

COURSE SYLLABUS

for

HUMAN MORPHOLOGY

Gross Anatomy, Embryology, Histology, Cytology

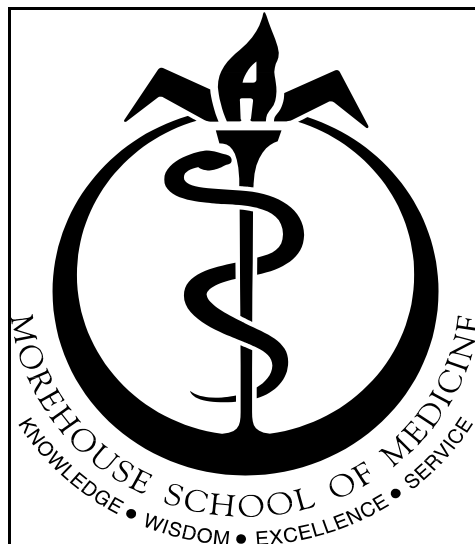
Lawrence E. Wineski, Ph.D.

Douglas F. Paulsen, Ph.D.

Department of Anatomy & Neurobiology

MOREHOUSE SCHOOL OF MEDICINE

ATLANTA, GEORGIA



2004-2005

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***Note:** The Study Objectives (plus self examination questions) for histology and cell biology are included in Dr. Paulsen's book, (*Histology & Cell Biology: Examination and Board Review, 4th edition. 2000. Lange/McGraw-Hill, New York*).

FACULTY & STAFF	OFFICE	TELEPHONE
Brown, Mazola Laboratory Manager	HGBB 201B	752-1562
Pitts, Doris Administrative Assistant, Department of Anatomy & Neurobiology	HGB 356	752-1560
Bumpers, Harvey, M.D. (HB) Associate Professor, Surgery	HGB 356	752-1560
Densler, James, M.D. (JD) Adjunct Professor, Anatomy and Surgery	HGB 356	752-1560
Elks, Martha, M.D. (ME) Associate Dean for Educational Affairs	HGB 208	752-1881
Etemadi, Amir, M.D. (AE) Associate Professor, Anatomy	HGB 357	752-1555
Ford, Byron, Ph.D. (BF) Assistant Professor, Anatomy	MRC 222	752-5222
Jones, Herb, M.D. (HJ) Adjunct Professor, Anatomy and Surgery	HGB 356	752-1560
Klement, Brenda, Ph.D. (BK) Assistant Professor, Anatomy	HGB 306	752-1637
Lo, Woo-Kuen, Ph.D. (KL) Professor, Anatomy	MEB 1358	752-1558
Patrickson, John, Ph.D. (JP) Associate Professor, Anatomy	HGB 356B	752-5717
Paulsen, Douglas, Ph.D. (DP) Professor, Anatomy Co-Course Director, Human Morphology	HGB 305	752-1559
Thomas, Kelwyn, Ph.D. (KT) Associate Professor, Anatomy	MEB 1211	752-1507
Wineski, Lawrence, Ph.D. (LW) Associate Professor, Anatomy Co-Course Director, Human Morphology	HGB 356C	752-1563

COURSE SCHEDULE 2004-2005

1. DATES: **July 12, 2004 - March 18, 2005**
Check the schedule below for specific days and times.
 2. Lecture sessions meet in the First-year Lecture Hall. Laboratory sessions meet in either the Anatomy teaching lab (Room 203 B) or the dissection lab (Room 201 HGB). Class begins promptly, as scheduled.
 3. No smoking, food, or beverages are allowed in either the lecture hall or laboratory.
 4. In the schedule below:
 - a. Initials noted after the lecture topic refer to faculty listed on page 4 of this syllabus.
 - b. Pages listed after the gross anatomy lab assignments refer to Grant's Dissector (GD).
 - c. The Histology Lab Manual is posted on Blackboard, under Course Documents. Please refer to that document for the appropriate material for each histology lab.
 5. Check the video catalog (syllabus page 41) for recommended video-tape programs pertaining to daily subject matter.
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NOTE: All aspects of this schedule are subject to change. All changes will be announced during lecture or laboratory sessions and posted on Blackboard. Students are responsible for attending all lectures and laboratory sessions and for learning of any and all changes to the schedule. Missing a lecture or lab is not a valid excuse for missing a scheduling announcement unless there is an excused absence.

UNIT I: CELL AND TISSUE BIOLOGY

Reading: **Junqueira** **Chapters 1-13.**
 Paulsen **Chapters 1-13.**
 Sadler **Chapters 2-5, 7-9, 19 (pp. 440-443).**
 Alberts **Chapters 1, 7, 8, 11, 12, 14-19.**

<u>DATE</u>	<u>LECTURE</u>	<u>LABORATORY</u>
07/12/M		
10:30-10:50	Course Introduction (DP).	
11:00-12:20	Histological Methods (KL).	
1:30-3:00	Cell Biology Methods (KT).	
3:00-5:00	Cell Structure I (DP).	
07/13/Tu		
10:30-12:20	Cell Structure I (DP).	
07/14/W		
10:30-12:20	Cell Structure II (DP).	
1:30-4:20	Cell Structure III (DP).	
07/15/Th		
10:30-12:20	Nucleus, Nucleolus, and Ribosomes (KT).	
07/16/F		
10:30-12:20	Mitosis and Cell Cycle (KT).	
1:30-2:20		Histology Lab Check-in.
2:20-2:40		Histology Lab Warm-up (DP).
2:40-4:20		Cytology Lab.

07/19/M

10:30-12:20

1:30-1:50

1:50-2:50

1:50-3:20

Epithelia and Glands (BK).

**Histology Lab Warm-up (DP).
HISTO LAB QUIZ - Cytology.
Epithelia and glands.**

07/20/Tu

10:30-12:20

Connective and Adipose Tissues (BK).

07/21/W

10:30-12:20

1:30-1:50

1:50-2:50

1:50-3:20

Cartilage and Bone (BK).

**Histology Lab Warm-up (DP).
HISTO LAB QUIZ - Epithelia & glands.
Connective and adipose tissues; Cartilage.**

07/22/Th

10:30-12:20

Cell Adhesion (KL).

07/23/F

10:30-12:20

1:30-1:50

1:50-2:50

1:50-3:20

Blood and Bone Marrow (DP).

**Histology Lab Warm-up (DP).
HISTO LAB QUIZ - Connective and Adipose Tissues; Cartilage.
Peripheral Blood.**

07/26/M

10:30-12:20

1:30-1:50

1:50-4:20

Bone Marrow (DP).

**Histology Lab Warm-up (DP).
Bone Marrow I.**

07/27/Tu

10:30-12:20

Bone Marrow II.

07/28/W

10:30-12:20

1:30-1:50

1:50-2:50

1:50-4:20

Bone (BK)

Histology Lab Warm-up (DP).

HISTO LAB QUIZ, Blood and Bone Marrow.

Cartilage and Bone.

07/29/Th

10:30-12:20

Embryogenesis (DP).

07/30/F

10:30-12:20

1:30-1:50

1:50-2:50

1:50-3:20

Nerve (JP).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ - Bone.

Nerve.

08/02/M

10:30-12:20

1:30-4:20

Embryogenesis/Differentiation/Induction/Histogenesis (DP).

Applied Anatomy Lab: Cells, Tissues, Organs (Histological Methods; Cell Biology Methods; Cell, Tissue, and Organ Culture; Intro to Gross Anatomy Lab).

08/03/Tu

10:30-12:20

Skeletal Muscle (BF).

08/04/W

10:30-12:20

1:30-1:50

1:50-2:50

1:50-4:20

Cardiac and Smooth Muscle (DP).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ - Nerve.

Muscle Tissue.

08/05/Th

10:30-12:20

Clinical Correlation: Congenital Malformations (AE).

08/06/F

10:30-12:20

1:30-1:50

1:50-2:50

1:50-4:20

Blood and Lymphatic Vessels(DP).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ - Muscle.

Blood and Lymph Vessels.

08/09/M

10:30-12:20

10:30-12:20

1:30-3:20

Exam Strategies: Ph.D. Students. Multiple choice and essay questions. Anatomy Conference Room (BMSB 356A). (BK)

Exam Strategies: Medical and Summer Component Students. Answering USMLE-style questions (First-Year Classroom). (DP)

Practice Lab Practical Exam.

08/10/Tu

9:30 - 11:30 a.m.

Unit 1 Written Exam

Noon - 1:30 p.m.

Unit 1 Lab Practical Exam

UNIT II: SKIN; LYMPHOID SYSTEM; BACK; UPPER LIMB.

Reading: Junqueira Chapters 14, 18.
Paulsen Chapters 14, 18.
Sadler Chapters 8, 9, 18, 19.
Moore & Agur Chapters 1, 5, 7.

<u>DATE</u>	<u>LECTURE</u>	<u>LABORATORY</u>
08/12/Th 10:30-12:20 1:30-2:30 2:30-2:50 2:50-4:20	Skin (AE).	Histology and Gross Anatomy Lab Check-In. Histology Lab Warm-up (DP). Skin.
08/13/F 10:30-12:20 1:30-2:00 2:00-4:20	Organization of the back 1 (AE).	Dissection Lab Warm-up (LW). The Back 1: Before you begin; Vertebral column; Skin incisions; Superficial muscle group (GD XIII-XVIII, 129-135).
08/16/M 10:30-12:20 1:30-2:20 2:30-2:45 2:45-5:20	Organization of the back 2 (AE). Introduction to Radiology (JD).	Dissection Lab Warm-up (LW). The Back 2: Intermediate and deep muscle groups; Suboccipital region; Vertebral canal and spinal cord (GD 135-142).
08/17/Tu 10:30-11:20 11:30-12:20	Introduction to Immunology (DP). Lymphoid Tissue and Organ Histology I (DP).	

08/18/W

10:30-12:20

1:30-1:50

1:50-2:50

1:50-4:20

Lymphoid Tissue and Organ Histology II (DP).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ: Skin.

Lymphoid System.

08/20/F

10:30-Noon

1:30-4:20

Organization of the nervous system 1 (LW).

Applied Anatomy Lab: Back and Skin.

08/23/M

10:30-Noon

1:30-1:45

1:45-4:20

Organization of the nervous system 2 (LW).

Dissection Lab Warm-up (LW).

Upper limb 1: Back and shoulder region (GD 188-192).

08/24/Tu

1:30-3:20

3:30-4:20

3:30-4:20

Development of the Limbs (DP).

HISTO LAB QUIZ: Lymphoid system.

GROSS LAB QUIZ: The Back.

08/25/W

10:30-Noon

1:30-1:45

1:45-4:20

Organization of the Upper Limb 1 (LW).

Dissection Lab Warm-up (LW).

**Upper limb 2: Pectoral region; Axilla (Walls; Contents)
(GD 193, 2-8, 193-194).**

08/26/Th

1:30-1:45

1:45-4:20

Dissection Lab Warm-up (LW).

**Upper limb 3: Axilla (Axillary artery and branches; Brachial plexus
(GD 195-199).**

08/27/F

10:30-Noon

1:30-1:45

1:45-4:20

Clinical Correlation: Breast Cancer and Surgery (HB).

Dissection Lab Warm-up (LW).

**Upper limb 4: Superficial structures; Arm and cubital fossa; Flexor
region of forearm (GD 186-188, 199-207).**

08/30/M

10:30-Noon

1:30-1:45

1:45-4:20

Organization of the Upper Limb 2 (LW).

Dissection Lab Warm-up (LW).

Upper limb 5: Palm of the hand (GD 208-212).

08/31/Tu

10:30-Noon

REVIEW (AE/DP/LW).

09/01/W

10:30-Noon

1:30-1:45

1:45-4:20

Organization of the Upper Limb 3 (LW).

Dissection Lab Warm-up (LW).

Upper limb 6: Extensor forearm and dorsum of the hand (GD 212-216).

09/02/Th

1:30-1:45

1:45-4:20

Dissection Lab Warm-up (LW).

Upper limb 7: Joints (GD 217-219, 300-302).

09/03/F

10:30-12:20

1:30-3:00

Applied Anatomy Lab: The Upper Limb.

GROSS LAB QUIZ: The Upper Limb.

09/06/M

LABOR DAY HOLIDAY

09/07/Tu

9:30-11:30 a.m.

Unit 2 Written Exam

Noon-1:30 p.m.

Unit 2 Lab Practical Exam

UNIT III: THORAX; CARDIOVASCULAR AND RESPIRATORY SYSTEMS; ABDOMEN; DIGESTIVE AND URINARY SYSTEMS.

Reading:	Junqueira Paulsen Sadler Moore & Agur	Chapters 11, 15-17, 19. Chapters 11, 15-17, 19. Chapters 10, 11, 12, 13. Chapters 2, 3.
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<u>DATE</u>	<u>LECTURE</u>	<u>LABORATORY</u>
09/08/W 1:30-2:50 3:00-3:15 3:15-5:30	Organization of the thoracic walls and cavity (AE).	Dissection Lab Warm-up (AE). Thoracic wall; Pleural cavities (GD 1-18).
09/10/F 10:30-12:20 1:30-1:45 1:45-4:20	Middle mediastinum and heart (AE).	Dissection Lab Warm-up (AE). Mediastinum; Middle mediastinum and heart (GD 18-28).
09/13/M 10:30 -12:20 1:30-1:45 1:45-4:20	Respiratory development and histology (AE).	Histology Lab Warm-up (DP). Respiratory system & cardiac histology.
09/20/M 10:30-12:20 1:30-3:20	Cardiovascular embryology 1 (AE). Cardiovascular embryology 2 (AE).	
09/22/W 1:30-1:45 1:45-4:20		Dissection Lab Warm-up (AE). Posterior mediastinum (GD 28-30).
09/23/Th 1:30-1:45 1:45-4:20		Dissection Lab Warm-up (AE). Superior mediastinum (GD 30-35).

09/24/F

1:30-4:20

Applied Anatomy Lab: The Thorax.

09/27/M

10:30-12:20

Autonomic nervous system (LW).

1:30-2:20

Clinical Correlation: Thoracic Surgery (JM)

2:30-4:00

GROSS LAB QUIZ: The Thorax

09/30/Th

1:30-2:50

Organization of the abdominal wall and inguinal region (AE).

3:00-3:15

Dissection Lab Warm-up (AE).

3:15-5:20

Anterior abdominal wall; Scrotum, spermatic cord, and testes (GD 41-54).

10/01/F

1:30-3:20

Digestive system histology 1: Oral cavity, pharynx, esophagus (DP).

3:30-3:45

Histology Lab Warm-up (DP).

3:45-4:10

HISTO LAB QUIZ: Respiratory System & Heart.

3:45-5:20

Oral cavity and esophagus.

10/04/M

10:30-12:20

Development of the digestive system (AE).

1:30-2:20

Abdominal cavity gross anatomy 1 (AE).

2:30-2:45

Dissection Lab Warm-up (AE).

2:45-5:20

Abdominal cavity 1: Orientation; Inspection; Omental bursa and peritoneal reflections (GD 55-65).

10/06/W

1:30-3:20

Digestive system histology 2: Digestive tract (DP).

3:30-3:45

Histology Lab Warm-up (DP).

3:45-4:45

HISTO LAB QUIZ: Oral Cavity.

3:45-5:20

Stomach, Intestines, Anal canal.

10/07/Th

1:30-2:20
2:30-2:45
2:45-5:20

Abdominal cavity gross anatomy 2 (AE).

Dissection Lab Warm-up (AE).

Abdominal cavity 2: Bile passages, celiac trunk, and portal vein (GD 65-68).

10/08/F

1:30-2:50
3:00-3:15
3:15-3:30
3:30-5:00

Digestive system histology 3: Digestive glands (DP).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ: Digestive Tract.

Salivary glands, Liver, Exocrine Pancreas, Gall Bladder.

10/13/W

1:30-2:20
2:30-2:45
2:45-5:20

Abdominal blood supply and lymphatics (KL).

Dissection Lab Warm-up (AE).

Abdominal cavity 3: Superior and inferior mesenteric vessels (GD 68-70).

10/14/Th

1:30-2:20
2:30-2:45
2:45-5:20

Abdominopelvic autonomies (LW).

Dissection Lab Warm-up (AE).

Abdominal cavity 4: Removal of the GI tract; Detailed examination of GI tract and its unpaired organs (GD 71-77).

10/15/F

1:30-2:20
2:30-2:45
2:45-5:20

Posterior abdominal wall and diaphragm (KL).

Dissection Lab Warm-up (AE).

Abdominal cavity 5: Posterior abdominal structures; Posterior abdominal wall; Thoracic diaphragm (GD 77-85).

10/18/M

10:30-12:20
1:30-1:45
1:45-2:45
1:45-4:20

Urinary system histology(DP).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ: Digestive Glands.

Urinary system.

10/22/F
1:30-4:00

Applied Anatomy Lab: The Abdomen.

10/25/M
10:30-12:00
1:30-3:30
1:30-3:30

Clinical Correlation: Hernia Repair (JM).

HISTO LAB QUIZ: Urinary System.
GROSS LAB QUIZ: The Abdomen.

10/26/Tu

9:30-11:30 a.m.
Noon-1:30 p.m.

Unit 3 Written Exam

Unit 3 Lab Practical Exam

UNIT IV: PELVIS & PERINEUM, ENDOCRINES, MALE & FEMALE REPRODUCTIVE SYSTEMS, LOWER LIMB.

Reading: **Junqueira** **Chapters 20-23.**
 Paulsen **Chapters 20-23.**
 Sadler **Chapters 1, 14.**
 Moore & Agur **Chapters 4, 6.**

<u>DATE</u>	<u>LECTURE</u>	<u>LABORATORY</u>
10/27/W		
1:30-2:50	Male reproductive system 1: Testes and spermatogenesis (DP).	
3:00-3:15		Histology Lab Warm-up (DP).
3:15-5:00		Male reproductive system 1: Testes.
 10/28/Th		
1:30-2:50	Organization of the pelvis & perineum 1(KL).	
3:00-3:15		Dissection Lab Warm-up (LW).
3:15-5:20		Pelvis and perineum 1 (Begin GD 89-126; Note the major changes in the Dissection Notes).
 10/29/F		
1:30-2:50	Male reproductive system 2: Extrinsic glands and ducts; External genitalia (DP).	
3:00-3:15		Histology Lab Warm-up (DP).
3:15-5:00		Male reproductive system 2: Glands, ducts, penis.
 11/01/M		
1:30-2:50	Organization of the pelvis & perineum 2 (KL).	
3:00-3:15		Dissection Lab Warm-up (LW).
3:15-5:20		Pelvis and perineum 2 (Continue GD 89-126; Note the major changes in the Dissection Notes).

11/04/Th

1:30-2:50

3:00-4:20

Endocrine system 1: Pituitary and pineal glands (DP).

Endocrine system 2: Thyroid and parathyroid glands (AE).

11/05/F

1:30-2:50

3:00-3:15

3:15-3:45

3:15-5:00

Endocrine system 3: Adrenal gland and endocrine pancreas (AE).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ: Male reproductive system.

Endocrine system.

11/08/M

10:30-12:20

1:30-2:30

2:30-3:00

3:00-5:00

Female reproductive system 1: Ovaries and ovulation (DP).

Histology Lab Warm-up (DP).

HISTO LAB QUIZ: Endocrine system.

Female reproductive system 1: Ovary and uterine tube.

11/11/Th

1:30-2:50

3:00-3:15

3:15-5:20

Organization of the pelvis & perineum 3 (KL).

Dissection Lab Warm-up (LW).

Pelvis and perineum 3 (Finish GD 89-126; Note the major changes in the Dissection Notes).

11/12/F

10:30-12:20

1:30-3:20

Male reproductive system: Cell biology and meiosis (KT).

Urogenital embryology (AE).

11/15/M

1:30-2:50

3:00-3:30

3:30-5:20

Female reproductive system 2: Uterine tubes, uterus, and placenta (DP).

Histology Lab Warm-up (DP).

Female reproductive system 2: Uterus, placenta, mammary glands.

11/17/W

1:30-3:20

Concept review and integration: Menstrual cycle and birth control (ME).

11/18/Th
1:30-2:50
3:00-3:15
3:15-5:20

Organization of the lower limb 1 (AE).

Dissection Lab Warm-up (AE).
Lower limb 1: Superficial structures; Anterior region of thigh; Medial region of thigh (GD 145-156).

11/19/F
1:30-4:20

Applied Anatomy Lab: Pelvis & Perineum.

11/22/M
10:30-12:20
1:30-1:45
1:45-4:20

Organization of the lower limb 2 (AE).

Dissection Lab Warm-up (AE).
Lower limb 2: Gluteal region (GD).

11/23/Tu
1:30-3:00
1:30-3:00

HISTO LAB QUIZ: Female reproductive system.
GROSS LAB QUIZ: Pelvis and perineum.

11/24-28/ W-Sun

THANKSGIVING HOLIDAY

11/29/M
10:30-12:20
1:30-1:45
1:45-4:20

Organization of the lower limb 3 (AE).

Dissection Lab Warm-up (AE).
Lower limb 3: Posterior region of thigh (GD 161-165).

12/01/W
1:30-1:45
1:45-4:20

Dissection Lab Warm-up (AE).
Lower limb 4: Anterior crural compartment and dorsum of foot; Lateral crural compartment and lateral side of ankle (GD 166-170).

12/02/Th
1:30-1:45
1:45-4:20

Dissection Lab Warm-up (AE).
Lower limb 5: Posterior crural compartment and medial side of ankle (GD 170-173).

12/03/F

1:30-1:45

1:45-4:20

Dissection Lab Warm-up (AE).

Lower limb 6: Sole of the foot (GD 174-177).

12/06/M

10:30-12:20

1:30-4:20

Clinical Correlation: Orthopedic Surgery (Dr. Bonnie Simpson).

Applied Anatomy Lab: Orthopedic Surgery Demonstrations.

12/09/Th

1:30-3:20

Lower limb 7: Joints (GD 177-183, 298-300).

12/10/F

1:30-4:20

Applied Anatomy Lab: The Lower Limb.

12/13/M

10:30-12:20

1:30-3:00

3:00-4:20

Review: Endocrine and reproductive histology (DP).

GROSS LAB QUIZ: The Lower Limb.

Review: Pelvis and perineum; Lower limb (KL/AE).

12/16/Th

9:30-11:30 a.m.

Unit 4 Written Exam

Noon-1:30 p.m.

Unit 4 Lab Practical Exam

12/19-01/02 CHRISTMAS & NEW YEARS HOLIDAYS

UNIT V: HEAD & NECK

Reading:	Junqueira	Chapter 24.
	Paulsen	Chapter 24.
	Sadler	Chapters 8, 9, 15, 16, 17, 19.
	Moore & Agur	Chapters 8, 9, 10.

<u>DATE</u>	<u>LECTURE</u>	<u>LABORATORY</u>
01/04/Tu 10:30-12:20 3:00-5:00	Concept Review and Integration: Cell Biology (Organelles/Functions) (DP). Concept Review and Integration: Cell Biology (Mitosis/Apoptosis, Differentiation) (DP).	
01/05/W 1:30-3:20	Concept Review and Integration: Musculoskeletal and Nervous Tissues, Skin (AE/BK/DP).	
01/07/F 10:30-12:20 1:30-3:20	Concept Review and Integration: Cell Biology (Cell Signaling and Adhesion) (DP). Concept Review and Integration: Cardiovascular, Blood, and Lymphoid Systems (DP).	
01/10/M 10:30-12:20 1:30-3:20	Concept Review and Integration: Respiratory and Digestive Systems (AE/DP). Concept Review and Integration: Urinary and Urogenital Systems (AE/DP).	
01/11/Tu 10:30-12:20 1:30-3:20	Concept Review and Integration: Endocrine and Reproductive Systems (AE/DP). Concept Review and Integration: Early Embryology and Placentation (AE/DP).	
01/12/W 1:30-3:20	Introduction to sensory receptors (DP).	
01/14/F 10:30-12:20 1:30-3:20	Introduction to eye and ear embryology and histology (DP). Development of the head and neck (AE).	

01/17/M

MARTIN LUTHER KING, Jr. HOLIDAY

01/18/Tu

9:30-12:30

HISTOLOGY AND CELL BIOLOGY MINIBOARD EXAM.

01/21/F

10:30-12:20

1:30-1:45

1:45-4:20

Organization of the face (LW).

Dissection Lab Warm-up (LW).

Anterior aspect of skull and face; Scalp (GD 221-232).

01/24/M

10:30-12:20

1:30-1:45

1:45-4:20

Cranial nerves (LW).

Dissection Lab Warm-up (LW).

Anterior aspect of skull and face; Scalp (Finish GD 221-232).

01/25/Tu

10:30-12:20

1:30-1:45

1:45-4:20

Interior of the skull (AE).

Dissection Lab Warm-up (AE).

Interior of skull (GD 232-244).

01/28/F

10:30-12:20

1:30-1:45

1:45-4:20

Orbit and eye (KL).

Dissection Lab Warm-up (LW).

Orbit and contents (GD 244-250).

01/31/M

10:30-12:20

1:30-1:45

1:45-4:20

Organization of the neck (KL).

Dissection Lab Warm-up (LW).

Posterior triangle of neck; Anterior triangle of neck 1 (GD 251-262).

02/01/Tu

10:30-12:20

1:30-1:45

1:45-2:45

1:45-4:20

Cranial autonomic nervous system (LW).

Dissection Lab Warm-up (LW).

GROSS LAB QUIZ: Face, Scalp, Interior of Skull, Orbit.

Anterior triangle of neck 2 (Continue GD 254-262).

02/02/W

1:30-1:45

1:45-4:20

Dissection Lab Warm-up (LW).

Anterior triangle of neck 3 (Finish GD 254-262).

02/07/M

10:30-12:20

1:30-1:45

1:45-4:20

Cranial nerve pathways and lesions (LW).

Dissection Lab Warm-up (LW).

Root of neck; Parotid region (GD 262-265).

02/08/Tu

10:30-12:20

Clinical Correlations: Face and Neck (HJ).

02/10/Th

1:30-1:45

1:45-4:20

Dissection Lab Warm-up (LW).

Temporal region 1 (GD 265-270; View the TIPS CD-ROM before starting this lab).

02/11/F

1:30-2:50

3:00-4:20

Nose and pharynx (AE).

Temporal region 2 (Finish GD 265-270).

02/14/M

10:30-12:20

1:30-3:00

Oral cavity (AE).

GROSS LAB QUIZ: Neck, Temporal Region.

02/15/Tu

10:30-12:20

1:30-1:45

1:45-4:20

Clinical Correlations: Ear, Nose, and Throat (HJ).

Dissection Lab Warm-up (LW).

Craniovertebral joints and removal of head; Prevertebral and lateral vertebral regions; Exterior of base of skull (GD 270-276).

02/16/W

1:30-1:45

1:45-4:20

Dissection Lab Warm-up (LW).

Pharynx; Bisection of head; Nasal cavities (GD 276-285).

02/18/F

1:30-1:45

1:45-4:20

Dissection Lab Warm-up (LW).

Palate, tonsil, and pharyngeal wall (GD 285-288).

02/21/M

10:30-12:20

1:30-1:45

1:45-4:20

Larynx and speech (AE).

Dissection Lab Warm-up (LW).

Mouth and tongue; Larynx (GD 288-293).

02/22/Tu

10:30-12:20

1:30-1:45

1:45-3:30

Ear and hearing (KL).

Dissection Lab Warm-up (LW).

Middle ear (GD 293-295).

02/23/W

1:30-4:20

Applied Anatomy Lab: Head & Neck.

02/25/F

1:30-3:30

Concept Review and Integration: Head & Neck (AE/DP/KL/LW).

02/28/M

10:30-12:20

GROSS LAB QUIZ: Pharynx, Nasal Cavity, Oral Cavity, Larynx, Middle Ear.

03/01/Tu

9:30-11:30 a.m.

Unit 5 Written Exam

Noon-1:30 p.m.

Unit 5 Lab Practical Exam

03/02/W

1:30-3:20

Concept Review and Integration: Back and Limbs (AE/DP/LW).

3:30-5:20

Concept Review and Integration: Thorax (AE/DP).

03/04/F

10:30-12:20

Concept Review and Integration: Nervous System (DP/LW).

1:30-3:20

Concept Review and Integration: Abdomen, Pelvis, and Perineum (AE/DP).

03/11/F

1:30-3:20

Concept Review and Integration: Cardiovascular Embryology (AE/DP).

03/16/W

1:30-3:20

Concept Review and Integration: Digestive, Respiratory, Urogenital Embryology (AE/DP).

03/18/F

9:30-12:30

GROSS ANATOMY AND EMBRYOLOGY MINIBOARD EXAM.

03/21-25/M-F SPRING BREAK

GENERAL APPROACH

The primary source of information in human anatomy is the human body itself. Therefore, the overwhelmingly most important part of this course is the laboratory, where dissection of a human cadaver and inspection of histological slides are your primary goals. These tasks require efficiency, manual dexterity, the ability to follow directions, inquisitiveness, creativity, endurance, hard work, and the capacity to mentally visualize a three dimensional image of parts as they relate to the whole. Ultimately, your ability to transpose dissection and microscopy to the intact, living subject constitutes your major challenge, both as student and practicing physician. Perhaps the next most daunting task is learning the language of anatomy, so that you may communicate clearly and effectively with your teachers and colleagues, as well as your future patients. During this course you will be expected to learn massive numbers of new words and the contexts in which they are used appropriately. Because medicine is increasingly a collaborative profession, your ability to communicate efficiently may, one day, mean the difference between life and death.

The laboratory manuals are your most important texts, as they present the anatomy that you must know and offer step-by-step procedures for visualizing that material in regional plans. Read your manuals before, during, and after lab. Prepare for lab by scanning the appropriate sections in the manuals. This will give you a feel for the work to come. Once in lab, read the manuals carefully; let them serve as guides through the body and slide sets. Most importantly, when in dissection, read and consider before you cut. Be patient (where would a doctor be without patience?). As each structure is exposed and verified, you make a discovery. At this point, the relationships of the structure to others are most meaningful and should be learned, since further dissection exposes the structure completely but destroys the true relationships. After lab, use the manuals as review guides for compiling and organizing information. However, the manuals do not contain sufficient information to fully explain or clarify what you have seen. Further key information on structures, relationships, functions, and clinical relevance is presented in lectures and/or is found in your textbooks.

Formal lectures are designed to introduce topics, present organizational concepts, clarify specific aspects of developmental, regional, and microscopic anatomy, and to expound on subjects of particular interest. Lectures augment and highlight key aspects of your lab work and readings. They have been likened to a guided bus tour of a city with many monuments; they provide a useful overview, but do not substitute for getting off the bus and visiting the monuments yourself. **Do not rely on lectures alone to cover all the relevant information.** You must carry out your laboratory work, read your texts, and attend the lectures, in order to achieve a comprehensive coverage of the subject.

Use the study objectives contained in your course materials as guides to pertinent text information. The most common question students have in mind when they speak with their instructors is “What should I study for the test?”. That is precisely what the study objectives are designed to tell you. Don’t wait until two days before the test to read the objectives. They should be the first thing you read before cracking a book or attending a lecture. Understanding the goals of your study will make you a more efficient student. With the rate at which new material is covered in medical school, efficiency is critical.

Another approach to efficiency is to think of Human Morphology as a combination geography and foreign language course. You want to learn the functional topography of the human body and you want to discuss that topography in a universal, exacting tongue. Avoid rote memorization (painful and inefficient). Rather, stress understanding of anatomy (enjoyable and efficient). Rote memorization alone will make your life miserable and will not get you through this course. Frequent use of visual aids is essential for a comprehensive understanding of anatomy and its subdisciplines. The more perspectives from which you view any structure, the better your chance of understanding it and its relationship to others. Various models and projections demonstrating organs and relations are available in the anatomy laboratory. Video programs (on reserve in the library) demonstrating dissections of specific regions can be used as previews or reviews of a dissection. Computer programs (accessible through the Institutional Computer Network) are valuable tools for visualizing, reviewing, and self-testing many aspects of anatomy. We encourage you to make simple line drawings of structures, diagrams of regional boundaries, or "road maps" of pathways to reinforce learning and recall. You will be amazed at how simple line drawings facilitate your recall of complex details. The perennial excuse, "I'm not an artist." only obstructs you from using this highly productive approach to learning. Draw the picture and have an instructor check it for accuracy. It doesn't have to be beautiful to carry a tremendous amount of information in a very small amount of space. Additionally, your atlases are professionally organized arrangements of drawings and photographs that will assist in your work and help your visual recall outside of the laboratory. Still, all of these resources can become more bewildering than they are helpful if you don't approach them from the outset with a clear understanding of what you're looking for. Again, that is the purpose of the study objectives that have been provided for each topic in this course. Those for Gross Anatomy and Embryology are in this syllabus, while those for Histology and Cell Biology are included in Dr. Paulsen's review text.

You are in a position to be both a teacher and a learner. Sharing information, communicating conceptual problems, generating questions, carrying your share of dissection, and demonstrating your dissection are your major responsibilities in this respect. Teamwork within a dissecting group is necessary for an efficient and beautiful dissection. No one person should hold back or retard a dissection team.. At the same time you should never hesitate to ask questions of a classmate, or to answer a classmate's questions. It is in this teaching mode that your learning is most efficient, and the teacher always benefits more than the student from the interaction. Team attitude, cooperation, understanding, sensitivity, and respect for each other are essential to a healthy laboratory relationship.

Learning by direct as well as vicarious exposure, learning how definitive anatomy is derived embryologically, how form and relationships appear in "normal" adult anatomy, and how the body of anatomical knowledge is applied clinically and functionally spells out the philosophy of this course. Throughout, a demonstration of professional attitude, humane respect, and personal sensitivity is expected of you.

BOOKS AND SUPPLIES

BOOKSTORE:

Majors Scientific Books /Engineer's Bookstore
748 Marietta Street NW
Atlanta, GA 30318
404-873-3229

REQUIRED TEXTS:

For all students:

Berman, I. (2003) **Color Atlas of Histology, 3rd edition.** McGraw Hill, New York.

Junqueira, L.C., Carneiro, J. (2003) **Basic Histology, 10th edition.** Lange/McGraw Hill, New York.

Paulsen, D.F., (2000) **Histology & Cell Biology: Examination and Board Review, 4th edition,**
Lange/McGraw-Hill, New York.

Sadler, T.W., (2004) **Langman's Medical Embryology, 9th edition,** Lippincott, Williams &
Wilkins, Philadelphia.

For medical and summer program students:

Alberts, B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P. (2004)
Essential Cell Biology, 2nd edition. Garland Science. New York.

For Ph.D. students:

Alberts, B., Bray, D., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P. (2002) **Molecular
Biology of the Cell, 4th edition.** Garland Pub. Inc. New York.

For medical students:

Sauerland, E.K. (1999) **Grant's Dissector, 12th edition,** Lippincott, Williams & Wilkins,
Philadelphia.

Moore, K.L., Agur, A.M.R. (2002) **Essential Clinical Anatomy, 2nd edition,** Lippincott, Williams
& Wilkins, Philadelphia.

ADDITIONALLY, medical students should select a gross anatomy atlas from the following:

Abrahams, P.H., Marks, S.C. Hutchings, R.T. (2003) **McMinn's Color Atlas of Human Anatomy,**
5th edition. Mosby, St. Louis.

Agur, A.M.R., Dalley, A.F. (2005) **Grant's Atlas of Anatomy, 11th edition,** Lippincott, Williams
& Wilkins, Philadelphia.

Clemente, C., (1997) **Anatomy: A Regional Atlas of the Human Body, 4th edition,** Lippincott,
Williams & Wilkins, Philadelphia.

Netter, F.H. (2003) **Atlas of Human Anatomy, 3rd edition**. Icon Learning Systems, Teterboro, New Jersey.

Rohen, J.W., Yokochi, C., Lutjen-Drecoll, E. (2002) **Color Atlas of Anatomy, 5th edition**. Lippincott, Williams & Wilkins, Philadelphia.

NOTE: Grant's Atlas and Grant's Dissector can be purchased as a package ("Lab Partners package") at a reduced rate

RECOMMENDED additional study aids (if money is no object). The following are recommended additional (not required) materials. We recommend them because they are helpful and interesting supplements to your current studies and valuable resources for later work. We urge you to at least look through these sometime during the course. Copies of all required and recommended texts are on reserve in the library.

REFERENCE TEXTS:

Alberts, B., D. Bray, J. Lewis, M. Raff, K. Roberts, J.D. Watson.(2002) **Molecular Biology of the Cell, 4th edition**. Garland Press, New York.

Barrett, C.P., Anderson, L.D., Holder, L.E., Poliakoff, S.J. (1994) **Primer of Sectional Anatomy with MRI and CT Correlation, 2nd edition**. Lippincott, Williams & Wilkins, Philadelphia.

Bickley, L. (1999) **Bates' Guide to Physical Examination and History Taking, 7th edition**. Lippincott, Williams & Wilkins, Philadelphia.

Dean, D., Herbener, T.E. (2000) **Cross-Sectional Human Anatomy**. Lippincott, Williams & Wilkins, Philadelphia.

Dorland's Illustrated Medical Dictionary, 30th edition. (2003) Saunders, Philadelphia.

Drake, R.L., Vogl, W., Mitchell, A.W.M. (2005) **Gray's Anatomy for Students**. Elsevier/Churchill Livingstone, Philadelphia.

England, M.A., (1996) **Life Before Birth, 2nd edition**, Mosby, St. Louis.

Fawcett, D.W. (1994) **Bloom and Fawcett. A Textbook of Histology, 12th edition**. Chapman & Hall, NY

Goodman, S.R. (1998) **Medical Cell Biology, 2nd edition**. Lippincott, Williams & Wilkins, Philadelphia.

Larsen, W.J., (2001) **Human Embryology, 3rd edition**. Churchill Livingstone, NY

Moore, K.L., and Persaud, T.V.N., (2003). **The Developing Human, 7th edition**. Saunders, Philadelphia.

Standring, S. (2004) **Gray's Anatomy: The Anatomical Basis of Clinical Practice, 39th British Edition**. Elsevier, Philadelphia.

Stedman's Medical Dictionary, 27th edition (2000), Lippincott, Williams & Wilkins, Philadelphia.

REVIEW TEXTS:

Burns, E.R. (1995) **Review Questions for Human Histology**. The Parthenon Publishing Group, Pearl River, NY

Chung, K.W., (2000) **Board Review Series: Gross Anatomy, 4th edition**. Lippincott Williams & Wilkins, Philadelphia.

Dudek, R.W., Fix, J.D. (1998) **Board Review Series: Embryology, 2nd edition**. Lippincott Williams & Wilkins, Philadelphia.

Gartner, L.P., Hiatt, J.L., Strum, J. (2002). **Board Review Series: Cell Biology & Histology, 4th edition**. Lippincott Williams & Wilkins, Baltimore.

Gest, T.R., Anderson J.M., (1995). **Review Questions for Human Embryology**. The Parthenon Publishing Group, Pearl River, NY

Goldberg, S. (1990) **Clinical Anatomy Made Ridiculously Simple**. MedMaster, Inc. Miami, FL

Henrickson, R.C., Kaye, G.I., Mazurkiewicz, J.E., (1997). **NMS Histology**. Lippincott Williams & Wilkins, Baltimore.

Paulsen, D.F., (2000). **Histology & Cell Biology: Examination and Board Review, 4th edition**, Lange/McGraw-Hill, New York.

Snell, R.S. (2000) **Clinical Anatomy. An Illustrated Review with Questions and Explanations. 3rd edition**. Lippincott Williams & Wilkins, Philadelphia.

Tank, P.W., (1996) **Review Questions for Human Anatomy**. The Parthenon Publishing Group, Pearl River, NY

LAB COATS:

Each student is required to wear clean, protective clothing such as a laboratory coat or surgical scrubs while in the dissecting laboratory. Prices vary with item and style. Street clothes are fine for the histology laboratory.

GLOVES:

All students are required to wear suitable dissecting gloves while working in the dissecting laboratory. Latex exam-type gloves best meet this demand. These are relatively durable, disposable gloves that fit most people's hands well enough to allow good grip plus providing

adequate touch sensitivity. **You will need at least one pair of new gloves each time you work in the dissecting room.** The most economical way to buy gloves is to buy by the box (100 gloves/box; sized as small, medium, or large). Individually packaged surgical gloves are very expensive and less hardy. Commercial dish-washing gloves are **not** suitable.

DISSECTING INSTRUMENTS:

You will spend many hours in the physical work of dissection. Attempting to dissect with inappropriate instruments will make dissection a longer, more difficult process, with less sense of personal accomplishment. Therefore, each student must obtain a set of proper dissecting instruments. Pooling instruments is more economical but rarely practical, because you rotate through different dissecting teams and cannot count on being teamed with your pool member(s). You **MUST** have tools readily at hand. The following is the MINIMUM dissecting kit required:

- 1 - Blunt metal probe.
- 1 - Medium (approx. 5 inches) scissors with sharp/sharp tips.
- 1 - Medium (approx. 5 inches) scissors with sharp/blunt tips.
- 1 - #3 scalpel handle
- 1 - #4 scalpel handle
- 1 - 5 inch forceps with transversely ridged (serrated) tips.
- 1 - 5 inch forceps with 1x2 rat-tooth tips.
- 1 - Medium (approx. 5 inches) straight hemostat.
- Assortment of #10 and #22 or #23 blades.

All instruments are shown below. All are available either individually or in full dissection kits at Major's bookstore. Full kits usually are less expensive and include an assortment of scalpel blades. Any instruments you get on your own should be of substantially similar size, weight and style to those shown.

BONE SETS:

A complete set of human real bone skeletal parts will be issued to pairs of students for use throughout the course. You may remove these from the laboratory, but take extreme care to prevent breakage or loss of these fragile and valuable specimens. You are jointly responsible (ethically and financially) for returning these bones at the end of the course, intact, and in clean condition. Do not mark the specimens with pencil, pen, or chalk. Always use a metal probe or fine wire to point out bony details.

MICROSCOPES AND SLIDES:

A brightfield light microscope will be issued to each student for use throughout the course. You automatically will be charged a rental fee for a scope as a part of your tuition and fees for the first year of medical school. You may avoid the scope rental fee if you have your own microscope only if: (1) That scope is judged adequate by the Course Director, (2) It is cleared through the Dean's Office and Business Office. Routine maintenance of the rental scopes will be assumed by MSM; however, expenses incurred for the repair of serious damage to, or replacement of, any part of a rental scope will be considered your responsibility. Each microscope costs approximately \$1,000. We encourage you to treat them kindly.

A set of glass microscope slides will be provided to pairs of students. Each team of two students is

jointly responsible for the care of the loaned set of slides. A replacement charge will be incurred by the team for every damaged or lost slide. **Some advice:** Do not place your slide box close to the edge of the laboratory table where it may be knocked onto the floor; Don't place your slide box on top of your car while you're opening the car. You may end up forgetting it's there and drive off.

LOAN ATLASES:

You are required to buy the Berman histology atlas listed under required books. In addition, each microscope slide team will be loaned four histology atlases (see below) for use during the course. A replacement fee will be charged to the team for lost or damaged atlases.

Erlandsen, S.L., J.E. Magney. (1992) **Color Atlas of Histology**. Mosby Year Book, St. Louis.

Wheater, P.R., Burkitt, H.B. & V. G. Daniels. (1979) **Functional Histology**. Churchill, Livingstone, New York, NY.

diFiore, M.S.H. (1989) **Atlas of Normal Histology, 6th ed.**, V.P. Eroschenko (Ed.) Lea & Febiger, Philadelphia.

Moran, D.T., J.C. Rowley. (1988) **Visual Histology**. Lea & Febiger, Philadelphia.

\$\$\$: Failure to settle outstanding debts incurred during the course will result in the reporting of a grade of incomplete (I) for the course. You cannot be promoted into the second year of medical school with an Incomplete in Human Morphology.

COURSE GRADING

The course is divided into five regional lecture/laboratory units (see the course schedule). Examinations are scheduled around each of these units. **All examination material will be derived from the course study objectives.** Some material overlaps units (e.g., cervical vertebrae in units on the back and head & neck). However, exam subject matter is taken from applicable anatomy. Thus, some anatomy (e.g., cervical vertebrae) may appear on more than one unit exam.

Each unit contains three types of tests: Multiple laboratory quizzes, one written exam, and one practical lab exam. Specific dates/times are listed in the Course Schedule. The written and practical exams are administered on the same day, one immediately following the other. You generally can expect each histology laboratory session to include a quiz on material covered in the previous histology laboratory session. Gross anatomy lab quiz grades will be based on the thoroughness and clarity of your dissection and your ability to demonstrate requested structures, and will be shared equally among members of the dissection team. Histology lab quizzes will include an individual and team component involving identification and demonstration of specific structures on slides and electron micrographs.

Written exams will be mainly of the objective, multiple choice type, using the USMLE (U.S. Medical Licensing Exam) format. Other styles of questions (e.g., essay, short answer, fill-in) also may be utilized. Ph.D. students will take an essay examination in addition to each written Medical Student Exam. Practical exams will be held in the laboratory, and will center around identification of lab materials and functional applications of those structures.

Two external, comprehensive, written, final exams will be administered at the end of the course. These are USMLE style exams (often referred to as the "Anatomy Miniboards"), and are used as anatomy finals by many medical schools. One exam will cover histology and cell biology. The second exam will cover embryology and gross anatomy. Each will contain about 150 questions.

Anyone missing a scheduled examination will, with a legitimate and properly documented excuse, be given a make-up examination only during the make-up period at the end of each semester.

Letter grades will be assigned according to the following numerical scale:

A = 90 - 100%

B = 80 - 89%

C = 70 - 79%

D = 60 - 69%

F = Below 60%

For medical students, the percent contribution of each examination to the final grade will be:

Evaluation	Percentage of Final Grade
Unit 1 Written Exam	7.5
Unit 1 Practical Exam	7.5
Unit 2 Written Exam	7.5
Unit 2 Practical Exam	7.5
Unit 3 Written Exam	7.5
Unit 3 Practical Exam	7.5
Unit 4 Written Exam	7.5
Unit 4 Practical Exam	7.5
Unit 5 Written Exam	7.5
Unit 5 Practical Exam	7.5
Histology & Cell Biology Shelf Exam (miniboard)	10
Gross Anatomy & Embryology Shelf Exam (miniboard)	10
Laboratory evaluations (Quizzes)	5
Total	100.0%

Ph.D. students are permitted to enroll for the entire Human Morphology course. However, only Unit 1 (Cells and Tissues) constitutes a required (core) component of the graduate curriculum. This represents 2 of the 14 credit hours awarded for the full course.

For Ph.D. students, the percent contribution of each examination to the final grade will be:

Evaluation	Percentage of Final Grade
Unit 1 Written Exam	20
Unit 1 Practical Exam	20
Unit 1 Essay Exam	45
Classroom Presentations and Participation	10
Laboratory evaluations (Quizzes)	5
Total	100.0%

Summer program students are permitted to enroll for only Unit 1 (Cells and Tissues) of the entire Human Morphology course.

For summer students, the percent contribution of each examination to the final grade will be:

Evaluation	Percentage of Final Grade
Unit 1 Written Exam	47
Unit 1 Practical Exam	47
Laboratory evaluations (Quizzes)	6
Total	100.0%

When preparing for examinations or reviewing the answers, please remember that **each faculty member covering a particular topic in lecture is responsible for submitting and discussing questions for that topic**. The course director merely assembles the exam from the submitted questions.

A variety of review, study, and self-assessment materials is available for your use in the Multi-Media Center, on the Institutional Computer Network, and in your course materials. These include different sets of review notes, past exams and, most importantly, a series of "practice questions" and tutorials. The question banks contain representative materials covering all course units, in USMLE format. We urge you to make use of these resources throughout the course. By testing yourself in this fashion, you can gauge your progress, review subject matter, and gain experience and familiarity with the various styles of questions that will be used in your examinations.

If you are having difficulty with something, **please talk to the faculty**, especially about their own lecture material. Clarify your questions as soon as they come up. Don't stockpile problems until just before an exam when you might not have the time to deal with them.

ANATOMY LABORATORIES

General Laboratory Rules:

The Anatomy laboratories (HGB 201, 203) are available for your use at all times during the course. Since the laboratories are a learning environment, please extend your respect and consideration to your classmates studying there. A professional attitude and decorum is expected of all students using the Anatomy laboratories. Extracurricular use of the labs must be approved by the Course Director prior to actual use.

1. The dissection laboratory (BMSB 205) is a restricted area. Only those faculty, staff, and students actively participating in Department of Anatomy & Neurobiology courses/research involving human remains are permitted to enter or utilize the laboratory. The laboratory is not to be used for socializing amongst friends, institutional tours, general curiosity, or the like.
2. Cadavers and prosections are to be handled with care and respect at all times. No part of any cadaver or prosection specimen is to be removed from the dissection laboratory under any circumstances.
3. Dry materials (skeletal displays, commercial models, radiographs, etc.) also must be handled with care and respect. Do not remove any of these materials from the laboratory. Always remove your dissecting gloves and clean your hands before handling these learning aids. Use metal probes or wires (NOT pencils and pens) to point out features on bones/models/radiographs. Return dry materials to their proper shelf/table spaces immediately when you finish examining them so that other students may utilize them. Please reassemble any "break down" models you use.
4. Each student is required to wear clean protective clothing and proper dissecting gloves while working on cadavers or prosection specimens.
5. No smoking, food, or beverages are allowed in the laboratory.
6. No photography is permitted in the dissecting laboratory.

Dissection Teams:

You will be assigned to a team of four students at a particular dissecting table, and given the responsibility of dissecting a human cadaver. While you will work primarily at that table, you must study the other cadavers in the lab as well. Always show the same consideration and respect for your classmates' dissections that you expect for your own. ***Do not dissect another team's cadaver.***

For each laboratory session, each team must arrange to have at least one dissection manual (plus a copy of the Dissection Notes), one atlas, and one textbook available. A good approach is to work in pairs and have one person serve as a "reader," and one as a "cutter." Be sure that everyone in the group sees all pertinent relationships at each level of dissection, before structures are altered.

Dissection teams will be reorganized and rotated at each subject unit change. This will serve to accustom you to variation in body form and promote cooperative work habits among all class members.

The responsibility for a thorough, professional dissection must be shared by your entire dissecting team. Cooperation, congeniality, and assistance among team members will yield optimal achievement for each of you. The dissection team assumes care of its assigned cadaver. As the most important instrument in your learning of anatomy, the cadaver must be kept clean, properly covered, and moistened.

Laboratory Care and Safety:

You must wear clean protective clothing (e.g., lab coat, surgical scrubs) and proper dissecting gloves while handling cadavers or prosection specimens. It is your responsibility to keep your laboratory clothing clean, in keeping with a professional appearance and decorum. Your supply of gloves can be stretched by using common sense: Do not double or triple glove, or change gloves each time you walk out on a break. You can wash, dry, and repowder intact gloves, and easily have them last an entire lab session

A container for used scalpel blades is provided in the lab, at the sinks. **Do not** put used blades in any other waste container, or leave them in the cadaver or on instrument trays. At the end of each lab, account for all dissecting instruments in your set, then wash and dry the tools.

Use the waste containers at the dissecting tables for discarded cadaver material only. Place other waste (paper towels, gloves, etc.) in the trash containers provided around the periphery of the lab. Please keep your work/study areas clean.

Take care to avoid spilling fluid or tissue upon the lab floor, as this can be hazardous. Clean the floor of any debris or fluid as soon as it is noticed. Notify Ms. Brown of any large spills or potentially hazardous conditions. The laboratory must be kept neat and clean at all times.

Acquaint yourself with the locations of the wash stations and first-aid kits in the dissecting lab. Minor wounds should be washed, bleeding stopped by application of direct pressure, and dressed if necessary. Major wounds or any emergency arising in the lab must be brought to the attention of the faculty immediately. If no faculty are available, seek assistance from other students and notify the Security Desk immediately. You assume full responsibility for personal injury sustained during anatomical dissections.

We emphasize that the cadavers are to be treated with respect at all times. Each dissection team is responsible for the condition of the body in its charge. Continued exposure of cadaver parts hastens drying of tissues. Therefore, parts and regions of the cadaver that are not in actual use should be well covered and moistened. At the end of each lab session, lower the cadaver into its tank. If there are signs of drying, or if any mold is discovered on the cadaver or its wrappings, notify Ms. Brown immediately.

The cadavers you will be dissecting have been fixed by injection of embalming fluid containing a mixture of chemicals, some of which (formaldehyde and phenol) are known to be toxic. The holding solution in your tanks is dilute phenoxyethanol, a lightly-scented, non-toxic preservative commonly used in first-aid and cosmetic products. Although we try to maximize the use of phenoxyethanol, it may be necessary to reintroduce embalming fluid if poorly fixed regions are discovered. Because there are potential health risks from overexposure to formaldehyde and phenol, we provide the following information about their effects on human tissues. Should you experience any of these symptoms, please notify the course faculty.

Chemical	Tissues	Reaction
Formaldehyde (formalin)	Mucous membranes, eyes, skin.	Irritation, hardening, cracking or ulceration of skin. Conjunctivitis. Respiratory tract irritation or distress. Possible carcinogen after long-term, high- concentration exposure.
Phenol	Skin, eyes, respiratory and digestive tracts, liver, kidneys.	Corneal and respiratory mucosal irritation. Anesthesia of fingers. Whitening or burning of skin. Headache or dizziness. Digestive disturbances. Liver and kidney damage. Contact dermatitis.

HUMAN REMAINS

Most of your practical anatomical studies will revolve around human remains: The cadavers you dissect and the prosections, skeletons, and bone sets you examine. For many of you, this will be your first direct exposure to death and human remains. Additionally, the dissection room is a very different environment from that of a hospital, morgue, or funeral home. It is not unusual for this situation to evoke uncertain or uneasy emotions. You will get over these quickly, as you become involved in your studies. However, don't put your emotions aside completely; don't ignore your more philosophical thoughts. Remember that you are learning from the remains of once living people. As such, the cadavers and skeletons deserve the same respect and dignity that you expect for yourself and will extend to your future patients. When you experience the philosophical side of gross anatomy, feel comfortable to talk about it with your classmates and/or the faculty. Further, it behooves you, as a medical professional, to gain some insight into the use of human remains in medical education.

The Morehouse School of Medicine is granted the privilege of providing human materials for its students with the understanding that these shall be used for purposes of instruction or research only, as legislated by the Georgia Anatomical Gift Act of 1969, and administered by the Anatomical Board of Georgia. Traditionally, Anatomy Departments relied upon the bodies of the indigent and unidentified dead for dissection cadavers. This has not been the case in Georgia for some years now. Most of the cadavers you will dissect were willed by people who wish to help medical education by leaving their bodies to science. Some cadavers will not have eyes, as these were

removed soon after death for use in eye banks.

In many cases, the donor's family has held a private memorial service without the presence of the body. Following dissection, all remains of the cadavers are cremated. If the family requests, the ashes are returned to them for private interment. If not requested for return, the ashes are buried with a memorial service in a cemetery plot owned and administered by the Anatomical Board of Georgia. No expenses are charged to the estate of the deceased after receipt of the body.

There is a common misconception by the general public that medical schools pay a fee to body donors for their "donations." However, this is not true. Neither we nor any other institution pays living persons for the promise of their bodies at their deaths. Living persons are not allowed to sell us their bodies. Medical schools do pay fees for cadavers. However, these are administrative costs, covering embalming, transportation, and cremation, and are paid to a licensed preparator (at present, Emory University in this area).

At some time, you may have the opportunity to answer questions about the use of human remains in medical education. Should family, friends, or members of the public ask you about donating their bodies after death to medical schools, we hope you will acknowledge the importance of such gifts, encourage them, and assure them that their donations are greatly appreciated and that their bodies would not be subject to unnecessary indignity. If you would like further information regarding willed body programs, contact Dr. Wineski.

WEBSITES

You may find the following websites to be helpful adjuncts to your studies. All have been reviewed by MSM faculty and/or students. This certainly is not a comprehensive listing of all relevant websites. If you discover additional sites that you find useful, please pass them on to the faculty and your fellow students.

General:

American Association of Anatomists

<http://www.anatomy.org> Follow the links to Education & Teaching Tools/Anatomy Links.

This is the official website of the American Association of Anatomists. It houses links to numerous educational, professional, and commercial sites that cover anatomy and broader aspects of medical training.

Integrated Medical Curriculum

<http://imcip.gsm.com/>

The Gold Standard Multimedia Group produces high quality CD-ROMs on the topics of Human Anatomy, Cross-Sectional Anatomy, Radiologic Anatomy, Essentials of Human Physiology, Microscopic Anatomy, Essentials of Immunology, The Doctor's Dilemma (an ethics case study exercise), and Clinical Pharmacology. MSM has purchased all that are applicable to the Human Morphology Course. However, now they are also available on the Integrated Medical Curriculum web site at www.imc.gsm.com. Users must register to use the site, but it is free of charge. The site has over 6,000 cadaveric images, and over 1,200 histology slides plus much more. It is an excellent resource.

Medical Terminology:

<http://www.dmu.edu/medterms/index.htm>

A short course in medical terminology.

Gross Anatomy:

Medical Gross Anatomy - University of Michigan School of Medicine.

<http://med.umich.edu/lrc/coursepages/M1/anatomy/html/home.html>

Lots of anatomy material here.

Get Body Smart - Gross Anatomy.

<http://www.Getbodysmart.com>

Wonderful flash animation teaching aids for gross anatomy, including quizzes.

Radiology:

Radiologic anatomy.

<http://www.rad.washington.edu/radanat/>

Radiology file with and without labels.

Radiology of the chest.

<http://www.vh.org/adult/provider/radiology/icmradiology/chest/chest.html>

Virtual hospital introduction to chest radiology. View x-rays under "normal anatomy."

Histology:

LUMEN - Histology: Loyola University School of Medicine.

http://www.meddean.luc.edu/lumen/MedEd/Histo/frames/histo_frames.html

Contains histology images by topic as well as practice exams.

JayDoc Histology: Kansas University Medical Center.

<http://www.kumc.edu/instruction/medicine/anatomy/histoweb/>

Nice site, divided by topics.

HistoBank-Interactive Histology Atlas: National Institutes of Health.

<http://histology.nih.gov/>

Anatomy-Histology Tutorials: University of Utah School of Medicine.

<http://www-medlib.med.utah.edu/WebPath/HISTHTML/HISTO.html>

General Histology: University of Southern California School of Dentistry.

<http://www.usc.edu/hsc/dental/ghisto/>

Ed's Basic Histology Gallery: University of Health Sciences, Kansas City.

<http://www.pathguy.com/histo/000.htm>

Human Microscopic Anatomy Course Site: University of California, Davis.

<http://alice.ucdavis.edu/CHA/402/course.htm>

Embryology:

McGill University Embryology.

<http://sprojects.mmi.mcgill.ca/embryology/>

Nice reviews of topics in medical embryology.

Human Embryo developed for NOVA (PBS).

<http://www.pbs.org/wgbh/nova/odyssey/clips/movhum.html>

Time lapse sequences of the human embryo available in different formats (e.g., QuickTime, AVI).

Carnegie stages.

<http://anatomy.med.unsw.edu.au/cbl/embryo/Movies/Movies.htm>

University of New South Wales, Australia, has a nice collection of QuickTime movies covering different Carnegie stages.

University of Pennsylvania: "Basic Embryology Review Program."

<http://www.med.upenn.edu/meded/public/berp/>

This lists movies on a variety of topics, including an animation of the development of the limbs:

<http://www.med.upenn.edu/meded/public/berp/overview.mov>

The Multidimensional Embryo.

<http://embryo.soad.umich.edu/index.html>

Developed by The National Institute of Child Health and Human Development (NICHD), this is a human embryo atlas consisting of MRI images. All slices in all three planes can be viewed.

Cell Biology:

Judy Kimball's Pages.

<http://www.ultranet.com/~jkimball/BiologyPages>

This is useful for Dr. Thomas' material. Look under the alphabet for specific topics (e.g., C for Cell cycle, N for nucleus).

Cell Biology Link.

<http://193.175.244.148/index.html>

Link found and recommended by MSM students.

VIDEO PROGRAMS

MSM has a large number of commercial video-tape programs available for your use. Some of these will be shown during class hours, as supplements to appropriate lectures or labs. All programs are available at the Reserve Desk in the Library. We strongly urge you to check out these tapes, and use them as part of your study-plan. You will find these materials to be extremely helpful in previewing and reviewing specific topics. The listing below is a complete catalog of the video-tape programs pertinent to this course.

- I. Cine Prosector Series (CP) - 20 titles
 1. Axillary Walls
 2. Axillary Contents
 3. Muscles of the Anterior Forearm
 4. The Palmar Hand. Part I: Orientation
 5. The Palmar Hand. Part II: Intrinsic Muscles
 6. Spinal Cord and its Relations
 7. Anterolateral Abdominal Wall
 8. Inguinal Region
 9. Gluteal Region and Hip Joint
 10. Anterior Thigh and Femoral Triangle
 11. Knee Joint
 12. Duodenum, Pancreas, and Biliary System
 13. Female Pelvic Viscera
 14. Male Perineum
 15. Thoracic Mediastinum
 16. Neck. Part I: Orientation, Fascia, Superficial Structures
 17. Neck. Part II: Visceral and Neurovascular Units
 18. Neck. Part III: Root and Thoracic Inlet
 19. Muscles of Mastication and Infratemporal Fossa
 20. Pterygopalatine Fossa

- II. Skeletal and Topographic Anatomy Series (STA) - 30 titles
1. Introduction to Topographic Anatomy: Anatomical Position, Orientation, and Movements
 2. Skeletal Features of the Skull, Part I: The Cranium
 3. Skeletal Features of the Skull, Part II: The Face
 4. Skeletal Features of the Skull, Part III: Vascular Structures
 5. Skeletal Features of the Skull, Part IV: Neural Structures
 6. Topographic Anatomy of the Head and Neck, Part I: The Neck
 7. Topographic Anatomy of the Head and Neck, Part II: The Face
 8. Topographic Anatomy of the Head and Neck, Part III: The Cranium
 9. Topographic Anatomy of the Head and Neck, Part IV: The Oral Cavity
 10. Skeletal Features of the Upper Extremity
 11. Topographic Anatomy of the Upper Extremity, Part I: Shoulder, Axilla, Arm, and Elbow
 12. Topographic Anatomy of the Upper Extremity, Part II: Forearm, Wrist, and Hand
 13. Skeletal Features of the Lower Extremity
 14. Topographic Anatomy of the Lower Extremity, Part I: Femoral, Gluteal, and Popliteal Regions
 15. Topographic Anatomy of the Lower Extremity, Part II: Knee, Leg, Ankle and Foot
 16. Topographic Anatomy of the Upper and Lower Extremities: Nerve Injury
 17. Skeletal Features of the Thorax
 18. Topographic Anatomy of the Thorax, Part I: External Features
 19. Topographic Anatomy of the Thorax, Part II: Internal Features
 20. Topographic Anatomy of the Abdomen
 21. Skeletal Features of the Pelvis
 22. Topographic Anatomy of the Pelvis, Perineum, and Inguinal Region
 23. Skeletal Features of the Vertebral Column
 24. Topographic Anatomy of the Back
 25. Topographic Anatomy of Articular Sites, Part I: General and Axial
 26. Topographic Anatomy of Articular Sites, Part II: Appendicular (Upper Extremity)
 27. Topographic Anatomy of Articular Sites, Part III: Appendicular (Lower Extremity)
 28. Postnatal Development of the Skeleton, Part I: The Skull
 29. Postnatal Development of the Skeleton, Part II: Vertebral Column and Extremities
 30. Postnatal Development of the Skeleton, Part III: Deciduous and Permanent Dentition
- III. Dissection of the Thorax (DT) - 4 titles
1. Part I: The Thoracic Wall
 2. Part II: Pleurae and Lungs
 3. Part III: Middle Mediastinum
 4. Part IV: Posterior and Superior Mediastina

- IV. Skull Anatomy Series (SA) - 9 titles
 - 1. Introduction
 - 2. The Facial Region
 - 3. The Temporal and Infratemporal Region
 - 4. The Cranial Cavity
 - 5. The Orbit
 - 6. The Base of the Skull
 - 7. Nasal Cavities
 - 8. The Oral Cavity
 - 9. Pterygopalatine Fossa

- V. Muscles of Facial Expression (MFA) - 1 Title

- VI. Neuroanatomy Series (NA) - 1 Title
 - 1. The Human Brain in Dissection, Part III: The Meninges and Dural Venous Sinuses

- VII. Anatomy of the Human Eye Series (AHE) - 7 Titles
 - 1. The Orbit
 - 2. The Extraocular Muscles
 - 3. The Visual System: The Globe
 - 4. The Visual System: The Visual Pathway
 - 5. The Anterior Adnexa
 - 6. The Circulation
 - 7. The Nerves

- VIII. The Development of Bone (DB) - 1 Title

STUDENT EVALUATION OF INSTRUCTION IN BASIC MEDICAL SCIENCES AND OTHER FIRST AND SECOND YEAR COURSES

INSTRUCTIONS: ANSWER THE NUMBERED ITEMS IN SECTIONS A, B, AND C USING THE FOLLOWING SCALE:

5 = Strongly Agree 4 = Agree 3 = Disagree 2 = Strongly Disagree 1 = Unable to Determine or Not Applicable

A. Course Organization & Presentation

1. The learning objectives of this course are clearly stated in the syllabus.
2. Assigned readings are clearly matched with subject matter/lecture topics.
3. Course policies are clearly stated in the syllabus.
4. The material covered on each exam is clearly identified in the course schedule.
5. The lecture schedule is clearly presented in the syllabus.
6. The lecture topics are logically sequenced and provide a coherent flow of information.
7. Overall, this course was well organized and well presented.

B. Didactics & Learning Experience

8. Assigned readings were valuable to your understanding of the subject matter.
9. Interactive learning experiences (e.g., problem-solving, discussions) were included to assist understanding of the subject matter.
10. Reference to other courses and subjects was made to enhance understanding and integration of knowledge of this subject.
11. A reasonable number of quality practice examination questions were made available for self-progress evaluation.
12. Course examination questions related to learning objectives.
13. A reasonable period of time was allotted to complete examinations.
14. The clinical relevance of the subject matter was brought to your attention.
15. Examinations were challenging and fairly tested the subject matter.

[Questions 16 - 20 pertain to laboratory courses; answer where applicable to the course being evaluated]

16. Laboratory exercises facilitated learning the subject matter.
17. Laboratory manuals and instructions were explicit and clearly written.
18. Objectives of laboratory learning were clearly stated.

19. Sufficient equipment and materials were available to complete laboratory exercises in a timely fashion.
20. Instructor/student ratio was adequate to permit completion of laboratory objectives and exercises.

C. Evaluation of Individual Instructors (Use individual answer sheet for each Instructor)

5 = Strongly Agree 4 = Agree 3 = Disagree 2 = Strongly Disagree 1 = Unable to Determine or Not Applicable

1. Presented well-organized lectures covering stated learning objectives.
2. Encouraged thinking and class participation.
3. Responded well to questions (regardless of whether an answer was available).
4. Spoke clearly.
5. Paced conversation to maximize note-taking.
6. Highlighted key points and concepts.
7. Helped students having difficulty understanding the material.
8. Appeared to be well-prepared.
9. Demonstrated confidence in lectureship.
10. Used examples and illustrations to reinforce discussion.
11. Was respectful of students' comments and points of view.
12. Clearly explained abstract ideas and difficult concepts.
13. Summarized the topic matter at appropriate intervals.

D. Please provide answers to the following questions:

1. Approximately what percent of classes did you attend in this course?
2. Did you complete most reading assignments, work exercises and other suggested learning experiences?
3. What did you like best about the course?
4. What did you like least about the course?
5. Based upon your experiences in this course, do you believe you have a sufficient fund and command of knowledge to achieve a passing score in this subject matter on the NBME Part I?

COMMENTS: For those items answered negatively in sections A and B, please provide constructive criticism and suggestions for improvement below:

COMMENTS: Please provide any suggestions you may have on improving the areas you perceive to be deficient or unsuitable below:

Please provide any written comments you believe to be appropriate and pertinent to each Instructor's evaluation:

DEPARTMENT: ANATOMY

Instructor:

Instructor:

Instructor:

Instructor:

Instructor:

STUDY OBJECTIVES

The most difficult aspect of this course is organizing your time to allow uptake and retention of a large quantity of information in a limited amount of time. To help you organize yourself, this syllabus contains lists of study objectives. The general objectives, listed below, apply to all course material. The specific unit objectives are important guides to pertinent topics in each subject unit.

Consider these carefully as you progress through the relevant dissections and lectures.

Remember, all examination material will be derived from the study objectives.

GENERAL COURSE OBJECTIVES

1. Spell and pronounce anatomical terminology correctly and precisely.
2. Identify, differentiate and/or delimit body regions, organ systems, organs, and subdivisions of organs of the human body.
3. Recognize in situ relationships of bones, muscles, nerves, blood vessels, and organs.
4. Delineate surface projections of internal structures and their components.
5. Correlate structure and function of organs and organ systems.
6. Integrate gross and microscopic continuities of organs and organ systems within and among body regions.
7. Describe how organogenesis of systems accounts for the disposition of organs in the adult body.
8. Describe major congenital anomalies of organs or regions.
9. Identify major structures and relationships in radiographs and other standard medical images.
10. Predict the significance or consequence of pathology from a knowledge of normal anatomy.
11. Identify the organs and organ systems of the human body in dissection.
12. Develop a three-dimensional working knowledge of the composition of the human body by the integration of its component parts.

SPECIFIC STRUCTURE OBJECTIVES - A SAMPLE PLAN FOR GROSS ANATOMY

The outline below provides a precise method for organizing gross anatomical information. You may find this an effective study methodology. For each structure encountered in class, ask yourself the appropriate questions listed. Remember, use the outline only in the context of structures presented in dissection and lecture; do not attempt to assimilate every structure noted in your textbook.

BONE

1. Location.
2. Articulation(s).
3. Developmental type (membrane or endochondral).
4. Growth centers (primary and secondary).
5. Maturation age.
6. Muscle, tendon, ligament attachments.
7. Neurovascular or other structures housed or conveyed.
8. Surface projection and palpable points.
9. Effect of fracture.

JOINT

1. Type (classification and range of motion permitted).
2. Bones involved (specific parts of bones concerned).
3. Extent and attachment of capsule and lining.
4. Supporting extra-articular ligaments and muscles.
5. Intra-articular structures (articular disc and/or ligaments).
6. Movement caused by each muscle affecting joint.
7. Innervation.
8. Blood supply and drainage.

MUSCLE

1. Origin
2. Insertion.
3. Structure (subdivisions, fiber direction, pinnation, etc.).
4. Action (on what joint or joints - type of action).
5. Innervation.
6. Blood supply.
7. Relations.
8. Antagonist(s).
9. Effect of loss.
10. Surface projection and/or palpation.

BLOOD VESSEL

1. Artery or vein.
2. Origin (from what other vessel).
3. Course & relations (subdivide into parts if needed).
4. Named branches (where each originates).
5. Area supplied or drained by each named branch (give specific area).
6. If any branches have named divisions, list these.
7. Companion structures.
8. Major anastomotic connections and collateral routes.
9. Effect of blockage.
10. Surface projection and/or palpation.

NERVE

1. Functional components
2. Origin of fibers.
3. Course and relations of fibers.
4. Target(s) of fibers.
5. Location of cell bodies of fibers concerned.
6. If visceral innervation is of concern:
 - a. Afferent & Efferent.
 - b. Parasympathetic & Sympathetic.
 - c. Origin & course of preganglionic fiber.

- d. Location of synapses.
- e. Origin, course, and target of postganglionic fiber.
- f. Location of cell bodies for all fibers concerned.
- 7. Effect of loss.
- 8. Surface projection and/or palpation.

ANATOMICAL SPACE OR AREA

- 1. Location.
- 2. Boundaries.
- 3. Contents and/or transients.
- 4. Surface projection and/or palpation point(s).

ORGAN

- 1. Definition (type).
- 2. Location.
- 3. Relations (contacts).
- 4. Structure (size, shape, lobes, fissures, ducts, stroma, parenchyma, etc.).
- 5. Function.
- 6. Blood supply and drainage.
- 7. Innervation.
- 8. Lymphatic drainage.
- 9. Developmental history.
- 10. Effect of loss or pathology.
- 11. Surface projection and/or palpation.

LYMPHATIC DRAINAGE

- 1. Area(s) drained.
- 2. Course of channels from area drained to nodal groups.
- 3. Names of node groups.
- 4. Location of node groups.
- 5. Routes of drainage from node groups to next major node groups.
- 6. Tap-in with venous system.
- 7. Palpation points of nodal groups.
- 8. Function.

SPECIFIC STRUCTURE OBJECTIVES - A SAMPLE PLAN FOR HISTOLOGY

The outline below provides a precise method for organizing histologic information. You may find this an effective study methodology. For each structure encountered in class, ask yourself the appropriate questions listed. At a minimum, you should know the structure, function and location of each named structure.

Organelles:

1. **Structure** and biochemical composition
2. Marker enzymes or unique proteins present
3. **Function(s) and Clinical Significance**
4. **Location**
 - a. Position in the cell
 - b. Cell types in which each organelle is especially well represented

Cells:

1. **Structure**
 - a. Size
 - b. Shape
 - c. Nuclear morphology
 - 1) Size
 - 2) Shape
 - 3) Position in tissue or organ
 - 4) Nucleocytoplasmic ratio
 - 5) Chromatin density
 - d. Organelles and types that are characteristic or especially well represented
2. **Function(s) and Clinical Significance**
3. **Location**
 - a. Tissues and organs in which the cell type is characteristically found
 - b. Specific sites in which the cell type is typically found
4. **Embryonic Lineage**
 - a. Embryonic germ layer of origin (e.g., mesoderm, endoderm, ectoderm, neural crest)
 - b. Intermediate tissues of origin where particular maturation steps have taken place.
 - c. Major changes in cell structure occurring during maturation.

Tissues:

1. **Structure**
 - a. Tissue components (e.g., cell types, extracellular materials, etc)
 - b. Relative amounts of each component
 - c. Arrangement of the components
2. **Function(s) and Clinical Significance**
3. **Location**
 - a. Organs in which the tissue type is characteristically found
 - b. Position in the organ in which the tissue type is characteristically found
 - c. Specific sites in the body in which the tissue type is typically found

4. ***Embryonic Lineage***
 - a. Embryonic germ layer of origin (e.g., mesoderm, endoderm, ectoderm, neural crest)
 - b. Histogenesis: changes occurring to change a cluster of embryonic cells into this particular tissue.

Organs:

1. ***Structure***
 - a. Cell and tissue components characteristically found in each organ
 - b. Arrangement of characteristic cells and tissues
2. ***Function(s) and Clinical Significance***
3. ***Location***
 - a. Position in the body
 - b. Relation to adjacent or connecting organs (overlap with Gross)

Organ systems:

1. ***Structure:*** Organs and tissues comprising the system and their composite shapes and relative sizes
2. ***Function(s) and Clinical Significance***
3. ***Location:*** Position of the system and each of its components in the body

SPECIFIC UNIT STUDY OBJECTIVES - GROSS ANATOMY & EMBRYOLOGY
(Study Objectives for cell biology and histology topics are located in Dr. Paulsen's book)

UNIT 1: GENERAL EMBRYOLOGY

- I. Early Development (fertilization through week 3)
1. Describe the major steps in the process of fertilization, beginning with ovulation and the release of spermatozoa into the vagina. Include a discussion of:
 - a. Germ cell viability (life-span).
 - b. Location of fertilization.
 - c. Sperm entry.
 - d. Changes occurring in the ovum and spermatozoan.
 - e. Fusion of pronuclei.
 - f. Results of fertilization.
 2. Describe the processes of cleavage of the zygote and implantation of the blastocyst. Include definitions of: cleavage, blastomere, morula, blastocyst, inner cell mass (embryoblast), outer cell mass (trophoblast), blastocyst cavity (blastococele).
 3. Define ectopic pregnancy. Note the most common sites of abnormal implantation and discuss the consequences of such conditions.
 4. Trace the differentiation of the trophoblast. Include definitions of cytotrophoblast and syncytiotrophoblast. Note the fate of each.
 5. Trace the development of the bilaminar germ (embryonic) disc and surrounding structures. Include definitions of: epiblast (ectoderm), hypoblast (endoderm), bilaminar germ disc, amniotic cavity, exocoelomic cavity (primitive yolk sac), extra-embryonic coelom (chorionic cavity), connecting stalk (primitive umbilical cord), secondary (definitive) yolk sac, prochordal plate.
 6. Trace the development of the trilaminar germ (embryonic) disc. Include definitions of: primitive streak, primitive node (knot), invagination, intra-embryonic mesoderm, gastrulation, cardiogenic plate, cloacal plate (membrane), allantois.
 7. Trace the development of the notochord. Include definitions of: primitive pit, notochordal (head) process, notochordal (central) canal, notochordal plate, notochord. Note the functional significance of the notochord in later development. Note the adult remnant of the notochord.
 8. Trace the early development of the central nervous system. Include definitions of: induction, neural plate, neural folds, neural groove, neural tube, neuropore, spinal cord, brain vesicles, neural crest. Note the derivatives of the neural crest.
 9. Trace the early differentiation of intra-embryonic mesoderm. Identify: paraxial mesoderm, lateral plate mesoderm, intermediate mesoderm, somatic (parietal)

mesoderm, splanchnic (visceral) mesoderm, intraembryonic coelom, somites, sclerotome, mesenchyme, dermatome, myotome, blood islands.

10. Describe the establishment of general body form resulting from folding of the embryonic disc. Note the main processes that contribute to cephalocaudal and lateral folding. Explain the effect of folding on the formation of the body cavities, on the gut tube, yolk sac, allantois, umbilical cord, and heart. Include definitions of: intra-embryonic coelom, parietal and visceral serous membranes, vitelline duct, head and tail folds, buccopharyngeal membrane, cloacal membrane.
 11. Summarize the sequence of major events occurring during each of the first three weeks of development.
- II. The Embryonic Period (weeks 4-8).
1. Explain why the embryonic period constitutes the most critical period of human development. Differentiate between embryology and teratology.
 2. Outline the contributions of each of the germ layers to the different tissues and organs of the embryo.
- III. The Fetal Period (week 8 to birth)
1. Describe the significant differences in development during the embryonic vs. fetal periods. Include outlines of the major external features that appear during each period. Comment on the differences in vulnerability to teratogenic agents.
 2. Define "congenital malformation." Discuss the causes and incidences of congenital malformations under each of the following headings, giving examples of some characteristic malformation patterns:
 - a. Environmental factors: infectious agents, radiation, chemical agents, nutrition.
 - b. Chromosomal and genetic factors: numerical abnormalities, structural abnormalities.
 - c. Environmental AND genetic factors
 3. Describe the basic principles of teratogen action, with special emphasis on the differences between predifferentiation stage, embryonic period, and fetal period exposures.

UNIT 2: GENERAL ORIENTATION

1. Define the anatomical position, the major planes of section, and the primary terms of direction used in anatomical descriptions.
2. Define the primary movements utilized in anatomical descriptions.

UNIT 2: ORGANIZATION OF THE BACK

1. Identify the bones of the back and their major features. Describe the functional aspects of these structures. Identify these structures on standard radiographic images.
2. Identify the regions of the vertebral column. Determine the number of vertebrae in each region. Define the characteristic features of a typical vertebra in each region.
3. Identify the components of a typical embryonic vertebra and their fate in each region of the adult vertebral column. Describe the embryonic basis of:
 - a. Cervical rib
 - b. Spina bifida
4. Compare and contrast the normal curvatures of the vertebral column in a midterm fetus, young child, and an adult. Identify the features, and describe the clinical significance of:
 - a. Kyphosis.
 - b. Lordosis.
 - c. Scoliosis.
5. Identify the intervertebral joints. Define their structural types, and describe the movements allowed within each of the regions of the vertebral column.
6. Identify the components of the intervertebral disc, the embryonic source of each, and the functional significance of each. Describe the anatomical basis of a herniated disc.
7. Identify the arterial supply and venous drainage of the vertebral column and spinal cord. Describe the topography and major anastomoses of the vertebral venous plexuses. Describe the significance of this network in collateral circulation and metastasis of cancer.
8. Identify the muscles of the back, according to (1) Topographic layers, (2) Extrinsic vs. intrinsic components. Identify the attachments, innervation, and major actions of the muscles. Predict the functional consequences of lesions of specific motor nerves and paralysis of associated muscles.
9. Describe the boundaries and major contents of the suboccipital triangle.

UNIT 2: ORGANIZATION OF THE NERVOUS SYSTEM: SPINAL CORD AND SPINAL NERVES.

1. Identify the major subdivisions of the nervous system. Define the functional components of a typical spinal nerve.
2. Define “segmentation” of the spinal cord. Describe the components of a typical spinal cord segment, including the formative structures of a typical spinal nerve. Describe the relationship of each to the spinal meninges and to a typical intervertebral articulation. Trace the distribution of a typical spinal nerve.

3. Identify the spinal meninges, the spaces between them, and the major contents of each space. Describe the functions and clinical significance of each.
4. Describe the development of the neural tube in relation to that of the vertebral column. Identify the features of spina bifida.
5. Describe the developmental changes in the length of the spinal cord relative to the vertebral column. Note the location of the spinal segments, and the relationship of spinal roots and nerves to the intervertebral spaces in an embryo, newborn, and adult. Describe the relationship between herniated intervertebral discs and specific spinal roots and nerves in the cervical and lumbar regions.
6. Describe the anatomical basis for and clinical significance of a lumbar puncture.
7. Define a dermatome. Contrast this with the cutaneous territory of a peripheral nerve.

UNIT 2: ORGANIZATION OF THE NERVOUS SYSTEM: AUTONOMIC NERVOUS SYSTEM

1. Describe the general organization of the autonomic nervous system. Differentiate between sympathetic and parasympathetic components and pathways, and preganglionic and postganglionic elements.
2. Define the basic functions of the autonomic nervous system. Differentiate between sympathetic and parasympathetic functions.
3. Describe the development of the autonomic nervous system.
4. Describe the specific pathways involved in the autonomic innervation of the body wall and limbs, head and neck, and internal organs.

UNIT 2: ORGANIZATION OF THE UPPER LIMB

1. Identify the specific anatomical regions of the upper limb.
2. Identify the bones of the upper limb and their major features. Describe the functional aspects of these structures. Identify these structures in standard radiographic and cross-sectional images.
3. Describe the major steps in development of the upper limb.
4. Define the components of the shoulder complex. Identify the muscles of the shoulder, indicating their attachments, innervation, and major actions.
 - a. Identify the muscles composing the "rotator cuff." Describe the functional significance of this group.

5. Identify the quadrangular and triangular spaces of the shoulder. Describe the contents and functional significance of each.
6. Describe the general structure of the female breast and its relationship to the thoracic wall. Describe the lymphatic drainage of the breast and the anatomical bases for various degrees of mastectomy.
7. Define the boundaries of the axilla. Identify its contents.
8. Identify the brachial plexus and its component parts, from spinal segmental sources to terminal branches.
9. Trace the course of motor and cutaneous innervation in the upper limb.
 - a. Identify the spinal segmental level(s) of origin and relationship to the brachial plexus of each major peripheral nerve.
 - b. Predict the functional consequences of lesions to specific spinal levels and individual peripheral nerves.
10. Define the osseofascial compartments of the upper limb.
 - a. Identify the muscles contained in each compartment.
 - b. Describe the attachments, innervation, and major actions of each muscle.
 - c. Describe the innervation of each compartment as a whole, and the major actions governed by that innervation.
 - d. Predict the functional consequences of loss of action of each muscle and each compartment.
11. Trace the flow of blood from the subclavian artery to and through the upper limb by describing the courses and branching patterns of the major arteries and veins. Note:
 - a. The main collateral routes around the shoulder.
 - b. The main collateral routes around the elbow.
 - c. The composition and anastomoses of the palmar arterial arches.
 - d. The territories supplied and drained by the major vessels.
12. Describe the pattern of lymphatic drainage of the upper limb, including the relationship of this drainage to that of the axilla and breast.
13. Identify the boundaries of the cubital fossa. Identify its contents.
14. Describe the mechanisms of pronation and supination. Identify the muscles involved, their sites of attachment, and their innervation.
15. Define the carpal tunnel. Describe the topographic relationships of the main muscle tendons, nerves, and blood vessels to the carpal tunnel. Describe the clinical significance of this arrangement in the context of carpal tunnel syndrome.

16. Describe mechanics of precision movements of the hand and digits. Note the movements of the thumb vs. the other digits. Describe the interaction of the extrinsic and intrinsic muscles, retinacula, and fibrous digital sheaths. Describe the relationship between the extensors of the digits and the lumbrical and interosseous muscles.
17. Describe the arrangement of the synovial sheaths in the wrist and hand. Describe the clinical significance of this patterning.
18. Define the "anatomical snuff box." Identify its major contents.
19. Identify the bony components, major supporting ligaments, key accessory structures (e.g., intraarticular discs), and movements permitted at the shoulder, elbow, and wrist joints. Describe the characteristic features of the major disorders of each joint.
20. Identify the surface projections and palpation points of the major structures of the upper limb in a basic surface examination.

UNIT 3: ORGANIZATION OF THE THORAX

1. Identify the bones and joints of the thoracic cage and thoracolumbar spine, and their major features. Describe the functional aspects of these structures.
2. Describe the structure of the thoracic wall, including the composition of a typical intercostal space. Note the arrangement of the intercostal muscles and the neurovascular elements. Describe the collateral routes and anastomotic connections of the arteries.
3. Identify the major subdivisions of the thoracic cavity and list their contents. Identify the mediastinum. Define its subdivisions and list their contents.
4. Identify the boundaries and contents of the pleural cavities. Identify the parietal and visceral pleurae, their different components, and the innervation of each. Identify the pleural recesses, and the boundaries of the pleura in projection onto the body surface. Describe the clinical significance of these arrangements in terms of access to the pleural cavities.
5. Identify the lobes and fissures of the lungs. Identify the impressions made on the surfaces of each lung by surrounding structures. Identify the surface projections of the lungs.
6. Identify the primary, secondary, and tertiary branches of the bronchial tree and of the pulmonary arteries and veins. Define a bronchopulmonary segment. Describe the clinical significance of this segmentation.
7. Identify the pericardial sac. Describe its relationship to the pleurae and diaphragm, and its surface projections. Differentiate between parietal and visceral pericardia, and the composition of each.

8. Describe the courses and relationships of the major longitudinal structures (trachea, esophagus, vagus nerve, phrenic nerve, aorta, sympathetic network, azygous system, thoracic duct) running through the thoracic cavity.
9. Trace the flow of blood in the azygous venous system. Identify its collateral connections to other venous tracts.
10. Identify the surface projections of the major thoracic structures in a basic surface anatomy examination.
11. Identify the major structures of the thorax in radiographic and cross-sectional examinations.

UNIT 3: FUNCTIONAL ANATOMY OF THE HEART

1. Identify the gross structures of the heart, including the fibrous cardiac skeleton.
2. Trace the course of blood through the heart. Identify the internal structures of each chamber, including the structure of each of the valves.
3. Identify the elementary sounds of the normal heart. Relate these to the flow of blood through the heart and the actions of its valves.
4. Describe the surface anatomy of the heart in the context of the location of its chambers.
5. Identify the structures that form the borders of the mediastinal shadow in a normal chest radiograph. Identify the major structures of the heart in normal cross-sectional imaging of the chest.
6. Identify and differentiate the anatomical and auscultation surface projections of each of the cardiac valves.
7. Trace the course of blood through each of the major coronary vessels. Identify which vessels provide the main supply to and drainage from each of the chambers and the interventricular septum. Describe the main collateral pathways. Describe the anatomical basis of coronary artery dominance.
8. Describe the conducting system and extrinsic innervation of the heart.

UNIT 3: DEVELOPMENT OF THE CARDIOVASCULAR SYSTEM

1. Describe the development of the heart from the cardiogenic cord stage to the attainment of adult form. Note the:
 - a. Histogenesis of the heart wall.
 - b. Formation of the heart loop and external form.
 - c. Partitioning of internal structures and formation of the definitive chambers, valves, and roots of the great vessels.

2. Describe the "theoretical" arterial arch plan. Trace the major steps in the development of the embryonic aortic arch system. Identify the fate of each aortic arch in the development of the adult arterial system.
3. Compare and contrast the pattern of blood flow (both cardiac and systemic circuits) in the fetus and adult. Note the differences in oxygen tension levels, and the functional roles these play. Describe the changes that occur at and after birth, and the functional/clinical significance of failures of normal neonatal changes.
4. Describe the features of the major congenital defects in heart and aortic arch formation, and their developmental bases. Note the characteristics of the newborn that would indicate the occurrence of each of these defects. Include the following: atrial septal defects, atrioventricular canal defects, atrioventricular and semilunar valve defects, ventricular septal defects, tetralogy of Fallot, transposition of great vessels, patent ductus arteriosus, coarctation of aorta, double aortic arch, dextrocardia.

UNIT 3: ABDOMINAL WALL

1. Identify the surface regions of the abdominal wall. Describe the projections of the major internal organs onto these surface regions.
2. Identify the layers of the abdominal wall. Describe the formation of the rectus sheath at various levels.
3. Describe the organization of the neurovascular supply of the thoracic and abdominal walls in terms of: Sources of supply, segmental organization, relationships to muscular layers, areas of overlap and communication.
4. Identify the inguinal canal, its boundaries and contents, and its surface projections. Describe the development of the inguinal canal, and its relation to the descent of the gonads in both males and females. Identify the homologies between abdominal and scrotal/labial structures. Define the major types of abdominal wall hernias. Differentiate between direct and indirect inguinal hernias and femoral hernias.
5. Locate the surface projections and palpation points of the major abdominal structures in a basic surface examination.

UNIT 3: ABDOMINOPELVIC CAVITY

1. Identify parietal and visceral peritoneum and the major peritoneal folds, reflections, and spaces in the abdominopelvic cavity. Describe the functional and clinical significance of such arrangements. Identify which abdominopelvic organs are interperitoneal or retroperitoneal.
2. Identify the viscera of the abdominopelvic cavity. Describe the positional relations, gross structure, blood supply, innervation, lymphatic drainage, and basic function of each.

3. Identify the features that differentiate the duodenum, jejunum, and ileum of the small intestine. Describe the features that distinguish the small from the large intestine. Describe the variability in location of the vermiform appendix.
4. Trace the course of the biliary system from the liver, into and out of the gallbladder, and into the duodenum. Note the relations of the bile tract. Trace the course of exocrine pancreatic secretions from their source to the duodenum. Note the relations of this system to the biliary tract.
5. Identify the major structures of the abdomen in normal radiographic and cross-sectional examinations.

UNIT 3: VASCULAR AND LYMPHATIC ORGANIZATION OF THE TRUNK AND BODY CAVITIES

1. Trace the flow of blood from the heart to the thoracoabdominal and pelvic walls and organs by describing the courses, branching patterns, and distributions of the main arteries. Note the relations of these vessels to neighboring organs, mesenteries, and major veins.
2. Identify the major arterial trees/axes and their territories. Note the anastomoses between arterial trees and the importance of these in providing collateral circulation.
3. Identify, and explain the function of, vascular arcades.
4. Define and differentiate anatomical vs. functional end arteries. Give examples of each and identify the organs supplied by each.
5. Trace the flow of blood from the thoracoabdominal and pelvic walls and organs to the heart by describing the formations and courses of the portal, caval, azygos, and vertebral venous tracts. Identify the main anastomoses between these tracts, and describe their clinical significance. Note the relations of the major veins along their courses.
6. Identify the major components of the lymphatic system, their functions, and relationships.
7. Trace the primary drainage routes of lymph from the thoracic, abdominopelvic, and perineal organs and walls.

UNIT 3: DIAPHRAGM AND POSTERIOR ABDOMINAL WALL

1. Describe the development, structure, position, and actions of the diaphragm. Identify its innervation, including the spinal segmental sources and pathways taken by these nerves to reach the diaphragm. Describe the mechanics of respiration, including a comparison of the roles of the diaphragm, thoracic cage, and thoracoabdominal muscles in normal respiration.
2. Identify the muscles of the posterior abdominal wall. Describe their attachments, innervation, and major actions.

3. Identify the kidneys and suprarenal glands. Describe their normal positions, relations, and neurovascular supplies.
4. Trace the flow of urine from the gross collecting structures in the kidney to the urinary bladder. Describe the relationships of the ureters along their course.
5. Identify the lumbar plexus, its spinal segmental origins, and its major peripheral branches. Predict the functional consequences of lesions to particular spinal levels and each of the main peripheral nerves.

UNIT 3: DEVELOPMENT OF THE DIGESTIVE AND RESPIRATORY SYSTEMS

1. Describe the development of the primitive gut, including the respiratory system. Note the roles of embryonic disc folding, the prochordal plate and buccopharyngeal membrane, cloacal membrane, yolk sac, vitelline duct, and allantois. Define the three divisions of the primitive gut.
2. Identify the derivatives of each division of the primitive gut. Describe the roles of rotation, budding, herniation, reduction, and fixation on development of adult form. Describe the role of the urorectal septum in determining the fates of the hindgut, allantois, and cloaca.
3. Describe the formation of definitive mesenteries, the omental bursa, and intraperitoneal and retroperitoneal structures in relation to the differentiation of the primitive gut.
4. Describe the features and developmental bases of the major defects in gut tube development. Include definitions of atresia, stenosis, malrotation, fistulation, cystation, ileal diverticulum, omphalocele, congenital umbilical hernia, and imperforate anus.
5. Describe the mechanism of gut tube atresia and hydramnios.

UNIT 4: PELVIS

1. Identify the bones, their major features, and the joints and ligaments of the pelvis. Describe the general mechanics and the sexual dimorphic features of the pelvis.
2. Identify the urinary bladder. Describe its gross features, relationship to the peritoneal cavity, and its position in the pelvis in both full and empty states. Describe the pattern of innervation of the bladder, and the neuromuscular control of urination.
3. Identify the pelvic diaphragm, its components, basic functions, and innervation. Describe the differences between males and females with respect to relationships to the urogenital tracts.
4. Identify the rectum and anal canal, and their major features, including the anal sphincters. Describe the relationships of these structures in the context of conducting a digital anorectal exam in both males and females. Describe the anatomical basis for the control of defecation

and the cause of hemorrhoids.

5. Trace the courses of the male and female reproductive tracts. Identify the component organs and accessory glands, and their relationships. Describe the neuromuscular and vascular control of normal sexual functioning in males and females.
6. Identify the sacral plexus, its spinal segmental origins, and its major peripheral branches. Predict the functional consequences of lesions to particular spinal levels and peripheral nerves.
7. Trace the flow of blood through the iliac vascular tracts. Identify the specific target structures/regions, relationships to surrounding structures, and major collateral connections.
8. Identify the surface projections and palpation points of the major pelvic structures in a basic surface examination.
9. Identify the major structures of the pelvis in normal radiographic and cross-sectional examinations.

UNIT 4: PERINEUM

1. Identify the boundaries and subdivisions of the perineum. Identify the contents of each.
2. Identify the urogenital diaphragm, its components, basic functions, and innervation. Describe the differences between males and females with respect to relationships to the urogenital tracts.
3. Identify the ischioanal (ischiorectal) fossae and their major contents. Describe the functional/clinical significance of the area.
4. Describe the innervation, vascular supply and drainage, and lymphatic drainage of the perineum, with particular emphasis on urogenital and digestive tract structures.
5. Describe the relations of the anorectal canal (in males and females) and the vagina as relevant to digital anorectal and vaginal examinations.

UNIT 4; DEVELOPMENT OF THE UROGENITAL SYSTEM

1. Describe the common origins of the urinary and genital systems, including the roles of the intermediate mesoderm and urogenital ridge.
2. Outline the development of the three sets of kidney systems in humans, with special emphasis on the development of the permanent kidneys. Note the time sequence of formation, functional capabilities, and contributions to adult form of each. Trace the formation of collecting and excretory components and positional changes of the permanent kidney. Trace the path of urine produced within the nephron to the urinary bladder.

3. Describe the development of the urinary bladder and urethra, relating these to simultaneous development of the kidney and reproductive tracts. Trace the path of urine excretion from the urinary bladder to the outside in males and females.
4. Describe the characteristics and consequences of the major defects in urinary tract development. Include definitions of renal agenesis, ectopic kidney, congenital polycystic kidney, horseshoe kidney, supernumerary kidney, urachal malformations, and extrophy of the urinary bladder.
5. Describe the mechanism and role of the kidney in the formation of oligohydramnios.
6. Outline the process of sex determination in human embryos. Include descriptions of:
 - a. The appearance, migration, and significance of primordial germ cells.
 - b. The differentiation and roles of definitive gonads.
 - c. The difference between genetic and phenotypic sex.
7. Describe the development of the genital duct systems and external genitalia in males and females. Note the fates of the mesonephric and paramesonephric ducts and the development of the seminal and prostate glands, uterus and vagina, and urethra. List the homologies between male and female adult structures and clinically significant vestigial structures.
8. Describe the characteristics and consequences of the major defects in reproductive tract development. Include definitions of duplications of the uterine canal, hypospadias, epispadias, gonadal dysgenesis, testicular feminization syndrome, and pseudohermaphroditism.

UNIT 4: ORGANIZATION OF THE LOWER LIMB

1. Identify the specific anatomical regions of the lower limb.
2. Identify the bones of the lower limb and their major features. Describe the functional aspects of these structures. Identify these structures in standard radiographic and cross-sectional images.
3. Compare and contrast the pattern of development of the lower limb with that of the upper limb.
4. Identify the lumbosacral plexus and its component parts, from spinal segmental sources to major terminal branches.
5. Identify the muscles of the gluteal region, indicating their attachments, innervation, and major actions. Note:
 - a. The roles of the gluteal muscles in providing stability during locomotion.
 - b. The importance of the piriformis muscle as a reference for gluteal structures.

6. Describe the geographic relationships of neurovascular structures in the gluteal region and the consequences of intragluteal injections into specific quadrants of the region.
7. Describe the arrangement and mechanical significance of the fascia lata, iliotibial tract, and intermuscular septa in the hip and thigh.
8. Define the osseofascial compartments of the lower limb.
 - a. Identify the muscles contained in each compartment.
 - b. Describe the attachments, innervation, and major actions of each muscle.
 - c. Describe the innervation and major actions of each compartment as a whole.
 - d. Predict the functional consequences of loss of action of each muscle and each compartment.
9. Trace the course of cutaneous and motor innervation in the gluteal region and lower limb.
 - a. Identify the spinal segmental level(s) of origin and relationship to the lumbosacral plexus of each major peripheral nerve.
 - b. Predict the functional consequences of lesions to specific spinal levels and individual peripheral nerves.
10. Define the boundaries and contents of the femoral triangle. Describe the composition of the femoral sheath, canal, and ring. Describe the anatomical basis of a femoral hernia.
11. Define the boundaries of the popliteal fossa and describe its contents. Note the spatial relationships of the major neurovascular structures in the fossa. Identify the main components of the arterial anastomotic network around the knee.
12. Trace the flow of blood from the common iliac artery to and through the gluteal region and lower limb. Note:
 - a. The different sources of arterial supply, their pathways, and their major branches.
 - b. The significance of the obturator canal, femoral sheath, adductor canal, adductor hiatus, greater sciatic foramen, and lesser sciatic foramen.
 - c. The composition and significance of the cruciate anastomosis.
 - d. The territories supplied by and the pathways of the major peripheral vessels.
13. Trace the venous drainage of the lower limb through the saphenous tract to the pelvic cavity. Describe the significance of the saphenous veins in terms of:
 - a. Varicose veins.
 - b. Coronary bypass surgery.
14. Describe the pattern of lymphatic drainage of the lower limb, including the relationship of this drainage with those of the abdominal wall and groin regions.
15. Determine the movements that occur at the knee joint during normal locomotion. Describe the mechanics of "locking" and "unlocking" of the knee.
16. Identify the extrinsic and intrinsic muscles of the foot, indicating their attachments,

innervation, and major actions. Compare and contrast the patterning and functions of muscles of the hand and foot.

17. Describe the arrangements of flexor, extensor, and peroneal retinacula, and the major tendons around the ankle, including the functional significance of these arrangements.
18. Identify the bony components, major ligaments, key accessory structures (e.g., intraarticular discs), and movements permitted at the hip, knee, and ankle joints. Describe the features of major traumas to each joint.
19. Identify the medial and lateral longitudinal, and transverse arches of the foot. Describe the roles of bones, ligaments, and muscles in maintaining these arches.
20. Identify the projections and palpation points of the major structures of the lower limb in a basic surface examination.

UNIT 5: HEAD AND NECK OSTEOLOGY

1. Identify the bones of the skull and cervical spine, and their major features. Describe the functional aspects of these structures. Identify these structures in standard radiographic and cross-sectional images.

UNIT 5: DEVELOPMENT OF THE HEAD AND NECK

1. Define the terms "branchial (pharyngeal) apparatus/basket," "branchial arch," "branchial pouch," and "branchial cleft/groove." Describe the development of the branchial apparatus, including the role of neural crest, and list the components of the pharyngeal basket.
2. Trace the developmental fate of each component of the branchial apparatus. Describe the features and consequences of the major defects in development of the branchial apparatus. Include the following: Branchial fistulas, sinuses and cysts; mandibulofacial dysostosis; Pierre Robin syndrome; DiGeorge syndrome.
3. Trace the development of the tongue and thyroid gland. Describe the embryonic basis of ankyloglossia, microglossia, macroglossia, cleft/bifid tongue, thyroglossal duct cysts and fistulas, and ectopic thyroid gland.
4. Outline the features of the developing skull, giving definitions of neurocranium, chondrocranium, and viscerocranium. Identify the major fontanelles and describe their functional significance. Define the features and developmental bases of cranioschisis, cranial meningocele, craniosynostosis (craniostenosis), scaphocephaly, acrocephaly, plagiocephaly, microcephaly, and hydrocephaly.

UNIT 5: ORGANIZATION OF THE FACE AND SCALP

1. Define the boundaries of the face and scalp.
2. Describe the development of the face and palate. Identify the features and developmental bases of the major orofacial malformations, including clefts and holoprosencephaly.

3. Describe the structure of the scalp.
4. Identify the major muscles of facial expression and their actions.
5. Describe the innervation of the face and scalp. Describe the deficit expected following injury to each of the major nerve branches.
6. Trace the arterial supply into and the venous drainage of the face and scalp. Identify the clinically significant anastomoses in these networks.
7. Describe the morphology and general relationships of the parotid gland. Describe the clinical significance of the relationship between the parotid gland, its duct, and the extracranial distribution of the facial nerve.

UNIT 5: INTERIOR OF THE SKULL

1. Identify the three cranial fossae, the bony components of each, and the major contents of each.
2. Identify the cranial meninges and the dural folds that subdivide the cranial cavity. Describe the functional/clinical significance of this arrangement. Describe the innervation of the dura mater.
3. Trace the flow of blood into the cranial cavity, indicating major anastomoses and collateral routes. Describe the formation of the cerebral arterial circle, and explain its clinical significance.
4. Identify the dural venous sinuses, indicating their relations to the cranial meninges. Trace the routes of venous drainage of the cranial cavity. Identify the emissary connections between the venous sinuses and the extracranial venous system. Explain the functional/clinical significance of this arrangement.
5. Describe the anatomical basis for epidural, subdural, and subarachnoid cranial hemorrhages.
6. Identify each of the cranial nerves within the cranial cavity. Note the relationships of each nerve to specific cranial fossae, to the dura mater, and to specific bony foramina. Describe the pathway each nerve takes in exiting the cranium, and any major accompanying structures.

UNIT 5: ORBIT AND EYE

1. Identify the bony elements of the orbit. Identify the position of the eyeball relative to the orbit. Identify the extraorbital structures that immediately surround the orbit.
2. Identify the extraocular muscles, their actions, and their innervation. Describe the functional deficit resulting from damage to each muscle.
3. Identify the major nerves of the orbit, their functional components, and their distributions. Describe the functional deficit resulting from lesion of each nerve.

4. Trace the arterial supply and venous drainage of the orbit.
5. Identify the main components of the eyelids. Describe the mechanics of movement of the eyelids.
6. Identify the components of the lacrimal apparatus. Trace the pathway a tear takes from the lacrimal gland to the inferior nasal meatus.
7. Trace the course of autonomic nervous supply to the orbital structures, indicating the pre- and postganglionic sources of innervation. Differentiate sympathetic and parasympathetic functions.

UNIT 5: ORGANIZATION OF THE NERVOUS SYSTEM: CRANIAL NERVES AND AUTONOMICS

1. Define the functional components of the nervous system.
2. Identify the functional components contained within and/or conveyed by each of the cranial nerves.
3. Trace the course of each of the cranial nerves from its origin at the base of the brain to its final destination(s). Describe the avenue(s) taken in exiting the skull, and the relations of each nerve. Describe the functional deficit expected from lesion of each nerve.
4. Identify the sources of autonomic innervation to the head.
5. Trace the pathways of preganglionic and postganglionic autonomic neurons in the head from their origins to their final destinations. Identify the specific synapse points between pre- and postganglionic elements.
6. Describe the basic functions governed by each autonomic component in the head.

UNIT 5: ORGANIZATION OF THE NECK

1. Describe the arrangement and functions of the deep cervical fascia with respect to the organization of the neck.
2. Identify the major triangles of the neck, the boundaries of each, and the major contents of each.
3. Identify the muscles in the neck, including their attachments, innervation, and major actions.
4. Describe the contents of the carotid sheath. Describe the topographic relations of the sheath as a whole and of each constituent.
5. Identify the thyroid and parathyroid glands, their vascular and nervous supply, and their relations to each other and surrounding cervical structures.

6. Trace the pathways of cranial nerves IX-XII in the neck. Describe the topographic relationship of each nerve to its major surrounding structures. Describe the functional deficit expected from lesion of each nerve.
7. Describe the formation of the cervical and brachial plexuses of nerves, noting the spinal segments of origin, relations to major surrounding cervical structures, and the distribution of the main peripheral branches. Note, in particular, the formation, relations, and distributions of the phrenic nerve and the ansa cervicalis.
8. Identify the cervical sympathetic trunk and its ganglia. Describe their relations to major surrounding structures.
9. Trace the flow of blood through the subclavian artery and its branches. Describe the regions supplied by each branch, the relationship of the branches to surrounding structures, and significant anastomoses between the branches.
10. Trace the flow of blood through the carotid arterial tract. Describe the regions supplied by each of the major branches, the relationship of the branches to surrounding structures, and significant anastomoses between the branches. Describe the locations and functions of the carotid sinus and carotid body.
11. Trace the flow of blood through the jugular system of veins. Describe the regions drained by each of the tributaries, and significant anastomoses between the major venous trunks.

UNIT 5: TEMPORAL, INFRATEMPORAL, PTERYGOPALATINE REGIONS

1. Identify the temporal, infratemporal, and pterygopalatine fossae. Identify the major structures contained in each.
2. Identify the muscles of mastication, their sources of innervation, and their major actions in chewing.
3. Trace the flow of blood through the maxillary artery and its major branches. Describe the regions supplied and the significant anastomoses between branches.
4. Trace the pathways of the nerves that traverse the above fossae. Describe the functional components of each nerve, their sources, and their target areas/structures. Describe the functional deficit expected from lesion of each nerve.

UNIT 5: LYMPHATIC DRAINAGE OF THE HEAD AND NECK

1. Trace the main routes of lymphatic drainage in the head and neck. Identify the major groups of lymph nodes.

UNIT 5: NASAL PASSAGES

1. Describe the basic structure and relationships of the external nose and nasal cavities.
2. Identify the paranasal sinuses. Describe the drainage route of each into the nasal cavity.

Describe the relationship of each sinus to the surrounding oral, orbital, and cranial cavities.

3. Identify the major morphological features of the lateral nasal walls and the nasal septum.
4. Describe the pattern of innervation of the nasal cavity and paranasal sinuses.
5. Trace the arterial supply to the nasal cavity.

UNIT 5: ORAL CAVITY AND PHARYNX

1. Identify the boundaries and subdivisions of the oral cavity and pharynx. Describe the bony, muscular, neurovascular, and glandular relations of each.
2. Identify the muscles of the oral floor and walls, soft palate, auditory tube, and pharynx. Identify the attachments, actions, and innervation of these muscles.
3. Identify the extrinsic and intrinsic muscles of the tongue. Describe the sensory and motor nerve supply to the tongue. Describe the deficit expected following lesion of each nerve.
4. Describe the mechanism of swallowing. Describe the sequence of events, the muscles responsible for each event, and the nerves controlling each event.
5. Describe the pattern of innervation of the oropharyngeal region. Identify the source, region supplied, and the functional components of each nerve.
6. Trace the arterial supply to the oropharyngeal region. Identify the major arteries, their territories, and any significant anastomoses.
7. Describe the location, innervation, lymphatic drainage, secretory drainage, and general relationships of the submandibular and sublingual salivary glands.
8. Describe the location, lymphatic drainage, and general relationships of the oropharyngeal tonsils.
9. Identify the major anatomical features seen when examining the oral cavity and pharynx.

UNIT 5: LARYNX

1. Identify the major morphological features of the larynx.
2. Identify the major intrinsic muscles of the larynx. Describe the actions of these muscles, and the roles of these actions in sound production.
3. Trace the pathways of the vascular supply and motor and sensory innervation of the larynx. Describe the deficit expected following lesion of each nerve.
4. Describe the major topographic relationships of the larynx and its neurovascular supply. Note the clinical significance of such arrangements.

UNIT 5: EXTERNAL AND MIDDLE EAR

1. Describe the development of the external and middle ear regions.
2. Identify the boundaries and components of the external ear. Describe the innervation of the region.
3. Identify the boundaries and contents of the middle ear. Describe the relationships of the major neighboring structures.
4. Identify the muscles of the middle ear, their actions, and their innervation.
5. Describe the connections between the pharynx, middle ear cavity, and mastoid air cells. Describe the relations of these areas with the cranial cavity and the clinical significance of this arrangement.
6. Describe the functions of the middle ear ossicles in the transmission of sound. Describe the effect of otosclerosis on the transmission of sound.