

HUMAN GROSS ANATOMY

ANTH 695 – SPRING 2018
THE UNIVERSITY OF TENNESSEE

Instructor: Benjamin Auerbach, Ph.D.

Contact information: Office: 416 Strong Hall

Office hours: Wednesdays, 2:00 – 3:00 P.M., or by appointment

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Lab instructor: Kristen R.R. Savell, M.A., ABD

Contact information: Office: 425 Strong Hall

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Time: Lecture and lab*

Tuesday: 8:30 – 10:30 A.M.

Wednesday: 8:30 – 10:30 A.M.

Thursday: 8:30 – 10:30 A.M.

Friday: 8:30 – 10:30 A.M.

Special Topics in Anatomy Lecture Series

Fridays: 2:30-3:40 (followed by Happy Hour with speaker)

* Access to the dissection lab after scheduled course hours is open.

See course schedule for lecture and lab plan.

Location: Lecture: 512 Strong Hall

Lab: 514 Strong Hall

Special topics lectures: 104 HASLAM BUSINESS BUILDING (pending)

Course description: Human Gross Anatomy provides advanced graduate students with in-depth anatomical training. A thorough comprehension of anatomy is at the core of biological anthropology, functional anatomy, and comparative evolutionary research. Skeletal function and form, often subjects of analysis in these fields, cannot be fully interpreted and understood without the context of the soft tissues—from muscles and ligaments to blood vessels and organs—that surround and interact with the bones. Using cadaver-based dissection, students experience the best method by which to learn about the structures of the human body, their integration, and, most importantly, variation among humans.

The course consists of three combined subjects: an anatomy lecture course, a laboratory dissection course, and an overview of human development. These topics are paired with nine guest lectures (the Special Topics in Anatomy Lecture Series) that bridge the textbook and lab knowledge with medicine, research and practical applications. This is an intensive course, requiring hours of study both in the lab and from texts, but it rewards you for those hours. Special emphasis is placed on evolution and functional anatomy of the body, though an understanding of development (embryology) and pathology (clinical knowledge) is also stressed.

Course textbooks: Human Gross Anatomy uses four different books to cover the various topics of the course: regional and functional anatomy, developmental biology, and gross anatomical dissection. These are all required for the course. Additional readings will be made available via Blackboard for topics not covered in these publications, and for the Special Topics Lectures. Students are encouraged to seek additional resources (e.g., additional anatomical atlases, study guides) if they prove useful, though all of the course content is more than adequately covered in the four books assigned for the course. Copies of all textbooks should be purchased via Internet retailers (as these will be cheaper than rates the campus bookstore is able to offer).

Principal textbook:

Keith L. Moore, Arther F. Dalley, Anne M.R. Agur. 2018. *Clinically Oriented Anatomy. Eighth edition.* Baltimore: Lippincott Williams & Wilkins. ISBN: 978-1496347213

Embryology textbook:

Gary C. Schoenwolf, Steve B. Bleyl, Philip R Brauer, Philippa H. Francis-West. 2015. *Larsen's Human Embryology. Fifth edition.* Philadelphia: Elsevier. ISBN: 978-1455706846

Anatomical atlas:

Anne Gilroy, Brian R. MacPherson, Lawrence M. Ross. 2016. *Thieme Atlas of Anatomy. Third Edition.* New York: Thieme Medical Publishers. ISBN: 978-1626232525

Anatomical dissector:

Patrick W. Tank. 2016. *Grant's Dissector. Sixteenth edition.* Baltimore: Lippincott Williams & Wilkins. ISBN: 978-1496313805

YOU WILL NOT ALWAYS FOLLOW THE INSTRUCTIONS OF THE DISSECTOR VERBATIM. A LIST OF DISSECTION SUGGESTIONS AND ANNOTATIONS TO THE DISSECTOR ARE PROVIDED IN THE LABORATORY MANUAL. BE SURE TO READ THESE, ALONG WITH THE DISSECTOR, BEFORE YOU COME TO LAB!!!

Optionally, you may be interested in acquiring copies of the following supplemental books:

Julia C. Boughner and Campbell Rolian (editors). 2016. *Developmental Approaches to Human Evolution*. New York: Wiley-Blackwell. ISBN 978-1118524688.

John H. Langdon. 2005. *The Human Strategy: An Evolutionary Perspective on Human Anatomy*. New York: Oxford University Press. ISBN: 978-0-19-516735-1.

Robert H. Whitaker and Neil R. Borley. 2016. *Instant Anatomy*. Fifth edition. New York: Wiley-Blackwell. ISBN 978-1119159384.

David Levine, Jim Richards, and Michael Whittle. 2012. *Whittle's Gait Analysis*. Fifth edition. New York: Chuchill Livingstone (Elsevier). ISBN: 978-0702042652.

Course objectives: By the end of the course, you should:

- have developed an advanced understanding of human anatomy & some functional anatomy.
- possess a good basic comprehension of human developmental biology.
- have learned the fine dissection skills necessary to identify, isolate and preserve the delicate structures encountered throughout the course.
- be able to relate the anatomical knowledge gained to research and practical applications.

Course layout: Two major components comprise the course: lectures and dissection labs. However, the structure and content of these vary further. In addition, there are nine guest lectures that are required components of the course (see below). **Be sure to reference the course schedule at the end of the syllabus.**

Lectures occur on the majority of meeting days of the course, and will be of variable length. Dr. Auerbach will deliver all lectures. Topics of lectures include general anatomy, functional anatomy, and human development. **Development lectures will be delivered in a flipped classroom format, with lectures produced online for you to download and watch before class on specified dates. Dr. Auerbach will make reference to developmental processes as appropriate when discussing the definitive anatomy, so be sure to watch these online lectures by the date specified.** Unless otherwise noted in the schedule, be sure to complete readings for each day before the lecture.

There are 24 scheduled dissections in the course. Labs will occur separately from lectures. Be prepared to spend the full time allotted dissecting in the lab. Many dissections, especially cleaning up structures, will most likely take longer than the assigned time. The course is

scheduled to finish at 10:30 on all days. Dr. Auerbach and Ms. Savell will leave the lab no later than 11:00, and so students are strongly encouraged to be efficient with their time in dissection. Students are permitted to continue dissections in the lab outside of scheduled course hours. Specific instructions for accessing the lab and policy for dissecting outside of course hours will be discussed during the first day of the course. (Also see Laboratory and Dissection Safety below, and well as the Lab Manual.)

Special Topics in Anatomy Lecture Series: Ten guest lectures are scheduled to occur on Fridays throughout the course. Clinicians and researchers from multiple disciplines and from various institutions will be visiting to share their knowledge and research. All of these visitors have extensive anatomical training, and all will participate in laboratory dissections in addition to their guest lectures. Lectures will link anatomical knowledge with their areas of research and practical application. Given the rare and exceptional opportunity the Special Topics in Anatomy Lectures provide, they are included as a required (though not assessed) portion of the course. Students and faculty not enrolled in the course but who are interested are welcome to attend these lectures.

Course web site: All course communication, study aids, external web resources, and supplementary readings will be available via Canvas the University of Tennessee Blackboard service (<https://utk.instructure.com>). Be sure to check this site frequently for updates.

LABORATORY AND DISSECTION SAFETY

You must be aware of the safety considerations that accompany human gross anatomy dissection. **All students enrolled in this course must attend the laboratory safety lecture on the 9th of January before being permitted to dissect.**

We are fortunate to be able to provide cadavers for use in this course. Remember that these individuals donated their bodies in order to further your pursuit of knowledge about human anatomy. Treat their bodies with respect and deference, and make the best possible use of their gift in your dissections. (After all, advanced gross anatomy courses that use human cadavers are very rarely taught outside of medical institutions.)

Written guidelines will be provided to you prior to the first course meeting. You must read through these and sign the consent and waiver form at the end of the guidelines *before* you are allowed to participate in dissections. Most of these rules concern your safety in the laboratory. This includes proper handling of biological waste generated by the dissection process, the

proper handling of sharp dissection equipment (namely disposable scalpels), and knowledge of what to do in the case of emergencies or accidents in the dissection lab. Problems, of course, are not anticipated, but an awareness of correct procedures will minimize the consequences should problems arise. Any lab incidents must be reported to Dr. Auerbach or to Ms. Savell.

Be aware that hazardous chemicals are used in the preservation of human cadavers, namely a small concentration of formaldehyde, and a larger concentration of phenol suspended in an aqueous solution including glycerin and methanol. **DIRECT SKIN CONTACT WITH THIS PRESERVATIVE FLUID WILL CAUSE IRRITATION AND MAY LEAD TO MORE SERIOUS COMPLICATIONS.** For this reason, all students must wear neoprene gloves rated to resist phenol and use a neoprene apron when dissecting. **ANY STUDENT WITH MEDICAL CONDITIONS THAT MAY BE AFFECTED BY THESE DISSECTIONS (E.G., RESPIRATORY ILLNESS, PREGNANCY, CIRCULATORY PROBLEMS, OR DIABETES) OR WHO HAVE CONCERNS SHOULD CONTACT DR. AUERBACH BEFORE THE FIRST CLASS MEETING.**

The anatomy laboratory is equipped with down-draft dissection tables and airflow in the lab is laminar. These tables directly vent from the tabletop to minimize the concentration of volatile chemicals into the air. Special care should be taken in attaching and detaching the umbilical connections between the tables and the exhaust hookups protruding from the lab walls.

Generally, use common sense in the lab. Do not leave sharp tools in places where others may accidentally bump into them, and do not lose the tools within or under the cadaver (a common but entirely preventable occurrence). Do not touch exposed skin with gloved hands. Wear facial protection when a chance of splatter is possible (e.g., during use of the Stryker saw). Do not work until fatigued in the lab; take breaks for water and to get off your feet. Be sure to properly dispose of all waste. See the list of guidelines provided before the first day of class for more information about the specific treatment of permanent laboratory equipment and for details on waste disposal, procedures for phenol exposure, and general laboratory safety.

Personal laboratory equipment: The laboratory component of this course requires proper equipment for the dissection of cadavers. **Students must acquire an anatomical dissection kit (e.g., McCoy Medical advanced dissection kit) before the beginning of the course. Dr. Auerbach will place bulk orders for these in early December; please contact him about pricing should you wish to participate in the bulk order (which is strongly recommended).** In addition, the students will be provided with safety attire:

- disposable neoprene surgical gloves & reusable neoprene gauntlets
- disposable surgical blades
- a reusable neoprene apron

Students are encouraged to invest in scrubs or to wear clothing that can be soiled; only long pants or long skirts are permitted. In addition, closed-toe shoes with good traction are required for the laboratory. Students wearing improper footwear will not be permitted to dissect. No exceptions will be made.

Study materials: Anatomical atlases will be made available to students in the lab for reference during dissection, though students are encouraged to acquire used copies of atlases in addition to these to provide multiple perspectives. Models of some anatomical structures will be made available to students in the laboratory, though these models may not leave the lab. Human crania will also be provided during the head and neck section, though these too may not be removed from the lab.

Skeletal study will help you make sense of much of the soft anatomy encountered throughout the course, and so it would benefit you to spend time studying or refreshing your osteological knowledge. A special arrangement has been made with the Forensic Anthropology Center to allow access during normal business hours to select skeletons from the William Bass Skeletal Collection. These skeletons will be available to be borrowed from the OVAL (Room 427D), and may be studied in the Steadman Osteology Lab. Space is limited, so try to stagger your visits with classmates.

Assessment: There are four forms of evaluation used during the course: lecture written exams, lecture pop quizzes, laboratory practical exams, and oral laboratory presentations. Each is explained below, and the dates for all of these (except pop quizzes) are highlighted in grey boxes in the course schedule.

Lecture written exams: There are four written lecture exams. The first is a short (one hour) exam on the thorax only, designed to give you a taste of the exam layout and content for the course. The remaining three exams are full-length (three hour) tests that cover sections of the course divided thematically and regionally. All lecture exams will cover material from the principal textbook (Moore et al.), readings from the human developmental biology textbook (Schoenwolf et al.), and lectures supplementing these two textbooks. Question forms on these exams will be short answer, fill-in-the-blank, identification (using anatomical illustrations), and some true-false and matching. **Written exams from prior years of the course are available on the course web site.**

Lecture pop quizzes: There will be ten unscheduled quizzes that will take place during the course. These are designed to serve as “checkpoints” for you throughout the semester, to

ensure that you are studying effectively and may pinpoint topics that require additional attention in studying. The material on which you may be quizzed is the same as what appears on the major exams, and quizzes will focus on material already covered in lecture and lab.

Laboratory practical exams: Three laboratory practical exams occur simultaneously with the three full-length lecture exams. You will be given an answer form and have free access during the testing period to complete answers to questions on flagged structures located on the cadavers or models. These lab practical exams involve identification of structures from the cadavers, models, and isolated bones, as well as some functional questions.

Laboratory oral presentations: Once during the semester, each student will be asked to present on the completed dissections of the previous section of the course. Presentations may occur on one of six possible days throughout the course listed in the syllabus, and will cover specific topics reflecting recent dissections. Guidelines for the material that must be covered during these presentations may be found in the lab manual along with dissector annotations. These oral presentations must be completed in front of Dr. Auerbach *and all dissection partners from the presenter's table*, and may take no longer than twenty minutes. As a maximum of four students will be dissecting at each table, each student at each table is only responsible for one presentation. Presentations will be graded as fail, pass, and high pass, which translate into scores of 60, 90, and 100 points out of 100 possible points. (High passes require a demonstration of good organization of knowledge, a clear presentation of the required topics, and an ability to show information and synthesize relationships beyond guideline requirements.)

Exams and points: The point values for assessment are given below. A total of 1000 points are available in the course, and are divided into letter grades according to the following rubric.

Thorax mini lecture exam	50 points
TAPP lecture exam	200 points
TAPP lab practical exam	50 points
Back & limbs lecture exam	200 points
Back & limbs lab practical exam	50 points
Head & neck lecture exam	200 points
Head & neck lab practical exam	50 points
Lecture pop quizzes (10 points each)	100 points
Lab oral presentation	<u>100 points</u>
TOTAL	1000 points

Letter grades: A: 865-1000 B: 730-864 C: 600-729 D: <600

Tips for getting the most out of the course: Any course on human anatomy is challenging but rewarding. You are taking this course in preparation for a professional career in which anatomical knowledge will be essential. Even if you are not taking this for professional reasons, knowledge of your anatomy has long-term practical use. So, remember that you are not learning this information for the exam, but for the rest of your life, professional or otherwise.

A golden rule for anatomy: **DON'T GET BEHIND!** It is to your advantage to keep up with the reading and keep reviewing throughout the course. I strongly encourage you to review nightly, **and read both for the lecture and, especially, the lab dissections ahead of time.** Learning anatomy is similar to studying a language; constant review of terminology is essential. Cramming in anatomy just before the exam isn't to your advantage. Some learning is, admittedly, rote memorization, but much of anatomical study involves integrating functions and intuiting spatial relationships. In short, give time to reading anatomy each day. Drawing, like in osteology, is a key to helping you learn anatomy. Draw schematics of blood flow or nerves & their branches. Create tables of muscles and their functions, and then draw the muscles, linking them to bony origins and insertions. These techniques will help you much more than all-nighters before exams.

A number of resources are available as study aids, and I would recommend that you employ these as you find them to be useful in supplementing your primary studying. Web sites that are recommended for mnemonics, cross-sectional imagery, and embryology are available as "External Links" on the course Blackboard web site. There are also good summary study guides, the best of which is *Instant Anatomy* (see citation on page 3); this volume is recommended to help you to review vasculature, nerve distributions, and anatomical spatial relationships.

Staying healthy while taking anatomy: As noted previously, this is a very intensive and high demand course. It is crucial that you look after yourself, both mentally and physically throughout the semester. You are not expected to be proficient at dissection or fully knowledgeable about any aspect of anatomy at the start of the course, even if you have dissected or taken anatomy previously. Give yourself a chance to learn and appreciate the material, and have fun learning it. Forming study groups and working with fellow students helps not only with knowledge but with morale. Taking breaks from dissection to minimize fatigue is important, but so is taking breaks from studying for the course. Pacing your studies will help significantly toward this end; as noted above, do not cram. Getting enough sleep and eating properly, in addition to good hygiene in and out of the lab will minimize the chances of getting sick over the course of the semester. Sleep is crucial for learning and good mental health, so make sure you do not sacrifice rest for study. If you are experiencing unusual anxiety over the course, please do not hesitate to meet with Dr. Auerbach.

Students with disabilities: If you require accommodation because of special needs in learning, please contact the Office of Disability Services at 2227 Dunford Hall (974-6087). Please also contact Dr. Auerbach immediately via e-mail after you register with the Office of Disability Services. Arrangements will be made to adjust exams to fit your needs.

Make-up policy: Short of legitimate professional, religious, legal or medical reasons, you will not be eligible to take examinations at any time other than those that are officially designated. If you must miss an exam, you must contact Dr. Auerbach *before* the examinations.

COURSE SCHEDULE – ANTH 695 – SPRING 2018

COA – Clinically Oriented Anatomy LHE – Larsen’s Human Embryology GD – Grant’s Dissector STAL – Special topics lecture
SPECIAL TOPICS LECTURE TITLES WILL BE POSTED THROUGHOUT THE SEMESTER

DATE	LECTURES	DISSECTION / LAB	READINGS
9 JANUARY	Special meeting: Lab safety Course orientation Anatomical terminology & study methods		GD: p. 1-4 Lab Manual COA: p. 2-8
10 JANUARY	Embryonic development [ONLINE] Systemic overview of anatomy The nervous system		LHE: Chapters 1-5 COA: p. 11-65
11 JANUARY	Thinking evolutionarily about anatomy Introduction to the thorax & thoracic wall Pleural cavity and lungs		COA: p. 291-347
12 JANUARY	NO STAL	1. Thoracic wall & pleural cavity	GD: p. 63-72
16 JANUARY	Heart development [ONLINE] Heart & middle mediastinum Posterior mediastinum		LHE: Chapters 12 & 13 COA: p. 348-393
17 JANUARY		2. Heart and the mediastinum	GD: p. 73-87
18 JANUARY	The abdominal wall & the inguinal canal Abdominal viscera (start)		COA: p. 406-548
19 JANUARY	STAL: John Bach, M.D. (Riverside Hospital)	3. Anterior abdominal wall & inguinal canal	GD: p. 89-98
23 JANUARY	MINI EXAM: Thorax	FIRST LAB DISSECTION PRESENTATION: THORAX	
24 JANUARY	Gastrointestinal tract development [ONLINE] Abdominal viscera (finish) Introduction to the pelvis		LHE: Chapter 14 COA: p. 554-629
25 JANUARY		4. Abdominal cavity I	GD: p. 98-102; 114-116

26 JANUARY	STAL: Arthur Kumpf, M.D. (private practice)	5. Abdominal cavity II	GD: p. 102-114; 116-124
30 JANUARY	Urogenital development [ONLINE] Pelvic viscera and the perineum		LHE: Chapters 15 & 16 COA: p. 630-660
31 JANUARY		6. Perineum	GD: p. 125-137 (male) GD: p. 147-152 (female)
1 FEBRUARY	Development discussion & TAPP Review		
2 FEBRUARY	STAL: Jason Organ, Ph.D. (Indiana University School of Medicine)	7. Pelvic cavity	GD: p. 137-147 (male) GD: p. 152-163 (female)
6 FEBRUARY (3 hours)	EXAM: Thorax, abdomen, pelvis & perineum (TAPP)	LAB PRACTICAL EXAM: Thorax, abdomen, pelvis & perineum	
7 FEBRUARY	The thigh and gluteal region The hip & knee (part one)		COA: p. 667-745
8 FEBRUARY	The hip & knee (finish) The leg and the foot		COA: p. 746-815
9 FEBRUARY	STAL: Valerie DeLeon, Ph.D. (University of Florida)	8. Anterior thigh & medial thigh	GD: p. 165-176
13 FEBRUARY		9. Gluteal region and posterior thigh	GD: p. 176-183
14 FEBRUARY		10. Popliteal region and posterior leg	GD: p. 183-184; 185-189
15 FEBRUARY	Gait		COA: p. 701 & Whittle
16 FEBRUARY	STAL: Jason Mussell, Ph.D. (Louisiana State University School of Medicine)	11. Anterior & lateral leg	GD: p. 190-193
20 FEBRUARY	Development of the limbs [ONLINE] Development discussion	12. The foot / Lower limb dissection catch-up	LHE: Chapters 8 & 20
21 FEBRUARY			GD: p. 193-198
NO CLASS 22 & 23 FEBRUARY (American Academy of Forensic Science Annual Meeting)			
27 FEBRUARY	The back The brachial plexus (start)	THIRD LAB DISSECTION PRESENTATION: LOWER LIMB	COA: p. 71-139; 189-200

28 FEBRUARY	The brachial plexus (finish) The arm		COA: p. 143-214
1 MARCH	The forearm and hand		COA: p. 215-289
2 MARCH	STAL: Cara Ocobock, Ph.D. (SUNY – Albany)	13. The back	GD: p. 8-14
6 MARCH		14. The axilla	GD: p. 21-34
7 MARCH		15. The arm; anterior forearm	GD: p. 34-47
8 MARCH	Back & limbs review		
9 MARCH	STAL: Adam Sylvester, Ph.D. (Johns Hopkins University School of Medicine)	16. Posterior forearm and the hand	GD: p. 46-55
NO CLASS WEEK OF 12-16 MARCH (SPRING BREAK)			
20 MARCH (3 hours)	EXAM: Back & limbs	LAB PRACTICAL EXAM: Back & limbs	
21 MARCH	Introduction to the head and neck Neck triangles, muscles & viscera	FOURTH LAB DISSECTION PRESENTATION: UPPER LIMB	COA: p. 830-850; 991-1030
22 MARCH	The face & muscles of mastication		COA: p. 851-872; 922-935
23 MARCH	STAL: Noreen von Cramon-Taubadel, Ph.D. (SUNY – Buffalo)	17. Suboccipital region; anterior neck	GD: p. 14-15; 206-214
26 MARCH*		18. Anterior neck & root of the neck	GD: p. 215-218
27 MARCH	Brain, blood flow, meninges, and ventricles		COA: p. 873-896
28 MARCH	Cranial nerves I		COA: p. 1062-1076
29 MARCH	Cranial nerves II		COA: p. 1077-1091
30 MARCH	No class scheduled (Spring Recess)	Dissection catch-up	
3 APRIL	The eye and orbit		COA: p. 897-921
4 APRIL		19. Superficial face, parotid & temporal regions	GD: p. 221-228; 230-235
5 APRIL		20. Brain (& completion of deep face)	GD: p. 228-229; 235-238 Dr. Auerbach will

			remove brains
6 APRIL	STAL: Karen Baab, Ph.D. (Midwestern University)	21. The orbit	GD: p. 245-252
NO CLASS 10-13 APRIL (American Association of Physical Anthropologists Annual Meeting)			
17 APRIL	Deep face (oral and nasal cavities)	FIFTH LAB DISSECTION PRESENTATION: CRANIAL NERVES, EYE & FACE	COA: p. 936-973
18 APRIL	The pharynx The larynx & ear		COA: p. 974-989; 1031-1049
19 APRIL	Development of the head [ONLINE]	22. Head disarticulation, pharynx, & bisection of the head	LHE: Chapters 9, 17-19 GD: p. 252-259
20 APRIL		23. Nasal and oral cavities	GD: p. 259-271
NO CLASS 24 & 25 APRIL (American Association of Anatomists Annual Meeting)			
26 APRIL		24. Larynx & the ear	GD: p. 271-278
27 APRIL	Development discussion, head & neck review	FINISH DISSECTIONS	
1 MAY – 3 MAY		SIXTH LAB DISSECTION PRESENTATION: NECK, DEEP FACE, LARYNX	
4 MAY (3 hours)	EXAM: Head and neck	LAB PRACTICAL EXAM: Head and neck	

*Note that 26 March is a Monday; this is the only schedule shift during the semester to account for the day lost to Spring Recess.