

Human Anatomy

Lab Manual

Sixth Edition

Summer Term

Mark Nielsen
University of Utah

Contents

| | |
|------------------------|----|
| Orientation | 1 |
| Tips | 3 |
| Labs | 5 |
| Laboratory One | 9 |
| Laboratory Two | 17 |
| Laboratory Three | 23 |
| Laboratory Four | 29 |
| Laboratory Five | 35 |
| Laboratory Six | 41 |
| Laboratory Seven | 51 |
| Laboratory Eight | 57 |
| Laboratory Nine | 63 |
| Laboratory Ten | 69 |
| Practical Tips | 75 |



Preface

This book is for students in Biology 2325 - Human Anatomy. As you begin your anatomical learning adventure, use this book to prepare for the laboratory. It is designed to help you prepare for and get the most out of each of the laboratory sessions. There is a chapter for each of the labs that has a list of objectives that you should use to prepare for lab. If you follow these objectives you will arrive at lab prepared and you will maximize your learning efforts. All the material you will cover in each laboratory along with what you will need to do to prepare for the lab quizzes each week is covered in this manual.

Orientation

Welcome to the human anatomy laboratory that accompanies the lecture in Biology 2325 - Human Anatomy. This lab provides you with a rare opportunity to explore anatomy using dissected human cadavers. Exploring cadavers is the true approach to learning anatomy, that is, experiencing anatomy in its three-dimensional reality. There is no better way to learn this subject. In lecture you will use your sense of hearing to listen and learn and your visual sense to see two-dimensional illustrations throughout the lecture. The lab opens the door to additional senses — those of touch, three-dimensional vision, and even the unique smell of a cadaver lab. This allows you to gain a total exposure to the design of the human body.

You may have asked yourself as you were registering for this class, what can I expect in the anatomy lab? How do I prepare for lab? What is expected of me? The following information will help answer these questions and provide guidelines for a successful learning experience.

1. Each lab will begin with a visual quiz that will require approximately 10 minutes to administer. There will be a total of eleven quizzes during the semester. All will count towards your grade. The quizzes are administered at the beginning of lab, so be on time. Questions will not be repeated for latecomers. You must attend the lab for which you are registered. **Only under extenuating circumstances, and with Professor's written approval, can you take a quiz in another lab, or for that matter attend another lab time.**
2. The quizzes are visual tests that you will take at the beginning of the lab session. The quiz will cover the material that you will study in the lab. The purpose behind quizzing students on material they will be studying in the current lab is to encourage students to come to lab prepared. Years of experience, have demonstrated that this helps students get the most out of their lab experience. The *Human Anatomy Interactive Atlas*, a web-based software that accompanies your books contains numerous cadaver photographs that you will study in preparation for the lab quizzes. These cadaver photographs correspond to lecture material from the previous week and are similar to the cadaver materials you will study in the lab. Each photograph is a professionally prepared dissection to not only help you prepare for the lab, but also to allow you to take the lab home with you. By having access to these excellent photographs, you can study the cadavers from the lab without being in the lab.
3. Attendance is required as the lab is 30% of the course grade. The lab time should be used wisely. Again, history demonstrates that the students who perform best in the course are those who come prepared for lab, work hard, and do not waste time in the laboratory.

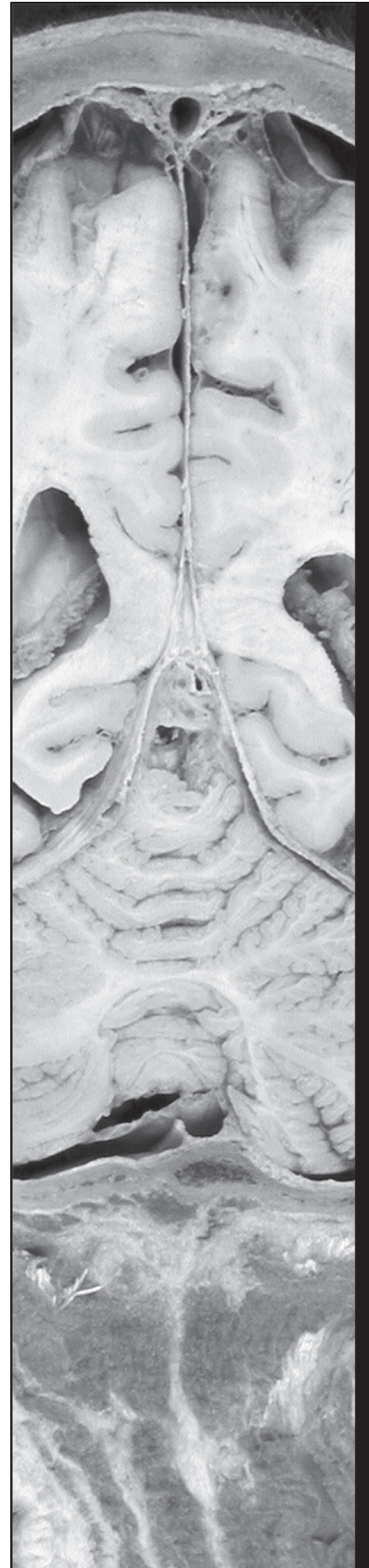


4. There can be no food or drinks in the lab.
5. A seating chart will be assigned, so pick the seat you want for the semester. This helps the teaching staff learn your names and allows them to run a more orderly lab.
6. **Never touch skeletal material or models with pens and pencils as it mars these expensive, hard-to-replace materials.** Use a probe to point to these objects. Handle all skeletal material with extreme care, as this will help us prolong the use of these unique and valuable teaching materials.
7. Guests and visitors are not allowed in the lab. There is simply not enough room for people who are not registered for the course to attend the lab.
8. Anatomical materials cannot be loaned out to students. The materials used in the lab are to remain within the lab. There are no exceptions.
9. It is a privilege to have human body parts to study and use as learning aids. Very few undergraduate courses have access to human body parts. Please respect this privilege.
10. Following the quiz there will be a brief orientation by the teaching assistant in charge of the lab. This will be followed by the general lab work.
11. **Students are responsible for identifying the structures listed on the designated pages of this manual for quiz and test purposes.** During the lab you will work with teaching assistants who will teach you using the prosected cadavers. They will help you identify the structures listed in the lab manual and will teach you techniques to learn anatomy on the cadaver prosections.
12. Students should prepare for lab by reading the objectives for the pertinent lab each week. This is extremely important. If you are prepared, you will maximize your learning experience.
13. It is important to use the lab time wisely. During the majority of the lab period you will be involved in small, structured learning groups. In these small groups a teaching assistant will work with you to help you see and learn the anatomy on the cadavers. There will be other periods of time during some of the labs where you will have time to review what you are learning by taking practice practical examinations.
14. The lab contains a variety of materials to help you visualize the anatomy being covered in the lectures. There are pictures, models, and human body parts. Be aware of all these materials and use them to your full advantage in learning anatomy.
15. Take advantage of the staff of teaching assistants in the labs. Do not hesitate to ask questions. The only bad questions are those that are not asked! Every effort will be made to answer even the most difficult of questions.
16. The anatomy staff encourages you to fully participate and take complete advantage of the materials and resources available. With proper **preparation** this lab can be an exciting and unique educational experience. ***HAVE FUN AND GOOD LUCK!***

Tips

The following techniques will be useful in learning anatomical concepts throughout this course. Before each lab, review this list and apply the appropriate concepts to the lecture material.

1. Hands on!!: Exploration and touching of cadaver parts is essential. The more you handle and examine cadaver parts the more familiar you will become with orienting, recognizing, and discovering specific anatomical structures.
2. Palpation: This is the process of exploring structures with your hands on your own or someone else's body. Realize that your own body is a human anatomy review sheet (anatomy can be fun with a partner, too). Palpation can be used to study bony landmarks, muscles, tendons, ligaments, vessels, and nervous structures. Whenever you are learning a new anatomical structure, try and palpate it on your own body.
3. Etymology: Many anatomical terms are derived from Latin and Greek roots. Often terms that look foreign to you are actually very descriptive. The term might describe the size, shape, action, or location of the anatomical structure being named. By dissecting a term's Latin or Greek origin you can make memory associations that help with learning the anatomical structures. For examples of this approach, look at the chapters Anatomical Nomenclature and Anatomical Etymology in the *Human Anatomy Lecture Manual*.
4. Traces: A trace is a sequential path of chambers, vessels, tubular structures, valves, or nervous structures through which a substance or impulse passes as it travels from one region of the body to another. When learning systems, such as the cardiovascular, respiratory, digestive, urinary, or nervous systems, traces provide an excellent technique for identifying the structures in an ordered fashion. This is an excellent way to see if you understand the big picture. Learning a trace through a system will help you reinforce the sequential relationship between the structures of that system. **Remember you can trace molecules from one system to another across diffusion or transport barriers, such as an oxygen molecule from the alveolar air spaces in the lungs to the pulmonary capillaries that surround those air spaces!**
5. Form and function: Often anatomical structures are not only named for their shape or size, but for functional characteristics as well. The reverse can also be true, the function or structure can be logically deduced from the anatomical name (i.e.; Name: Pronator teres; Function: round muscle which pronates).



6. Topography: The human body is like a map. Once you recognize a particular structure, it can then be used to identify other structures in the same area. As you learn the topographical relationships between muscles, organs, bones, nerves, and vessels, you can begin to make associations with known key structures. Understanding how structures are related to easily identifiable, obvious structures, makes identifying the various parts of the body an easier task.
7. Logic and simplification: Look for common themes, such as, compartments, innervation, action, location, tissue type, etc. Think logically! Learn structures according to common groups and characteristics. This is always superior to sheer memorization.
8. Mnemonics: Mnemonics can be a useful memory device. They are most useful in learning structures that can be grouped or categorized (i.e., the rotator cuff muscles the **S**upraspinatus, **I**nfraspinatus, **T**eres minor, and **S**ubscapularis are the **SITS** muscle group).

There is a wealth of material that you can use as a reference to help you prepare for the laboratory, as well as study for the course. These materials are visually stimulating and will, if used, enhance your lab preparation, along with your ability to learn anatomy. Anatomy is a visual subject, therefore one of the most effective ways to learn and understand it is to do as much visualization as possible. Gaining a strong visual knowledge of the structure increases one's ability to think critically, problem solve, and memorize the extensive language of anatomy. The following are some resources to help with your study of anatomy:

1. *Human Anatomy Interactive Atlas* by Shawn Miller and Mark Nielsen. This computer software is online and information to access this can be found at the beginning of the Lecture Manual. Weekly study of *Human Anatomy Interactive Atlas* will be required preparation for the laboratory quizzes. You will also find this to be an extremely useful resource as you study anatomy. The *Human Anatomy Interactive Atlas*, in essence, allows you to take the lab home with you.
2. *Real Anatomy* by Mark Nielsen and Shawn Miller. This is a software DVD, for Windows computers only, that allows you to dissect and explore the body. It is packaged with the textbook at the bookstore, or can be purchased as a stand alone DVD on Amazon.com.
3. *Real Anatomy 2.0* by Mark Nielsen and Shawn Miller. This is the new version of *Real Anatomy* that has been web enabled. It is a web-based software program that works on any operating system and also on mobile devices by purchasing a subscription to access it via the web.

Labs

The next chapters in this manual are outlines of the weekly laboratories. They are designed to help you accomplish three important tasks: 1) to prepare for the lab; 2) to benefit maximally from the time you spend in the lab; and 3) to summarize what you should learn during lab. These chapters are concise and to the point. Use them to learn what is expected. Doing so will help you get the most out of the laboratory. Each chapter follows a consistent layout that has the following topics or headings:

Collaborative learning stations

In the lab the students are divided into groups of six to eight people and each group is assigned a teaching assistant for that lab. The lab consists of five of these groups. Within the lab there are five collaborative learning stations. Each group will start at one of the collaborative learning stations, where they will explore and learn anatomy under the tutelage of a teaching assistant. After approximately 20 minutes, the groups will rotate to a different station. By the end of the laboratory session each group will have visited each of the five learning stations. The learning stations are interactive, hands-on explorations of bones and human cadavers. The cadavers are professionally dissected to illustrate the relevant anatomy for the lab. This is a wonderful opportunity to explore anatomy in the third dimension. Learning anatomy on the cadavers will broaden the perspective you gain from the two dimensional approach of lecture. During these sessions do not sit back passively, instead, actively become involved in the lab so you can maximize your learning experience. In each of the lab chapters that follows, the learning stations for that lab will be listed in this collaborative learning section.



How to prepare for the lab

This section in each lab chapter presents a clear summary of the necessary information you need to be aware of in order to prepare for the laboratory. There are two main areas of preparation for each laboratory period. First, you must prepare for a quiz at the beginning of each lab. Second, you must prepare for the lab itself. By accomplishing the first task you begin to accomplish the second. In this section, throughout the chapters that follow, you will find helpful hints to guide you as you prepare for the lab. Included in this section will be a list of the modules on the *Human Anatomy Interactive Atlas* online that you should study to prepare for the quiz. The quiz is a visual test that includes projected photographs identical to the photographs present on the *Human Anatomy Interactive Atlas*. These photographs show anatomical structures that you will study on dissections in the laboratory. By studying these pictures for the quiz, you will begin to familiarize yourself with the anatomy you need to identify on the cadavers. In addition to the quiz guide, other study tips, suggestions, and questions are presented in this section. This will help you maximize your preparation so you can get the most from your lab experience.

Objectives during the lab

This section outlines the main learning objectives for each lab period. Preview these objectives prior to the lab to help guide your study at the collaborative learning stations. After the lab, these objectives will serve as a checklist for what you should have accomplished. Review them and ask, “Did I accomplish the objectives?”

Structures to identify for the quiz

This section provides you with the necessary information to prepare for the weekly laboratory quiz. To prepare for the quiz use the information provided here in conjunction with the *Human Anatomy Interactive Atlas* online. The quiz will consist of a number of projected photographs from the *Human Anatomy Interactive Atlas*. Each photo will be projected onto a large screen at the front of the lab, where a teaching assistant will point to an anatomical structure on the picture and ask you to identify it. This section of the lab manual will list the *Human Anatomy Interactive Atlas* module and the specific photos within that module that will be on the weekly quiz. Each anatomy module on the *Human Anatomy Interactive Atlas* has two labeling buttons — a “Basic Labels” button and an “All Labels” button. To prepare for the quiz each week, refer to the *Human Anatomy Interactive Atlas* module and the specific photos listed in this section. Then simply select the “Basic Labels” button and study the labeled structures. The *Human Anatomy Interactive Atlas* has been designed to allow you to easily prepare for the quiz. By selecting the “Basic Labels” button on the *Human Anatomy Interactive Atlas*, all the structures you need to know for the quiz will be marked with flashing circular markers. You can then quiz yourself by pointing and clicking on the markers to view the label. The “Basic Labels” button on the *Human Anatomy Interactive Atlas* covers the material that you will study in each lab. Notice that there is an “All Labels” button that you

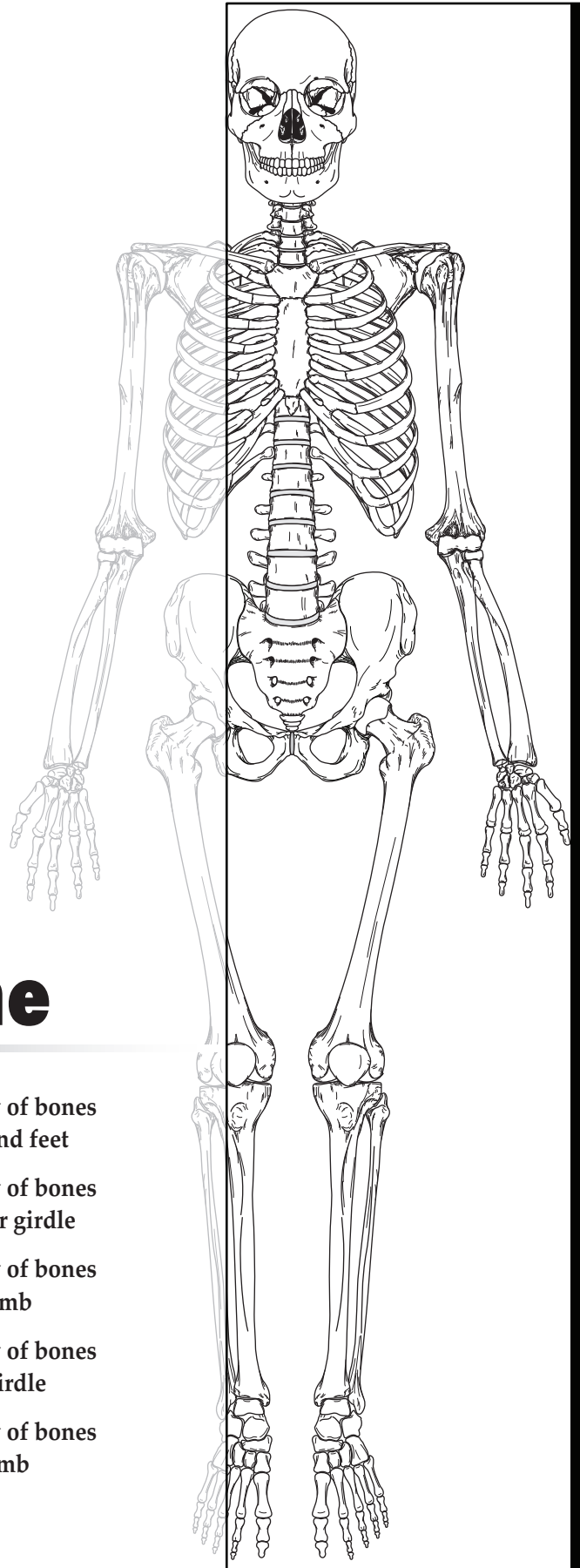
can use to quiz yourself later in the semester, as you begin to learn more and more anatomy. The “All Labels” button labels all structures on the cadaver photo, many of which you are not required to learn. For the weekly quiz, you need only to worry about identifying the “Basic Labels” associated with the photos listed in this section.

Structures to Identify in the lab

This section contains a complete list of structures that should be identified and learned during the lab. This is a reference list of all the structures that you will observe in the laboratory each week. This will also serve as a summary list of all the structures that you will be responsible for on the final practical examination. This can serve as a valuable checklist to use during the lab reviews as you prepare for the practical examination. In essence, this is a list of all the “Basic Labels” from all the photos within the modules on the *Human Anatomy Interactive Atlas* online.

After the lab is over

Towards the end of the semester, you will have the opportunity to attend review labs on weekends. This provides you with an opportunity to study the cadavers and reinforce the material that you are learning as you prepare for the final practical examination. This section of the lab manual will help you prepare for these reviews. After you have completed the lab, use this section to jot down notes on the structures and cadaver parts that you feel you would like to review in more detail. Being able to refer back to these notes will help you maximize your time during the weekend review labs. One of the major objectives you should keep in mind throughout the labs is to be constantly preparing for the lab practical examination. This review section can help you focus your efforts toward this end. Review labs allow you to study the body parts on your own, emphasizing your own specific needs. You determine where you need to spend your time and you then spend it most effectively. If you will look back over this section before coming to the special review labs, you will find that you can maximize your learning efforts.



Laboratory One

Collaborative Learning Stations

1. Appendicular skeleton– study of bones and landmarks of the hands and feet
2. Appendicular skeleton– study of bones and landmarks of the shoulder girdle
3. Appendicular skeleton– study of bones and landmarks of the upper limb
4. Appendicular skeleton– study of bones and landmarks of the pelvic girdle
5. Appendicular skeleton– study of bones and landmarks of the lower limb

How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Appendicular Skeleton module on the *Human Anatomy Interactive Atlas* online and read the section in the *Human Anatomy Study Guide and Workbook* (pages 3 - 20) that introduces you to the skeletal system and the appendicular skeleton.
2. Be able to identify each bone of the appendicular skeleton by name. This includes all the bones of the hands and feet.
3. Be able to identify the different views of each bone pictured on the *Human Anatomy Interactive Atlas* online and in the *Human Anatomy Study Guide and Workbook*. For example, recognize the difference between an anterior view of the femur and a posterior view of the femur. Try to notice key landmarks on the bones that allow you to identify the anterior aspect of the bone from the posterior aspect of the bone.
4. Be able to relate the appendicular bones to the terms of position covered in the Anatomical Nomenclature chapter of the lecture manual. It is important to become familiar with the basic terminology used to describe relationships between anatomical structures and the various parts of the body. For example, the radius is the lateral bone in the antebrachium and the head of the radius is at the proximal end of the bone.
5. Learn the names of all the bones (including all the bones of the wrist, hand, ankle, and foot) and the landmarks marked with an "*" on the bone illustrations in this chapter. Be able to identify these landmarks on the photos of the bones on the *Human Anatomy Interactive Atlas* online. These are key landmarks that will help you orient the appendicular bones.
6. As you are studying the bones and their landmarks, try to palpate them on your own body. Gaining an understanding of where these landmarks are on your own body can help you with the learning process.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

1. Describe the basic design of the skeletal system and understand its role in the human body.
2. Be able to differentiate between the axial and appendicular portions of the skeleton.
3. Recognize the differences between compact and spongy bone and be able to identify these different types of bone tissue.
4. Be able to identify the parts of a typical long bone.

5. Be able to orient the bones as they would appear in the fully articulated skeleton.
6. Understand the relationships between neighboring bones, i.e., learn the names of the articular surfaces of the bones. These landmarks are easily identified by their smooth, bearing-like surfaces. Surfaces which in life are covered with articular cartilage.
7. Identify all the landmarks indicated for each bone in the *Human Anatomy Study Guide and Workbook* and on the “Basic Labels” button on the *Human Anatomy Interactive Atlas* online. Realize that these landmarks are either surfaces of articulation with other bones or points of soft tissue attachment for muscles and ligaments. Learning these landmarks now will prove to be very beneficial when you study muscle anatomy later in the semester.

If by the end of the lab session you have not learned all the information outlined in these objectives, do not worry. The lab will introduce you to the required knowledge base and help you begin the learning process. For this reason, the more you prepare for the lab, the more you will benefit. Realize that to fully learn the information covered in this lab, you will need to do additional homework after you leave the lab. Use the *Human Anatomy Interactive Atlas* online and the *Human Anatomy Study Guide and Workbook* to further pursue your lab studies after the lab is over.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should do the following:

1. Be able to identify all the bones of the appendicular skeleton on the photographs in Appendicular Skeleton Module of the *Human Anatomy Interactive Atlas* online. You should be able to identify each of the following bones:
2. Be able to identify whether you are looking at the anterior aspect of each bone or the posterior aspect of the bone.

| | |
|-------------------|----------------------------------|
| Clavicle | Os coxae |
| Scapula | Ilium |
| Humerus | Ischium |
| Radius | Pubis |
| Ulna | Femur |
| Scaphoid | Patella |
| Lunate | Tibia |
| Triquetrum | Fibula |
| Trapezoid | Talus |
| Trapezium | Calcaneus |
| Capitate | Navicular |
| Pisiform | Cuboid |
| Hamate | Lateral cuneiform |
| Metacarpals | Middle or intermediate cuneiform |
| Phalanges of hand | Medial cuneiform |
| | Metatarsals |
| | Phalanges of foot |

3. Using the illustrations of the appendicular skeleton in the *Human Anatomy Study Guide and Workbook*, be able to identify the bony landmarks marked with an asterisk on the bone photos on the *Human Anatomy Interactive Atlas* online. We are breaking you in gradually and not trying to overwhelm you. By the end of the lab you should know all the bony landmarks listed on the following pages, but for the quiz you should be able to identify the following bony landmarks:

On Clavicle:

Acromial end
Sternal end
Conoid tubercle

On Scapula:

Acromion
Spine of scapula

On Humerus:

Head
Olecranon fossa

On Radius:

Head
Styloid process

On Ulna:

Radial notch
Olecranon process

On Os Coxae:

Iliac crest
Acetabulum

On Femur:

Head
Linea aspera

On Tibia:

Tibial tuberosity
Medial malleolus

4. Be able to use the terminology covered in the Anatomical Nomenclature chapter of the lecture manual with the photos of the bones on the *Human Anatomy Interactive Atlas* online.

Structures to Identify in the Lab

Clavicle

- ☐ Acromial end
- ☐ Sternal end
- ☐ Conoid tubercle
- ☐ Impression for costoclavicular ligament

Scapula

- ☐ Spine
- ☐ Acromion
- ☐ Glenoid cavity
- ☐ Coracoid process
- ☐ Infraspinous fossa
- ☐ Supraspinous fossa
- ☐ Subscapular fossa
- ☐ Inferior angle
- ☐ Superior angle
- ☐ Infraglenoid tubercle
- ☐ Supraglenoid tubercle
- ☐ Lateral border
- ☐ Medial border

Humerus

- ☐ Head of humerus
- ☐ Greater tubercle
- ☐ Lesser tubercle
- ☐ Intertubercular groove
- ☐ Deltoid tuberosity
- ☐ Trochlea
- ☐ Capitulum
- ☐ Medial epicondyle
- ☐ Lateral epicondyle
- ☐ Olecranon fossa

Ulna

- ☐ Olecranon
- ☐ Trochlear notch
- ☐ Coronoid process
- ☐ Ulnar tuberosity
- ☐ Radial notch
- ☐ Head of ulna
- ☐ Styloid process of ulna

Radius

- ☐ Head of radius
- ☐ Radial tuberosity
- ☐ Styloid process of radius

Carpal Bones

- ☐ Scaphoid bone
- ☐ Lunate bone
- ☐ Triquetrum bone
- ☐ Pisiform bone
- ☐ Trapezium bone
- ☐ Trapezoid bone
- ☐ Capitate bone
- ☐ Hamate bone

Metacarpal bones

Phalanges of the hand

- ☐ Proximal phalanx
- ☐ Middle phalanx
- ☐ Distal phalanx

Os Coxa

- ☐ Acetabulum
- ☐ Obturator foramen
- ☐ Greater sciatic notch
- ☐ Ilium
- ☐ Iliac crest
- ☐ Anterior superior iliac spine
- ☐ Anterior inferior iliac spine
- ☐ Iliac fossa
- ☐ Auricular surface for sacrum
- ☐ Iliac tuberosity
- ☐ Anterior gluteal line
- ☐ Posterior gluteal line
- ☐ Inferior gluteal line
- ☐ Ischium
- ☐ Ischial spine
- ☐ Ischial ramus
- ☐ Lesser sciatic notch
- ☐ Ischial tuberosity
- ☐ Pubis
- ☐ Pubic crest
- ☐ Pubic tubercle
- ☐ Pectineal line
- ☐ Pubic symphysis
- ☐ Superior pubic ramus
- ☐ Inferior pubic ramus

Femur

- ☐ Head of femur
- ☐ Neck of femur
- ☐ Greater trochanter
- ☐ Lesser trochanter
- ☐ Intertrochanteric crest
- ☐ Pectineal line
- ☐ Gluteal tuberosity
- ☐ Linea aspera
- ☐ Lateral condyle
- ☐ Medial condyle
- ☐ Adductor tubercle
- ☐ Patellar surface

Patella

Fibula

- ☐ Head
- ☐ Neck
- ☐ Lateral malleolus
- ☐ Malleolar fossa

Tibia

- ☐ Lateral condyle
- ☐ Medial condyle
- ☐ Tibial tuberosity
- ☐ Medial malleolus

Tarsal bones

- ☐ Talus bone
- ☐ Calcaneus bone
- ☐ Navicular bone
- ☐ Medial cuneiform bone
- ☐ Intermediate cuneiform bone
- ☐ Lateral cuneiform bone
- ☐ Cuboid bone

Metatarsal bones

Phalanges of the foot

- ☐ Proximal phalanx
- ☐ Middle phalanx
- ☐ Distal phalanx

Parts of a typical bone

- ☐ Epiphysis
- ☐ Diaphysis
- ☐ Medullary cavity
- ☐ Nutrient foramen
- ☐ Compact bone
- ☐ Spongy bone

After the Lab is Over

The Marriott Library has bone boxes that you can check out to study the bones. You can check the bones out from the general reserve desk and use them within the library.

Tips for reviewing bone material

Bone orientation

Be able to orient any bone and determine whether it is a right or a left bone. Try to do it with your eyes closed by feeling for prominent surface landmarks that you learned during the lab.

Landmarks

Every osteological landmark has a descriptive name and the Latin and Greek origins of these words can be very helpful learning aids. For example, in Latin the greater tubercle means the 'bigger bump'. Knowing the etymology of these words can help you use association techniques when learning the terminology to improve long term memory.

Take advantage of the opportunity to use the bone boxes at the library and during anatomy office hours and review the bony landmarks. Pair up with a partner and quiz each other. Take turns pointing to the bony landmarks and asking each other their names. This will help you prepare for the bone practical exams that you will take in some of the later labs in the semester.

Landmarks I need to review this week

In the space to the right, compile a list of the osteological landmarks from Lab 1 that you feel you need to focus on during your review opportunities.

The *Human Anatomy Study Guide and Workbook* contains additional unlabeled illustrations of the bones. These are provided for you to use as study aids to test your knowledge of the landmarks. During the first laboratory session you covered these landmarks with a teaching assistant. Now test yourself and make sure that you can identify them on your own. If you desire to spend additional time handling the actual bones, you can look at the bones at the library or in the laboratory during office hours.

Upper Limb Landmarks

Lower Limb Landmarks

An anatomical illustration of a tissue section, possibly a heart wall, showing various layers and structures. A vertical line indicates a dissection or section plane. The illustration includes a large, dark, shaded area representing a cavity or lumen, and several smaller, lighter areas representing different tissue layers or structures. The overall style is that of a scientific or medical textbook illustration.

Laboratory Two

Collaborative Learning Stations

1. Blood vessels - Major pathways
2. Arthrology
3. Heart 1
4. Heart 2
5. Integument, soft tissues, and myology

How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Soft Tissues and Cardiovascular modules on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the histology, integument, arthrology, myology, and cardiovascular lectures in the *Human Anatomy Lecture Manual*.
3. Be especially familiar with the major joint categories and the specific subcategories within each major joint category.
4. Be able to trace a drop of blood through the heart.
5. Using the major “highway system” of blood vessels, be able to trace a drop of blood from the heart to major regions of the body and then back again to the heart. Practicing blood traces will help you solidify the “big picture” relationships of the blood vessels.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Integument and soft tissues

1. Be able to recognize the gross appearance of different tissue types and their locations on the cadaver parts.
2. Understand the concept of a tissue versus a layer or structure. When learning structures always ask the question: From what tissue or tissues is this structure made? Realize that tissues are merely building materials. All anatomical layers and structures are made of tissues. For example, the epidermis is a layer or structure made up of stratified squamous epithelial tissue.
3. Learn to recognize and identify the different fiber orientations of dense regular connective tissue and dense irregular connective tissue. Identify specific examples of structures comprised of each of these dense connective tissues.
4. Be able to identify the layers of the integument, as well as the deeper fascial layers and connective tissue wrappings around and within a skeletal muscle.

Arthrology

1. Be able to recognize the different types of joints identified in the arthrology section of the lecture manual.
2. Be able to identify the structures of a synovial joint. Understand the role of a meniscus and the extracapsular ligaments around the synovial joints.

Cardiovascular system

1. Be able to identify all the structures of the heart including the chambers, vessels, and valves.
2. Be able to correctly orient a heart.
3. Understand how the valves function to create a unidirectional flow through the heart and be able to trace the flow of blood through the heart.
4. Understand how the atria and ventricles are different, in both appearance and function.
5. Acquire the skill to distinguish an artery from a vein on a cadaver.
6. Be able to identify the major arteries and veins on a cadaver and be able to trace blood through the vessels from one part of the body to another part.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Soft Tissues Module and Cardiovascular Module of the *Human Anatomy Interactive Atlas* online. There will be seven questions on the quiz on this material. In addition, there will be three questions on the quiz from the material you studied in Lab #1. These three questions can be anything in the Lab 1 Section titled “Structures To Identify In The Lab”.

Soft tissue photos

1. Step dissection of anterolateral neck
2. Thigh cross section at mid thigh
3. Anterior view of hand and wrist
4. Lateral view of the cranium
5. Knee joint, anterior and posterior views

Cardiovascular photos

1. External anatomy of the heart
2. Ventricles of the heart
3. Valves of the heart
4. Vessels of the proximal superior limb
5. Antebrachial arteries
6. Branches of abdominal aorta

Structures to Identify in the Lab

Integument and soft tissues

Integument

- ☐ Epidermis
- ☐ Dermis
- ☐ Hypodermis (tela subcutanea)

Miscellaneous soft structures

- ☐ Fascia
- ☐ Body of skeletal muscle
- ☐ Tendon of skeletal muscle
- ☐ Epimysium
- ☐ Perimysium
- ☐ Retinaculum
- ☐ Periosteum

Arthrology

Fibrous joints

- ☐ Gomphosis
- ☐ Interosseus membrane
- ☐ Plane suture
- ☐ Squamous suture
- ☐ Serrate suture
- ☐ Denticulate suture

Cartilaginous joints

- ☐ Intervertebral symphysis (disc)
- ☐ Epiphyseal growth plate

Synovial joints

- ☐ Articular cartilage
- ☐ Fibrous membrane (capsular ligament)
- ☐ Synovial membrane
- ☐ Meniscus
- ☐ Ligament

Synovial structures

- ☐ Synovial bursa
- ☐ Tendon sheath

Cardiovascular system

Heart

- ☐ Right atrium
- ☐ Left atrium
- ☐ Auricle

- ☐ Pectinate muscle
- ☐ Tricuspid valve
- ☐ Mitral or bicuspid valve
- ☐ Right ventricle
- ☐ Left ventricle
- ☐ Trabeculae carneae
- ☐ Papillary muscle
- ☐ Chordae Tendineae
- ☐ Pulmonary valve
- ☐ Aortic valve

Major vessels

- ☐ Pulmonary trunk
- ☐ Pulmonary arteries
- ☐ Pulmonary veins
- ☐ Aorta
- ☐ Coronary arteries
- ☐ Cardiac veins
- ☐ Coronary sinus
- ☐ Superior vena cava
- ☐ Inferior vena cava
- ☐ Brachiocephalic artery and veins
- ☐ Common carotid arteries
- ☐ Internal jugular veins
- ☐ Subclavian arteries and veins
- ☐ Axillary arteries and veins
- ☐ Brachial arteries and veins
- ☐ Radial arteries and veins
- ☐ Ulnar arteries and veins
- ☐ Common iliac arteries and veins
- ☐ Internal iliac arteries and veins
- ☐ External iliac arteries and veins
- ☐ Femoral arteries and veins
- ☐ Popliteal arteries and veins
- ☐ Anterior tibial arteries and veins
- ☐ Posterior tibial arteries and veins

Lymphatics

- ☐ Lymph node
- ☐ Lymph vessels

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs it is beneficial to jot down some notes after attending the lab. Use this section to make notes about areas of the anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information below and the space to the right for this purpose.

Tips for reviewing the integument and soft tissues

Work from superficial to deep whenever identifying the different layers on the step dissections and transverse sections. Always identify a starting point and think through the relationships that you learned in the lecture to guide your way through the structures.

Tips for reviewing arthrology

Use the dissection of the knee joint and find all the synovial joint structures from superficial to deep. Think about the relationships each of the structures form with one another and identify these relationships on the dissection.

Where would you look for a bursa? Try to find a few.

Tips for reviewing hearts

Orient several different hearts using the methods you learned in the lab.

Trace a red blood cell through the heart and identify all the chambers, valves and vessels you pass through.

Where do you look for muscular structures such as pectinate muscle and trabeculae carneae?

Some of the hearts have clearly dissected coronary arteries and cardiac veins. On these hearts, identify all the vessels that vascularize the cardiac muscle of the heart.

Structures I need to review

In the space to the right, compile a list of the anatomical structures from Lab 2 that you feel you need to focus on during the review labs.

Integument and soft tissues

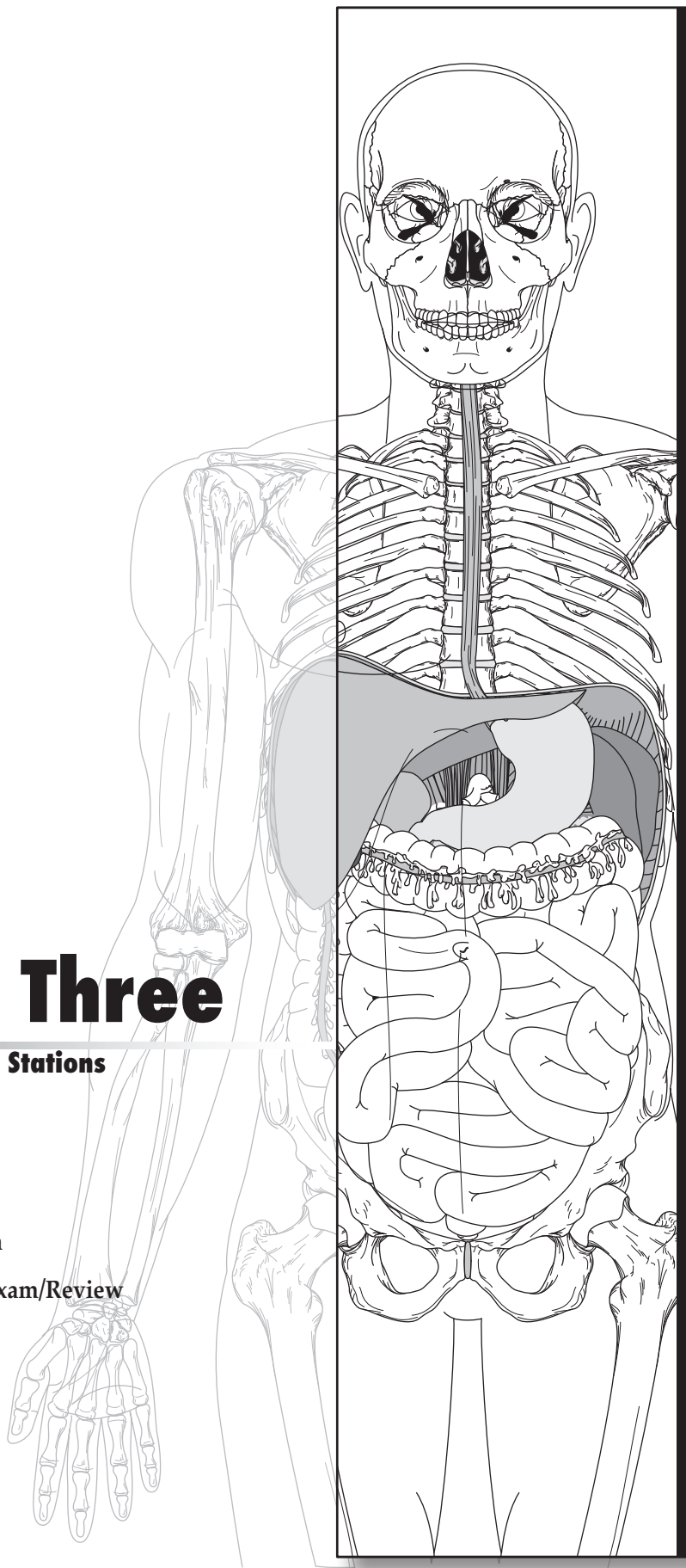
Arthrology

Heart structures and vessels

Laboratory Three

Collaborative Learning Stations

1. Digestive system
2. Organs in situ
3. Urinary system
4. Respiratory system
5. Practice practical exam/Review



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Systems module on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the urinary, respiratory, and digestive lectures in the *Human Anatomy Lecture Manual*.
3. Be able to trace molecules through the urinary, respiratory, and digestive systems and be prepared to follow these traces on the body parts in the lab. This will require that you know the different structures of each system and how they are related.
4. Understand the concept of diffusional exchange and the structural relations the urinary, respiratory, and digestive systems form with the cardiovascular system to promote these exchange sites.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Urinary system

1. Using the dissections and models in the lab, learn how to identify all the urinary structures listed in the section – Structures to identify in the lab.
2. Be able to orient a kidney as it would appear in situ (in the body). Distinguish a right from left kidney.
3. Understand the significance of the relationships between urinary tubes and circulatory vessels. Understand where molecular exchanges between these systems occur and the nature of the exchange barriers.
4. Understand the functional significance of increased surface area and identify the structures that contribute to this.

Respiratory system

1. Using the dissections in the lab, learn how to identify all the respiratory structures listed in the section – Structures to identify in the lab.
2. Be able to identify the anatomy of the larynx that is responsible for sound production.
3. Understand the relationship of the pulmonary air spaces of the lung to the capillaries of the cardiovascular system.
4. Understand where diffusion between the cardiovascular and respiratory systems occurs and the nature of the diffusional barriers.
5. Understand the functional significance of increased surface area and

identify the structures that contribute to this.

Digestive system

1. Using the dissections in the lab, learn how to identify all the digestive structures listed in the section – Structures to identify in the lab.
2. Be able to recognize the structural differences and modifications that occur along the length of the gut tube.
3. Understand the relationship between the absorptive surface of the gut and the cardiovascular system.
4. Understand where absorption occurs between the digestive and cardiovascular systems and the nature of the barriers to this molecular movement.
5. Understand the functional significance of increased surface area and identify the structures that contribute to this.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Exchange Systems Module of the *Human Anatomy Interactive Atlas* online. There will be five questions on the quiz from this material. In addition, there will be five questions on the quiz from the material you studied in Lab 1 and Lab 2. These five questions can be anything in the Lab 1 or 2 from the Section titled “Structures To Identify In The Lab”. These review questions will help you keep on top of past material and not forget it. This will help you prepare for comprehensive tests later in the semester.

Urinary system photos

1. Urinary organs in situ
2. Kidneys, posterior view
3. Frontal section of male pelvis

Respiratory system photos

1. Sagittal section of head and neck
2. Anterior view of the thorax – heart removed
3. Larynx and bronchial tree, posterior view

Digestive system photos

1. Sagittal section of head and neck
2. Esophagus – step dissection
3. Stomach – internal aspect
4. Preserved small intestine
5. Unpreserved large intestine

Structures to Identify in the Lab

Urinary system

Principal organ

- ☐ Kidney

Regions of the Kidney

- ☐ Cortex
- ☐ Medulla
- ☐ Renal pyramid
- ☐ Renal column

Urinary tubes

- ☐ Minor calyces
- ☐ Major calyces
- ☐ Renal pelvis
- ☐ Ureter
- ☐ Urinary bladder
- ☐ Urethra

The following urinary tubes are microscopic and must be identified on the models in the lab.

- ☐ Glomerular capsule
- ☐ Proximal convoluted tubule
- ☐ Nephron ansa
- ☐ Distal convoluted tubule
- ☐ Collecting tubule

Urinary vessels

- ☐ Renal artery
- ☐ Renal vein
- ☐ Segmental artery
- ☐ Segmental vein
- ☐ Interlobar artery
- ☐ Interlobar vein

The following urinary vessels are microscopic and must be identified on the models in the lab.

- ☐ Arcuate artery
- ☐ Arcuate vein
- ☐ Interlobular artery
- ☐ Interlobular vein
- ☐ Afferent glomerular arteriole
- ☐ Glomerulus
- ☐ Efferent glomerular arteriole
- ☐ Peritubular capillaries

Respiratory system

Nasal cavity and pharynx

- ☐ Nasal cavity
- ☐ Nasopharynx
- ☐ Oropharynx
- ☐ Laryngopharynx

Larynx

- ☐ Epiglottis

- ☐ Thyroid cartilage
- ☐ Cricoid cartilage
- ☐ Arytenoid cartilages
- ☐ Vocal fold
- ☐ Vocal ligament

Bronchial tree

- ☐ Trachea
- ☐ Tracheal cartilages
- ☐ Fibromuscular membrane
- ☐ Principal or main bronchi
- ☐ Lobar bronchi
- ☐ Segmental bronchi

Principal organ

- ☐ Right lung
- ☐ Left lung

Digestive system

Oral cavity and pharynx

- ☐ Oral cavity
- ☐ Hard palate
- ☐ Soft palate
- ☐ Uvula
- ☐ Tongue
- ☐ Oropharynx
- ☐ Laryngopharynx

Gut tube proper

- ☐ Esophagus
- ☐ Stomach
- ☐ Greater curvature
- ☐ Lesser curvature
- ☐ Gastric rugae
- ☐ Pyloric sphincter
- ☐ Duodenum
- ☐ Jejunum
- ☐ Ileum
- ☐ Circular folds
- ☐ Cecum
- ☐ Vermiform appendix
- ☐ Ascending colon
- ☐ Transverse colon
- ☐ Descending colon
- ☐ Sigmoid colon
- ☐ Semilunar folds
- ☐ Taenia coli
- ☐ Omental or fatty appendices
- ☐ Rectum

Glandular organs

- ☐ Liver
- ☐ Gall bladder
- ☐ Pancreas

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information and space below for this purpose.

Tips for reviewing the material

Respiratory

Identify all of the respiratory passageways on the sagittal head.

On the dissections look at the relationships of the heart and lungs. Find the trachea and bronchi. Are there other structures you recognize from previous labs?

Digestive

Visualize the thoracic and abdominal organs you have seen in the lab. Try and get a sense of where the different organs sit in the abdominal cavity. Understand the topography of the viscera in your own body.

Structures I need to review

Compile a list of the anatomical structures from Lab 3 that you feel you need to focus on when you get a chance to review.

Urinary system

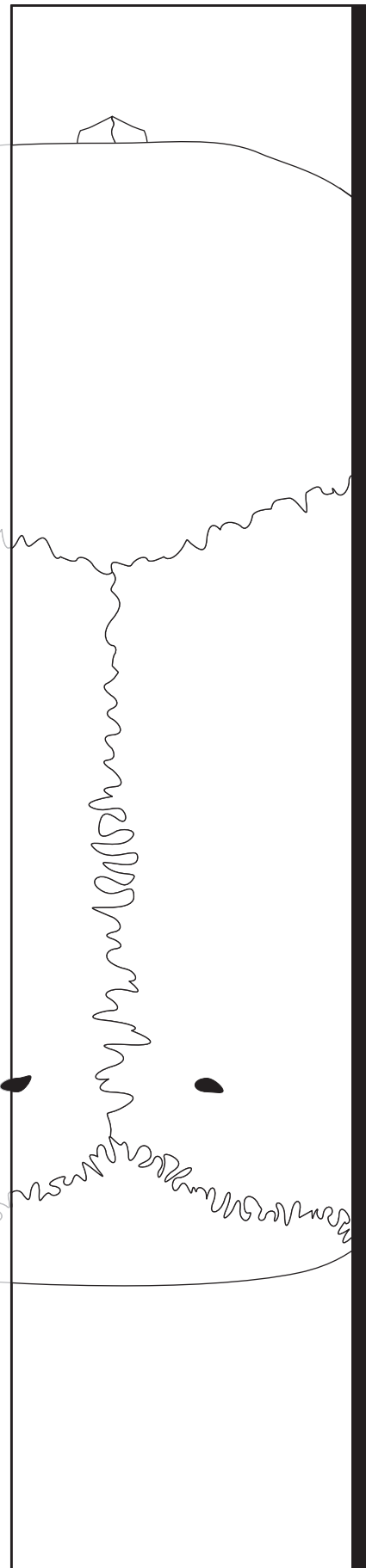
Respiratory system

Digestive system

Laboratory Four

Collaborative Learning Stations

1. Axial skeleton - Ribs, Sternum, Hyoid
2. Nervous System - Somatic
3. Nervous System - Autonomic
4. Axial Skeleton - Cranium
5. Axial Skeleton - Vertebral Column



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Axial Skeleton and Control Systems modules on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the nervous system lecture in the *Human Anatomy Lecture Manual*.
3. Read the section in the *Human Anatomy Study Guide and Workbook* (pages 21 - 47) about the axial skeleton. Be prepared to identify the different types of vertebrae and the characteristic features shared by all vertebrae.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Axial skeleton - vertebral column and ribs

1. Understand the structural design and functional significance of the vertebral column and rib cage in the human body.
2. Be able to identify the bony landmarks of a typical vertebra.
3. Be able to distinguish the bones in the five different regions of the vertebral column. For each vertebral region, know the number of bones and the diagnostic feature for the bones of that region.
4. Understand how the ribs articulate with the vertebral column.
5. Understand the difference between true ribs, false ribs, and floating ribs and recognize the relationships each of these rib types has with the sternum.

Axial skeleton - cranium

1. Be able to identify the individual bones of the cranium listed in the section – Structures to identify in the lab. (The *Human Anatomy Interactive Atlas* online and the *Human Anatomy Study Guide and Workbook* can help you study the individual bones.)
2. Be able to identify the names of the main sutures and recognize the different types of sutures.

Nervous system

1. Using the dissections in the lab, learn to identify all the nervous structures listed in the section – Structures to identify in the lab.

2. Be able to distinguish between the structures of the peripheral nervous system and the central nervous system.
3. Identify the somatic branches of the spinal nerves and the splanchnic branches of the spinal nerves. Understand the functional differences between these two nerve pathways.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Axial Skeleton and Control Systems Modules of the *Human Anatomy Interactive Atlas* online. There will be five questions on the quiz from this material. In addition, there will be five questions on the quiz from the material you studied in Lab 1, 2, and 3. These five questions can be anything in those labs from the Section titled “Structures To Identify In The Lab”. These review questions will help you keep on top of past material and not forget it. This will help you prepare for comprehensive tests later in the semester. Also, this quiz will have 1 or 2 questions from the illustration of the nervous system on page 147 of the *Human Anatomy Study Guide and Workbook*. You should be able to label all structures on this illustration.

Axial skeleton photos

1. Cranium, anterior view
2. Cranium, lateral view
3. Cranium, inferior view
4. Floor of cranial vault
5. Thoracic vertebrae

Nervous system photos

1. Posterior body wall, anterior view
2. Anterior dissection of the spinal cord
3. Cross-section of the spinal cord, inferior view

Structures to Identify in the Lab

Axial skeleton

Vertebral Column

- ☐ Body of vertebrae
- ☐ Pedicle
- ☐ Transverse process
- ☐ Superior articular process
- ☐ Inferior articular process
- ☐ Lamina
- ☐ Spinous process
- ☐ Vertebral foramen
- ☐ Intervertebral foramen
- ☐ Atlas (first cervical vertebra)
- ☐ Axis (second cervical vertebra)
- ☐ Dens (odontoid process)
- ☐ Cervical vertebrae
- ☐ Transverse foramen
- ☐ Thoracic vertebrae
- ☐ Costal facets
- ☐ Lumbar vertebrae
- ☐ Sacrum
- ☐ Coccyx

Rib cage

- ☐ Rib
- ☐ Head of rib
- ☐ Tubercle of rib
- ☐ Sternum
- ☐ Manubrium
- ☐ Body of sternum
- ☐ Xiphoid process

Cranium bones

- ☐ Frontal bone
- ☐ Parietal bone
- ☐ Occipital bone
- ☐ Temporal bone

- ☐ Maxillary bone
- ☐ Mandible
- ☐ Zygomatic bone
- ☐ Nasal bone
- ☐ Sphenoid bone
- ☐ Ethmoid bone
- ☐ Lacrimal bone
- ☐ Palatine bone
- ☐ Vomer bone
- ☐ Inferior nasal concha bone
- ☐ Hyoid bone

Nervous system

Central nervous system

- ☐ Brain
- ☐ Spinal cord
- ☐ Gray matter
- ☐ White matter

Peripheral nervous system

- ☐ Ventral rootlets
- ☐ Dorsal rootlets
- ☐ Ventral root
- ☐ Dorsal root
- ☐ Spinal ganglion
- ☐ Spinal trunk nerve
- ☐ Anterior or ventral ramus
- ☐ Posterior or dorsal ramus
- ☐ White communicating ramus
- ☐ Gray communicating ramus
- ☐ Intercostal nerve
- ☐ Sympathetic trunk
- ☐ Sympathetic trunk ganglion
- ☐ Parasympathetic splanchnic nerve
- ☐ Sympathetic splanchnic nerve

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information and space below for this purpose.

Tips for reviewing the material

The Marriott Library has bone boxes that you can check out to study the bones. You can check the bones out from the general reserve desk and use them within the library.

Take advantage of the opportunity to use the bone boxes at the library and during anatomy office hours to review the bones of the axial skeleton. Pair up with a partner and quiz each other. Take turns pointing to the bones and asking each other their names. This will help you prepare for the final practical exam that you will take at the end of the semester.

Structures I need to review

Compile a list of the anatomical structures from Lab 4 that you feel you need to focus on when you get a chance to review.

Vertebral column

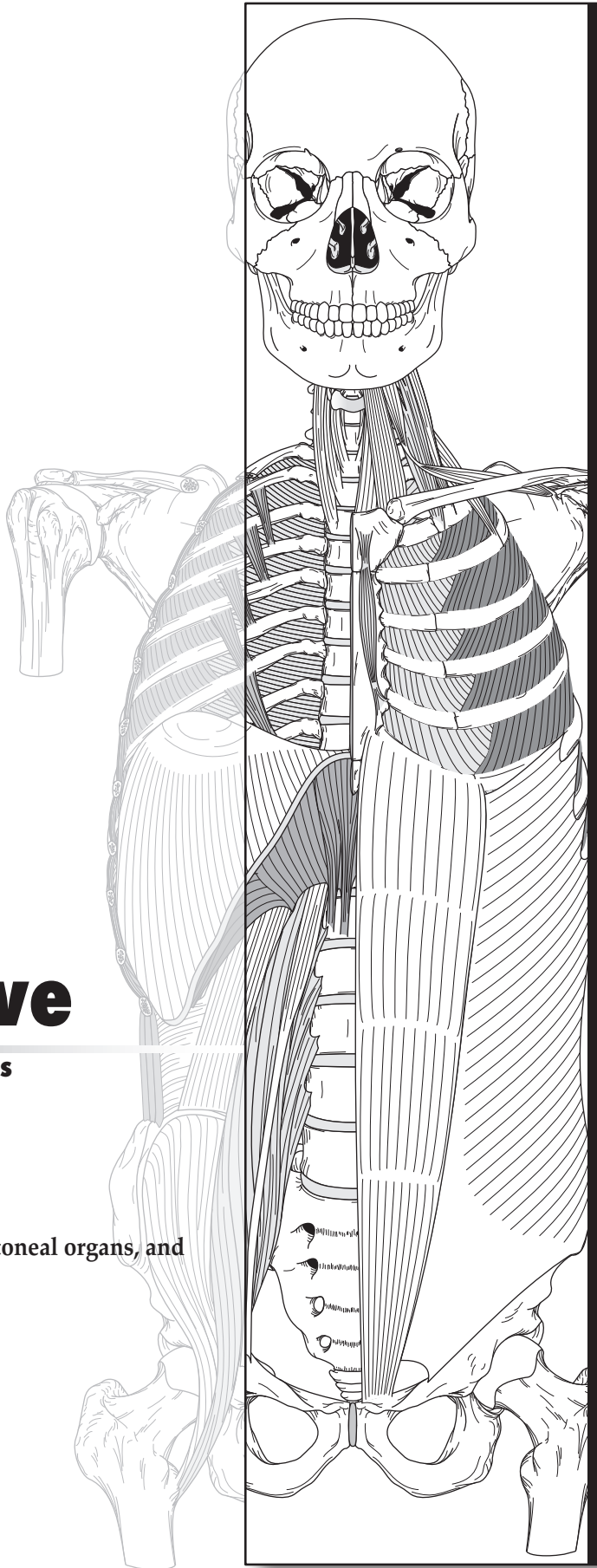
Rib cage

Cranium

Laboratory Five

Collaborative Learning Stations

1. Body wall muscles
2. Body wall blood vessels
3. Abdominal vascularization
4. Peritoneal organs, retroperitoneal organs, and mesenteries
5. Coeloms and cross-sections



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Thorax and Abdomen modules on the *Human Anatomy Interactive* online.
2. Know the material covered in the patterns of trunk design, thorax, and abdomen lectures in the *Human Anatomy Lecture Manual* book.
3. Know the pattern of organization for the body wall muscles. Be able to relate the pattern to the named muscles of the thoracic and abdominal walls.
4. Know the basic pattern of body wall vessels and their names in the two regions. Be able to recognize the continuity of the vessels between the thorax and abdomen.
5. Understand the fist in the balloon concept of a visceral organ in a coelomic cavity.
6. Understand and be able to differentiate between the following terms: parietal, visceral, mesentery, and omentum.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Thoracic anatomy

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Understand the concept of segmental somatic veins, arteries, and nerves and their relationship to the body wall. Be able to identify these structures. Note the possible collateral circuits that exist between vessels.
3. Understand and identify the regions of the thoracic cavity (pleural cavity, pericardial cavity, mediastinum) and the mesothelial membranes that define them. Identify the structures within each of these thoracic regions.
4. Learn how to identify any vessel by asking, “From where does it arise, and more importantly, where is it going?”

Abdominal anatomy

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Note the similarities between the abdominal body wall muscles and the thoracic body wall muscles and recognize how they fit the body wall pattern of design.
3. Identify the arteries, veins, and nerves of the abdominal body wall. Understand their relationships with vessels in the thoracic body wall.

4. Identify the extent of the peritoneal cavity and the visceral and parietal peritoneal layers. Recognize the difference between a mesentery and an omentum and be able to identify the mesenteries and omenta in the peritoneal cavity.
5. Recognize the relationships the various abdominal organs have with one another and within the peritoneal cavity.
6. Identify the retroperitoneal viscera. Understand the significance of peritoneal versus retroperitoneal organs.

Abdominal visceral vessels

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Be able to identify the visceral vessel that supplies and drains each abdominal organ.
3. Recognize the difference between the abdominal visceral arteries and veins, that is, the hepatic portal system. Understand the significance of the hepatic portal system.
4. Recognize the topographical relationships that exist among the blood vessels and the abdominal organs.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Thorax and Abdomen Modules of the *Human Anatomy Interactive Atlas* online:

Thorax photos

1. Thoracic cavity – heart removed
2. Thoracic cavity – posterior mediastinum
3. Heart dissection in situ
4. Posterior thoracic wall
5. Posterior thoracic wall – azygos vessels
6. Deep posterior mediastinum

Abdomen photos

1. Abdominal muscles, anterior view
2. Abdominal muscles, lateral view
3. Abdominal wall, anterior view
4. Abdominal cavity
5. Deep abdominal dissection
6. Abdominal vessels in situ
7. Abdominal vessels, transverse colon reflected
8. Abdominal vessels, stomach reflected

Structures to Identify in the Lab

Thorax

Thoracic muscles

- ☐ Sternalis
- ☐ Serratus posterior superior
- ☐ Serratus posterior inferior
- ☐ External intercostals
- ☐ Internal intercostals
- ☐ Innermost intercostals
- ☐ Transversus thoracis
- ☐ Subcostals
- ☐ Diaphragm
- ☐ Longus colli

Thoracic vessels and nerves

- ☐ Aorta
- ☐ Posterior intercostal artery and vein
- ☐ Superior phrenic artery and vein
- ☐ Internal thoracic artery and vein
- ☐ Pericardiophrenic artery and vein
- ☐ Anterior intercostal artery and vein
- ☐ Musculophrenic artery and vein
- ☐ Bronchial artery and vein
- ☐ Esophageal artery and vein
- ☐ Superior vena cava
- ☐ Azygos vein
- ☐ Hemiazygos vein
- ☐ Accessory hemiazygos vein
- ☐ Thoracic lymphatic duct
- ☐ Intercostal nerve
- ☐ Phrenic nerve
- ☐ Sympathetic trunk
- ☐ Communicating rami
- ☐ Sympathetic splanchnic nerve
- ☐ Vagus nerve

Coeloms and mediastinum

- ☐ Parietal pleura
- ☐ Visceral pleura
- ☐ Pleural cavity
- ☐ Parietal pericardium
- ☐ Visceral pericardium
- ☐ Fibrous pericardium
- ☐ Pericardial cavity
- ☐ Mediastinum

Abdomen

Abdominal muscles

- ☐ Rectus abdominis muscle
- ☐ Rectus sheath
- ☐ Linea alba
- ☐ Serratus posterior inferior
- ☐ External obliques
- ☐ Inguinal ligament
- ☐ Internal oblique
- ☐ Transversus abdominis
- ☐ Quadratus lumborum
- ☐ Psoas major
- ☐ Psoas minor

Abdominal vessels and nerves

- ☐ Aorta
- ☐ Inferior vena cava
- ☐ Inferior phrenic artery & vein
- ☐ Lumbar artery & vein
- ☐ Superior epigastric artery & vein
- ☐ Inferior epigastric artery & vein
- ☐ Ascending lumbar vein
- ☐ Sympathetic splanchnic nerves

Coeloms and mesenteries

- ☐ Parietal peritoneum
- ☐ Visceral peritoneum
- ☐ Peritoneal cavity
- ☐ Greater omentum
- ☐ Lesser omentum
- ☐ Mesentery
- ☐ Peritoneal organs
- ☐ Retroperitoneal organs

Abdominal visceral vessels

Visceral arteries

- ☐ Celiac artery
- ☐ Left gastric artery
- ☐ Esophageal artery
- ☐ Splenic artery
- ☐ Left gastro-omental artery
- ☐ Short gastric artery
- ☐ Common hepatic artery
- ☐ Right gastric artery
- ☐ Proper hepatic artery
- ☐ Gastroduodenal artery

- ☐ Right gastro-omental artery
- ☐ Pancreaticoduodenal artery
- ☐ Superior mesenteric artery
- ☐ Inferior mesenteric artery
- ☐ Renal artery
- ☐ Testicular / ovarian artery

Visceral veins

- ☐ Inferior vena cava
- ☐ Hepatic vein
- ☐ Hepatic portal vein
- ☐ Right gastric vein
- ☐ Left gastric vein
- ☐ Superior mesenteric vein
- ☐ Left gastro-omental vein
- ☐ Splenic vein
- ☐ Inferior mesenteric vein
- ☐ Right gastro-omental vein
- ☐ Renal veins
- ☐ Testicular / ovarian veins

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information and space below for this purpose.

Tips for reviewing material

One of the keys to learning the anatomy of the thorax and abdomen is to understand the body wall patterns of design taught in lecture. If you comprehend this basic underlying pattern of design it will be much less formidable to learn the detail of this anatomy. Understanding the patterns will simplify the learning process.

Thoracic anatomy

Identify each of the muscles in the thoracic wall pattern.

Recognize which layer of the lateral wall musculature is the most complex?

Try to identify the fist in the balloon analogy in the thoracic cavity?

Abdominal anatomy

Again, use the muscle wall pattern to help you simplify the muscles of the abdominal wall.

Make sure you understand the concept of retroperitoneal. How does this relate to the organs of the abdominal cavity?

Recognize how the fist in the balloon exists in the abdominal cavity also.

Coeloms

On the transverse sections of the thorax and abdomen ask yourself, "Where do I look for visceral pleura? Parietal pericardium? Mesentery? etc."

On any visceral dissection you see in lab try to name the coelomic membranes that are associated with the different organs.

Body wall vessels

Find the main posterior supply – the aorta. Now find all the branches of the aorta in the thorax. Do the same in the abdomen.

Look on the internal surface of the sternum to find the anterior supply of the thorax – the internal thoracic artery. Now look for and identify the small branches of this artery. Look on the internal surface of rectus abdominis, beneath the rectus sheath, to find the epigastric arteries. Look for the connection between the internal thoracic and the superior epigastric arteries.

Trace the veins of the posterior abdominal body wall up towards the thorax. The ascending lumbar veins in the abdomen become the azygos and hemiazygos veins of the thorax.

Structures I need to review

Compile a list of the anatomical structures from Lab 5 that you feel you need to focus on when you get a chance to review.

Body wall muscles

Body wall vessels

Coelomic anatomy

Handy Mnemonic Memory Tricks

Here is a mnemonic device to help you learn the retroperitoneal organs of the abdominal cavity:

Rocker **K**ids **P**arty **D**own with **AC/DC** **R**ecords

Retroperitoneal

Kidneys

Pancreas

Duodenum

Ascending **C**olon

Descending **C**olon

Rectum

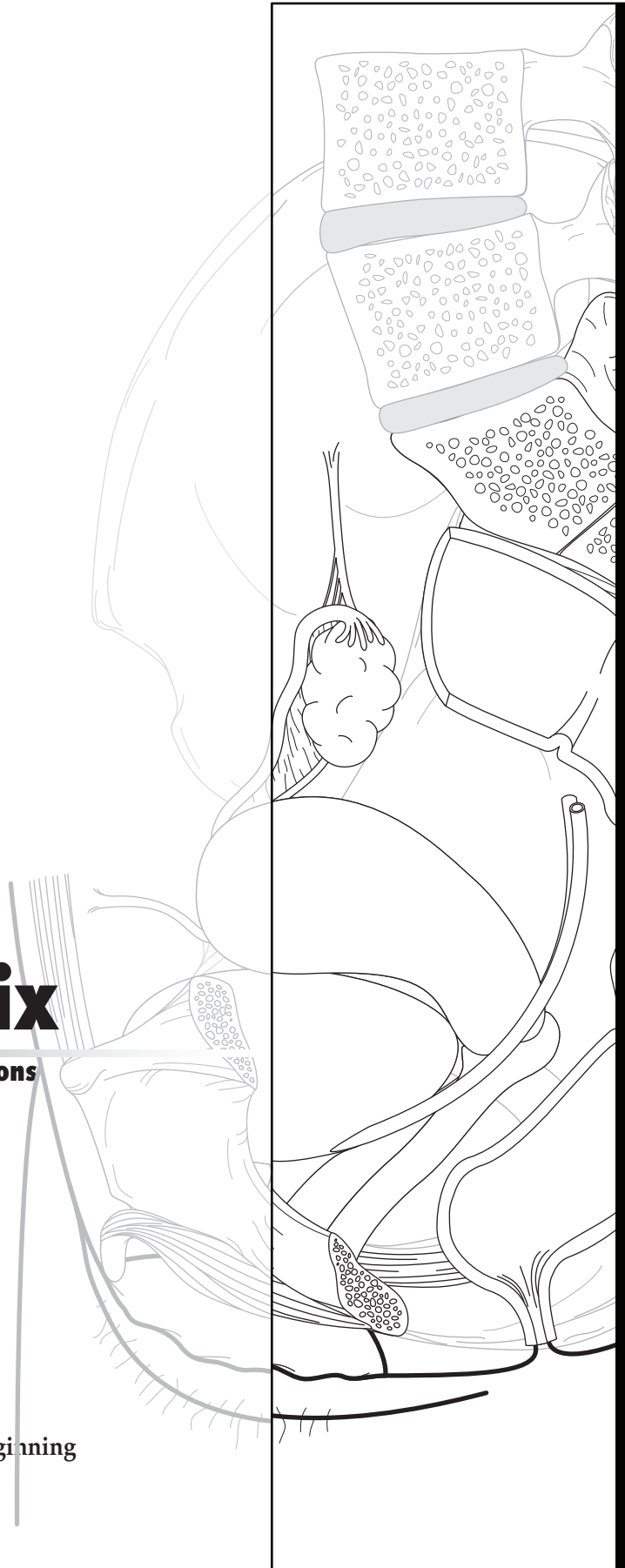
Laboratory Six

Collaborative Learning Stations

1. Reproductive anatomy
2. Pelvis and perineum
3. Pelvic vasculature
4. Epaxial muscles
5. Midterm practical quiz

Reminder:

Pelvis model is due at beginning
of lab! (6 points)



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Reproductive/Pelvis and Back modules on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the abdomen and reproductive lectures in the *Human Anatomy Lecture Manual* book.
3. Study the vessels, both arteries and veins, that carry blood to and form the digestive organs. Understand the basic pattern of design covered in the lecture that governs the basic structure of these vessels. Understand the functional significance of the hepatic portal system.
4. Be able to trace male and female gametes from their sites of production to the point where they meet. Understand the similarities and differences between male and female erectile tissues.
5. Review the bony landmarks of the os coxa. This is important! If you understand the skeletal anatomy of the pelvis, it is much easier to grasp the muscular anatomy of this region.
6. Understand the three layered lateral body wall muscles of the pelvis/perineum.
7. Build the paper pelvis model (it can be found in the back of this manual) and answer the questions that accompany it. Bring the model with you to your lab you will receive points for it. A rotation in this week's lab is devoted to helping you understand the muscles of the pelvis and perineum on your pelvic model. The pelvis and perineum is a challenging area of anatomy for most students. The purpose of the model is to help better prepare you for next week's lab when you will study this region of anatomy.
8. Review the "four layer" of the back muscles from superficial to deep

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Reproductive system

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Be able to demonstrate on the cadavers the gametic pathways in the male and female reproductive systems.
3. Be able to recognize and identify the homologies between male and female reproductive structures.

Pelvis model

1. Be able to identify the three muscle layers of the pelvic/perineal region.
Gain a three-dimensional understanding of these muscles on your pelvic model.
2. Analyze the topographical relationships between the pelvic/perineal muscles and the bony pelvis.
3. Identify the different boundaries and regions in the pelvis and perineum (e.g., true versus false pelvis, urogenital triangle versus anal triangle) and understand the difference between the pelvis and perineum.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Abdomen and Pelvis Modules of the *Human Anatomy Interactive Atlas* online:

Reproductive system photos

1. Male pelvis, anterior view (reproductive system structures)
2. Posterior view of male pelvic cavity (reproductive system structures)
3. Male pelvis, sagittal section (reproductive system structures)
4. Female pelvis, sagittal section (reproductive system structures)

Pelvis/perineal photos

1. Branches of internal iliac artery
2. Male pelvis, sagittal section (blood vessel)
3. Female perineum, inferior view (muscles)
4. Female pelvic inlet (muscles)

Back photos

1. Intrinsic (epaxial) back muscles
2. Deep posterolateral neck
3. Semispinalis, posterior view
4. Deep back – lumbar region

Structures to Identify in the Lab

Reproductive system

Male

- ☐ Scrotum
- ☐ Testis
- ☐ Seminiferous tubules
- ☐ Spermatic cord
- ☐ Ductus deferens
- ☐ Epididymis
- ☐ Seminal vesicle
- ☐ Ejaculatory duct
- ☐ Prostate gland
- ☐ Bulbourethral gland
- ☐ Prostatic urethra
- ☐ Intermediate or membranous urethra
- ☐ Spongy urethra
- ☐ Penis
- ☐ Crus of penis
- ☐ Bulb of penis
- ☐ Body of penis
- ☐ Glans of penis
- ☐ Corpus spongiosum
- ☐ Corpus cavernosum

Female

- ☐ Ovary
- ☐ Uterine tubes
- ☐ Fimbriae
- ☐ Uterus
- ☐ Cervix of uterus
- ☐ Vagina
- ☐ Vaginal fornix
- ☐ Labia majora
- ☐ Labia minora
- ☐ Clitoris
- ☐ Bulb of the vestibule
- ☐ Greater vestibular gland

Pelvis/perineum body wall muscles

- ☐ Levator ani
- ☐ Pubococcygeus part of the levator ani
- ☐ Iliococcygeus part of the levator ani
- ☐ Coccygeus
- ☐ Sacrospinous ligament
- ☐ Obturator internus
- ☐ Transversus perinei profundus (male)
- ☐ External urethral sphincter (male and female)
- ☐ Compressor urethrae (female)

- ☐ Sphincter urethrovaginalis (female)
- ☐ Deep external anal sphincter
- ☐ Sacrotuberous ligament
- ☐ Obturator externus
- ☐ Transverse perinei superficialis
- ☐ Ischiocavernosus
- ☐ Bulbospongiosus
- ☐ Superficial external anal sphincter

Pelvic/perineal regions

- ☐ Pelvic cavity
- ☐ Ischioanal fossa
- ☐ Deep perineal pouch
- ☐ Superficial perineal pouch

Pelvic blood vessels and nerves

- ☐ Common iliac vessels
- ☐ Internal iliac vessels
- ☐ Iliolumbar vessels
- ☐ Lateral sacral vessels
- ☐ Superior gluteal vessels
- ☐ Inferior gluteal vessels
- ☐ Obturator vessels
- ☐ Internal pudendal vessels
- ☐ Middle rectal vessels
- ☐ Superior vesicle vessels
- ☐ Inferior vesicle vessels
- ☐ Uterine vessels
- ☐ Obliterated umbilical artery
- ☐ Pudendal nerve
- ☐ Sympathetic splanchnic nerve
- ☐ Parasympathetic splanchnic nerve

Back muscles and nerves

- ☐ Splenius capitis
- ☐ Splenius cervicis
- ☐ Erector spinae
- ☐ Spinalis part of erector spinae
- ☐ Longissimus part of erector spinae
- ☐ Iliocostalis part of erector spinae
- ☐ Semispinalis
- ☐ Multifidus
- ☐ Dorsal ramus

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session.

Tips for reviewing the material

Reproductive anatomy

As long as you orient yourself on the dissections in the lab and clearly recognize what you are looking at, you should be able to easily identify the reproductive structures.

Pelvic muscles

Remember that there are three layers of musculature in the perineal region. Think about the model that you constructed and compare the muscles to the model.

Remember that the inner layer of muscle is the most complete and forms a basin shaped floor to the pelvic cavity.

Remember that the ischioanal fossa is the space between the internal and middle layers, while the deep perineal space and superficial perineal space are correlated to the middle and outer layers of the muscle wall, respectively.

Pelvic blood vessels

Follow the branches of the internal iliac artery and notice where they terminate in the pelvic region. Their names are based on the regions and structures they supply and drain. If you keep this in mind they are easy to learn.

Back muscles

If you remember the layers and fiber orientations associated with the epaxial back muscles, this group of muscles will be much easier to learn and identify.

To help with identification of the epaxial muscles, identify the spinous processes by palpation. The spinous processes are key landmarks for identifying the back muscles.

Focus first in the cervical region of the back. There are two prominent layers of muscle in the head and neck – the splenius muscles and underneath, semispinalis muscle.

Now move down into the thoracic and lumbar regions. Again you will find two prominent layers of muscle – most superficial are the three erector spinae muscles and underneath the erector spinae you will find the multifidus. You must be able to differentiate the erector spinae muscles. The spinalis muscle is the most medial of the group, sitting against the spinous processes. The longissimus muscle lies just lateral to spinalis muscle and is most prominent in the upper lumbar region and the thorax. The iliocostalis muscle sits lateral to longissimus and projects onto the rib cage.

Structures I need to review

Compile a list of the anatomical structures from Lab 6 that you feel you need to focus on when you get a chance to review.

Pelvic vessels

Pelvic vessels

Reproductive anatomy

Pelvis/perineal muscles

Back muscles

Handy Mnemonic Memory Tricks

Here is a mnemonic device to help you learn the muscles of the male pelvis and perineum.

Pelvic body wall muscles of the male - PIC DOTS and IBOTS

Pubococcygeus

Iliococcygeus

Coccygeus

Deep external anal sphincter

Obturator internus

Transversus perinei profundus

Sphincter urethrae

Ishiocavernosus

Bulbospongiosus

Obturator externus

Transversus perinei superficialis

Superficial external anal sphincter

Laboratory Seven

Collaborative Learning Stations

1. Brachial plexus
2. Scapular sling muscles
3. Muscles of the rotator cuff, shoulder cap, and intertubercular groove
4. Brachial muscles and shoulder topography
5. Bone Practical Quiz- Upper limb bones and bony landmarks (5 points)



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Superior Limb module on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the patterns of limb design and superior limb lectures in the *Human Anatomy Lecture Manual*.
3. Review the bony landmarks of the clavicle, scapula, humerus, radius, and ulna. Most of these landmarks will serve as sites of muscle attachment. Familiarity with these landmarks will make it easier to learn muscle anatomy. To encourage you to review your bones, there will be a five point practical exam covering this material from Lab 1. This is in addition to the regular quiz.
4. Understand the concept of limb compartments and recognize how this simplifies learning muscles.
5. Review the components of the brachial plexus and form a strong mental image of its structure.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Proximal muscles of the superior limb

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Gain a topographical understanding of all the muscles of the proximal superior limb.
3. Be able to identify the specific muscle groups and compartments. Recognize each muscle within these muscle groups and understand the features and functions they share in common.
4. Be able to identify each muscle's attachment sites on the bones.
5. Recognize how the muscles cross the joints, as this will help you understand the joint movements they produce.
6. Do not be afraid to explore the muscles in the lab. Most of the skeletal muscles in the superior limb are large, obvious structures that can be easily observed and studied.

Brachial plexus

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Use your visual image of the brachial plexus to help identify it on the cadavers. Note the relationships the nerves of the brachial plexus form with the surrounding muscles and bones.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Superior Limb Module of the *Human Anatomy Interactive Atlas* online. There will be five questions on the quiz from this material. In addition, there will be five questions on the quiz from the material you studied in any previous lab. These five questions can be anything in those labs from the Section titled “Structures To Identify In The Lab”. These review questions will help you keep on top of past material and not forget it. This will help you prepare for comprehensive tests later in the semester.

Superior limb photos

1. Brachial plexus
2. Posterior scapular and shoulder muscles
3. Rotator cuff, medial and posterior views
4. Left shoulder, anterior view
5. Shoulder and brachial muscle

Structures to Identify in the Lab

Scapular sling muscles

- ☐ Rhomboideus major
- ☐ Rhomboideus minor
- ☐ Levator scapulae
- ☐ Trapezius
- ☐ Serratus anterior
- ☐ Pectoralis minor
- ☐ Subclavius

Rotator cuff muscles

- ☐ Supraspinatus
- ☐ Infraspinatus
- ☐ Teres minor
- ☐ Subscapularis

Shoulder cap

- ☐ Deltoid

Intertubercular groove muscles

- ☐ Pectoralis major
- ☐ Latissimus dorsi
- ☐ Teres major

Brachial muscles

- ☐ Biceps brachii
- ☐ Coracobrachialis
- ☐ Brachialis
- ☐ Triceps brachii

Topographic landmarks

- ☐ Triangular space
- ☐ Quadrangular space
- ☐ Deltopectoral groove

Brachial plexus

- ☐ Posterior cord
- ☐ Medial cord
- ☐ Lateral cord
- ☐ Anterior divisions
- ☐ Posterior divisions
- ☐ Superior trunk
- ☐ Middle trunk
- ☐ Inferior trunk
- ☐ Long thoracic nerve
- ☐ Dorsal scapular nerve
- ☐ Nerve to subclavius
- ☐ Lateral pectoral nerve
- ☐ Medial pectoral nerve
- ☐ Suprascapular nerve
- ☐ Musculocutaneous nerve
- ☐ Median nerve
- ☐ Ulnar nerve
- ☐ Upper subscapular nerve
- ☐ Thoracodorsal nerve
- ☐ Lower subscapular nerve
- ☐ Radial nerve
- ☐ Axillary nerve

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information and space below for this purpose.

Tips for reviewing the material

Scapular, shoulder, and brachial muscles

One of the sure fire tricks to identifying muscles on the cadavers in the lab is to know the muscle attachments. If you know their attachments, it becomes easy to follow the muscles to the sites of attachment to check whether or not it is the correct muscle you are identifying.

Brachial plexus

On the brachial plexus dissection use musculoskeletal relationships to find the three large anterior division nerves. Follow them proximally, until you find the “M” of the brachial plexus.

Reflect the anterior division nerves and the axillary artery. Now you have isolated the posterior division nerves (the UTLRA trident).

Find the ‘M’ again, then work proximally up the plexus to find the pre-division nerves.

Find the root of the plexus (C5, C6, C7, C8, and T1). Note that the Long Thoracic and Dorsal Scapular nerves originate at the proximal end of the plexus where they are partially covered by neck muscles. Understanding other topographical relationships formed by these two nerves should help you locate them.

Structures I need to review

Compile a list of the anatomical structures from Lab 7 that you feel you need to focus on when you get a chance to review.

Proximal muscles of the superior limb

Brachial plexus

Handy Mnemonic Memory Tricks

Here are some mnemonic devices to help you learn the muscles of the superior limb.

Scapular sling muscles - Roger Rabbit Loves To Smoke Pot

Rhomboideus minor
Rhomboideus major
Levator scapulae
Trapezius
Serratus anterior
Pectoralis minor

Rotator cuff muscles - SITS

Three muscles **SIT** on the greater tubercle:

Supraspinatus
Infraspinatus
Teres minor

One muscle inserts on the lesser tubercle:

Subscapularis

Intertubercular groove muscles

Two **MAJORS** escorting a **MISS**

A **PLT** sandwich

Pectoralis major
Latissimus dorsi
Teres major

Brachial Plexus

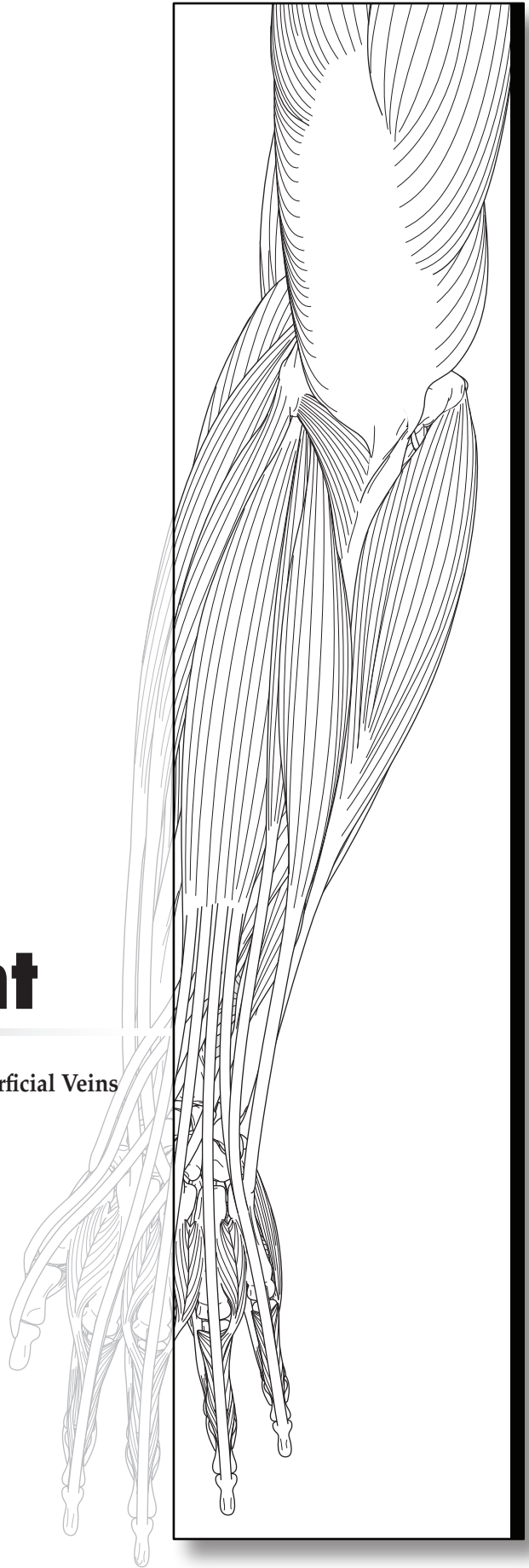
You Young Mermaids...

See the lecture manual for full details.

Laboratory Eight

Collaborative Learning Stations

1. Upper Limb Vasculature and Superficial Veins
2. Anterior antebrachial muscles
3. Posterior antebrachial muscles
4. Hand muscles
5. Review and plexus injuries



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Superior Limb module on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the patterns of limb design and superior limb lectures in the *Human Anatomy Lecture Manual*.
3. Review the osteology of the humerus, radius, ulna, and hand.
4. Understand the concept of limb compartments and recognize how this simplifies learning muscles.
5. Use the name of the antebrachial and hand muscles to help you identify them in the limb.
6. Be able to visualize the branches of the subclavian and axillary arteries and understand the relations they form with the surrounding muscles.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Antebrachial and hand muscles

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Using the muscle names learn to identify the muscles of the antebrachium and hand on the cadavers.
3. Gain a topographical understanding of all the muscles of the antebrachium and hand.
4. Be able to identify the specific muscle groups and compartments. Recognize each muscle within these muscle groups and understand the features and functions they share in common.
5. Recognize how the muscles cross the joints, as this will help you understand the joint movements they produce.
6. Be able to recognize the common attachment sites of the antebrachial muscles.
7. Do not be afraid to explore the muscles in the lab. Most of the skeletal muscles in the antebrachium and hand are obvious structures that can be easily observed and studied.

Axillary blood vessels

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Be able to identify all the branches of the axillary and subclavian arteries. Follow the vessels to their termination points and note the logic in their names.

Brachial plexus (review)

1. Know the innervation of each muscular compartment or group in the shoulder, brachium, antebrachium, and hand.
2. Recognize that nerves and vessels course together in the body in common bundles. Note which vessels and nerves are situated together. In most instances, vessels and nerves that share common pathways have similar names.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Superior Limb Module of the *Human Anatomy Interactive Atlas* online. There will be five questions on the quiz from this material. In addition, there will be five questions on the quiz from the material you studied in any previous lab. These five questions can be anything in those labs from the Section titled “Structures To Identify In The Lab”. These review questions will help you keep on top of past material and not forget it. This will help you prepare for comprehensive tests later in the semester.

Superior limb photos

1. Scapular collateral circuits
2. Antebrachial and hand muscles
3. Antebrachium and hand, anterior view
4. Antebrachium and hand, posterior view
5. Palmar surface of hand
6. Deep layers of the palm

Structures to Identify in the Lab

Anterior antebrachial muscles

- ☐ Pronator teres
- ☐ Flexor carpi radialis
- ☐ Palmaris longus
- ☐ Flexor carpi ulnaris
- ☐ Flexor digitorum superficialis
- ☐ Flexor digitorum profundus
- ☐ Flexor pollicis longus
- ☐ Pronator quadratus

Posterior antebrachial muscles

- ☐ Brachioradialis
- ☐ Extensor carpi radialis longus
- ☐ Extensor carpi radialis brevis
- ☐ Extensor digitorum
- ☐ Extensor digiti minimi
- ☐ Extensor carpi ulnaris
- ☐ Anconeus
- ☐ Supinator
- ☐ Abductor pollicis longus
- ☐ Extensor pollicis brevis
- ☐ Extensor pollicis longus
- ☐ Extensor indicis

Hand muscles

- ☐ Abductor pollicis brevis
- ☐ Flexor pollicis brevis
- ☐ Opponens pollicis
- ☐ Adductor pollicis
- ☐ Abductor digiti minimi
- ☐ Flexor digiti minimi brevis
- ☐ Opponens digiti minimi
- ☐ Palmaris brevis
- ☐ Lumbricals
- ☐ Palmar interossei
- ☐ Dorsal interossei

Superficial veins of the brachium

- ☐ Cephalic vein
- ☐ Basilic vein
- ☐ Median cubital vein

Subclavian and axillary arteries

- ☐ Subclavian artery
- ☐ Vertebral artery
- ☐ Thyrocervical trunk
- ☐ Suprascapular artery
- ☐ Dorsal scapular artery
- ☐ Axillary artery
- ☐ Superior thoracic artery
- ☐ Thoracoacromial artery
- ☐ Clavicular artery
- ☐ Acromial artery
- ☐ Deltoid artery
- ☐ Pectoral artery
- ☐ Lateral thoracic artery
- ☐ Subscapular artery
- ☐ Circumflex scapular artery
- ☐ Thoracodorsal artery
- ☐ Anterior circumflex humeral artery
- ☐ Posterior circumflex humeral artery
- ☐ Brachial artery

Antebrachial and Hand Vessels

- ☐ Radial artery
- ☐ Ulnar artery
- ☐ Superficial palmar arch
- ☐ Deep palmar arch

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information and space below for this purpose.

Tips for reviewing material

Antebrachial and hand muscles

Identify the medial epicondyle of the humerus. This is the origin of most of the anterior antebrachial muscles. Recall that there are two groups of anterior antebrachial muscles, a superficial group and a deep group. The superficial group forms two layers, so between the two groups there are three layers of muscle in the anterior compartment.

Identify the lateral epicondyle of the humerus. This is the origin of the majority of the posterior antebrachial muscles. Recall that the lateral muscles of the posterior compartment originate near the lateral epicondyle, while the radial muscles of this compartment are relatively shorter muscles and all converge towards the radial side of the hand.

If you remember your hand compartments (thenar, hypothenar, and intermetacarpal), you should be able to logically think through these muscles. Remember, the opponens muscles do not cross the MP joint. Using this piece of information you can easily identify the opponens muscles.

Axillary blood vessels

Start at the beginning of the subclavian artery and move distally along the artery. As you move along the artery note all the branches. Follow the branches out into the body and notice the region into which they terminate. Use the logic you gained from lecture to apply the correct name to the vessel. Use the same procedure for the axillary artery. It may help to draw a quick sketch of the vessels before starting.

Go back and identify the vessels randomly. If you are having trouble, try identifying other vessels in the vicinity and refer to your sketch.

Structures I need to review

Compile a list of the anatomical structures from Lab 8 that you feel you need to focus on when you get a chance to review.

Antebrachial muscles

Hand muscles

Upper limb blood vessels

Handy Mnemonic Memory Tricks

Here are some mnemonic devices to help you learn the muscles of the thenar and hypothenar groups and the brachial plexus.

Thenar and hypothenar muscles

All For One And One For All

Abductor pollicis brevis

Flexor pollicis brevis

Opponens pollicis

Adductor pollicis

Opponens digiti minimi

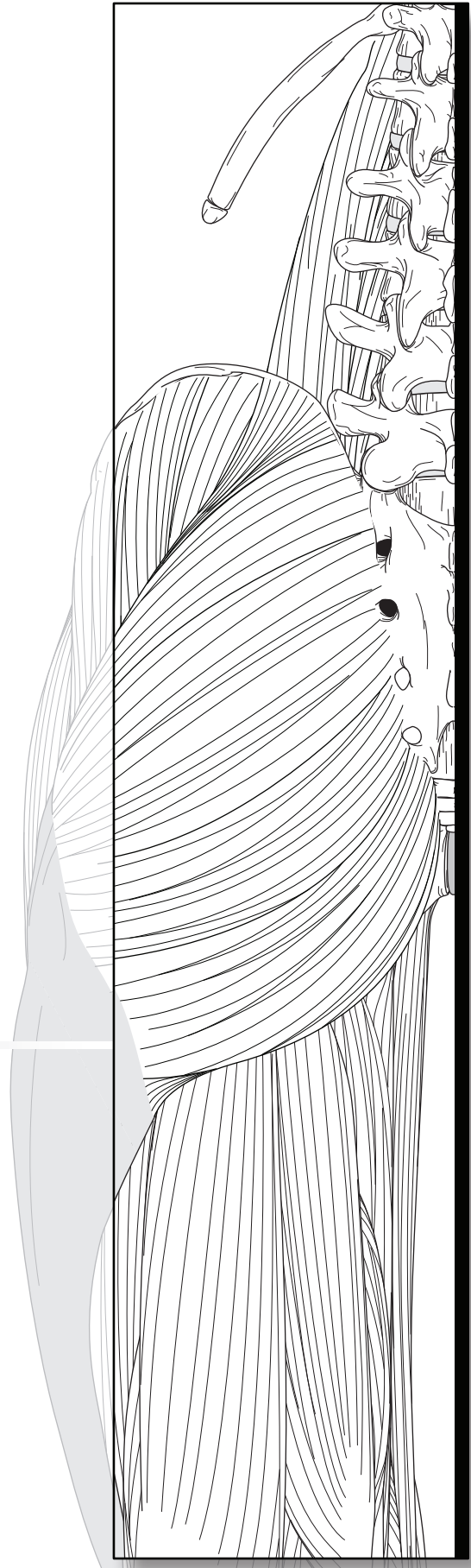
Flexor digiti minimi

Abductor digiti minimi

Laboratory Nine

Collaborative Learning Stations

1. Deep hip rotator muscles
2. Gluteal and hip flexor muscles
3. Thigh muscles - Anterior compartment/topography
4. Thigh muscles - Posterior and medial compartment
5. Bone Practical Quiz - Lower limb bones and bony landmarks



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Inferior Limb module on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the patterns of limb design and inferior limb lectures in the *Human Anatomy Lecture Manual* book.
3. Review the boney landmarks of the os coxa, femur, tibia, and fibula. Most of these landmarks will serve as sites of muscle attachment. Familiarity with these landmarks will make it easier to learn muscle anatomy. To encourage you to review your bones, there will be a ten point practical quiz covering this material from Lab 1. This is in addition to the regular quiz.
4. Learn the muscles of the hip joint and thigh, with their accompanying muscle attachments and actions.
5. Understand the concept of limb compartments and recognize how this simplifies learning muscles.
6. Know the structure and contents of the femoral triangle, adductor canal, and adductor hiatus.
7. Learn the structures that exit the pelvic cavity above the piriformis muscle and those that exit the pelvic cavity below the piriformis muscle.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Proximal inferior limb muscles

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Gain a topographical understanding of all the muscles of the proximal inferior limb.
3. Be able to identify the specific muscle groups and compartments. Recognize each muscle within these muscle groups and understand the features and functions they share in common.
4. Be able to identify each muscle's attachment sites on the bones.
5. Recognize how the muscles cross the joints, as this will help you understand the joint movements they produce.

6. Understand the concept of an anatomical pulley. Identify the muscles of the anatomical pulley associated with the medial condyles of femur and tibia.
7. Do not be afraid to explore the muscles in the lab. Most of the skeletal muscles in the inferior limb are large, obvious structures that can be easily observed and studied.

Topography of the thigh

1. Be able to identify the following topographical regions and their boundaries: femoral triangle, adductor canal, adductor hiatus, and popliteal fossa.
2. Identify the vessels and nerves found within the regions mentioned above.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Inferior Limb Module of the *Human Anatomy Interactive Atlas* online:

Inferior limb photos

1. Femoral triangle
2. Anterior and anteromedial thigh
3. Medial and posterior thigh
4. Gluteal region, superficial layer
5. Gluteal region, intermediate layer
6. Gluteal region, deep layer

Structures to Identify in the Lab

Deep hip rotator muscles

- ☐ Piriformis
- ☐ Superior gemellus
- ☐ Obturator internus
- ☐ Inferior gemellus
- ☐ Quadratus femoris
- ☐ Obturator externus

Gluteal muscles

- ☐ Gluteus minimus
- ☐ Gluteus medius
- ☐ Gluteus maximus
- ☐ Tensor fasciae latae

Hip flexor muscles

- ☐ Psoas major
- ☐ Iliacus

Medial thigh compartment muscles

- ☐ Pectineus
- ☐ Adductor brevis
- ☐ Adductor longus
- ☐ Adductor minimus
- ☐ Adductor magnus
- ☐ Gracilis

Anterior thigh compartment muscles

- ☐ Articularis genu
- ☐ Vastus intermedius
- ☐ Vastus lateralis
- ☐ Vastus medialis
- ☐ Rectus femoris
- ☐ Sartorius

Posterior thigh compartment muscles

- ☐ Biceps femoris
- ☐ Semitendinosus
- ☐ Semimembranosus

Fascia and regions

- ☐ Iliotibial tract
- ☐ Femoral triangle
- ☐ Adductor canal
- ☐ Adductor hiatus
- ☐ Popliteal fossa

Vessels

- ☐ Femoral artery
- ☐ Deep femoral artery
- ☐ Popliteal artery
- ☐ Great saphenous vein
- ☐ Small saphenous vein

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information and space below for this purpose.

Tips for reviewing the material

Muscles of the gluteal region

Work from superficial to deep, identifying the different muscles in the gluteal region. Note how the gluteal muscles get smaller as you go deeper.

The deep hip rotator muscles, with the exception of the anterior obturator externus, all sit in the same plane of space from superior to inferior. Identify the tendon of the obturator internus and notice the gemelli muscles on either side of the obturator tendon.

Again, use your knowledge of muscle attachments to help you identify the muscles.

Muscles of the thigh

How many muscle compartments should you look for in the thigh?

Note that each compartment contributes a muscle to the anatomical tripod. Identify these muscles as they all converge on the proximal tibia.

Again, use your knowledge of muscle attachments to help you identify the muscles.

Structures I need to review

Compile a list of the anatomical structures from Lab 9 that you feel you need to focus on when you get a chance to review.

Muscles of the hip joint

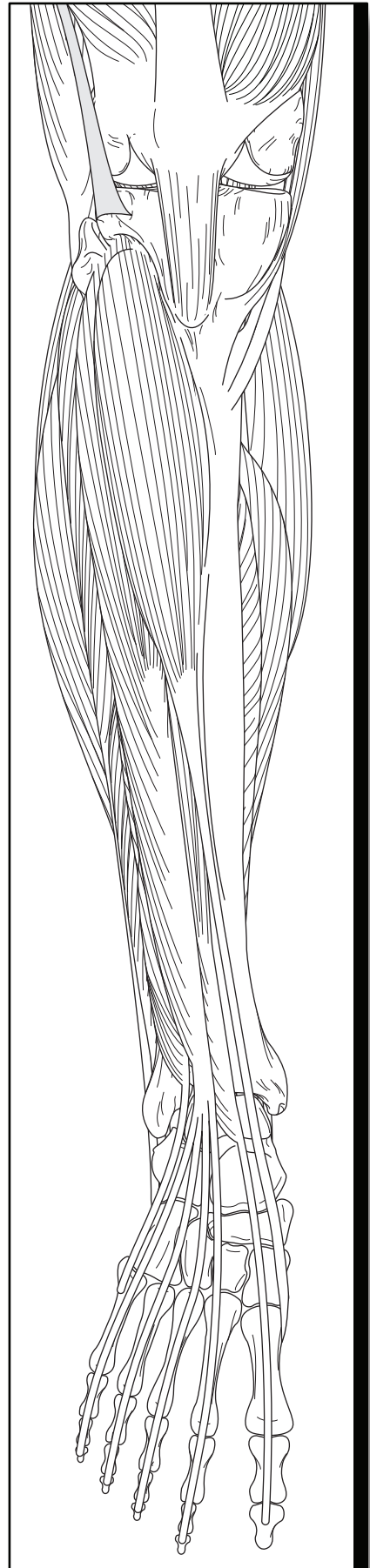
Thigh muscles

Vessels and regions

Laboratory Ten

Collaborative Learning Stations

1. Anterior and lateral compartment leg muscles
2. Posterior compartment leg muscles
3. Muscles of the foot
4. Review of cross-sectional anatomy
5. Evaluation rotation



How to Prepare for the Lab

By following the suggestions below you will come to lab better prepared to take advantage of the learning opportunities:

1. Study the Inferior Limb module on the *Human Anatomy Interactive Atlas* online.
2. Know the material covered in the patterns of limb design and inferior limb lectures in the *Human Anatomy Lecture Manual* book.
3. Review the osteology of the femur, tibia, fibula, and foot.
4. Understand the concept of limb compartments and recognize how this simplifies learning muscles.
5. Use the name of the crural and foot muscles to help you identify them in the limb.

Objectives During the Lab

During the laboratory session, keep the following objectives in mind as you study the lab material. By the end of the laboratory session you should be able to:

Leg and foot

1. Using the cadaver material in the lab, be able to identify all the structures listed in the section – Structures to identify in the lab.
2. Using the muscle names learn to identify the muscles of the crus and foot on the cadavers.
3. Gain a topographical understanding of all the muscles of the crus and foot.
4. Be able to identify the specific muscle groups and compartments. Recognize each muscle within these muscle groups and understand the features and functions they share in common.
5. Recognize how the muscles cross the joints, as this will help you understand the joint movements they produce.
6. Understand the concept of an anatomical pulley. Identify the muscles of the anatomical pulley associated with the medial and lateral malleoli of the crus.
7. Do not be afraid to explore the muscles in the lab. Most of the skeletal muscles in the antebrachium and hand are obvious structures that can be easily observed and studied.

Sample practical exam

1. Be prepared to take the practice practical exam as if it were the real thing. It will not count towards your grade, but will allow you to practice taking this type of exam. It will cover anatomy from Lab 8 through Lab 10. This exercise will show you where you need to concentrate your efforts for the final practical exam.

Evaluation rotation

1. During this final laboratory session you will have the opportunity to fill out an evaluation and give us feedback on your lab experience. Think back over the labs this past semester and tell us what we did that worked and how we can improve to better serve the students. It is my goal to create the best learning experience possible for students. My lab instructors and I appreciate your constructive feedback.

Structures to Identify for the Quiz

To encourage you to prepare for the lab so that you can get the most out of your laboratory experience, there will be a quiz at the beginning of the lab. To prepare for the quiz in this lab, you should be able to identify all the “Basic Labels” on the following photographs from the Inferior Limb Module of the *Human Anatomy Interactive Atlas* online:

Inferior limb photos

1. Muscles of the crus
2. Arteries of the posterior crus
3. Arteries of the anterior crus and foot
4. Crus, posterior view
5. Foot, dorsal and plantar views
6. Foot, plantar surface

Structures to Identify in the Lab

Anterior crural compartment

- ☐ Tibialis anterior
- ☐ Extensor digitorum longus
- ☐ Extensor hallucis longus
- ☐ Fibularis (Peroneus) tertius

Lateral crural compartment

- ☐ Fibularis (Peroneus) longus
- ☐ Fibularis (Peroneus) brevis

Posterior crural compartment

- ☐ Gastrocnemius
- ☐ Soleus
- ☐ Plantaris
- ☐ Popliteus
- ☐ Tibialis posterior
- ☐ Flexor hallucis longus
- ☐ Flexor digitorum longus

Foot muscles

- ☐ Extensor digitorum brevis
- ☐ Extensor hallucis brevis
- ☐ Abductor hallucis
- ☐ Flexor digitorum brevis
- ☐ Abductor digiti minimi
- ☐ Quadratus plantae
- ☐ Lumbricals
- ☐ Flexor hallucis brevis
- ☐ Adductor hallucis
- ☐ Flexor digiti minimi brevis
- ☐ Plantar interossei
- ☐ Dorsal interossei

Vessels

- ☐ Anterior tibial vessels
- ☐ Posterior tibial vessels
- ☐ Fibular (Peroneal) vessels

After the Lab is Over

Later in the semester you will have the opportunity to attend review labs as you prepare for your practical examination. To maximize your study during those review labs, it is beneficial to jot down some notes after attending the lab. Use this section to make notes about the areas of anatomy that you did not feel you understood or identified very well during the lab session. When you come to a review lab, you can look back at your notes and see where you need to spend your time. Use the information and space below for this purpose.

Tips for reviewing material

Leg muscles

Be able to identify the three muscle compartments in the leg.

Note that the muscles of the anterior compartment pass anterior to the ankle between the two malleoli, the muscles of the lateral compartment pass posterior to the lateral malleolus, and the large posterior compartment muscles attach to the calcaneus or pass posterior to the medial malleolus.

Again, having a general understanding of muscle attachments will help you identify the muscles.

Foot muscles

Remember that there are four layers of foot muscles (3,2,3,2).

Structures I need to review

Compile a list of the anatomical structures from Lab 10 that you feel you need to focus on when you get a chance to review.

Muscles of the leg

Muscles of the foot