 1 through 8

Figure 2.1 Arm abducted with rope to access axilla and anterior surface of arm. Rope is looped around the wrist and passed through the first web space. This rope is then tied to the table to maintain the arm in abduction while dissection proceeds.
CHAPTER 2

6. The anterior portion of the deltoid can be seen. Review the actions of this portion of the deltoid.

7. Observe the direction of the muscle fibers of the pectoralis major, noting the differences in fiber direction in the clavicular and sternal portions. Locate the insertion of this muscle on the humerus. Study the actions accomplished by each portion of this muscle as well as the muscle acting as a whole.

8. Make an incision through both the clavicular attachment and the humeral attachment of the clavicular portion of the pectoralis major. (Figure 2.3a)

9. The thoracoacromial artery and lateral pectoral nerve pierce through the clavipectoral fascia just deep to the clavicular portion of the pectoralis major. Much fascia will be encountered in this area surrounding the major nerves and blood vessels. Work carefully to identify branches of this artery and nerve using your probe. Leave the lateral pectoral nerve and thoracoacromial artery intact entering the deep surface of the clavicular head of the pectoralis major. These structures alone will keep this muscle attached to the cadaver; therefore, handle gently.

10. Release the sternal portion of the pectoralis major from its attachment on the sternum. (Figure 2.3b) With your fingers, probe under this muscle to locate branches of the medial and lateral pectoral nerves. The medial pectoral nerve can be felt piercing

2. Remove skin as shown in Figure 2.2. Make an incision from the jugular notch to the xiphoid process of the sternum. Beginning with the incision at the jugular notch, follow laterally along the clavicle to meet up with the posterior incision made previously for the superficial back and posterior axilla. This should leave one skin flap for the superficial back and one for the anterior chest. A third incision will be made following down the arm to the level below the axilla meeting up with the posterior incision made for the posterior axilla. An incision will be made along the lower rib cage to the midaxillary line meeting up with the posterior incision in the midthoracic area for the superficial back. This will leave an anterior skin flap to cover the tissue of the anterior chest and shoulder cap area.

3. Locate the cephalic vein between the anterior deltoid and the clavicular head of the pectoralis major. It lies in the cleft between these two muscles.

4. Identify:
   a. pectoralis major
   b. serratus anterior

5. Preserve several of the anterior and lateral cutaneous nerves, which are branches of the intercostal nerves and often referred to as ventral rami. Refer to the DVD for identification.

6. The anterior portion of the deltoid can be seen. Review the actions of this portion of the deltoid.

7. Observe the direction of the muscle fibers of the pectoralis major, noting the differences in fiber direction in the clavicular and sternal portions. Locate the insertion of this muscle on the humerus. Study the actions accomplished by each portion of this muscle as well as the muscle acting as a whole.

8. Make an incision through both the clavicular attachment and the humeral attachment of the clavicular portion of the pectoralis major. (Figure 2.3a)

9. The thoracoacromial artery and lateral pectoral nerve pierce through the clavipectoral fascia just deep to the clavicular portion of the pectoralis major. Much fascia will be encountered in this area surrounding the major nerves and blood vessels. Work carefully to identify branches of this artery and nerve using your probe. Leave the lateral pectoral nerve and thoracoacromial artery intact entering the deep surface of the clavicular head of the pectoralis major. These structures alone will keep this muscle attached to the cadaver; therefore, handle gently.

10. Release the sternal portion of the pectoralis major from its attachment on the sternum. (Figure 2.3b) With your fingers, probe under this muscle to locate branches of the medial and lateral pectoral nerves. The medial pectoral nerve can be felt piercing
through the pectoralis minor located just deep to the pectoralis major. This nerve then enters the deep (costal) surface of the sternal portion of pectoralis major. The lateral pectoral nerve is located at the upper border of the sternal portion of the pectoralis major. Leave these nerves intact entering the pectoralis major because following step 10, these structures alone will hold the muscle attached to the cadaver. The medial and lateral pectoral nerves are named for the trunks on the brachial plexus off which they come and **NOT** their location on the chest wall.

11. Release the sternal portion of the pectoralis major at its humeral attachment [Figure 2.3c].

12. The pectoralis major can now be shifted around gently in order to view underlying structures.

13. Identify:
   a. pectoralis minor
   b. medial pectoral nerve
   c. lateral pectoral nerve
   d. thoracoacromial artery—found at the upper border of the pectoralis minor

14. Note the insertion of the pectoralis minor at the coracoid process of the scapula. Review the actions of this muscle.

15. Release the costal attachment of the pectoralis minor [Figure 2.4]. Cut the attachment of the pectoralis minor on the coracoid process also. This muscle may now be shifted in order to identify the axillary sheath. Be careful to preserve the medial pectoral nerve piercing through this muscle.
1. A considerable amount of fascia is located in the area of the axillary sheath. **Proceed very cautiously**, removing with forceps only those tissues that are easily grasped. Open the axillary sheath and locate the brachial plexus and axillary artery and vein. Note the relationship of the brachial plexus to the axillary artery. Find in your atlas where the cephalic vein enters the axillary vein.

2. Identify the lateral, medial, and posterior cords of the brachial plexus.

3. The axillary sheath may be removed from around the brachial plexus and axillary artery and vein. The axillary vein and its tributaries should be removed also for better visualization of structures. However, preserve the cephalic vein and the area of the axillary vein where it enters.

4. Find where the following arteries branch from the axillary artery: **Figure 3.1**
   a. thoracoacromial
   b. subscapular (arises at the distal border of the subscapularis)
   c. posterior humeral circumflex (arises at the lower border of the subscapularis)
   d. anterior humeral circumflex (arises just opposite the posterior humeral circumflex artery on the lateral side of the axillary artery; passes anteriorly around the surgical neck of the humerus to join branches from the posterior humeral circumflex artery)

5. To dissect the axilla, first pull the skin in the axilla taut and release it from the underlying fascia. This will leave a large amount of fat in the axilla. **Using a probe or your fingers**, gently stroke through the fat in a distal direction toward the hand, slowly removing small pieces. This avoids tearing of nerve fibers. Continue until the nerves of the brachial plexus and the arterial system can be viewed clearly. Lymph nodes should also be removed at this time. Additional nerve branches piercing the ribs and entering the axillary fat may also be encountered. These branches may be removed.

6. Find the median nerve. Trace this nerve proximally to where it emerges from the medial and lateral cords of the brachial plexus. **Figure 3.2**

7. With a probe under the medial cord, identify:
   a. ulnar nerve
   b. medial pectoral nerve from the medial cord
   c. medial antebrachial cutaneous nerve
d. **medial brachial cutaneous nerve** (This nerve is often removed when dissecting the axilla. It does not need to be saved.)

**NOTE TO THE DISSECTOR** If a nerve cannot be located, it is recommended that dissection be continued into the arm, as this will facilitate identification. To spend large amounts of time searching an area will frequently result in destruction of structures and frustration of the dissector.

8. With the lateral cord well in view, identify:
   a. **musculocutaneous nerve** (This nerve pierces through the belly of the coracobrachialis.)
   b. **lateral pectoral nerve** (This nerve comes from the lateral cord.)

9. Move the medial and lateral cords and the axillary artery aside to locate the posterior cord, which is deep to these structures.

10. Identify from the posterior cord:
   a. **radial nerve** (This nerve may be located as it passes posteriorly through the axilla and then winds around the posterior aspect of the humerus to innervate the triceps brachii. The radial nerve is accompanied by the deep brachial artery [Figure 3.1].)
b. axillary nerve (This nerve may be found as it passes across the subscapularis and turns posteriorly at the lateral border of this muscle. It is accompanied by the posterior humeral circumflex artery [Figure 3.1].)

11. Study the muscle attachments of the subscapularis. Review the actions accomplished by this muscle.

12. The subscapular artery branches into the circumflex scapular artery and thoracodorsal artery (Figure 3.1). The circumflex scapular artery passes around the lateral border of the subscapularis into the posterior axilla, accompanied by the lower subscapular nerve. The thoracodorsal artery accompanies the thoracodorsal nerve to the latissimus dorsi. It can be seen piercing the anterior border of the latissimus dorsi.

13. Three nerves emerge from the posterior cord of the brachial plexus. Identify:
   a. lower subscapular nerve (This nerve can be located as it enters the subscapularis on the anterior surface of this muscle. A branch of the lower subscapular nerve passes posteriorly around the lateral border of the subscapularis to innervate the teres major. It is accompanied by the circumflex scapular artery before entering the substance of the teres major.)
   b. thoracodorsal nerve—or middle subscapular nerve (This nerve is found crossing the belly of the subscapularis before entering the anterior border of the latissimus dorsi. It is accompanied by the thoracodorsal artery.)
   c. upper subscapular nerve (This nerve may be located entering the upper medial portion of the subscapularis on its anterior surface.)

14. Study the muscle attachments of the serratus anterior and the scapular movement produced when this muscle contracts.

15. Identify the long thoracic nerve as it enters the lateral surface of the serratus anterior.

16. The suprascapular nerve and dorsal scapular nerve will be traced further after dissection of the neck has been completed.

17. Review the spinal cord segments for each nerve of the brachial plexus.

18. Review the muscle attachments and actions of each of these muscles:
   a. pectoralis major
   b. pectoralis minor
   c. subscapularis
   d. latissimus dorsi
   e. teres major
   f. serratus anterior

19. Trace the nerves of the brachial plexus to the muscles, which have been dissected.

20. Trace the following branches of the axillary artery to the area each supplies:
   a. thoracoacromial
   b. subscapular
   c. thoracodorsal
   d. circumflex scapular
   e. posterior humeral circumflex
   f. anterior humeral circumflex
1. On the skeleton, review the motions that occur at the elbow.

2. With the arm tied out to the side, make a vertical skin incision in the midline on the anterior surface of the arm. A transverse incision should be made across the anterior arm just above the elbow as shown in Figure 4.1.

3. The cephalic vein will be encountered as the skin is removed. This vein is superficial and easily cut. Continue to follow the cephalic vein into the arm. This vein should be preserved from the lateral border of the wrist to the pectoral region upon completion of dissection.

4. Remove the skin, working toward the sides of the arm in order to keep the skin flaps in one piece but completely free from the cadaver. The skin flaps should be used to rewrap the arm when dissection is completed.

5. Continue to trace the medial antebrachial cutaneous nerve into the arm.

6. Preserve branches of the posterior antebrachial cutaneous nerve (a branch of the radial nerve) as they emerge in the distal lateral arm. Trace branches into the dorsal forearm as dissection proceeds.

7. Identify:
   a. biceps brachii
   b. brachialis
   c. coracobrachialis
   d. ulnar nerve
   e. median nerve
   f. medial antebrachial cutaneous nerve

8. Follow the course of the tendons of the biceps brachii, and study the motions accomplished when this muscle contracts.

9. Study the actions of the brachialis and coracobrachialis, and observe their locations to understand why these actions occur.

10. Trace the branches of the musculocutaneous nerve as it innervates the coracobrachialis, biceps brachii, and brachialis.

11. The axillary artery becomes the brachial artery at the lower border of the teres major. Locate the brachial artery and the deep brachial artery (profunda brachii artery) in the
arm. The deep brachial artery accompanies the radial nerve as it winds around the posterior aspect of the humerus, where it is seen between the lateral and long heads of the triceps brachii.

12. The brachial veins are found on each side of the brachial artery. Remove the brachial veins and the numerous tributaries in the arm for better visualization of arterial structures and nerves. The basilic vein courses proximally medial to the biceps and brachial artery to the lower border of the teres major, where it then joins the axillary vein. The basilic vein should be preserved from the medial border of the wrist to the axilla region upon completion of dissection.

13. Place probes under the ulnar and median nerves and the brachial artery in the lower arm (Figure 4.2). Observe the relationship of the median nerve and the brachial artery that occurs in this area and in the cubital fossa.

14. Note that the ulnar nerve passes between the medial epicondyle of the humerus and the olecranon at the elbow.

15. Keeping these major structures well in view, remove the skin down to approximately 1 inch below the elbow. Multiple branches of the medial antebrachial cutaneous nerve are found in this area.
16. The lateral antebrachial cutaneous nerve is the cutaneous branch of the musculocutaneous nerve. It emerges in the distal lateral arm between the biceps brachii and brachialis, then courses into the lateral forearm to supply the skin. Locate this nerve in the cubital fossa in order to avoid destruction.

**NOTE TO THE DISSECTOR** The dissector will need to preserve this nerve and its branches throughout the forearm dissection in the next chapter.

17. Located in the front of the elbow is the median cubital vein, which joins the cephalic and basilic veins anterior to the bicipital aponeurosis. It is necessary to reflect this vein for deeper dissection of the cubital area to proceed. Release the median cubital vein at its connection to the cephalic vein; however, leave it attached to the basilic vein. Perforating veins should also be cut. The median cubital vein can then easily be repositioned for later study.

**NOTE TO THE DISSECTOR** Veins to be preserved as dissection proceeds into the forearm and hand are at the discretion of the instructor; however, the cephalic vein on the lateral forearm, the basilic vein on the medial forearm, the median cubital vein, and the dorsal venous arch are the major venous structures. Other veins may be removed.

18. Identify the bicipital aponeurosis (lacertus fibrosus) in the cubital fossa. The bicipital aponeurosis arises from the tendon of the biceps brachii and crosses the cubital fossa into the deep fascia over the common flexor tendon.
PROCEDURE: Tie the arm out to the side. Place a rope around the thumb to turn the forearm and hand into supination.

**NOTE TO THE DISSECTOR** Do not force the elbow into extension. This will result in tearing of muscle fibers. If the forearm cannot be extended sufficiently to dissect the proximal forearm, the tendon of insertion of the brachialis may be released by incising a few fibers at a time. This should aid in increasing elbow extension. In some cadavers, it may even be necessary to cut through the tendon of insertion of the biceps brachii to achieve a sufficient amount of extension. If this step is needed, cut through the tendon distally leaving approximately a 1- to 2-inch piece for repositioning. Be careful to protect the muscle belly of the brachioradialis from tearing. Occasionally the brachioradialis will also need to be cut. When cutting any of these muscles, it is necessary to locate the sensory and motor nerves in the area before cutting to avoid destruction of the nerves (Figure 5.1).

1. On a skeleton, review the motions that occur at the elbow and wrist.

2. Review in an atlas the location of the radial artery in the forearm to avoid severing this artery when removing the skin. Follow the brachial artery to its division into radial and ulnar arteries, then carefully trace the radial artery as dissection progresses distally. The radial artery will progress down the lateral side of the forearm.

3. Make a vertical incision in the midline on the anterior surface of the forearm using a probe to work under the skin, then cut on top of the probe with the scalpel. Continue from the elbow to the wrist (Figure 5.2). Remove the skin, working toward the sides of the forearm in order to preserve the skin flap.

4. In the proximal forearm on the lateral side, continue to trace branches of the lateral antebrachial cutaneous nerve (musculocutaneous nerve) as it pierces the deep fascia lateral to the tendon of the biceps brachii. Preserve several of its branches in the forearm.

5. On the medial forearm, continue to trace the medial antebrachial cutaneous nerve and preserve several of its branches. Note the location of the dorsal branch of the ulnar nerve so that
this nerve is preserved as skin is removed on the medial forearm.

6. In the distal forearm, be careful to preserve the **palmar cutaneous branch** of the **median nerve**, which arises just proximal to the flexor retinaculum and emerges between the tendons of the palmaris longus and the flexor carpi radialis muscles, and passes into the skin of the palmar surface of the hand superficial to the flexor retinaculum.

7. Numerous veins will be encountered in the proximal forearm. These veins will need to be removed except for the median cubital, cephalic, and basilic veins. Clip perforating veins where needed.

8. The muscles of the forearm are covered by a layer of deep fascia. This fascial layer will need to be removed in order to study the deeper structures. Leave a piece of the bicipital aponeurosis (lacertus fibrosus) attached to the distal tendon of the biceps brachii.

9. Identify on the cadaver the proximal muscle attachments for the following:
   a. common flexor tendon on the medial epicondyle
   b. pronator teres
   c. flexor carpi radialis
   d. palmaris longus
   e. flexor carpi ulnaris
   f. brachioradialis

10. Locate the median nerve on the medial aspect of the arm. Follow this nerve into the forearm, noting its branches into the common flexor tendon muscle mass innervating the pronator teres, flexor carpi radialis, and palmaris longus. The median nerve courses with the brachial artery and then pierces the muscle belly of the pronator teres. The median nerve continues in the distal forearm and crosses the wrist medial to the tendon of the flexor carpi radialis and lateral to tendons of the flexor digitorum superficialis.

11. Trace the brachial artery as it enters the cubital fossa. The brachial artery branches into the radial and ulnar arteries at the upper border of the pronator teres. Follow the course of the radial artery to the wrist.

12. The superficial branch of the radial nerve is found accompanying the radial artery in the distal lateral forearm. It emerges from under the brachioradialis and courses lateral to its tendon to the area of the thumb web. This nerve should be preserved to its terminal branches on the dorsum of the hand.

13. Carefully remove deep fascia overlying the distal forearm. Find the median nerve as it crosses the wrist medial to the tendon of the flexor carpi radialis and lateral to tendons of the flexor digitorum superficialis.
14. The ulnar nerve and artery are located deep to the tendon of insertion of the flexor carpi ulnaris on the medial distal forearm. This artery and nerve will be traced proximally later in the dissection.

15. The superficial layer of muscles of the anterior forearm can now be seen in their entirety. Locate both the proximal and distal muscle attachments of the following:
   a. pronator teres
   b. flexor carpi radialis
   c. palmaris longus
   d. flexor carpi ulnaris
   Perform the actions of each muscle by pulling on its respective tendon.

16. The median nerve passes between the superficial and deep heads of the pronator teres. Locate the median nerve as it enters this muscle, and place forceps over the nerve to protect it. Incise the superficial head a few fibers at a time until the median nerve is seen. Be careful not to cut the median nerve. Clip fibers of the deep head as necessary to clarify the nerve and to increase elbow extension.

When dissecting the forearm, leave tendons intact whenever possible. The muscles and tendons can be moved aside to view deeper areas. If deeper structures cannot be seen clearly, however, it may be necessary to cut the tendons as instructed in steps 17, 20, and 26.

NOTE TO THE DISSECTOR

17. Cut the tendons of the palmaris longus, flexor carpi radialis, and flexor carpi ulnaris at different lengths as shown in Figure 5.4. Tendons can then be matched to muscle bellies more easily upon later review. Proceed cautiously when cutting the tendon of the flexor carpi ulnaris, as the ulnar nerve and artery are lateral and deep to the tendon of this muscle in the distal forearm. Locate the nerve before cutting the tendon.

18. Turn aside the cut tendons and identify:
   a. flexor digitorum superficialis
   b. tendon of the flexor pollicis longus
   c. ulnar nerve
   d. ulnar artery

19. Review the muscle attachments of the flexor digitorum superficialis. Find branches of the median nerve innervating this muscle. Before disturbing the position of the tendons of this muscle, pull on each tendon and observe which digit moves and at which joints movement occurs.

20. Hold aside the median nerve. Place a probe under the tendons of the flexor digitorum superficialis. Tie the tendons together with string.
or woven dental floss, both proximal and distal to the incision line. Cut the tendons approximately 1 inch above the wrist.

21. Turn aside the cut tendons and identify:
   a. flexor digitorum profundus
   b. flexor pollicis longus

22. Continue to remove veins found in this area.

**NOTE TO THE DISSECTOR** It may be necessary to release the radial attachment of the flexor digitorum superficialis partly or completely in order to study the structures listed in steps 23–31.

23. Review the muscle attachments of the flexor digitorum profundus. Pull on each tendon and observe which digit moves and at which joints movement is occurring.

24. Locate the anterior interosseous branch of the median nerve deep to the flexor digitorum superficialis. Trace its branches to the radial half of the flexor digitorum profundus, which flexes the distal interphalangeal joints of the second and third digits.

25. Find a branch of the anterior interosseous nerve innervating the flexor pollicis longus. Pull on the tendon of this muscle and observe at which joint movement is occurring. Review the muscle attachments of the flexor pollicis longus.
26. Place a probe under the tendons of the flexor digitorum profundus. Tie the tendons together with the string or woven dental floss, both proximal and distal to the incision line. Cut the tendons approximately 2 inches proximal to the wrist [Figure 5.6]. Be sure that the flexor digitorum superficialis and profundus are cut at different lengths for ease of identification.

27. Identify structures deep to the flexor digitorum profundus:
   a. pronator quadratus
   b. interosseous membrane
   c. branch from the anterior interosseous nerve (off the median nerve) to the deep muscles of the forearm.

28. In review, trace the branches of the median nerve in the forearm to these muscles, and note the point at which the nerve enters each muscle:
   a. pronator teres—superficial and deep heads
   b. flexor carpi radialis
   c. palmaris longus
   d. flexor digitorum superficialis

29. In review, trace branches of the anterior interosseous nerve of the median nerve to the following:
   a. radial half of the flexor digitorum profundus
   b. flexor pollicis longus
   c. pronator quadratus

30. Locate the ulnar nerve as it passes in a groove between the medial epicondyle and the olecranon. Reflect the flexor carpi ulnaris from the ulna, working proximally until a branch of the ulnar nerve is found innervating the flexor carpi ulnaris and the ulnar half of the flexor digitorum profundus. This occurs approximately 1–2 inches distal to the medial epicondyle.

31. The dorsal branch of the ulnar nerve is sensory supply to the dorsal surface of the fifth digit and the ulnar half of the fourth digit. This branch is found approximately 5 cm proximal to the wrist. Follow the course of this nerve to the dorsum of the hand and preserve it for later dissection.

32. Identify the ulnar artery and follow it to the wrist. A branch of the ulnar artery, the common interosseous artery, branches off about 5 cm distal to the cubital fossa. Locate the common interosseous artery. The common interosseous artery divides into the anterior and posterior interosseous arteries. The anterior interosseous artery can be seen accompanying the anterior interosseous nerve to the pronator quadratus. Locate the posterior interosseous artery as it emerges through the supinator on the posterior forearm.

33. Review the location and branches of the brachial artery.

34. Review muscle attachments and actions for each muscle listed below [Figure 5.7]:
a. pronator teres
b. flexor carpi radialis
c. palmaris longus
d. flexor digitorum superficialis
e. flexor digitorum profundus
f. pronator quadratus
g. flexor pollicis longus

Figure 5.7
Flexor forearm.
1. Review on a skeleton the motions that occur at each joint in the hand.

2. Palpate on the cadaver (locating small bones of the hand on the skeleton is encouraged):
   a. pisiform bone
   b. tuberosity of the scaphoid
   c. metacarpal bones
   d. heads of the metacarpals
   e. carpometacarpal joint of the thumb
   f. thumb web
   g. thenar eminence
   h. hypothenar eminence

**NOTE TO THE DISSECTOR** It may be necessary to cut the tendon of the flexor pollicis longus in order to fully extend the thumb, allowing for dissection of the flexor thumb area. Release the tendon approximately 2 inches proximal to the wrist, so when the thumb is extended a portion of the tendon will still be visible.

3. In an anatomy atlas, review the location of the palmar cutaneous branch of the median nerve, the common palmar digital nerves and arteries, and the muscular (recurrent) branch of the median nerve on the thenar eminence. Preserve these structures as dissection proceeds in steps 4–16.

4. Make a vertical incision at the midline of the palm and a second incision across metacarpophalangeal joints. Begin to remove the skin on the flexor surface of the hand, including the skin on the flexor surface of the thumb.

5. Removal of the skin is a very slow and tedious procedure. Keep the blade of the scalpel turned horizontally and angled up toward the skin flap to avoid piercing deeper structures. Remove the skin and superficial fascia in small pieces off the flexor surface of the hand until the palmar aponeurosis, thenar fascia, and hypothenar fascia are encountered.

6. Trace the palmar aponeurosis distally to the area of the metacarpophalangeal joints.
7. Pull on the tendon of the palmaris longus, and observe the cupping movement of the palm. This muscle may not be present on some cadavers.

8. Note the relationship of the palmar aponeurosis to the tendonous sheaths and the superficial palmar arch. The palmar aponeurosis should be cut distally and removed in small pieces. Leave a portion of the palmar aponeurosis attached to the tendon of the palmaris longus for later identification. Continue to remove the palmar aponeurosis in small pieces until muscles, nerves, and arteries are clearly visible. In order to protect the median nerve, do not remove aponeuroses in the area where the recurrent branch of the median nerve enters the abductor pollicis brevis.

**NOTE TO THE DISSECTOR** Dissection of the hand should proceed slowly and cautiously. Take time to be careful in your work, and attend to small structures that need to be cleaned and identified.

9. In some cadavers, muscle fibers of the palmaris brevis may be visible on the hypothenar eminence in association with the fascia. Preservation of this small muscle is not necessary. Once the palmar aponeurosis is removed, identify:
   a. flexor retinaculum (transverse carpal ligament)
   b. superficial palmar arch (This arch is an extension of the ulnar artery and is completed by a branch from the radial artery.)
   c. common palmar digital arteries and nerves
   d. abductor pollicis brevis
   e. flexor pollicis brevis

10. Common palmar digital arteries branch from the superficial palmar arch. Trace several common palmar digital arteries to their division into proper palmar digital arteries, which will course along the medial and lateral side of each digit.

11. Release the superficial palmar arch, leaving it attached to the ulnar artery. Make the incision at the distal end of each common palmar digital artery, as well as through any arterial branches coursing to deeper structures. Turn the superficial palmar arch proximally.

12. On a skeleton, locate the four carpal bones—trapezium, tubercle of the scaphoid, hook of the hamate, and pisiform—to which the flexor retinaculum is attached.

13. Study the arrangement of each tendon of the flexor digitorum profundus and flexor digitorum superficialis in the carpal tunnel by pulling on each of the tendons. Observe the relationship of the median nerve to these tendons as they pass through the carpal tunnel.
14. The dissector will need to clip open the flexor retinaculum for better viewing of the carpal tunnel. Place one point of the forceps under the flexor retinaculum. Make an incision on top of the forceps through that portion of the flexor retinaculum to avoid cutting the median nerve and flexor tendons. Trim back the pieces of the flexor retinaculum on each side to open the carpal tunnel as much as possible for better viewing of the area.

15. Trace the median nerve from the forearm into the hand. This nerve can now be viewed fully. Put tension on the median nerve to locate its recurrent branch as it passes to the thenar eminence under the remaining aponeuroses. The aponeuroses and fascia covering this nerve can now be removed. The recurrent branch innervates the abductor pollicis brevis, the superficial head of the flexor pollicis brevis, and the opponens pollicis. Note the point at which it enters the abductor pollicis brevis.

16. Demonstrate the action of the abductor pollicis brevis. Locate the proximal attachment of this muscle on the cadaver.

17. Release the abductor pollicis brevis just distal to where the “recurrent” branch of the median nerve enters this muscle. Be careful not to cut the nerve.

18. Identify the opponens pollicis deep to the abductor pollicis brevis and study its muscle attachments and actions.

19. Review the muscle attachments and actions of the two heads of the flexor pollicis brevis. The superficial head can be viewed at this time.

20. Locate the recurrent branch (muscular branch) of the median nerve to the superficial head of the flexor pollicis brevis and the opponens pollicis.

21. On the hypothenar eminence, identify the abductor digiti minimi and study its attachments and actions.

22. Review the muscle attachments of the flexor digiti minimi and study the action of this muscle.

23. Hold the abductor digiti minimi and the flexor digiti minimi aside, and find the opponens digiti minimi located deep to these mus-
cles. Review the attachments of the opponens digiti minimi. Demonstrate opposition of the thumb to the fifth digit. Observe the direction of fibers of this muscle.

24. Trace the ulnar nerve across the wrist. Note its division into the deep and superficial branches in the region of the tunnel of Guyon. Follow the superficial branch distally, where it is sensory distribution for the fifth digit and the ulnar half of the fourth digit. The **deep branch of the ulnar nerve innervates** the hypothenar muscles after passing through the tunnel of Guyon.

25. Release the abductor digiti minimi approximately 1 inch distal to its proximal attachment. The abductor digiti minimi, flexor digiti minimi, and opponens digiti minimi are innervated just distal to the pisiform bone. Locate this general area. The deep branch of the ulnar nerve then passes with the deep palmar arch across the palmar surface of the hand deep to the flexor digitorum profundus, where it gives branches to the fourth and fifth lumbricales and to the dorsal and palmar interossei. Several branches should be identified.

26. Pull the tendons of the flexor digitorum superficialis distally through the carpal tunnel, and hold these tendons aside so that the flexor digitorum profundus tendons can be viewed.

27. Identify the lumbricales, which originate on the tendons of the flexor digitorum profundus. Trace branches of the median nerve innervating the first and second lumbricales. Locate the branches of the ulnar nerve to the third and fourth lumbricales.

28. Pull the tendons of the flexor digitorum profundus distally through the carpal tunnel and hold these tendons aside.

29. The deep palmar arch can now be studied [Figure 6.5]. The radial artery uniting with a branch of the ulnar artery forms the deep palmar arch. Palmar metacarpal arteries from this arch join the common palmar digital arteries of the superficial palmar arch. Locate the deep palmar arch. It is not necessary to locate the small palmar metacarpal arteries.

30. Identify the proximal attachments of the palmar interossei. Demonstrate the actions of these muscles. Locate several twigs of the deep branch of the ulnar nerve to the palmar interossei deep in the palm just distal to the deep palmar arch. These branches are very delicate, so handle with care.

31. Identify the transverse and oblique heads of the adductor pollicis. Review the action of this muscle. The transverse head is seen deep to the flexor digitorum superficialis and profundus tendons. Be sure to pull these tendons distally through the fingers to locate the transverse head of the adductor pollicis lying across the metacarpal arch. Identify on the medial side of the thumb: insertion of the flexor pollicis brevis and adductor pollicis.

32. On the lateral aspect of the deep palm, the deep branch of the ulnar nerve enters the adductor pollicis and the deep head of the flexor pollicis brevis to innervate these muscles. Dissection of this innervation is not necessary.

33. In summary, the **deep branch of the ulnar nerve supplies** the abductor digiti minimi, opponens digiti minimi, flexor digiti minimi, adductor pollicis, deep head of the flexor pollicis brevis, third and fourth lumbricales, and interossei.

34. Remove the skin from the anterior surface of the index finger as shown in Figure 6.1. Make the incision cautiously to avoid cutting the tendon of the flexor digitorum superficialis and flexor digitorum profundus, which are deep to the skin. Remove skin in order to study structures of the index finger. Preservation of the skin is unnecessary.
Digital arteries and nerves on the medial and lateral aspects of this digit will need to be preserved if possible.

35. Locate the insertion of the tendon of the flexor digitorum superficialis on each side of the middle phalanx. Note where the tendon of the superficialis divides into two slips to permit passage of the tendon of the flexor digitorum profundus.

36. Identify:
   a. digital tendon sheaths (attach to the palmar ligaments)
   b. vincula longa and brevia (small folds of connective tissue through which blood vessels pass from the periosteum of the phalanges to the long flexor tendons and their sheaths; can be seen by gently lifting the long flexor tendons with a probe from the palmar plate)
   c. palmar ligaments or plates (attach to the transverse metacarpal ligament and the hood)
   d. proper palmar digital arteries and nerves

37. Remove skin from the flexor surface of the thumb. See Figure 6.1.

38. Identify on the medial aspect of the thumb:
   a. insertion of the flexor pollicis brevis
   b. insertion of the adductor pollicis
The small muscles of the hand dry out very quickly with exposure to air during dissection. Keep the hand moist with preserving fluid. Upon completion of dissection each day, cover the hand in a white sock, making sure that the sock is moistened with preserving fluid. The sock should be white to avoid dyes leaking into the tissue.

39. Review on the cadaver the muscle attachments and actions for each of the muscles listed:
   a. abductor pollicis brevis
   b. flexor pollicis brevis—superficial and deep heads
   c. opponens pollicis
   d. abductor digiti minimi
   e. flexor digiti minimi
   f. opponens digiti minimi
   g. lumbricales
   h. palmar interossei

40. Review on the cadaver the distal attachments of those muscles of the anterior forearm that have an insertion in the hand:
   a. palmaris longus
   b. flexor carpi radialis
   c. flexor carpi ulnaris
   d. flexor digitorum superficialis
   e. flexor digitorum profundus
   f. flexor pollicis longus
PROCEDURE: Position the arm so its posterior surface is easily viewed.

1. Remove the skin from the posterior (extensor) surface by continuing to release the skin flap from the anterior arm. Keep the skin flap in one piece as a continuation of the anterior forearm flap if possible.

2. Identify the lateral and long heads of the triceps brachii. The medial head will be seen in step 7. Review the attachments for each of the three heads of the triceps brachii. Study the actions accomplished by this muscle.

3. Note the insertion of the large tricipital aponeurosis into the olecranon.

4. Find the radial nerve as it emerges from the brachial plexus, then trace it to the posterior axilla. This nerve enters the posterior arm at the lower border of the teres major to course between the long and lateral heads of the triceps. Separate the long and lateral heads of the triceps to locate the radial nerve using your fingers and/or a probe. The deep brachial artery (profunda brachii) is a branch of the brachial artery that passes with the radial nerve in the radial sulcus. Locate this artery.

5. Release muscle fibers of the lateral head as needed to follow the course of the radial nerve in the radial sulcus around the posterior humerus. Review in an atlas the location of the posterior antebrahial cutaneous nerve (from the radial nerve) as it pierces the lateral head of the triceps and passes along the posterior forearm. This nerve will need to be preserved as skin is removed.

6. Find branches of the radial nerve to the long and lateral heads of the triceps.

7. The medial head of the triceps is located deep to the lateral head and is seen on the medial aspect of the arm. Find a branch of the radial nerve to this head.

8. Locate the origin of the brachioradialis and extensor carpi radialis longus in the distal posterior-lateral arm.

9. Follow the radial nerve around the humerus to where it emerges between the brachioradialis and the brachialis. Identify a branch to the brachial. A branch to the brachialis may or may not be seen. It is usually a sensory branch.
PROCEDURE: Position the forearm so that the posterior-lateral surface of the forearm can be viewed. This can be accomplished with the cadaver prone or supine.

**NOTE TO THE DISSECTOR** Place a probe under the superficial branch of the radial nerve while removing skin in the posterior-lateral forearm so that this nerve is protected from destruction. The superficial radial nerve emerges from underneath the brachioradialis and then courses distally to the thumb web space.

1. Remove skin from the posterior-lateral surface of the forearm by continuing to release the anterior forearm skin flap, keeping the flap as one piece connected to the anterior flap. As the skin is removed, trace the following in the forearm:
   a. branches of the posterior antebrachial cutaneous nerve (radial)
   b. branches of the lateral antebrachial cutaneous nerve (musculocutaneous)
   c. basilic vein
   d. cephalic vein
2. Locate the anconeus. This small muscle participates in elbow extension. Locate this muscle in the atlas to aid in finding it on the cadaver. Remove the overlying fascia to expose the muscle fibers.
3. Identify the following muscles and locate the proximal attachment of each:
   a. brachioradialis
   b. extensor carpi radialis longus
   c. extensor carpi radialis brevis
   d. extensor digitorum
   e. extensor digitii minimi
   f. extensor carpi ulnaris
   Pull on the tendons of each of these muscles and study the actions that occur.
4. Locate the extensor retinaculum (dorsal carpal ligament) in the distal forearm. This retinaculum is a strong fibrous band with attachments to the ulna, triquetrum, pisiform, and bony ridges on the dorsal aspect of the radius. It forms small tunnels or compartments for the passage of the extensor tendons. Leave the extensor retinaculum intact as much as possible, except where it obstructs viewing of deeper structures.

**NOTE TO THE DISSECTOR** Tendons of the extensor digitorum should be left intact if they can be moved aside to view deeper structures. It will be necessary in many cadavers to release these tendons as instructed in step 5.

5. Place a probe under the tendons of the extensor digitorum. Tie the tendons together with string or woven dental floss, both proximal and distal to the incision line. Cut the tendons as shown in Figure 8.1.
6. Continue to separate the extensor digitorum proximally from the extensor carpi radialis longus until the belly of the supinator can be seen clearly. Branches of the posterior interosseous nerve and artery can be seen piercing the supinator.

7. Hold aside the cut tendons in order to identify the following:
   a. abductor pollicis longus
   b. extensor pollicis brevis
   c. extensor pollicis longus
   d. extensor indicis
   e. supinator

8. Find the radial nerve in the distal portion of the forearm on the lateral side. Trace this nerve to its division into a superficial branch and a deep branch just distal to the lateral epicondyle. The superficial branch was dissected in the anterior forearm.

9. The deep branch of the radial nerve pierces through the supinator supplying this muscle. After passing over the interosseous membrane, it then emerges in the posterior-lateral forearm as the posterior interosseous nerve.
   a. Find the branches supplying the extensor digitorum, extensor carpi ulnaris, and extensor digiti minimi. It may be necessary to separate some of the proximal portion of the extensor digitorum from the extensor carpi ulnaris in order to find the nerve branch innervating the extensor carpi ulnaris.
   b. Locate branches to the extensor pollicis longus, extensor indicis, abductor pollicis longus, and extensor pollicis brevis.
   c. Locate a branch passing along the interosseous membrane. This nerve supplies the ligaments and capsule of the wrist joint.

10. The common interosseous artery, a branch of the ulnar artery, was dissected in the anterior forearm. This artery divides into anterior and posterior interosseous arteries. The posterior interosseous artery accompanies the posterior interosseous nerve as it pierces the supinator muscle. Find this artery deep to the extensor digitorum.

11. Pull on the tendons of the following muscles to study their actions:
   a. abductor pollicis longus
   b. extensor pollicis brevis
   c. extensor pollicis longus
   d. extensor indicis
Observe the proximal muscle attachments for each of these muscles.

12. Locate the muscle attachments of the supinator, and note the direction of the muscle fibers. Demonstrate on the cadaver the action of this muscle.

13. Find once again the radial nerve in the cubital fossa as it passes medial to the belly of the brachioradialis. Find branches of this nerve to the extensor carpi radialis longus and extensor carpi radialis brevis.

14. Review on the cadaver the attachments, innervation, and actions for each of these muscles:
   a. brachioradialis
   b. extensor carpi radialis longus
   c. extensor carpi radialis brevis
   d. extensor digitorum
   e. extensor digitii minimi
   f. extensor carpi ulnaris
   g. supinator
   h. abductor pollicis longus
   i. extensor pollicis brevis
   j. extensor pollicis longus
   k. extensor indicis
1. Using forceps and a probe, work loose the skin from the underlying fascia on the dorsum of the hand. Remove skin from the dorsum of the hand and the ulnar border of the wrist. This skin will not be saved as a flap and should be disposed of properly. The hand should be covered with a white sock at the completion of each day's dissection to preserve the tissue in the area. The sock should be sprayed with preserving fluid to keep it moist.

2. Trace the superficial branch of the radial nerve and the dorsal branch of the ulnar nerve to the dorsum of the hand. Leave their terminal branches attached to fascia whenever possible.

3. Identify the cephalic vein and the basilic vein at the wrist. These veins branch from the dorsal venous arch found on the dorsum of the hand. In some cadavers, this arch may be clearly seen and should be dissected. Tributaries from the digits and from other areas of the hand do not need to be preserved.

4. Clear away any remaining fascia over the dorsal interossei so that these muscles can be studied. Review the muscle attachments and demonstrate the action of these muscles.

5. Note slips of tendons connecting adjoining tendons of the extensor digitorum. These slips are more prominent in tendons going to the third, fourth, and fifth digits. Explain how these slips influence digit extension.

6. Study the point of insertion for the following muscles:
   a. extensor carpi radialis longus
   b. extensor carpi radialis brevis
   c. extensor carpi ulnaris

7. Review the structures of the dorsal (extensor) expansion in an atlas—i.e., hood, insertions of interossei and lumbricales, central slip, and retinacular ligaments (lateral bands).

8. Remove skin from the dorsum of the index finger. Locate the insertions of the tendons of the extensor digitorum and extensor indicis (Figure 9.1). Note the relationship of the tendon of extensor indicis and extensor digiti minimi to the tendons of the extensor digitorum. The extensor indicis tendon is usually found on the ulnar side of the extensor digitorum to the index finger. The extensor digiti minimi tendon passes through a separate compartment of the extensor retinaculum and then the extensor digitorum tendons. It then divides into two slips, the lateral slip being joined by the tendon of extensor digitorum.

9. Identify on the cadaver:
   a. dorsal expansion
   b. hood (anchoring the expansion to the palmar ligaments)
   c. insertion of interossei into the dorsal expansion (proximal to the lumbricales insertion)
   d. insertion of lumbricales into the dorsal expansion (distal to the interossei insertion)
   e. central slip
   f. retinacular ligaments (lateral bands)
10. Continue to remove skin from the thumb so that the extensor surface can be viewed. Locate the insertions of the abductor pollicis longus and the abductor pollicis brevis.

11. Trace the extensor pollicis brevis and extensor pollicis longus to their insertions on the dorsum of the thumb.

12. Remove skin from the thumb web. The first dorsal interosseous muscle forms the dorsum of the thumb web, whereas the adductor pollicis forms the ventral surface of the thumb web. Locate these muscles.

13. Review the tendons that attach to the thenar side of the hand.

14. Use a white sock to cover the hand to prevent drying out of the structures.
Before proceeding with dissection:

1. Review muscle attachments, actions, and innervation for each muscle of the upper limb.

2. Trace each nerve of the brachial plexus, identifying its cutaneous and motor branches. Trace the cutaneous nerves of the brachial plexus, studying their area of sensory innervation.

3. Note throughout the course of the nerve the level at which various muscles are innervated. Locate the point at which the nerve enters the muscle.

4. Review on the cadaver the arterial system in the upper limb beginning with the axillary artery. Trace each artery to the area it supplies. Note the relationship of arteries and nerves that travel together.

5. Review the venous system of the upper limb. Beginning at the dorsal venous arch, trace the cephalic and basilic veins to the axillary region. Note that the basilic and brachial veins join to form the axillary vein. The cephalic vein then enters the axillary vein near the clavicle.

6. Review the dermatome distribution of the upper limb.