

Functional Anatomy

Department of Anatomy, Histology and Embryology

Dr. Gábor Gerber



“Doctors without anatomy are similar to moles: they work in the dark and their daily tasks are mole hills“.

(Tiedemann, Heidelberg anatomist, 1781-1861)

THE DEFINITION OF ANATOMY

- *Anatomy*
 - Greek=to cut up, or dissect
 - The science that deals with the **structure** of the body
- *Kinds:*
 - *Gross Anatomy*
 - *Microscopic Anatomy*
 - *Developmental Anatomy*
 - *Comparative Anatomy*

Gross Anatomy

- Definition:
 - That which can be seen with the naked eye
- Kinds:
 - Regional:
 - body studied by area
 - Systematic:
 - body studied by system

Microscopic Anatomy

- Definition:
 - That which can be seen with the assisted eye
- Kinds:
 - Cell biology:
 - The study of cells
 - Histology:
 - The study of tissue

Developmental Anatomy

- Definition:
 - The study of anatomical changes in a life cycle
- Kinds:
 - Embryology:
 - The study of prenatal development
 - Postnatal development:
 - The study of structures after birth
 - Ontogeny:
 - Total development of an individual



Comparative Anatomy

- Definition:
 - Study of similarities and differences in the anatomy of different species

Early Egyptians

- Perfected the science of **mummification**.
- Major organs were removed and placed in jars.
- Body cavity was filled with a “sawdust-like” material.
- Body was wrapped in linen cloth shrouds.



Alexandria, Egypt

- The study of anatomy flourished in **Alexandria** between 300-150 B.C.
- Only **criminals** were allowed to be dissected because these early cultures were very superstitious and believed that an intact body was necessary for a **successful afterlife**.

Roman Influence

- In 30 B.C. Alexandria was conquered by the Roman Empire.
- The Romans were interested in power, wealth and military strength, not in anatomical studies.
- Romans **outlawed** anatomical studies and human dissections.

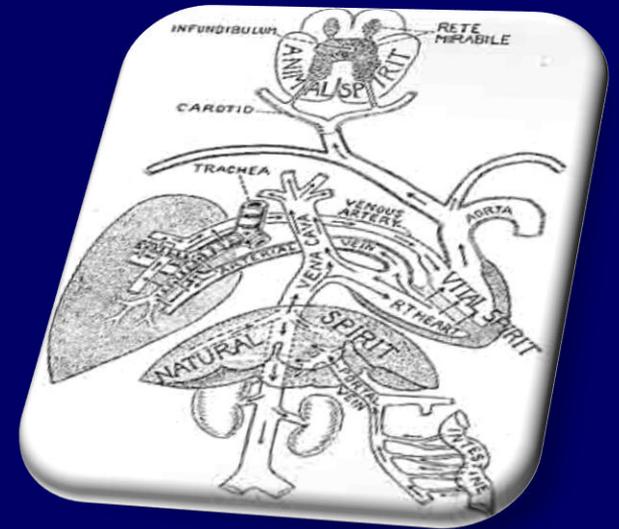




Galen of Pergamen

120-300 A.D.

- Perhaps one of the brightest spots in the early history of anatomy was the work of a Greek physician named **Galen**
- Galen had been trained in the Alexandrian tradition and wanted to further the scientific study of the human body.



Galen's Influence

- Galen's anatomy textbook, based on the dissection of the Barbary ape, became the accepted authority on human anatomy for **1300 years!**

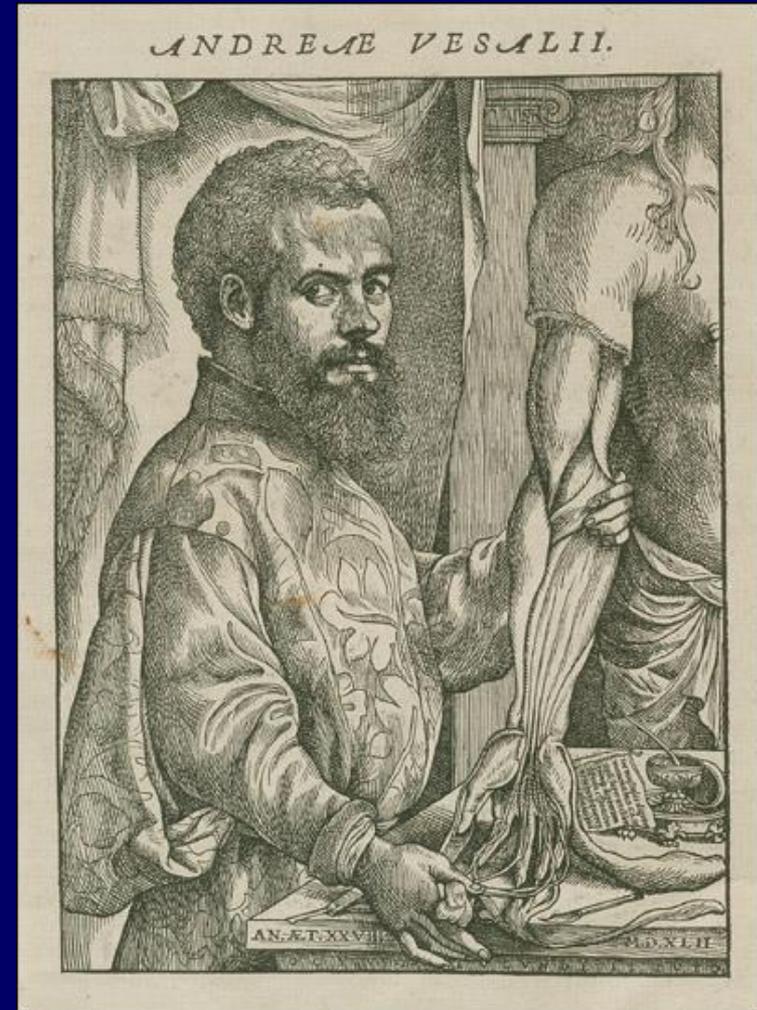
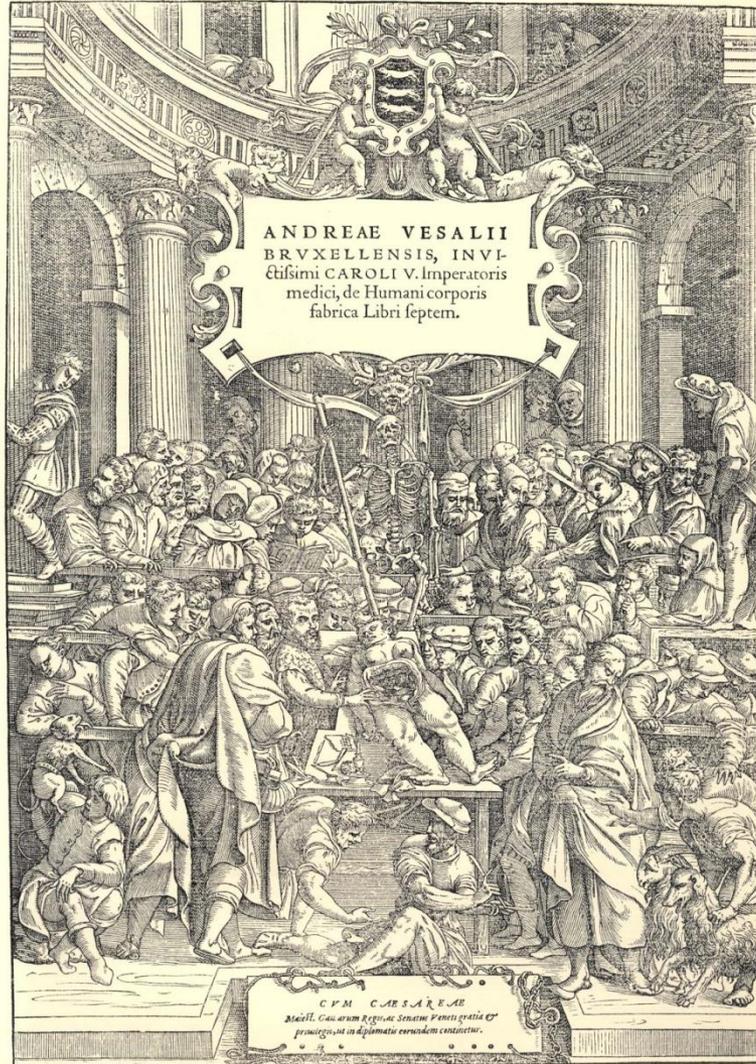


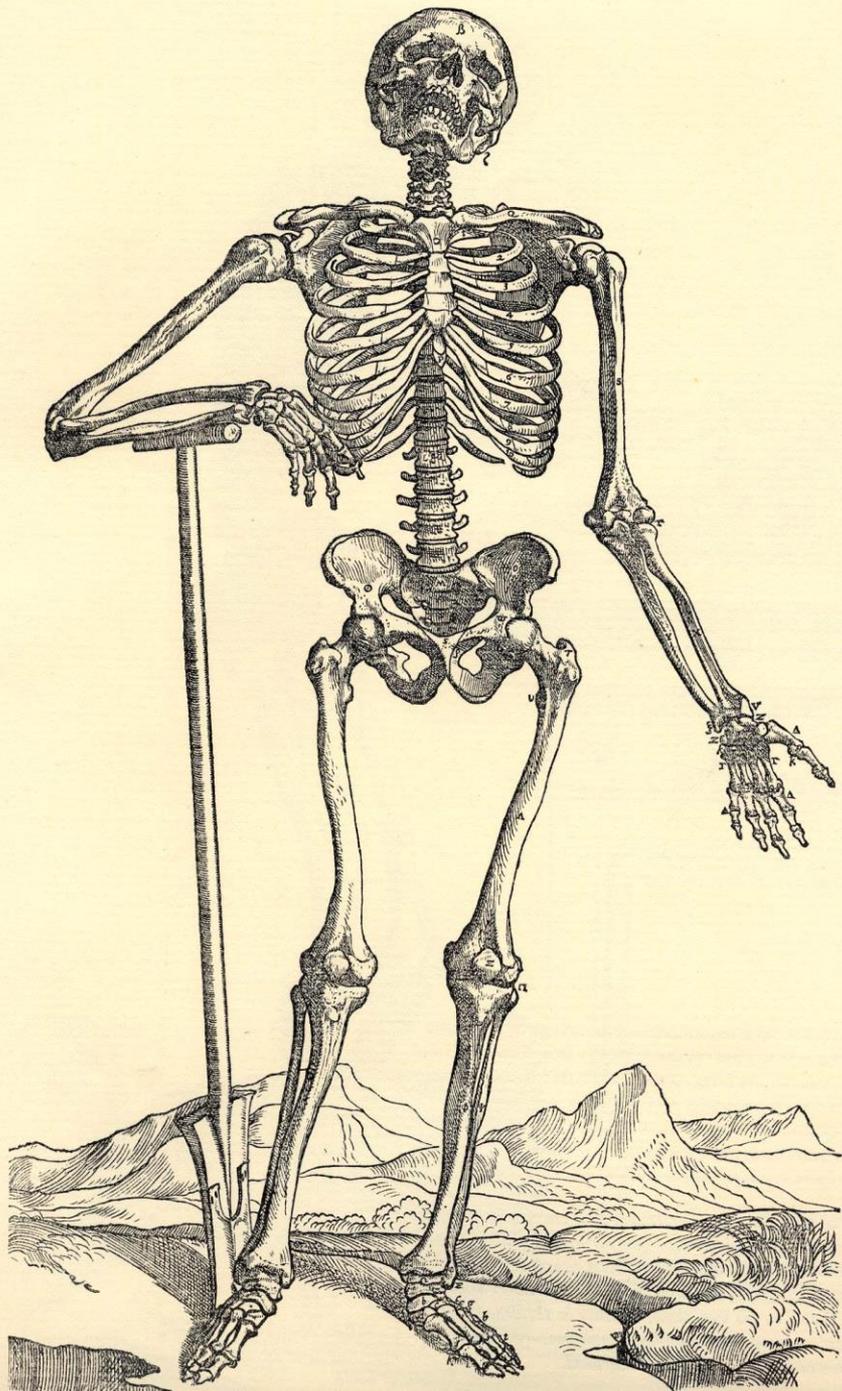
Leonardo's Anatomy Drawings

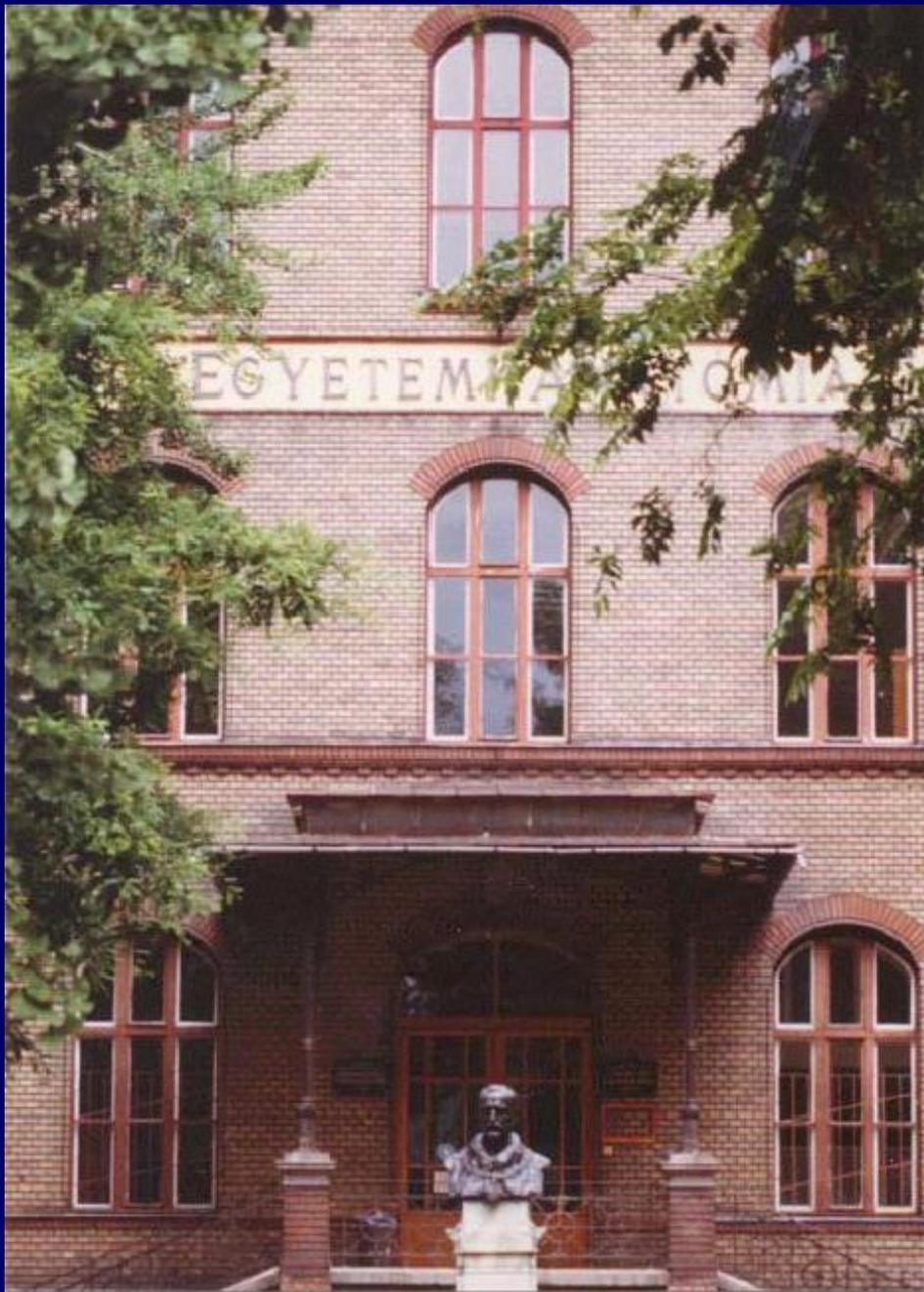


Andreas Vesalius:

De humani corporis fabrica, 1543







Semmelweis University

Ignác Semmelweis, 1818-1865

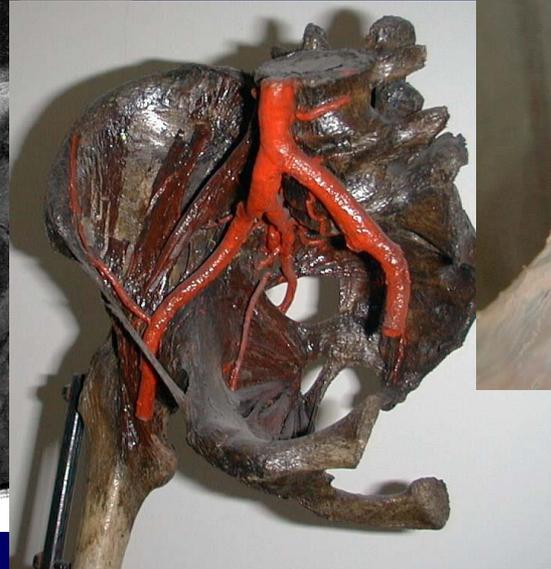
School of Medicine
1769. Nagyszombat

Department of Anatomy,
Histology and Embryology

1859 . Pest (Budapest)

(József Lenhossék)

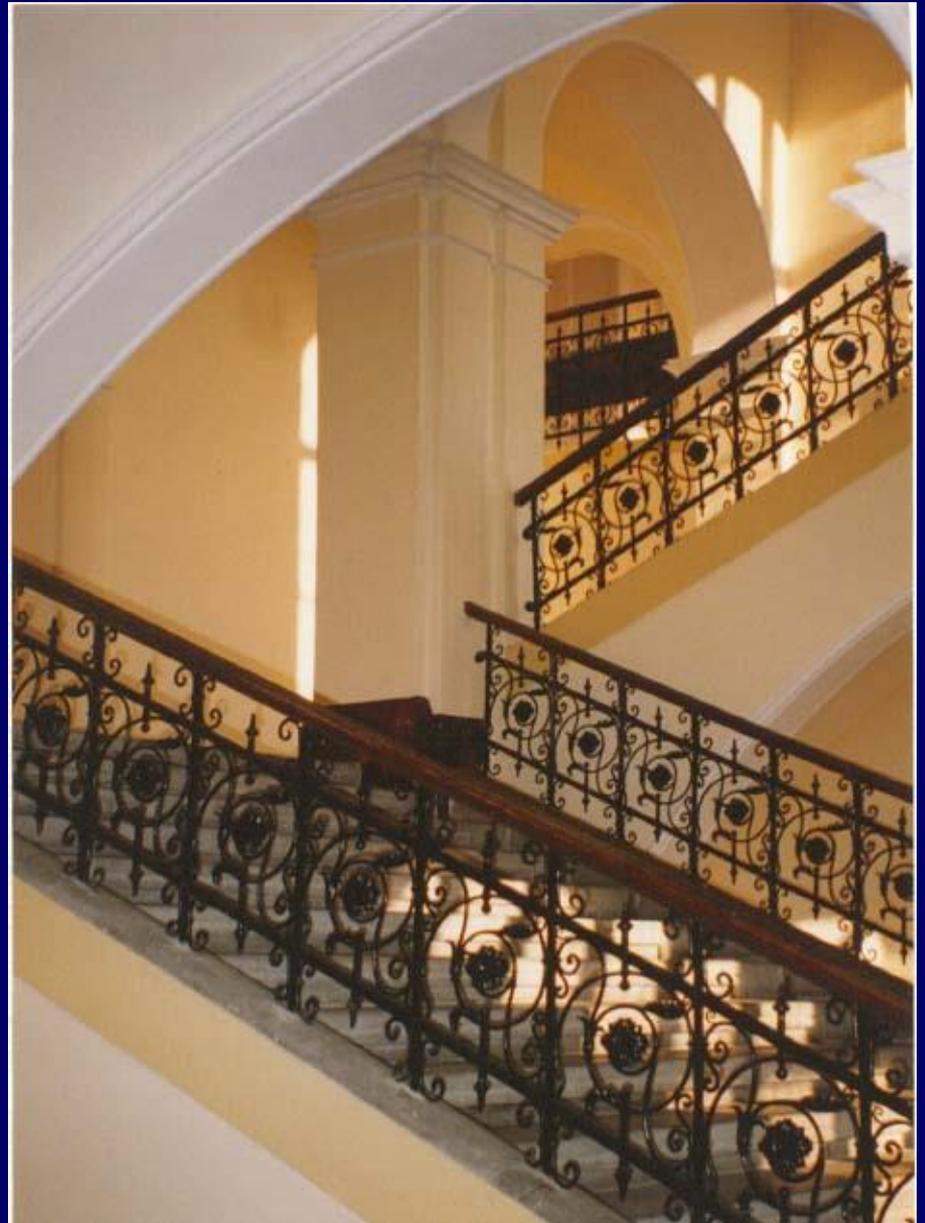
József Lenhossék, 1859-1888

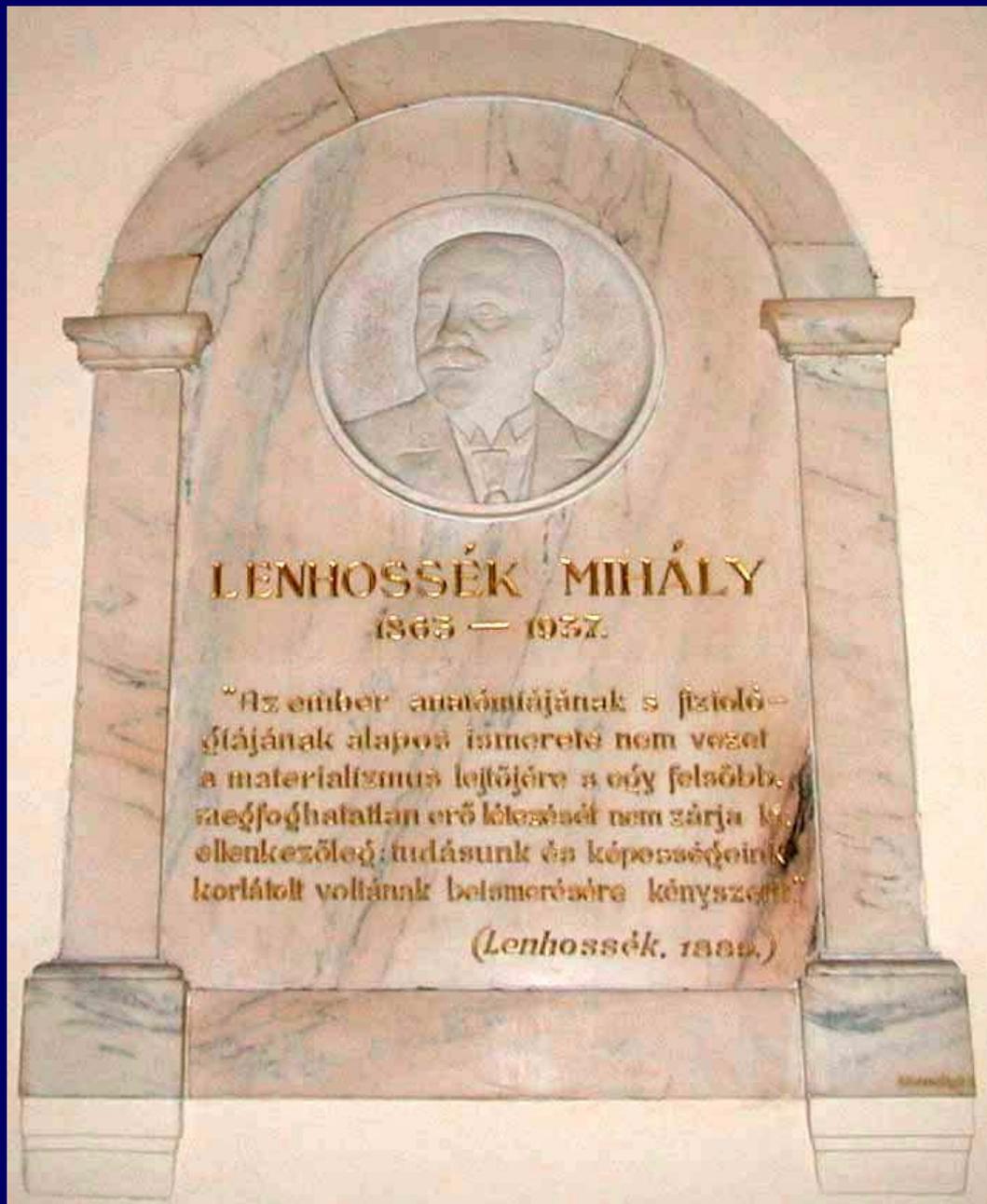




**Géza Mihalkovics,
1890-1899**

**Anatomy Building
(1897-98)**





Mihály Lenhossék,
1900-1934



Lenhossék Mihály,
1909



KISS FERENCZ
ANATÓMIAPROFESSZOR
1889 – 1966

Ferencz **Kiss**,
1934-1961



SZENTÁGOTHAI JÁNOS

1912 - 1994

„AZ ANATÓMIA SZÁMOMRA
NEM CSUPÁN MINDEN ORVOSI
GONDOLKODÁS ÉS CSELEKVÉS
ELIDEGENÍTHETETLEN ALAPJA,
HANEM AZ ANYAG ÉS A LÉT
ÖRÖK SZÉPSEGÉNEK ÉS
HARMÓNIAJÁNAK EGYIK
LEGMAGASABB RENDŰ
MEGNYILVÁNULÁSA.”
SZENTÁGOTHAI 1971

Tibor Donáth,

1961-1963

János Szentágothai,

1963-1977

Teréz Tömböl,

1977-1994

Miklós Réthelyi,

1994-2004

András Csillag,

2004-2014

Gábor Gerber,

2014-2015

Ágoston Szél,

2016-

CT (CAT)



Sagittal Head Scan (side view)



Shoulder



10:52:31 Mo 05/06/2006

F
OBSTETRIK
DS-2 5.0
FPS 25%

Single
BPD
FL
AIU
AFI

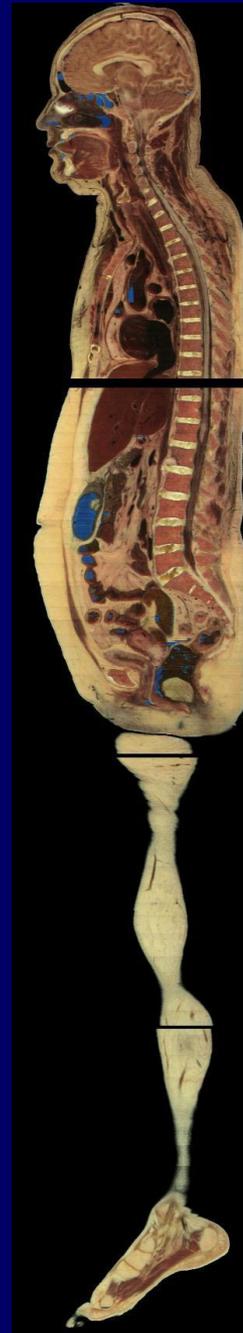


Fetal Heart
Report
WorkSheet
Graph

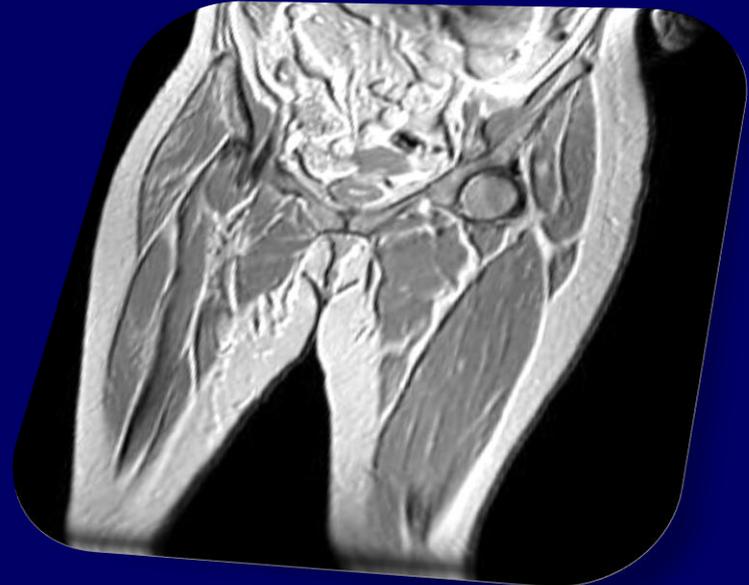
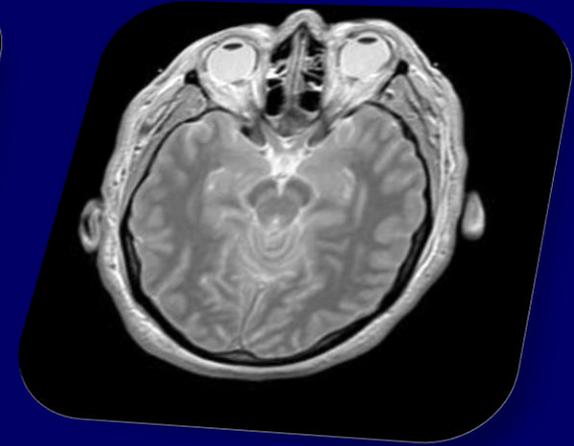
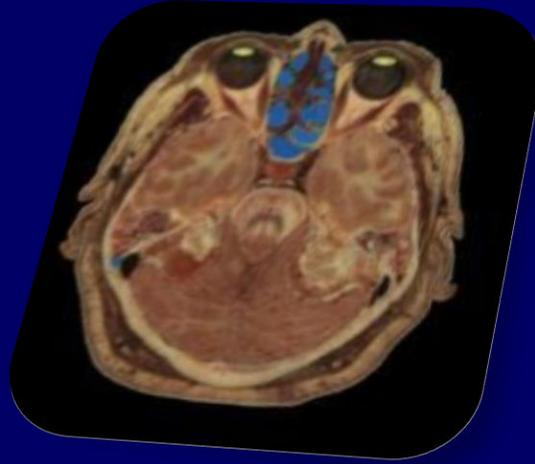
160
BPD 61.3mm 24w3d FL 40.8mm 23w1d

2D 001/16
MI 1.0 TIS 0.5 TIB 0.6 Ts 100%

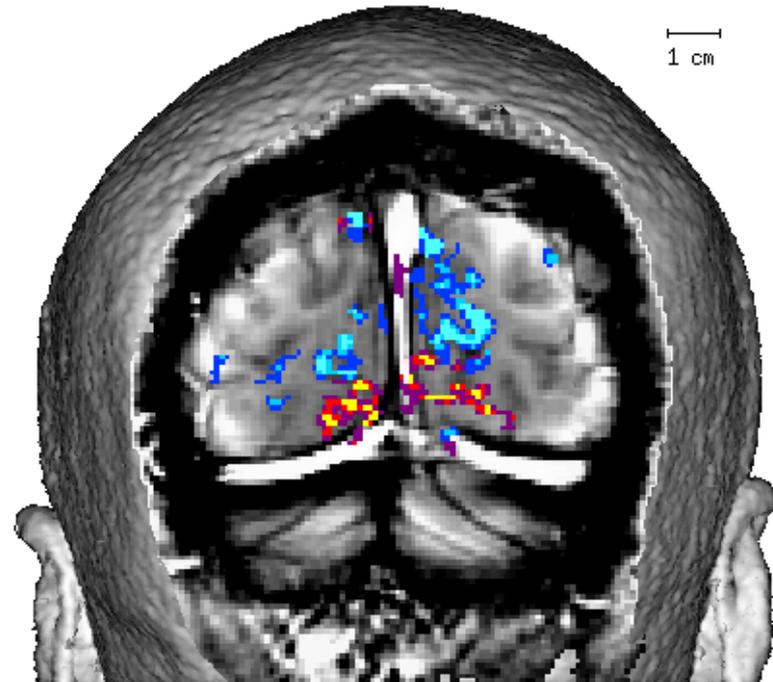
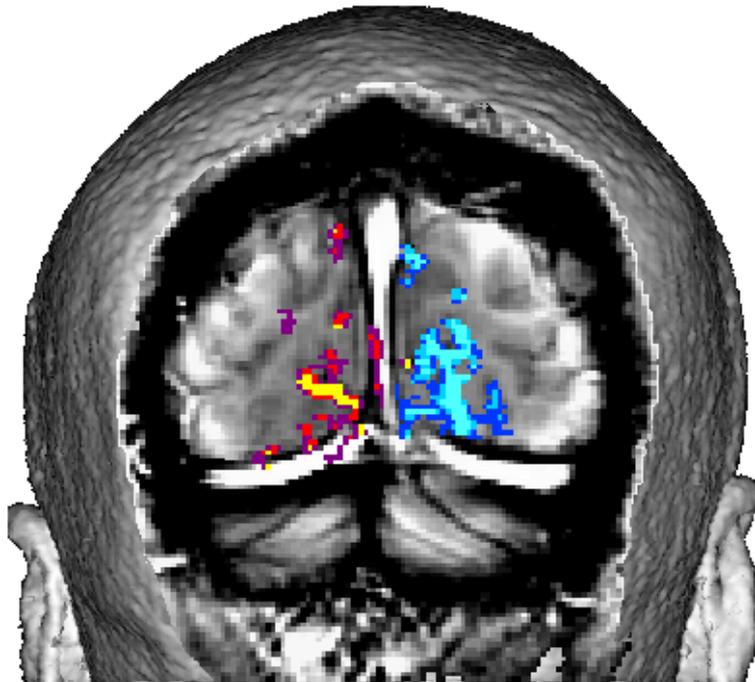
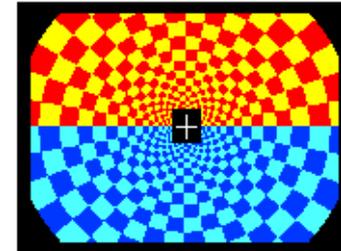
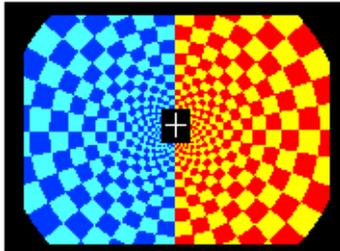
The
Visible
Human
Project



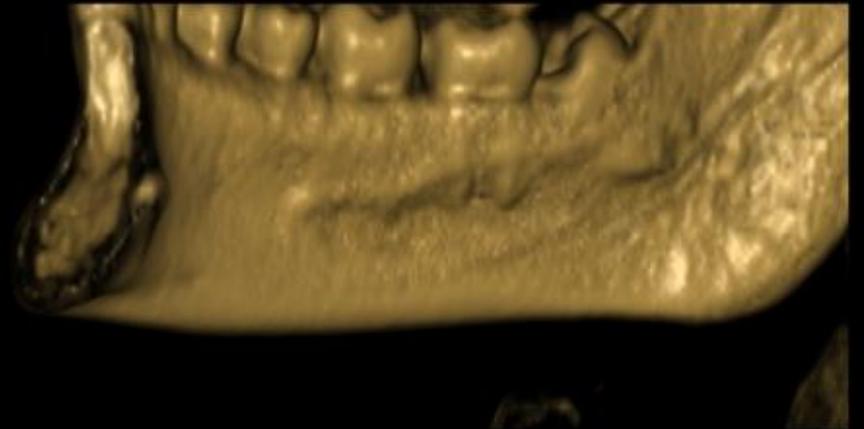
MRI (NMR)



functional magnetic resonance imaging (fMRI).



U. Pittsburgh



<http://semmelweis.hu/anatomia/>

- Head of the Department:
Dr. Ágoston Szél, MD, PhD. DSc.



English course director:
Dr. Andrea Székely DMD, PhD,

First semester

Anatomy

Upper limb

Test

Lower limb

Skull

Head- and neck muscles,

Histology

Cell Biology

Epithelial tissue

Connective tissue

Test

Muscle tissue

Nervous tissue

Semi-final exam

Embryology

Differentiation of the
germ cells –
fertilization –
embryo and fetal
membranes

Skull,

Academic year 2018/ 2019 Faculty of Medicine EM I. Groups 9-17

Week	Lectures <i>Mon 10.00 -11.40 and Wed 13.45 – 14.30</i>	Practical sessions	
		Dissection room <i>Grs 9-10-11-12-13 Mo & Thu Grs 14-15-16-17 Mo & Fri</i>	Histology laboratory <i>Grs 9-12 Fri; Grs 14-15 Mo; Grs 13,16-17 Tue;</i>
Week 1 Sept 10-14	1. The role of anatomy, histology and embryology in the medical curriculum. Terminology 2. The cell, cellular membrane, endoplasmic reticulum 3. Cell nucleus, mitochondrion, peroxysome	General introduction to practical work in the dissection room, tools and rules Upper limb Bones	Light and electron microscopical techniques, the principles of practical histology classes
Week 2. Sep 17-21	4. Adhesion molecules, intercellular connections, epithelial cells 5. Types of epithelia. Glandular epithelium 6. The cellular framework, microtubules, IM filaments, actin microfilaments	Upper limb Bones and joints	Simple epithelia Stratified epithelia I.
Week 3. Sept 24-28	7. Exocytosis, Golgi apparatus, vesicular transport, sorting. Endocytosis, cellular organelles. Apoptosis 8. General arthrology and myology. Joints, muscles and movements of the shoulder and the upper girdle 9. Muscles and actions of the elbow joint	Upper limb Dissection of the muscles, vessels and nerves of the flexor side	Stratified epithelia II. Glandular epithelium
Week 4. Oct 1-5	10. Joints, muscles and actions of the wrist and the hand 11. Connective tissue cells 12. Connective tissue fibres, types and formation. Extracellular matrix	Upper limb Dissection of the muscles, vessels and nerves of the flexor and extensor sides	Connective tissue I. Cells
Week 5. Oct 8-13 <i>Saturday is a workday (Monday schedule)</i>	13. The principles of cell division, differentiation. Cell cycle, mitosis, meiosis 14. Supporting tissues (cartilage, bone) 15. Ossification, bone remodelling 16. Components, muscles, joints and ligaments of the vertebral column. Intervertebral, atlantooccipital and atlantoaxial joints 17. Ribs, components and movements of the thorax. Abdominal muscles, rectus sheath.	1. Upper limb Dissection of the muscles, vessels and nerves of the extensor side, dissection of joints 2. Midterm test 1 Upper limb Bones and muscles of the trunk	Connective tissue II. Fibrous elements Saturday class for Grs 13-17 only Connective tissue III. Connective tissue types
Week 6. Oct 15-19	18. Muscles, fasciae and movements of the neck. Back muscles, occipital muscles 19. Bones, joints, construction of the pelvis. 20. Muscles and actions of the hip joint	Bones and muscles of the trunk. Demonstration of the muscles of the neck, back and abdomen.	Grs 9-12 Connective tissue III. Connective tissue types Grs 13-17 Supporting tissues Cartilage, bone
Week 7. Oct 22-26	October 22-23. are holidays 21. Muscles and actions of the knee joint	October 22-23. are holidays Lower limb and pelvis Dissection of joints	No class for Grs 13-17 Supporting tissues Cartilage, bone
Week 8. Oct 29 – Nov 2	22. Subinguinal hiatus. Inguinal canal. Adductor and femoral canals 23. Muscles and joints of the foot. Architecture of the foot 24. Blood. Corpuscular elements. Red bone marrow, erythropoiesis, Formation of leukocytes	Lower limb Dissection of the muscles, vessels and nerves of the dorsal side November 1-2 are holidays	November 1-2 are holidays No class for Grs 9-12 Types of ossification
Week 9. Nov 5-10 <i>Saturday is a workday (Friday schedule)</i>	25. Muscle tissue 26. Gametes, fertilization, cleavage and blastulation 27. Implantation, bilaminar embryo. Fetal membranes, umbilical cord. Structure of the placenta, placental circulation	Lower limb Dissection of the muscles, vessels and nerves of the dorsal side	Grs 9-12 Types of ossification Grs 13-17 Blood and red bone marrow Grs 9-12 Blood & red bone marrow
Week 10. Nov 12-16	28. Molecular basis for gastrulation. Formation, differentiation and derivatives of the germinal layers. 29. Neurulation, folding of the embryo. Body axes, left-right lateralization, asymmetry. 30. Formation of the primary tissues. Homeobox genes, stem cells	Lower limb Dissection of the muscles, vessels and nerves of the ventral side	Smooth,skeletal and cardiac muscle types Revision

Week 11. Nov 19-23	31. Histology of vessels. 32. Bony framework of the skull. Sphenoid and ethmoid 33. Temporal bone. Internal and external skull base	Lower limb Dissection of the muscles, vessels and nerves of the ventral side	Midterm test 2: Epithelia, connective and supporting tissue. General embryology
Week 12. Nov 26-30	34. Facial skeleton. Orbit, nasal cavity 35. Skull. Infratemporal and pterygopalatine fossae 36. Nervous tissue. Glial cells	Bones of the skull Internal and external skull bases	Vessels: arteries, veins, arterioles, venules, capillaries.
Week 13. Dec 3-7	37. Temporomandibular joint, muscles of mastication; muscles of facial expression 38. Development of the skull, fontanelles. 39. Development of the limbs and the vertebral column together with the trunk	Bones of the facial skeleton, mandible. Orbit, nasal cavity, pterygopalatine fossa Temporomandibular joint	Nervous tissue
Week 14. Dec 10-14	40. Developmental malformations 41. <i>Clinical anatomy of the musculoskeletal system</i> 42. Clinical anatomy of the musculoskeletal system	Muscles of mastication and facial expression	Placenta, umbilical cord Revision

Semmelweis University
Department of Anatomy, Histology and Embryology

Faculty of Medicine
1st year

**ANATOMY HANDBOOK
2018**



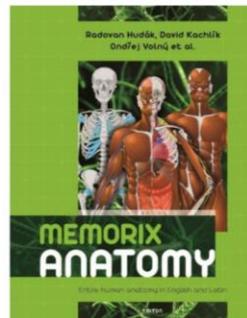
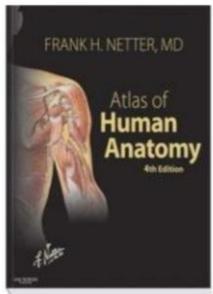
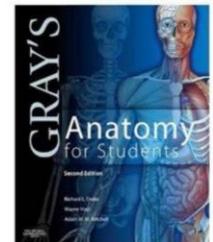
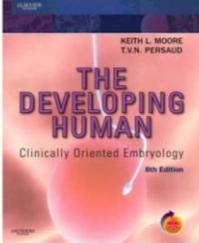
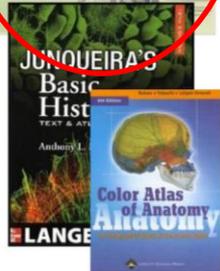
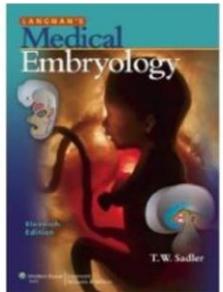
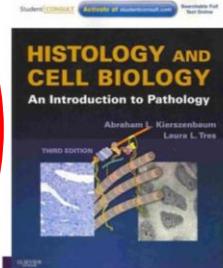
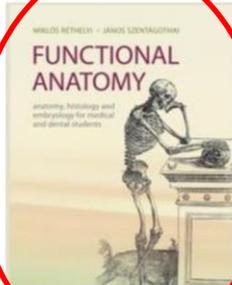
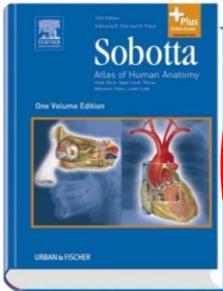
Dr. Andrea D. Székely
Associate Professor
Course Director

Dr. Ágoston Szél
Full Professor
Head of Department



RECOMMENDED BOOKS

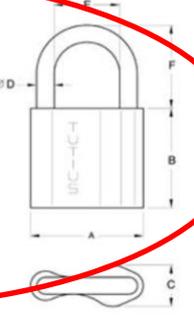
(see the complete list in the Calendar or the Departmental Homepage)



During dissection classes keep your belongings in the lockers and lock them with your padlock!

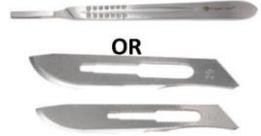
PADLOCK SIZE: 6 mm

Please, remember to keep your valuables always on you, or lock them in the lockers since the department takes no responsibility for lost items.



DISSECTION ROOM TOO

SCALPEL



OR



A PAIR OF ANATOMICAL FORCEPS

RUBBER GLOVES



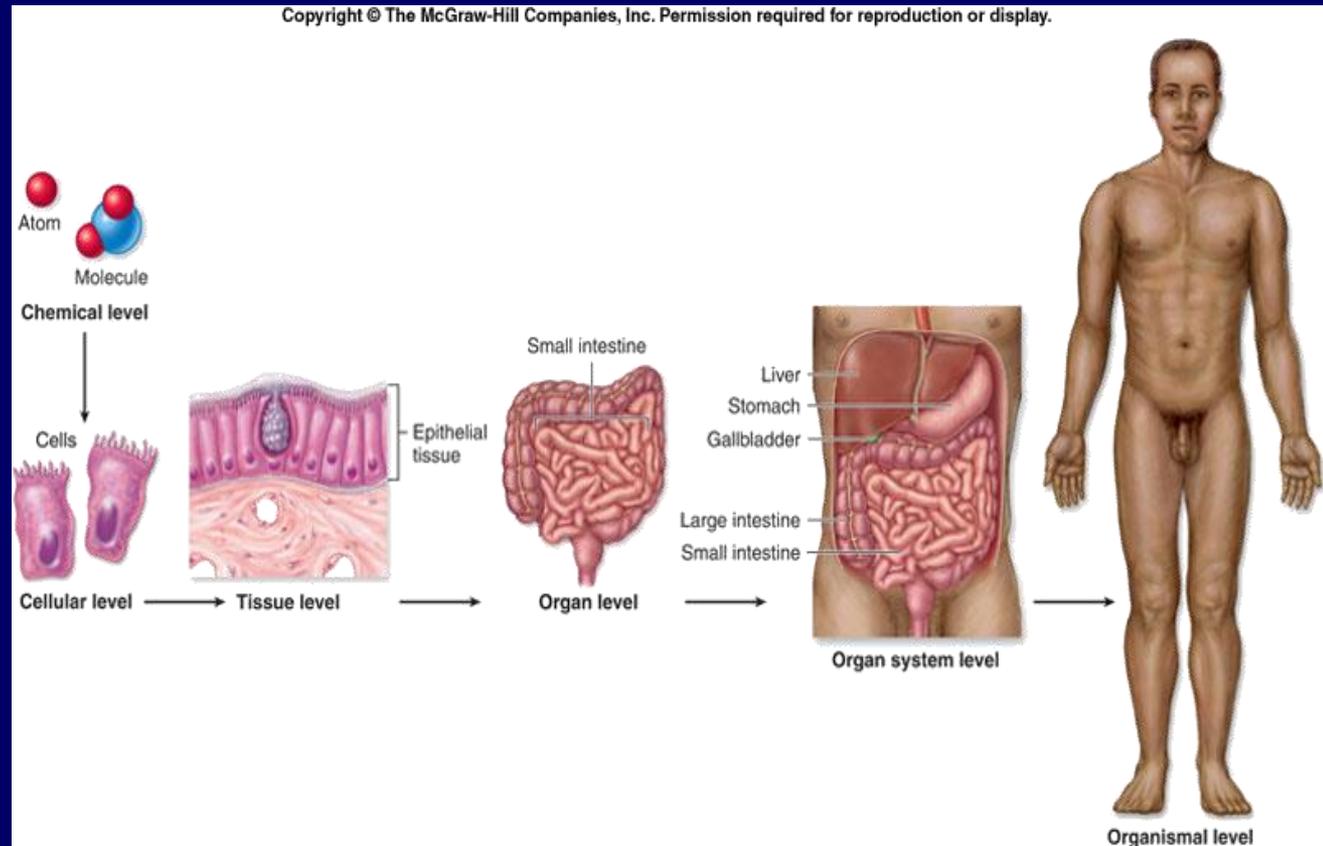
PROTECTIVE CLOTHING (LABCOAT)

GOGGLES



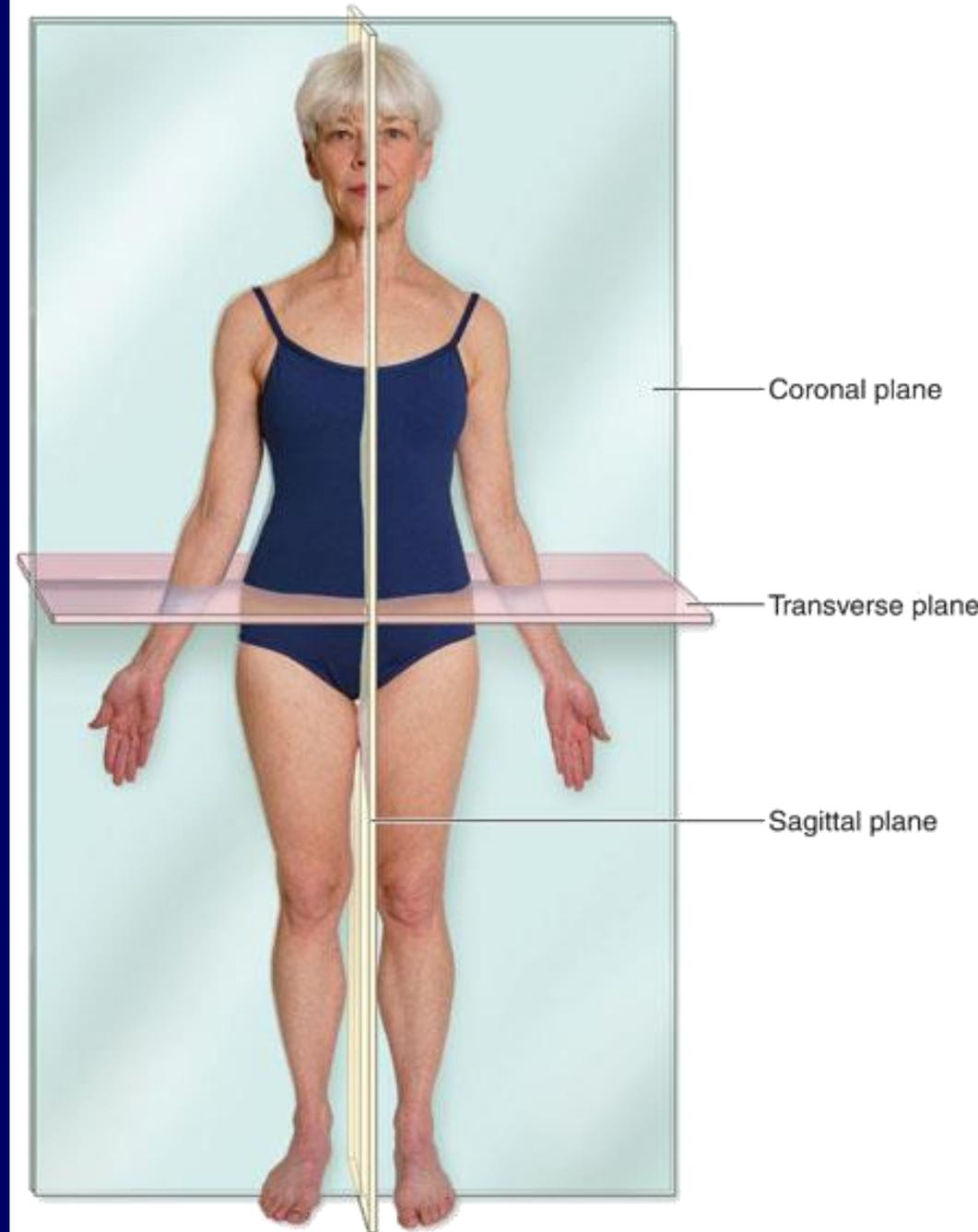
STRUCTURAL LEVELS OF ORGANIZATION

- Chemical
- Cellular
- Tissue
- Organ
- System
- Organism



Anatomical Terminology

- ❖ Anatomic position is a specific body position in which an individual stands upright with the feet parallel and flat on the floor.
- ❖ The head is level, and the eyes look forward toward the observer.
- ❖ The arms are at either side of the body with the palms facing forward and the thumbs pointing away from the body.

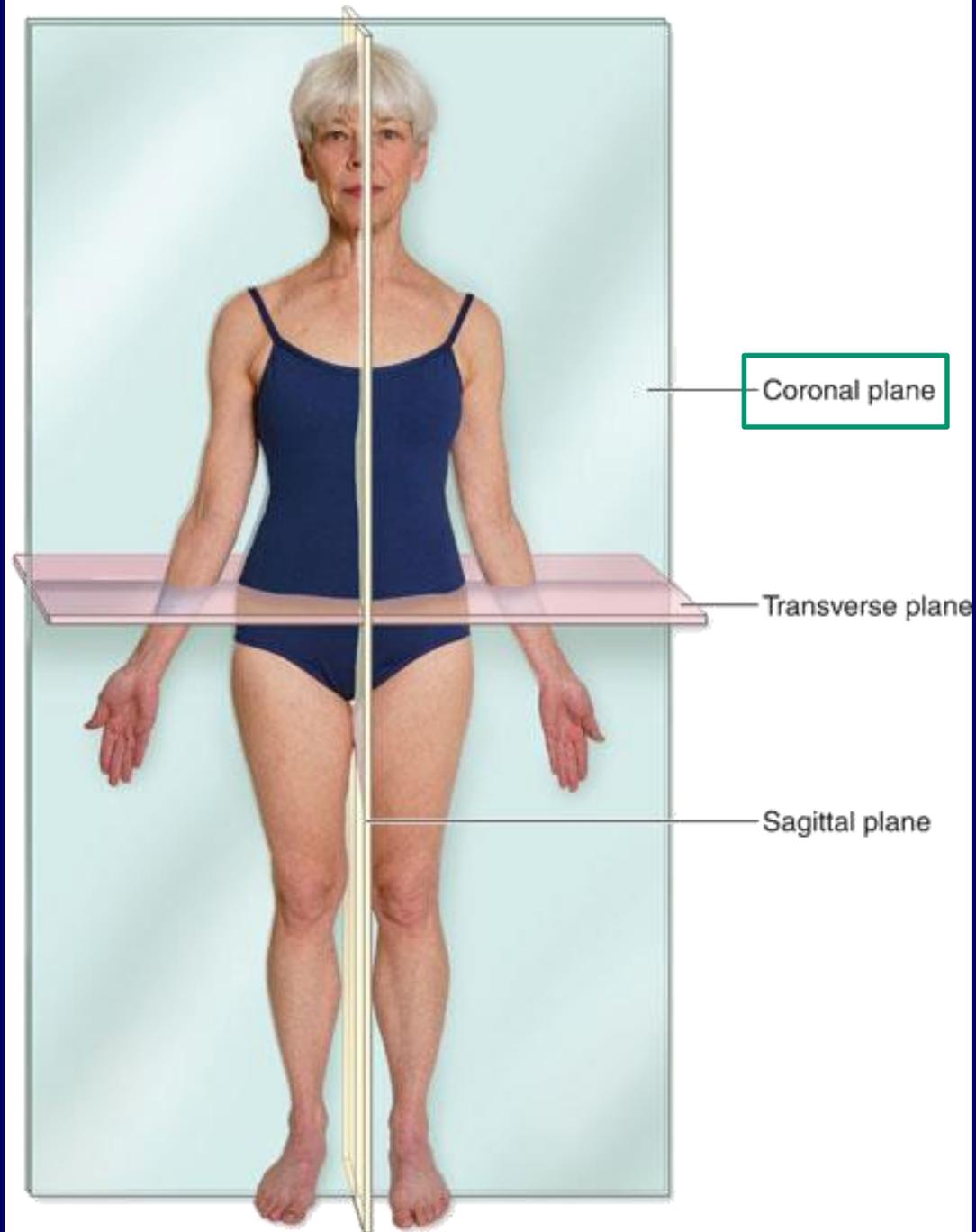


Anatomical Terminology

- ❖ A **plane** is an imaginary surface that slices the body into specific sections.
- ❖ The three major anatomic planes of reference are the **coronal, transverse, and sagittal** planes.

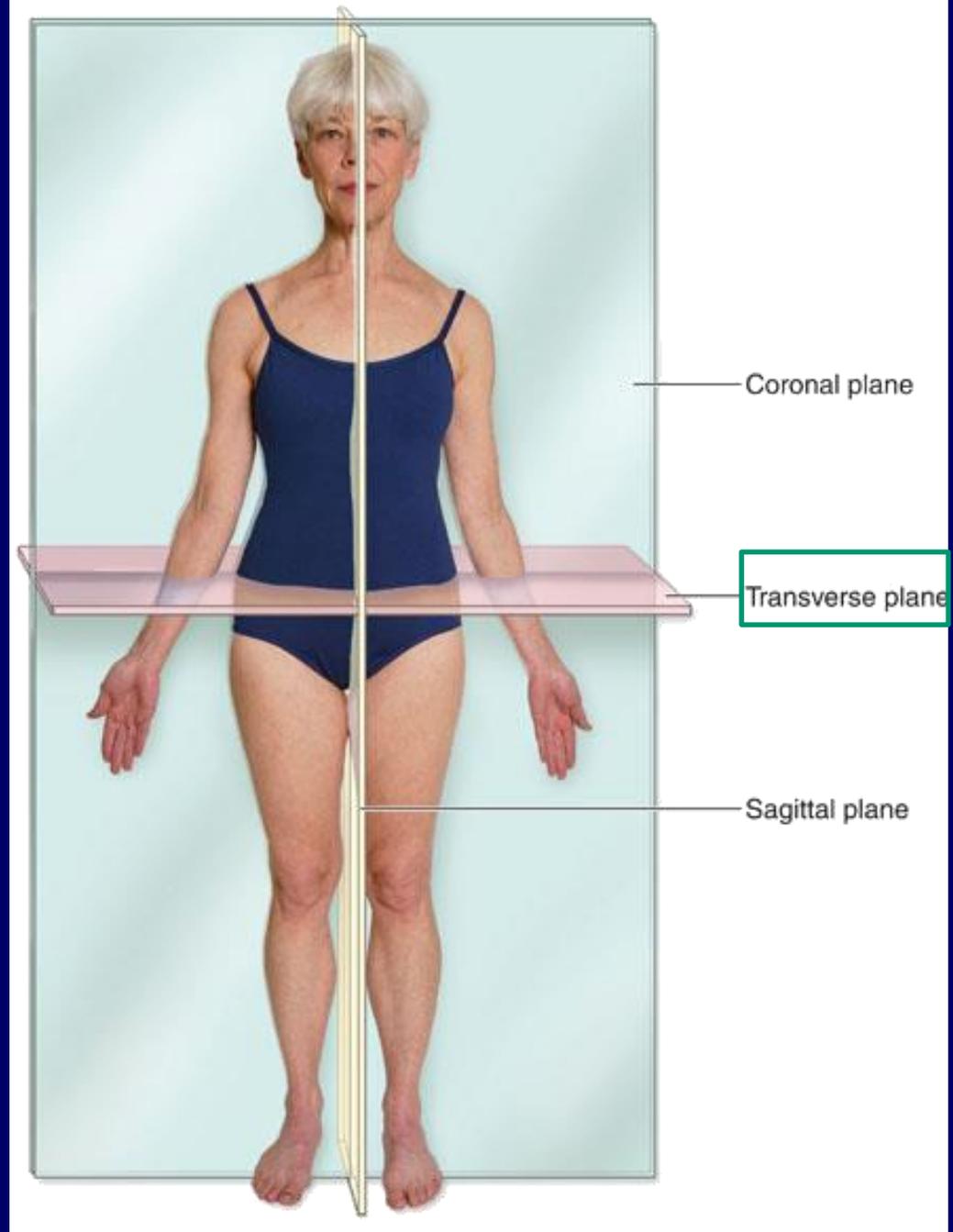
Sections and Planes

A coronal plane, also called a frontal plane, is a vertical plane that divides the body into anterior (front) and posterior (back) parts.



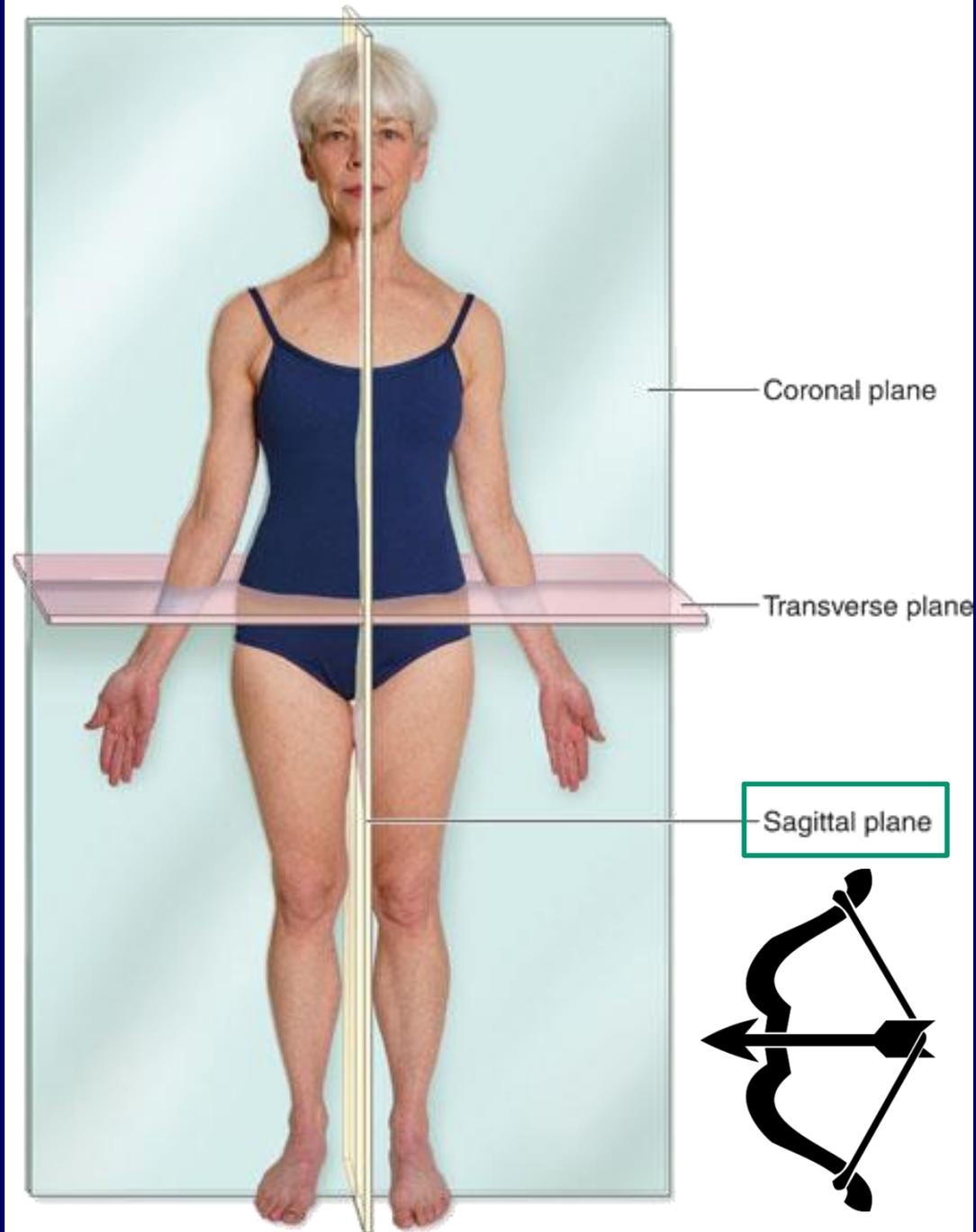
Sections and Planes

- ❖ A transverse plane, also called a cross-sectional plane or horizontal plane, cuts perpendicularly along the long axis of the body or organ separating it into both superior (upper) and inferior (lower) parts.



Sections and Planes

- ❖ A sagittal plane or median plane, extends through the body or organ vertically and divides the structure into right and left halves.



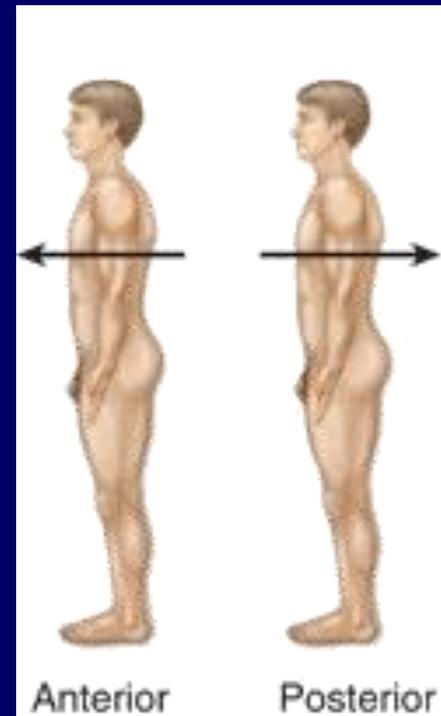
Sections and Planes

- ❖ A sagittal plane in the body midline is a midsagittal plane.
- ❖ A plane that is parallel to the midsagittal plane, but either to the left or the right of it, is termed a parasagittal (or sagittal) plane.
- ❖ A minor plane, called the oblique plane, passes through the specimen at an angle.

Relative and Directional Terms of the Body

❖ Relative to front (belly side) or back (back side) of the body :

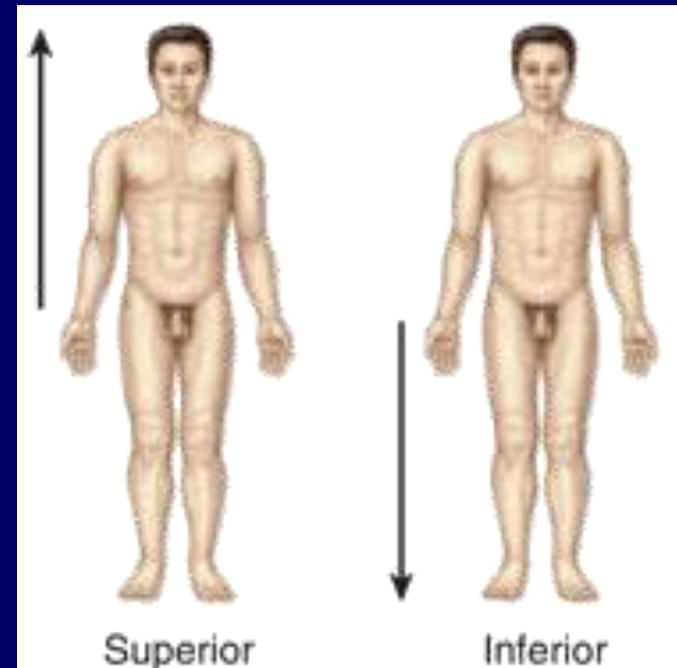
- **Anterior** = In front of; toward the front surface
- **Posterior** = In back of; toward the back surface
- **Dorsal** = At the back side of the human body
- **Ventral** = At the belly side of the human body



Relative and Directional Terms of the Body

❖ Relative to the head or tail of the body:

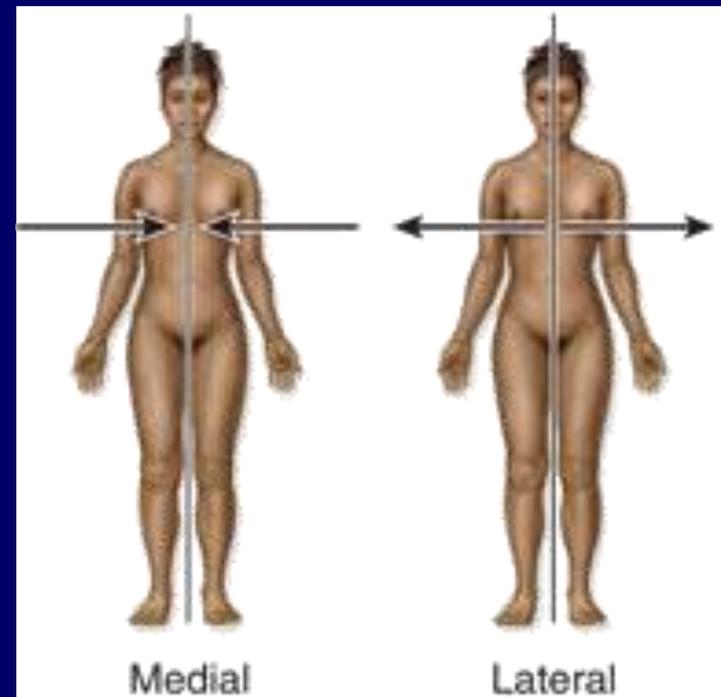
- **Superior** = Toward the head or above
- **Inferior** = Toward feet not head
- **Caudal** = At the rear or tail end
- **Cranial** = At the head end



Relative and Directional Terms of the Body

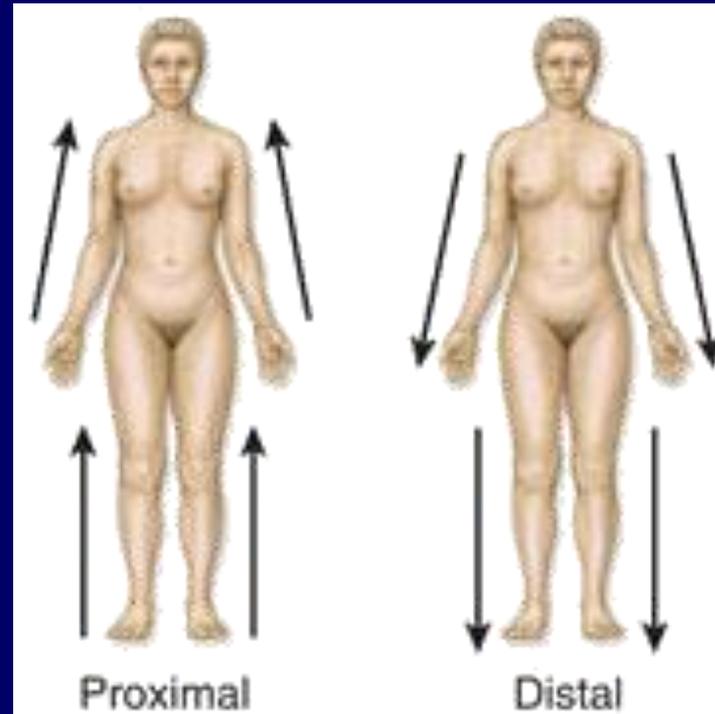
❖ Relative to the midline or center of the body:

- **Medial** = Toward the midline of the body
- **Lateral** = Away from the midline of the body
- **Deep** = On the inside, underneath another structure
- **Superficial** = On the outside



Relative and Directional Terms of the Body

- ❖ Relative to point of attachment of the appendage:
 - **Proximal** = Closest to point of attachment to trunk
 - **Distal** = Furthest from point of attachment to trunk



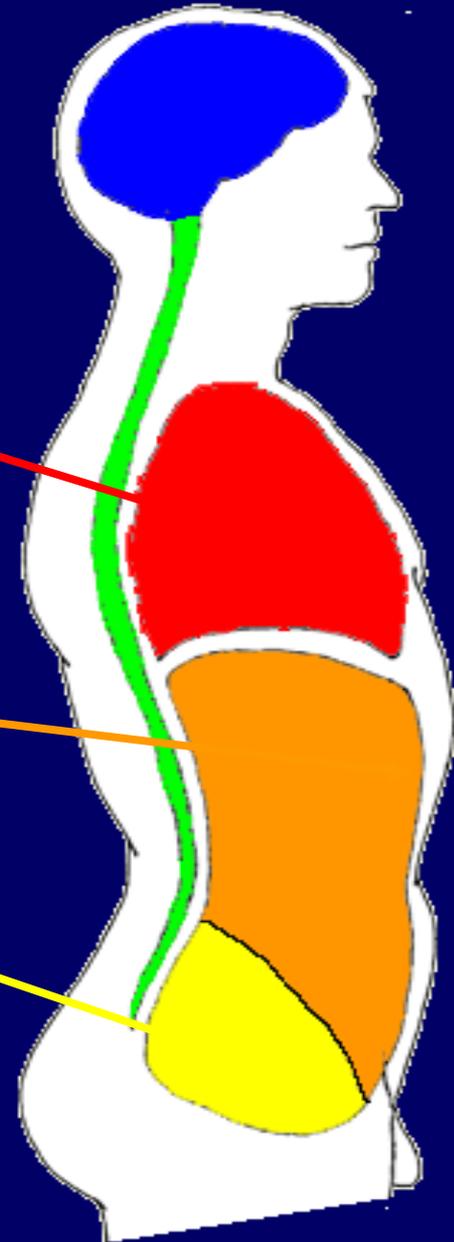
Body Cavities: Ventral (Lateral View)

Thoracic Cavity

Abdominal Cavity

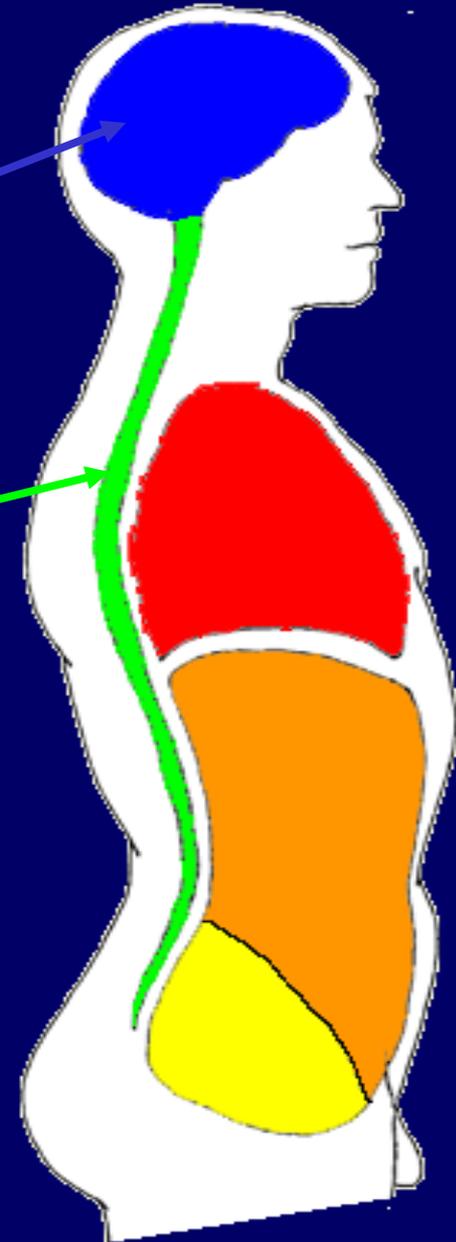
Pelvic Cavity

contains the “viscera”



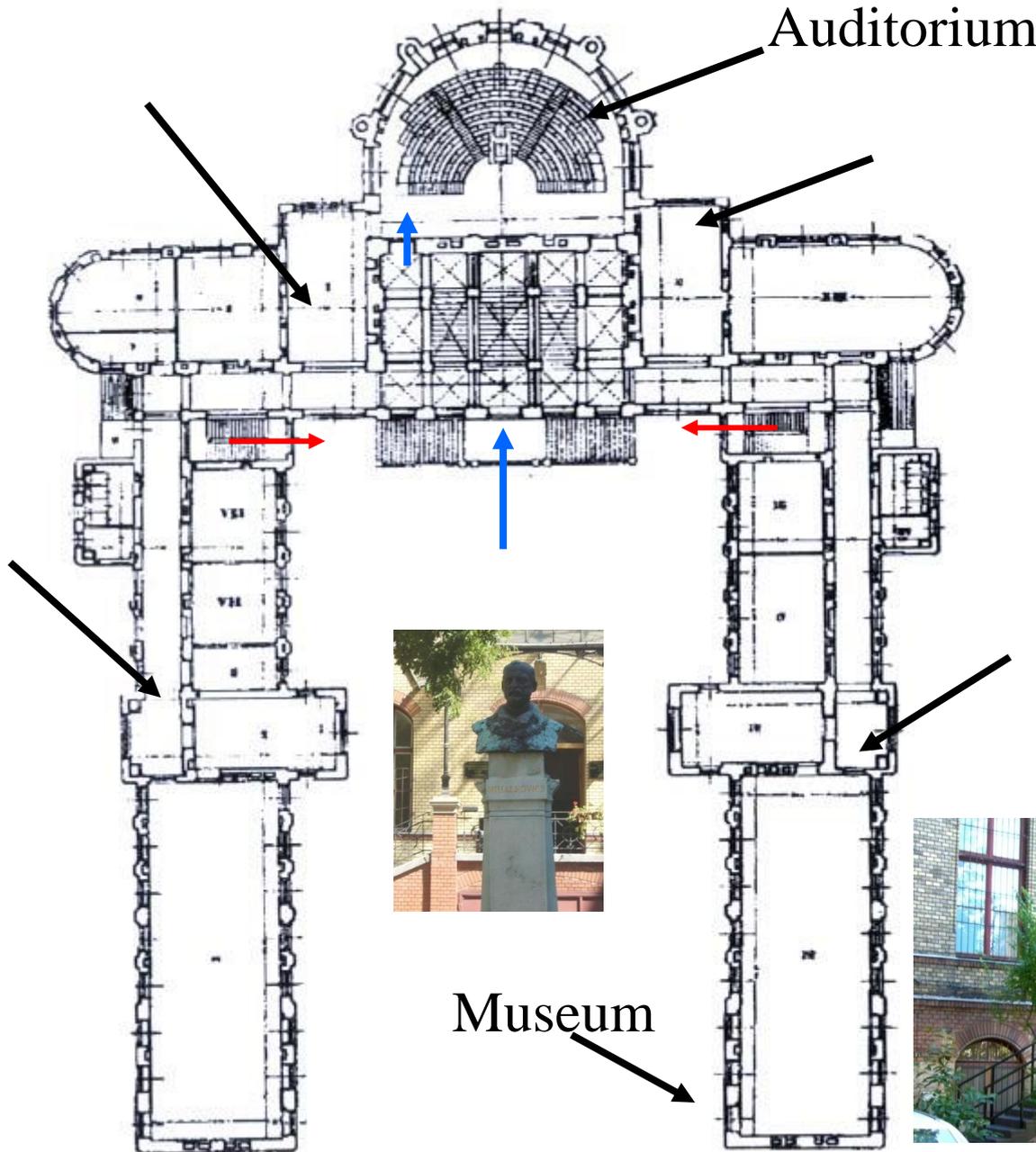
Body Cavities: Dorsal

- Cranial Cavity
 - Houses the Brain
- Vertebral Canal
 - Houses the Spinal Cord



Locker (1st floor)

Dissection room

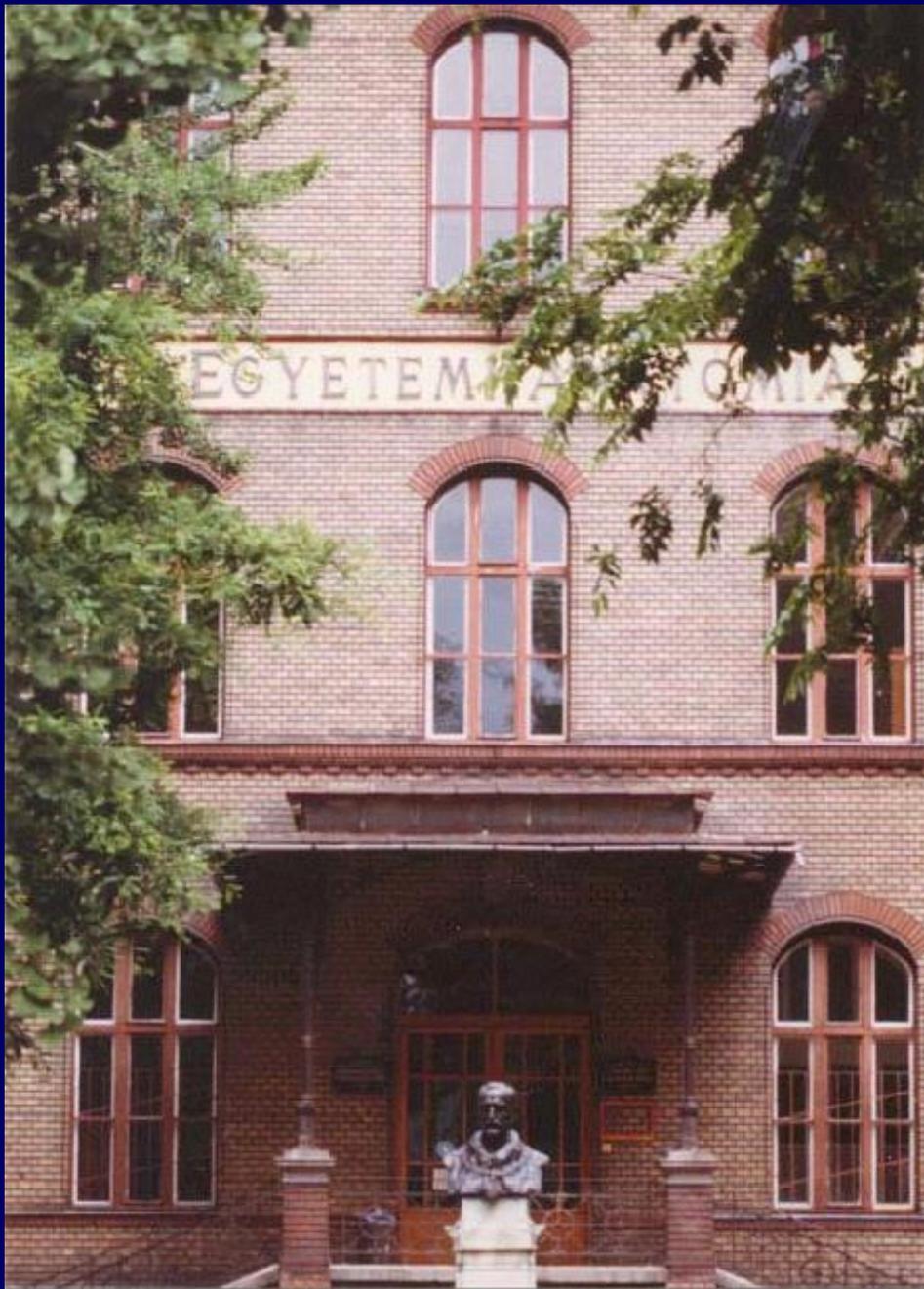


Histology (1st floor)









Enjoy your studies
at Semmelweis University!