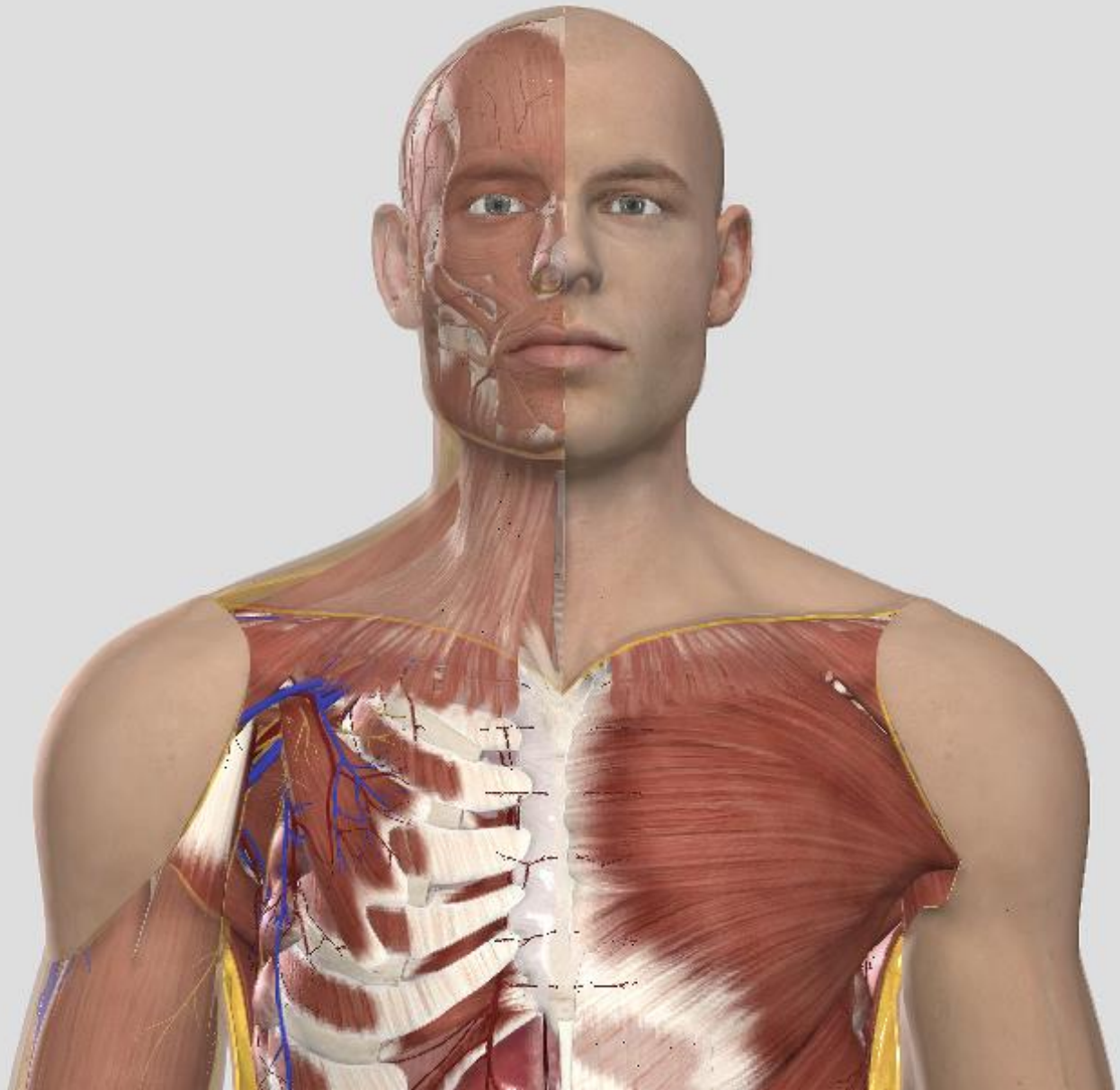
General anatomy 1.

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Anatomy on Moodle

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Vyhledat kurzy

- Ústav anatomie
- Aktuální informace/Current information
- Kontakty na vyučující/Contacts
- Studijní informace/Study Information
- Přednášky
- Lectures
- Informace k volitelným předmětům
- Ostatní studijní materiály/Other study materials
- Testy

Anatomy

01. week: 02. 10. - 06. 10. 2023

1) 3. 10. 2023 - Introduction - Anatomical terminology, orientation to the human body, cells, tissues, organs functional anatomy (Prof. MUDr. Jiří Ferda, Ph.D.)

2) 5. 10. 2023 - General osteology and arthrology (Prof. MUDr. Jiří Ferda, Ph.D.)

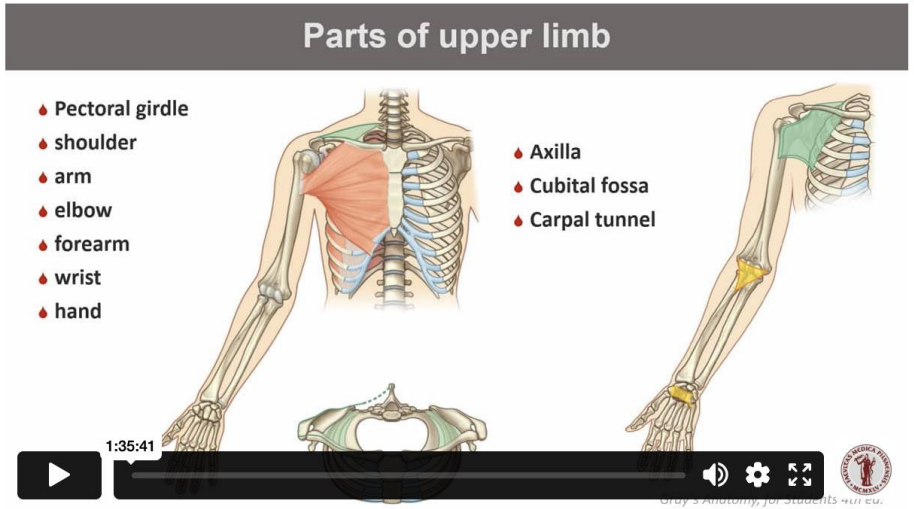
3) e-lecture - Upper limb 1 + 2 (Prof. MUDr. Jiří Ferda, Ph.D.)

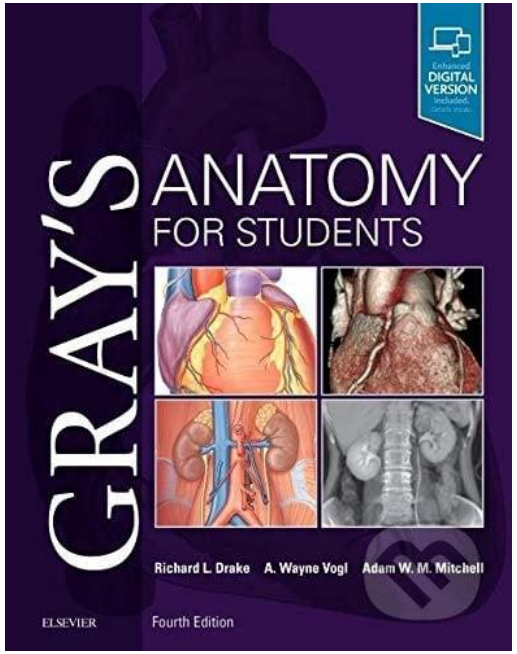
lecture materials

Recordings of lectures

Recordings of lectures

1. Upper extremity 1

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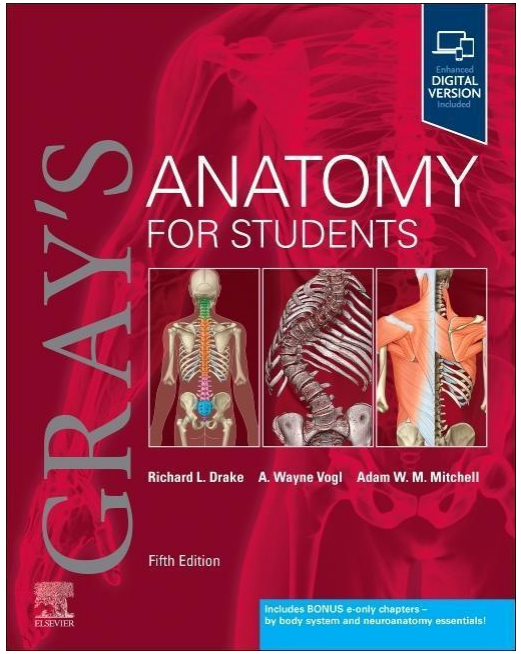
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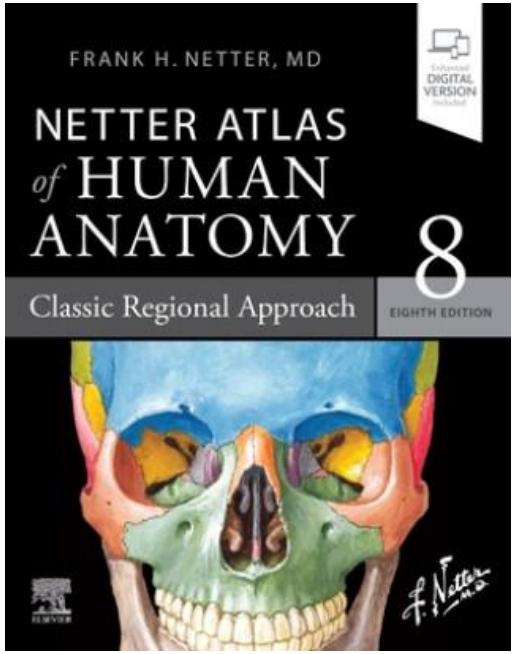
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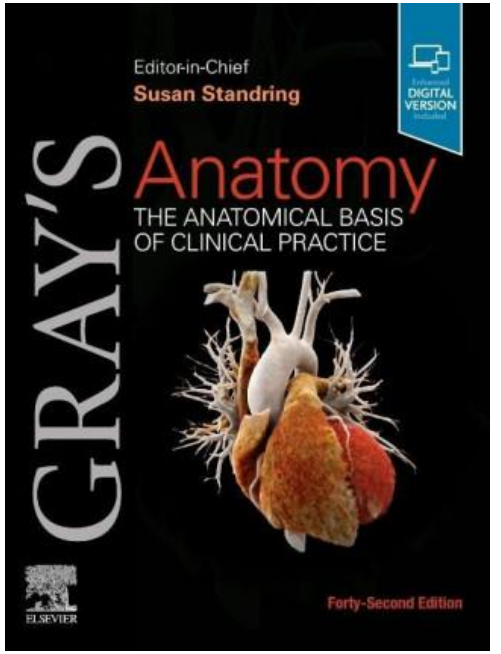
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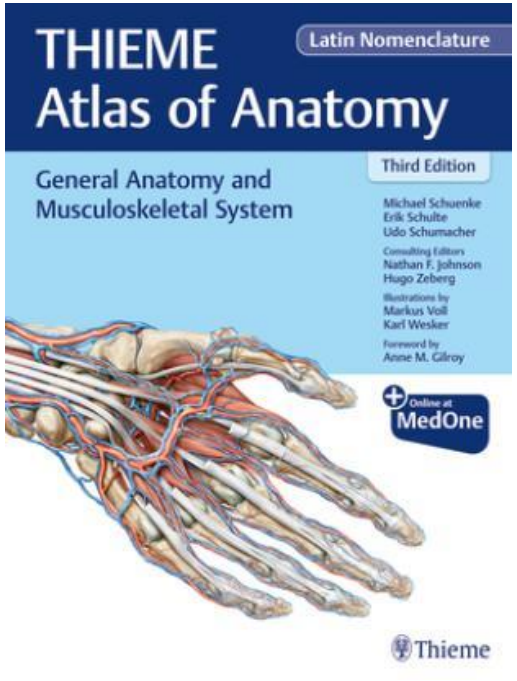
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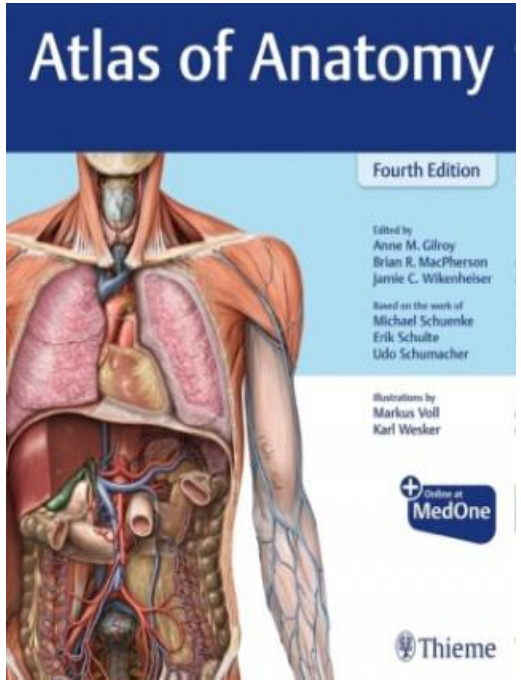
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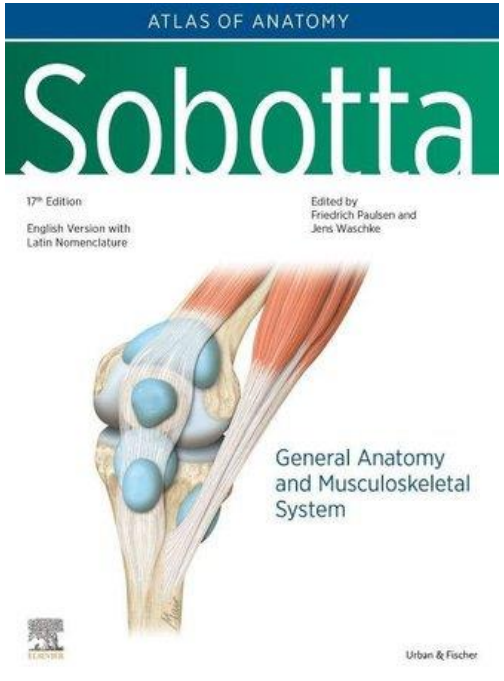
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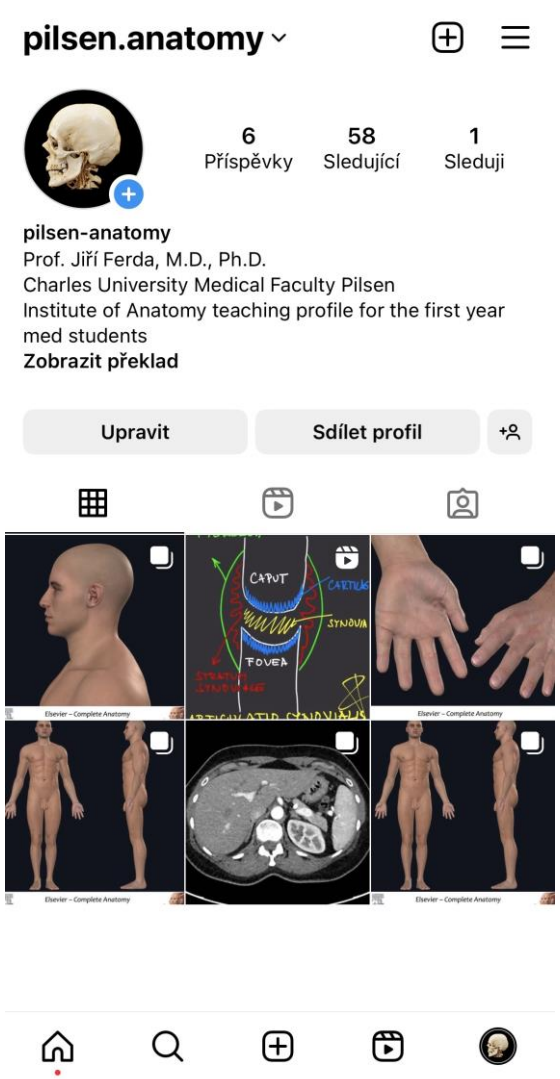

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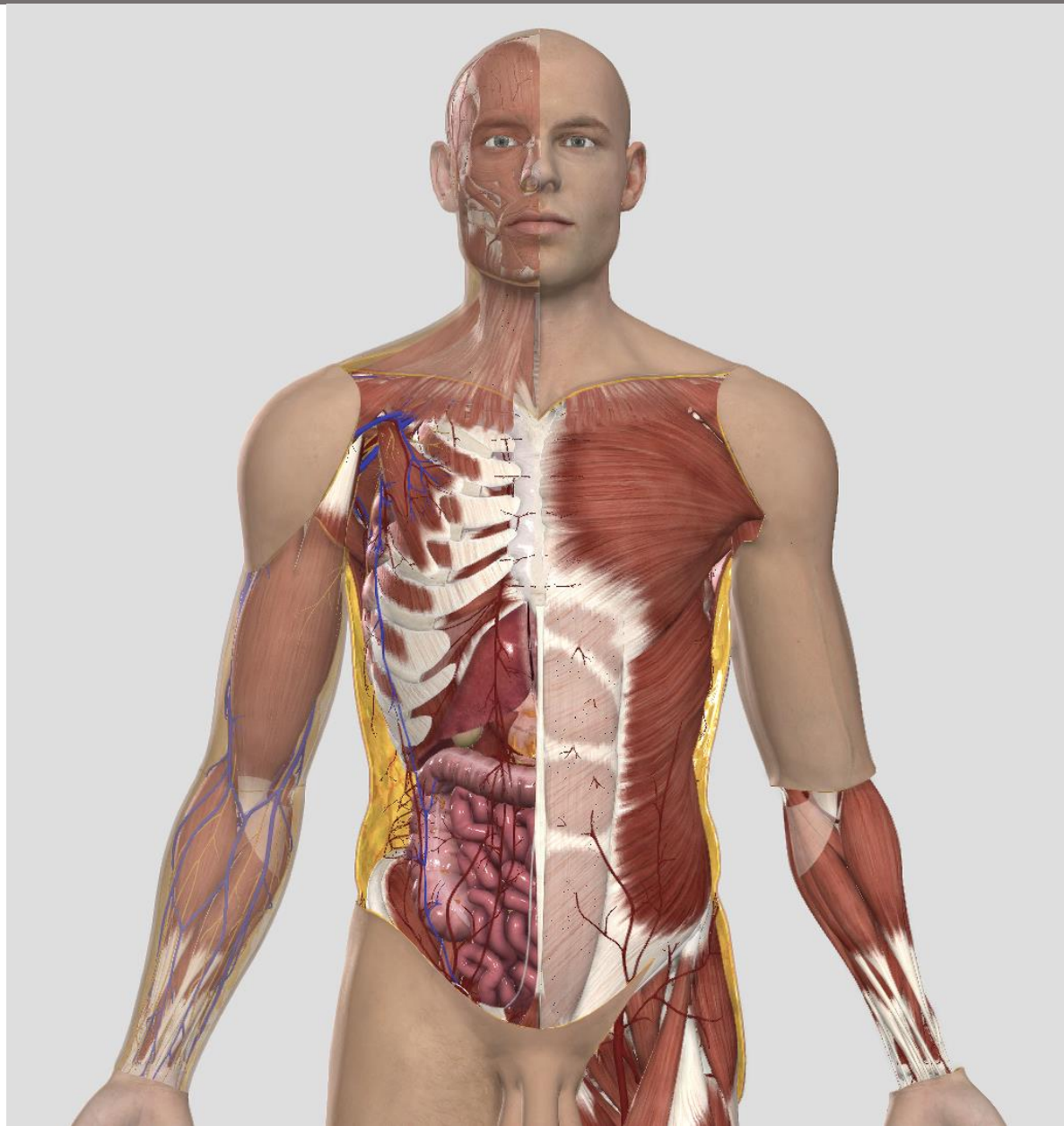
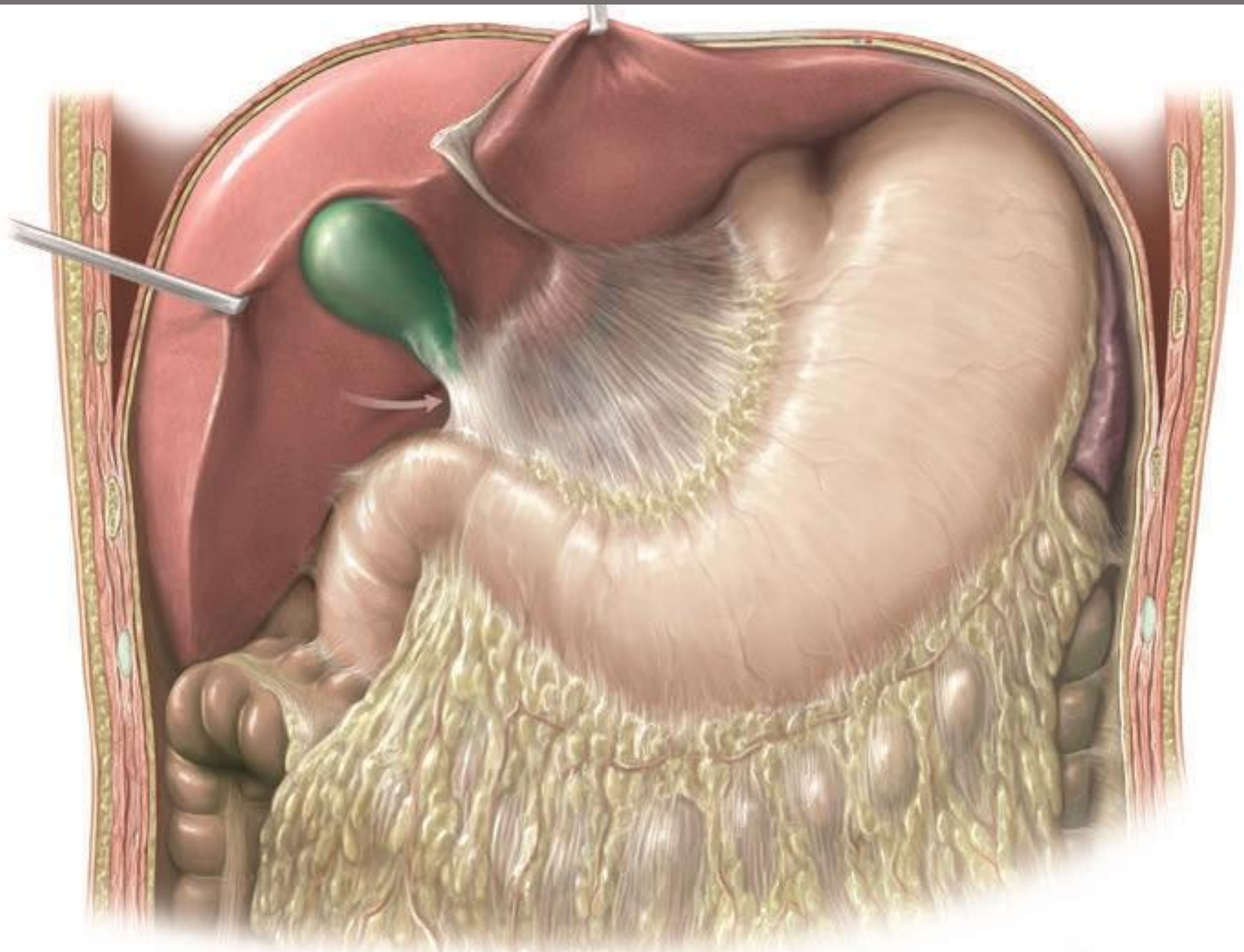
Anatomia - Anatomy

- **tomos – knife**
- **anatemnein – cut**

  - ***Systematic anatomy***
  - ***Topographic anatomy***
  - ***Evolutionary anatomy***
  - ***Surgical anatomy***
  - ***Radiological anatomy***
  - ***Microscopic anatomy – Histology***
  - ***Embrylology***
  - ***Experimental anatomy***



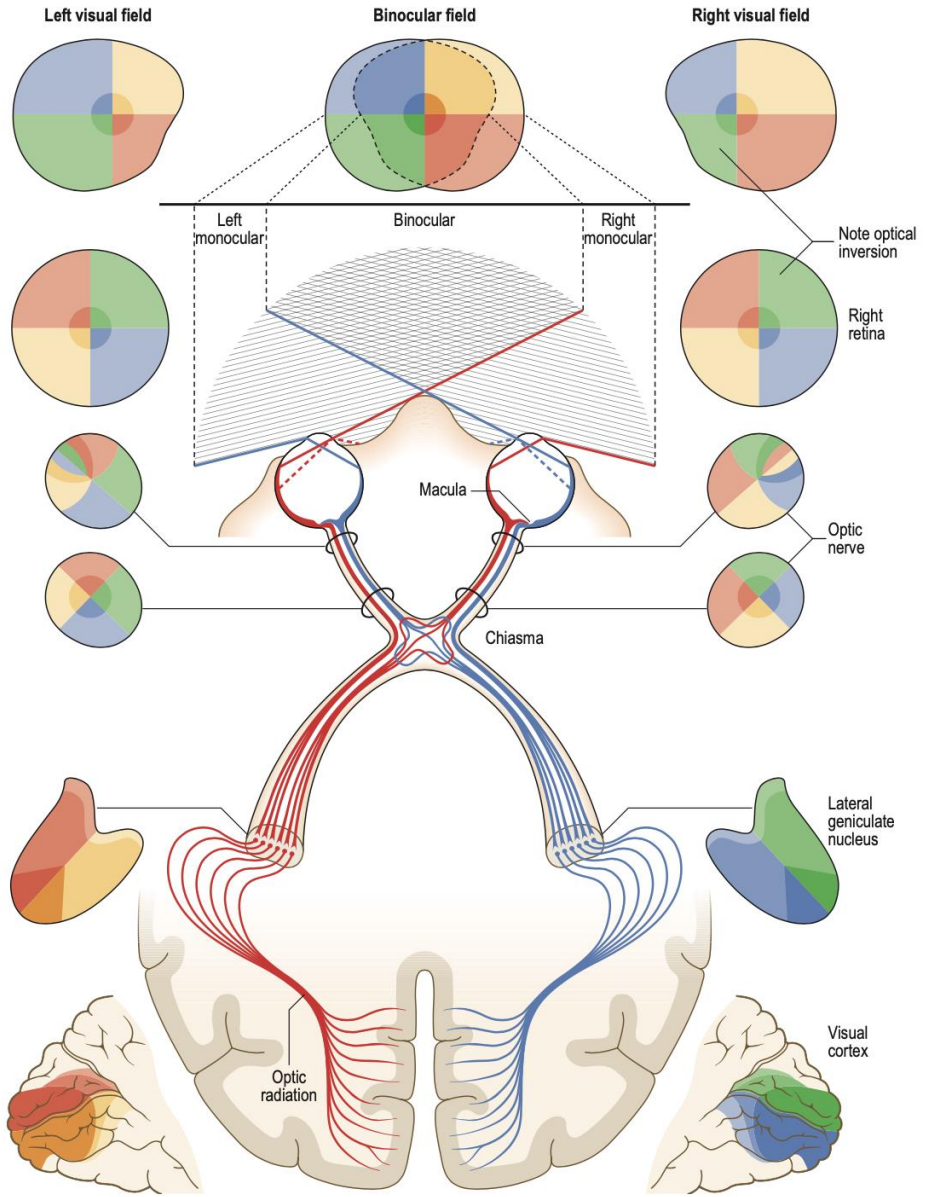
Organ anatomy, organ system anatomy, topography



Functional anatomy - visual pathway

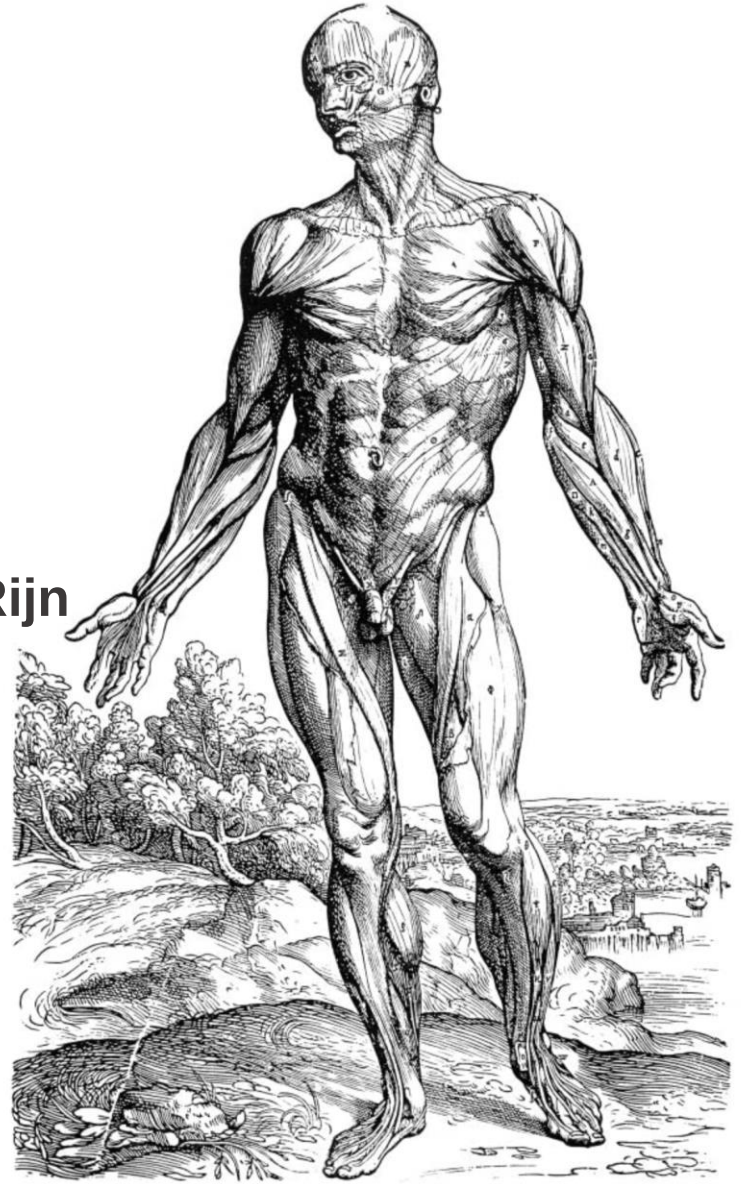
- Light sensitive cell
- 1/ interneuron of retina
- 2/ retinal ganglional cell

- 3/ neuron of corp. geniculatum laterale
  - Radiatio optica
- 4/ neuron of primar visual cortex



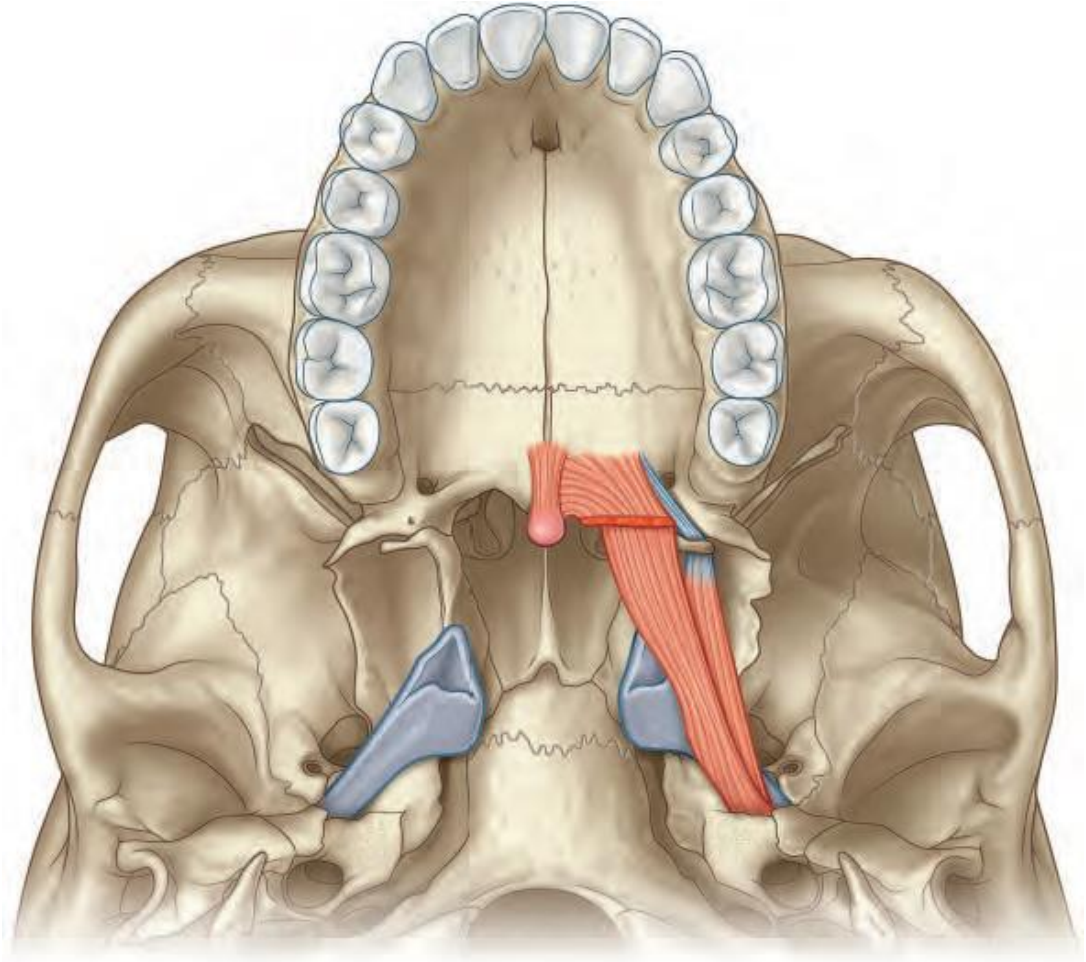
History of Anatomy

- **Antic**
  - ***Aristotelés, Hippokratés, Galénnos***
- **Medieval**
  - **Ibn Sinna (Avicenna)**
- **16. – 17. century**
  - **Andreas Vessalius, Johann Jessenius** – *public dissections*
  - **Ambroas Parré** – *war surgery*
  - **Leonardo da Vinci, Michelangiolo Buonarroti, Rembrant van Rijn**
- **19. century**
  - **Surgery on the battle fields** – *Napoleon wars, Krym war*
  - **Surgery development –** *French and German school*
  - **Discovery of X-rays**
- **20. century**
  - **World War I, and II., surgery development, imaging**



Anatomical nomenclature - terminology

- ***Historical nomenclature***
  - *Antic authors – Hippokratés, Aristotelés, Galenos*
  - *Arabic school– Avicenna*
  - *Renaisance – Andreas Vessalius*
- *Some terms traditional*
- *Aerterein – to conduct the air – arteria - artery*
- **Nomica anatomica**
  - *Basel 1895 (BNA)*
  - *Jena 1935 (JNA)*
  - *Paris 1955 (PNA)*
- **Terminologia Anatomica 1998**
  - *(International Anatomical Terminology)*
  - *General and gross anatomy*
  - *Topographical anatomy*
  - *Eponymous terms (according to the authors)*



- ***Synonyma – tuba pharyngotympanica, tuba auditiva, tuba Eustachii***

Basic anatomical position

- *Standing upright*
- *Palmar side of the hand anteriorly*
- *Thumb lateraly*

Body size

- **Mid-growth**
- *f 161 – 173 cm*
- *m 170 - 184*
- **Mean height**
- *Females 167*
- *Males 181*
- ***Gigantism***
- ***Dwarfism***
- *20% less or more than mid-growth*
- ***gender***
- ***ethnicity***
- ***age***

Body weight and surface

- **Body weight**
- *normal*
- ***Body mass index (BMI)***

$$\mathrm{BMI} = \frac{\mathrm{mass_{kg}}}{\mathrm{height_m}^2}$$

Category	BMI (kg/m²)[c]
Underweight (Severe thinness)	< 16.0
Underweight (Moderate thinness)	16.0 – 16.9
Underweight (Mild thinness)	17.0 – 18.4
Normal range	18.5 – 24.9
Overweight (Pre-obese)	25.0 – 29.9
Obese (Class I)	30.0 – 34.9
Obese (Class II)	35.0 – 39.9
Obese (Class III)	≥ 40.0

- **Body surface**
- ***Body surface area (BSA)***

$$BSA = \frac{\sqrt{W \times H}}{60}$$

m

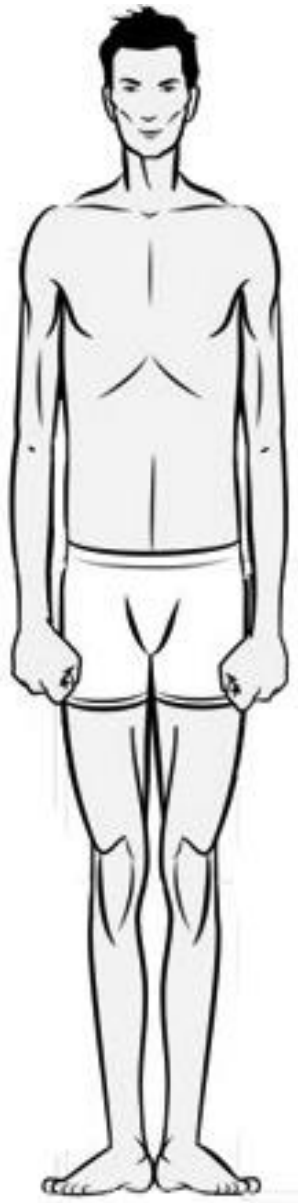
Age or age group	metric	
Neonate (newborn)	0.243	m^2
2 years	0.563	m^2
5 years	0.787	m^2
10 years	1.236	m^2
13 years	1.603	m^2
18 years	1.980	m^2
20–79 years	2.060	m^2
80+ years	1.920	m^2

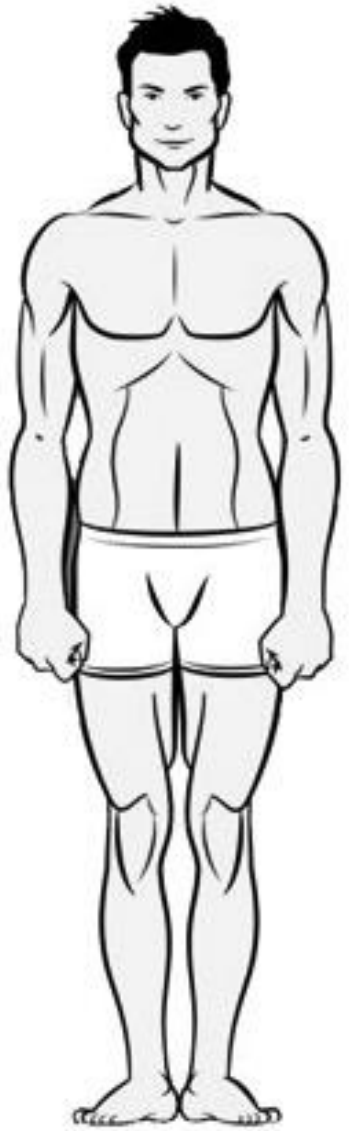
f

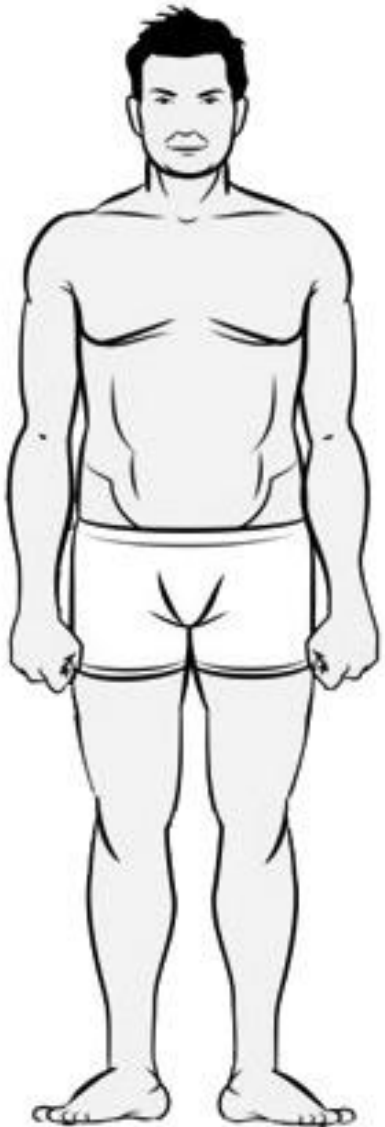
Age or age group	metric	
Neonate (newborn)	0.234	m^2
2 years	0.540	m^2
5 years	0.771	m^2
10 years	1.245	m^2
13 years	1.550	m^2
18 years	1.726	m^2
20–79 years	1.830	m^2
80+ years	1.638	m^2

Constitution

- *Height and weight rate*
- *Rate between body parts*
- ***Constitutional types***
- *Leptosomic (asthenic, ectomorphic)*
- *Athletic (mezomorphic)*
- *Pyknic (endomorphic)*



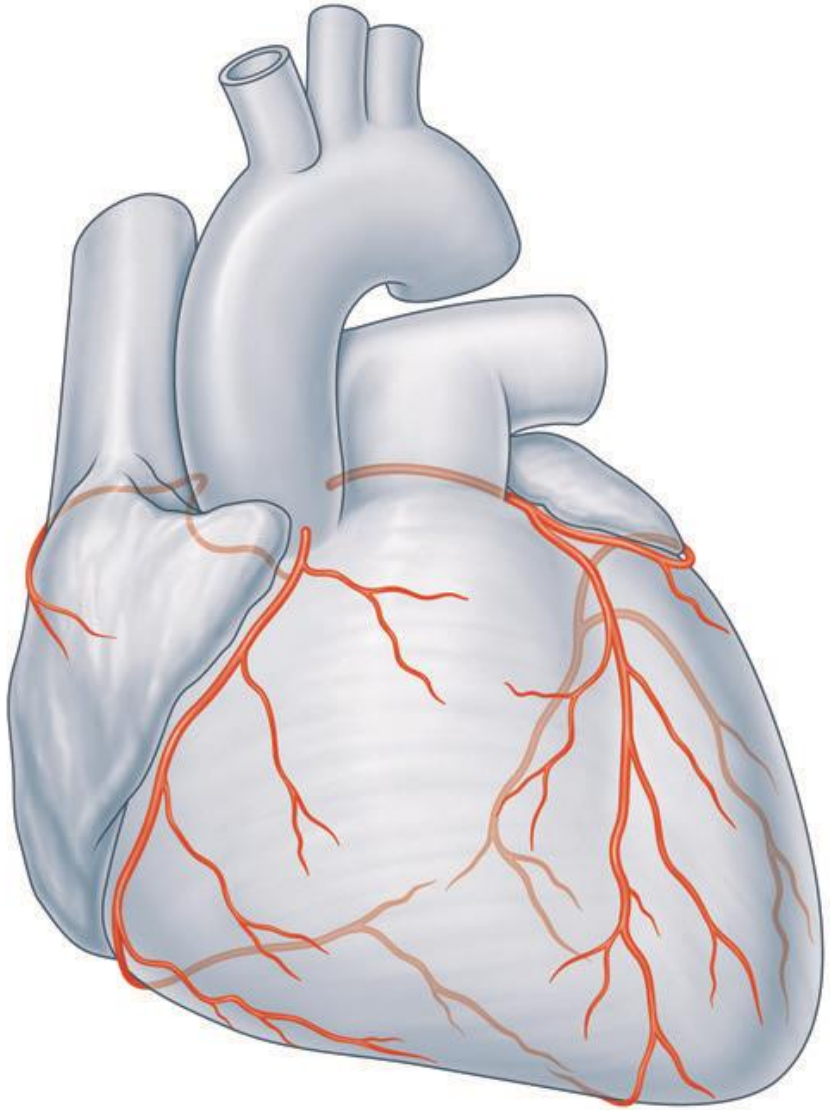


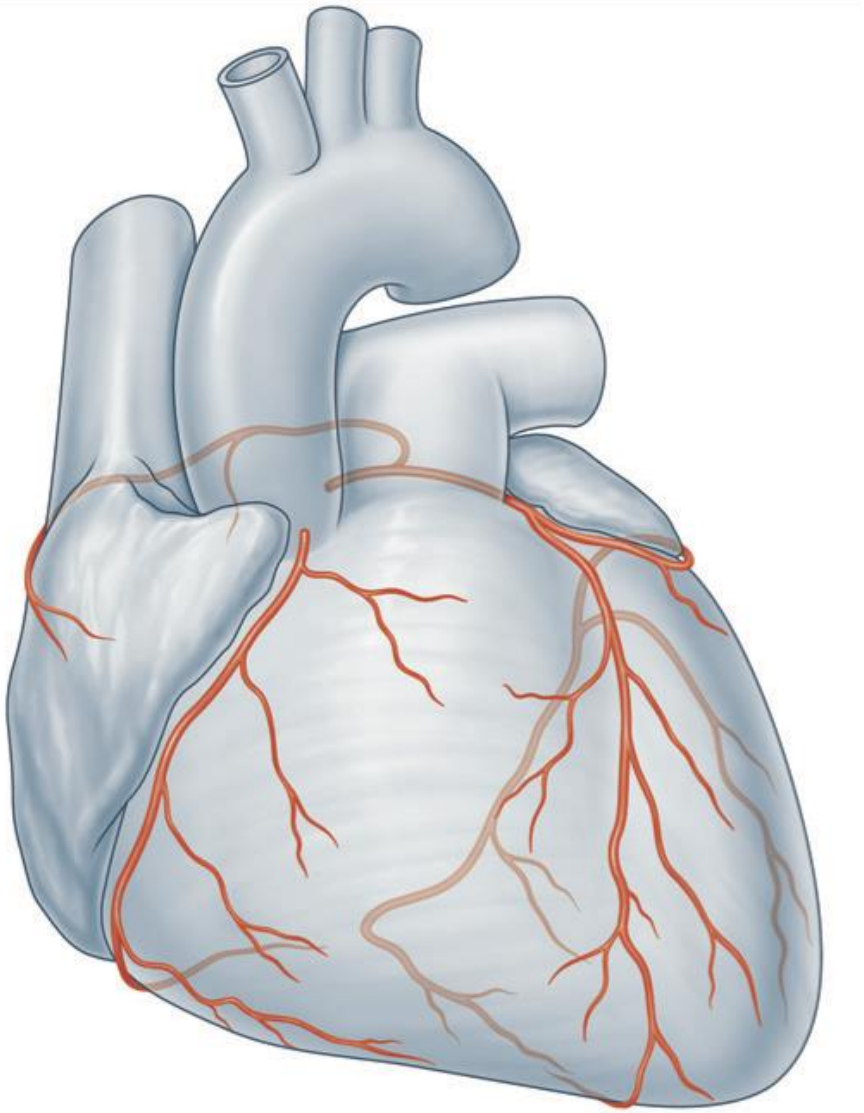


Normality, variability, anomaly

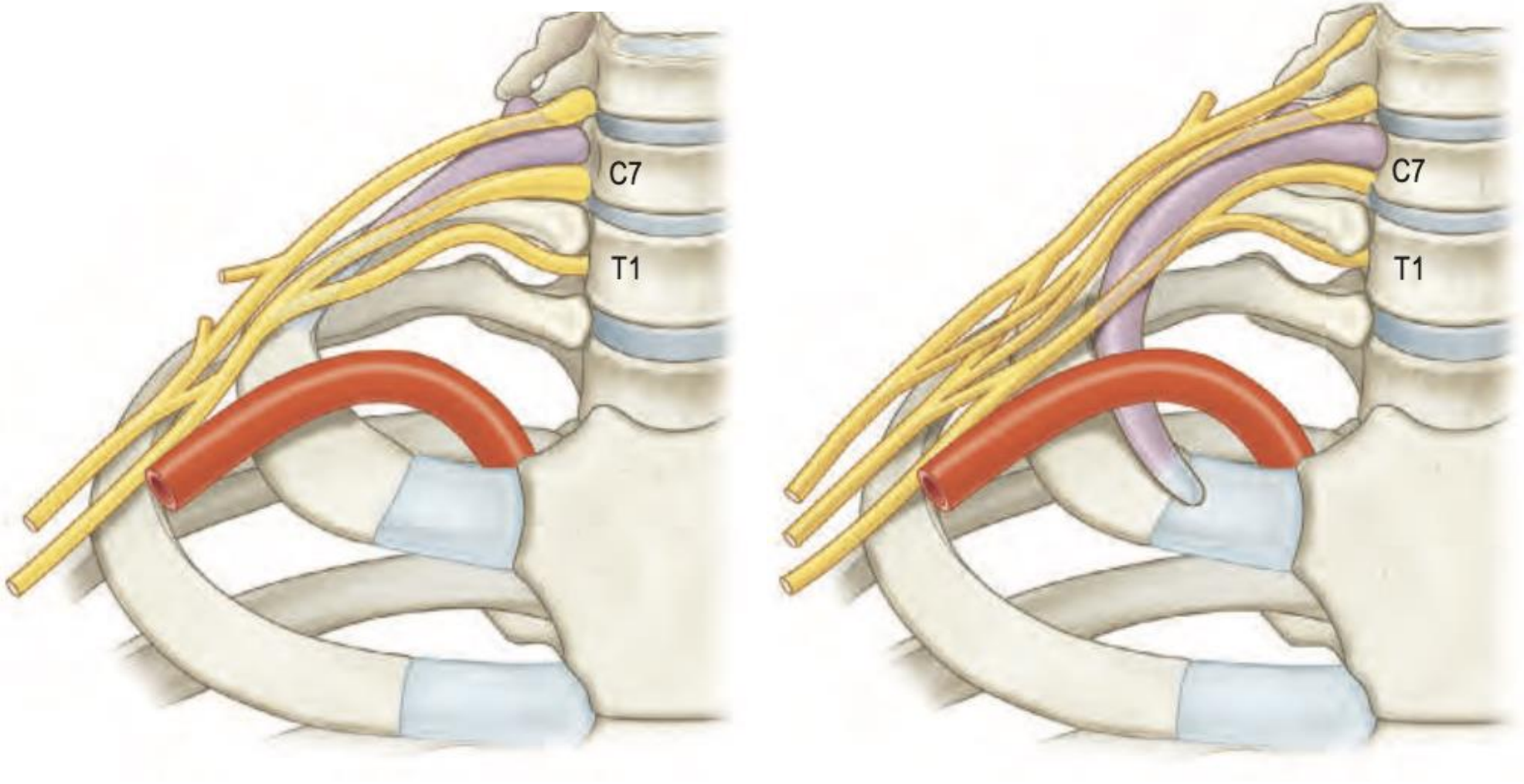
- **Norma**
- ***The most frequent appearance***
- *Variability*
- *Non-important differences in size and ratio, no functional consequence*
- **Variety**
- *Fully functioning deviation*
- *In complicated development of the structure*
- *Vascular varieties*
- **Anomaly**
- *Deviations with functional consequences*
- **Malformation**
- *In-born failed development ever leading to functional failure*

Variety

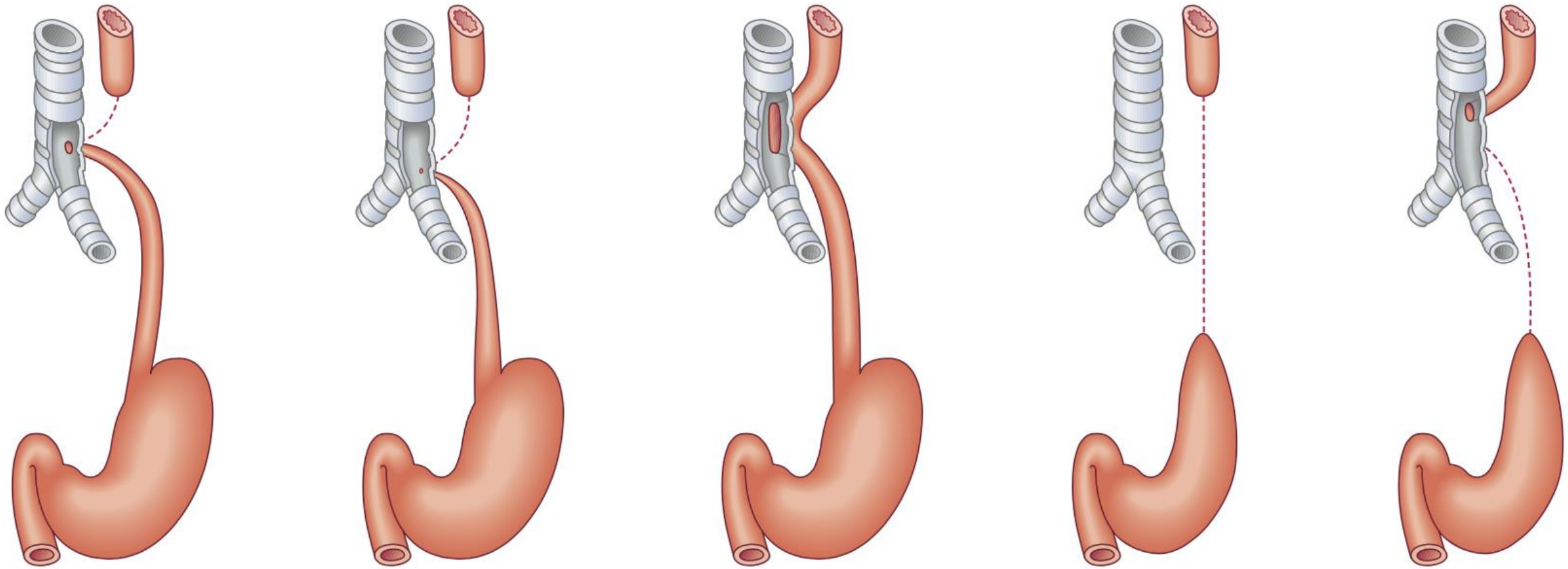




Anomaly



Malformation

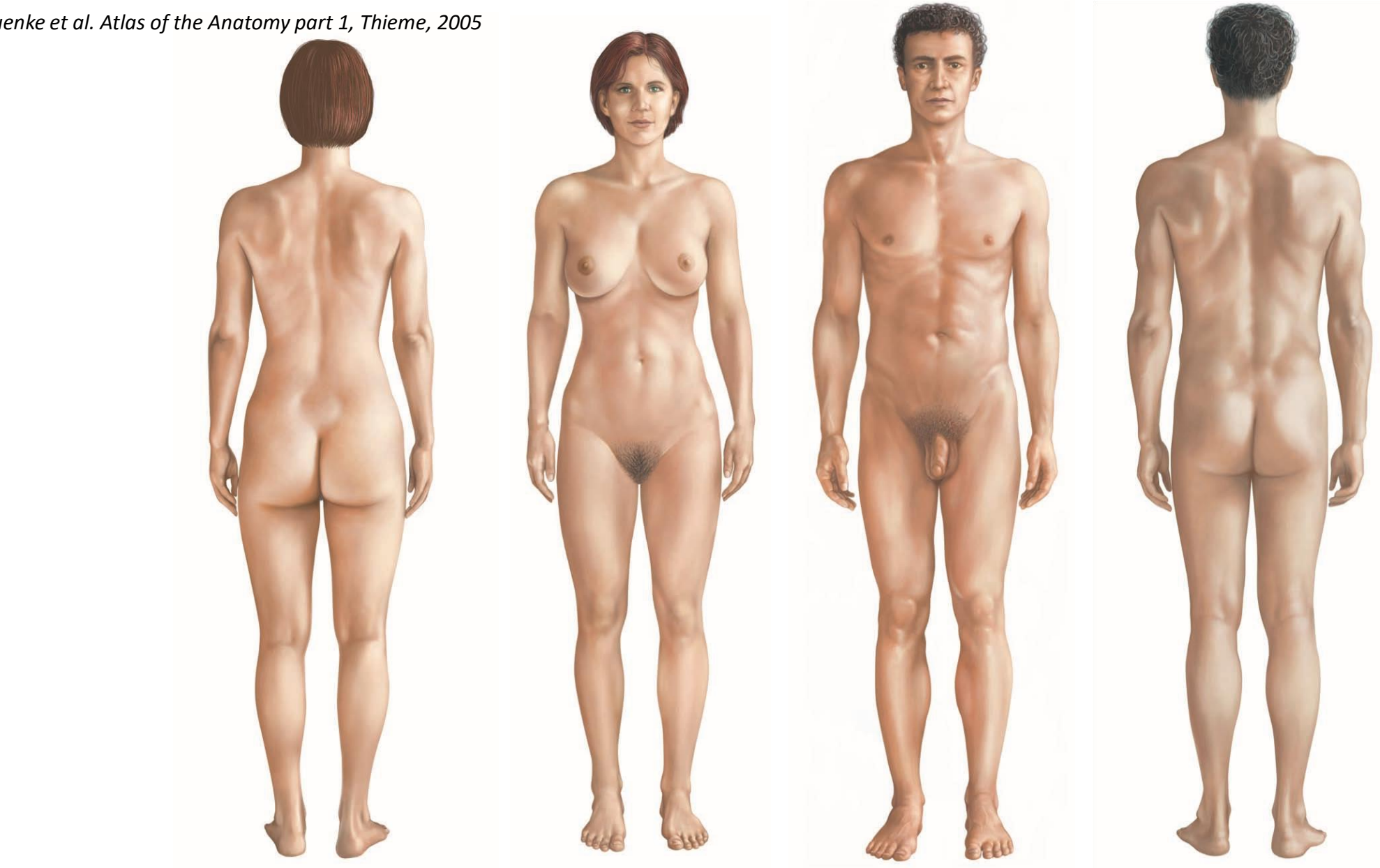


Sexual dimorfism

- **Anatomical differences based on the gender**
- **Primary sexual signs**
- *In fetus, newborn, and infant*
- **Secondary sexual signs**
- *Developed durin onset of pubertas*
- ***Android signs***
- ***Gynoid signs***
- *skull*
- *larynx*
- *chest*
- *pelvis*
- *hairs*

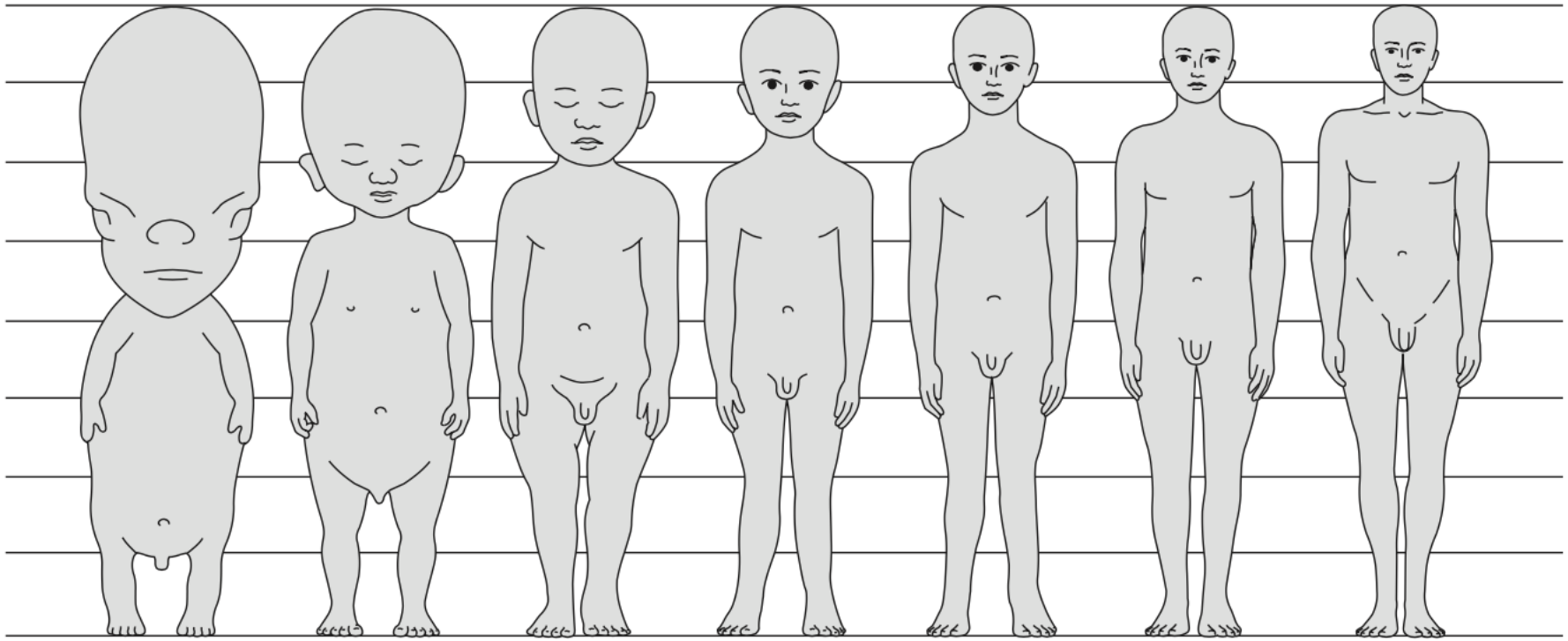
Sexual dimorfism

Schuenke et al. Atlas of the Anatomy part 1, Thieme, 2005



Anatomy and the age of the individual

- *Embryonal period*
- *Fetal period*
- *Infancy*
- *Childhood*
- *Pubertas*
- *Adolescency*
- *Adult age*
- *Senium*



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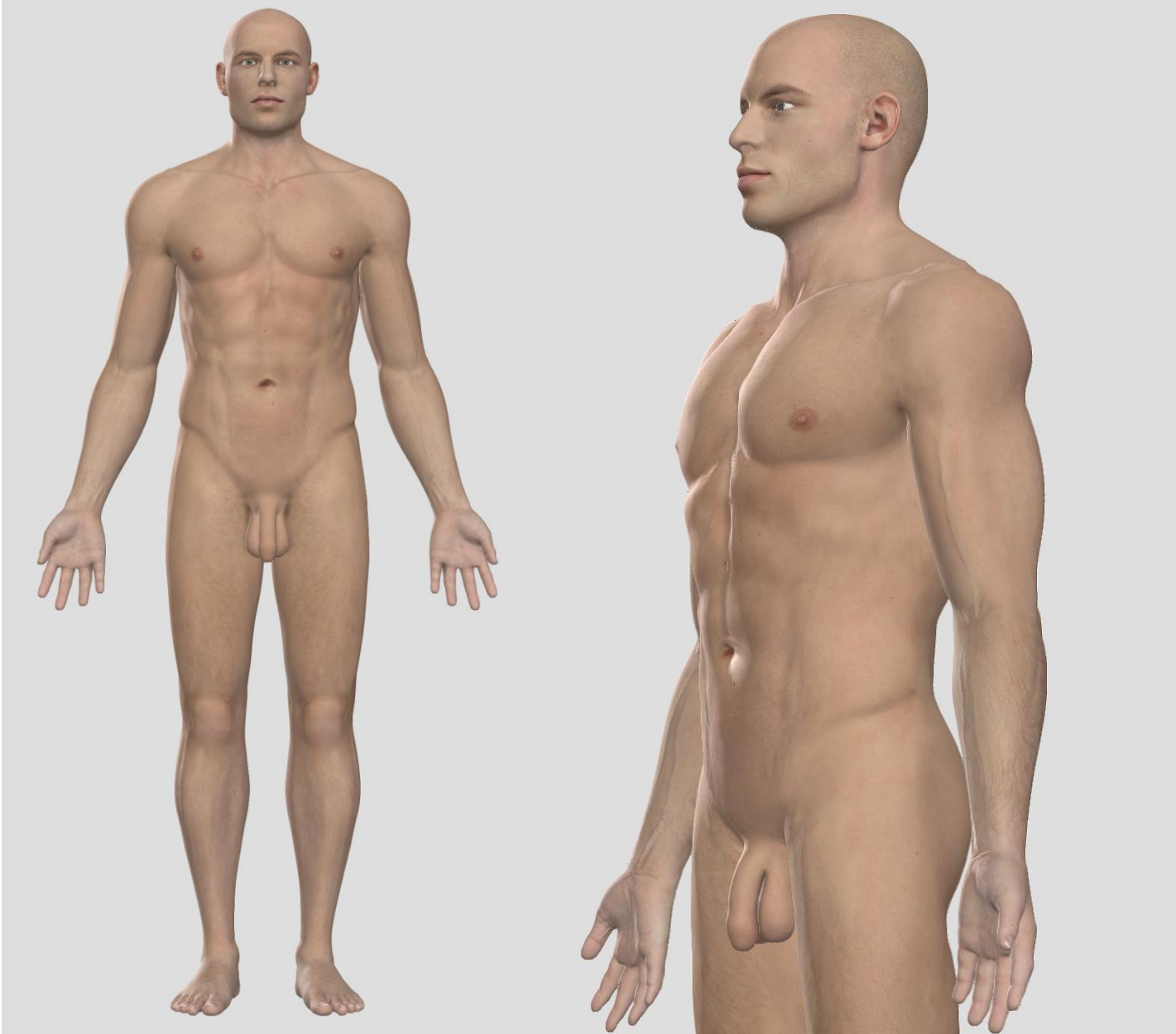
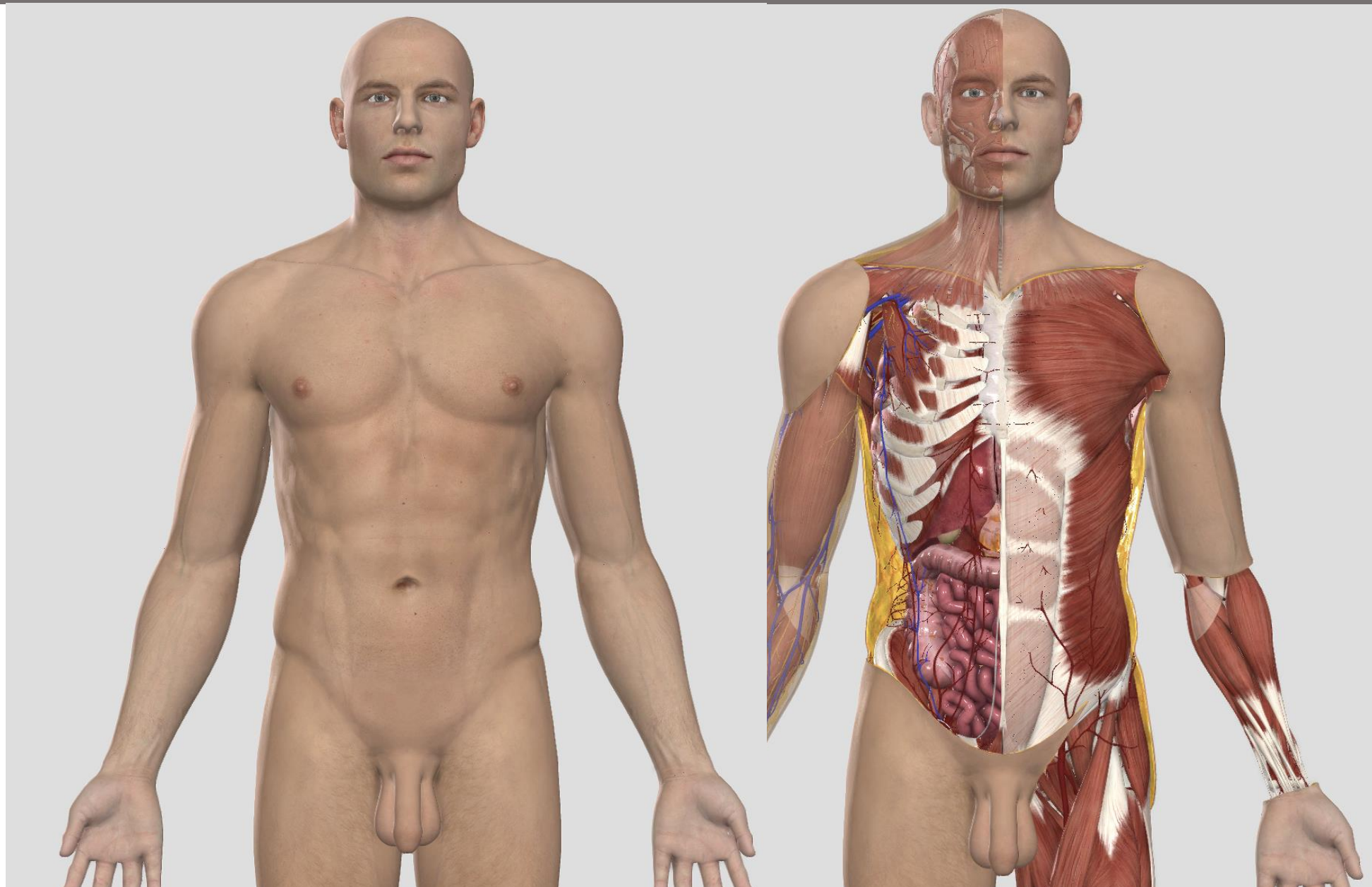
Body parts – partes corporis humani

- *Caput - head*
- *Collum - neck*
- *Truncus - trunk*
- *Membrum superius – upper limb*
- *Membrum inferius – lower limb*



Body cavities - cavitates corporis

- *Cavitas cranii*
- *Cavitas thoracis*
- *Cavitas abdominis*
- *Cavitas pelvis*



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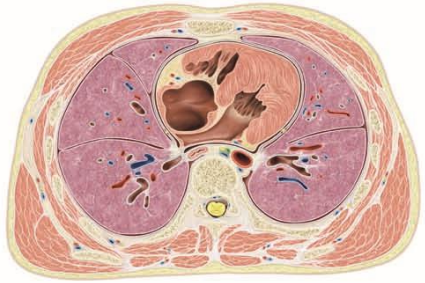
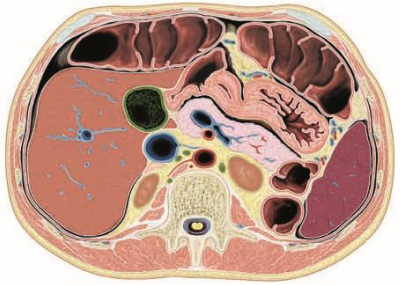
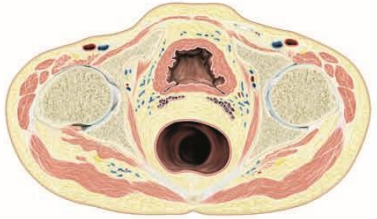
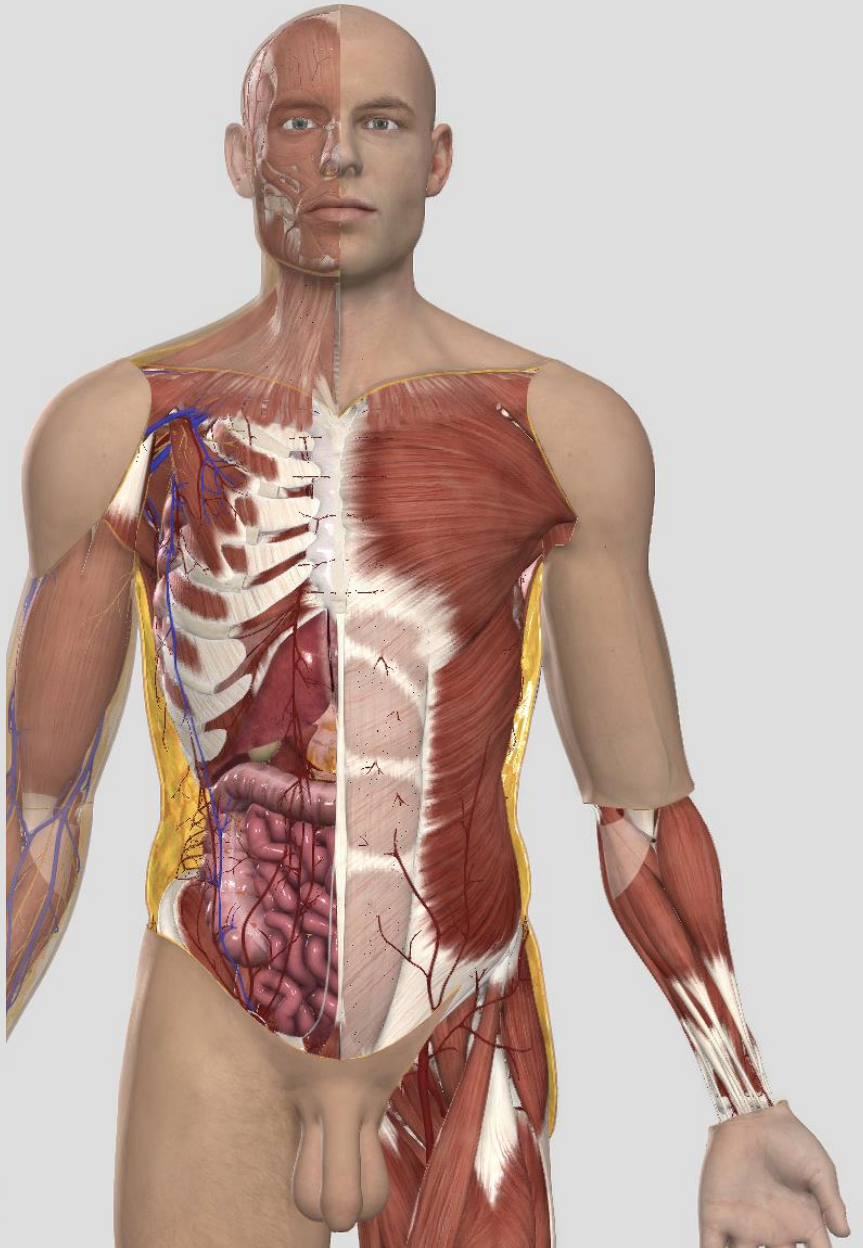


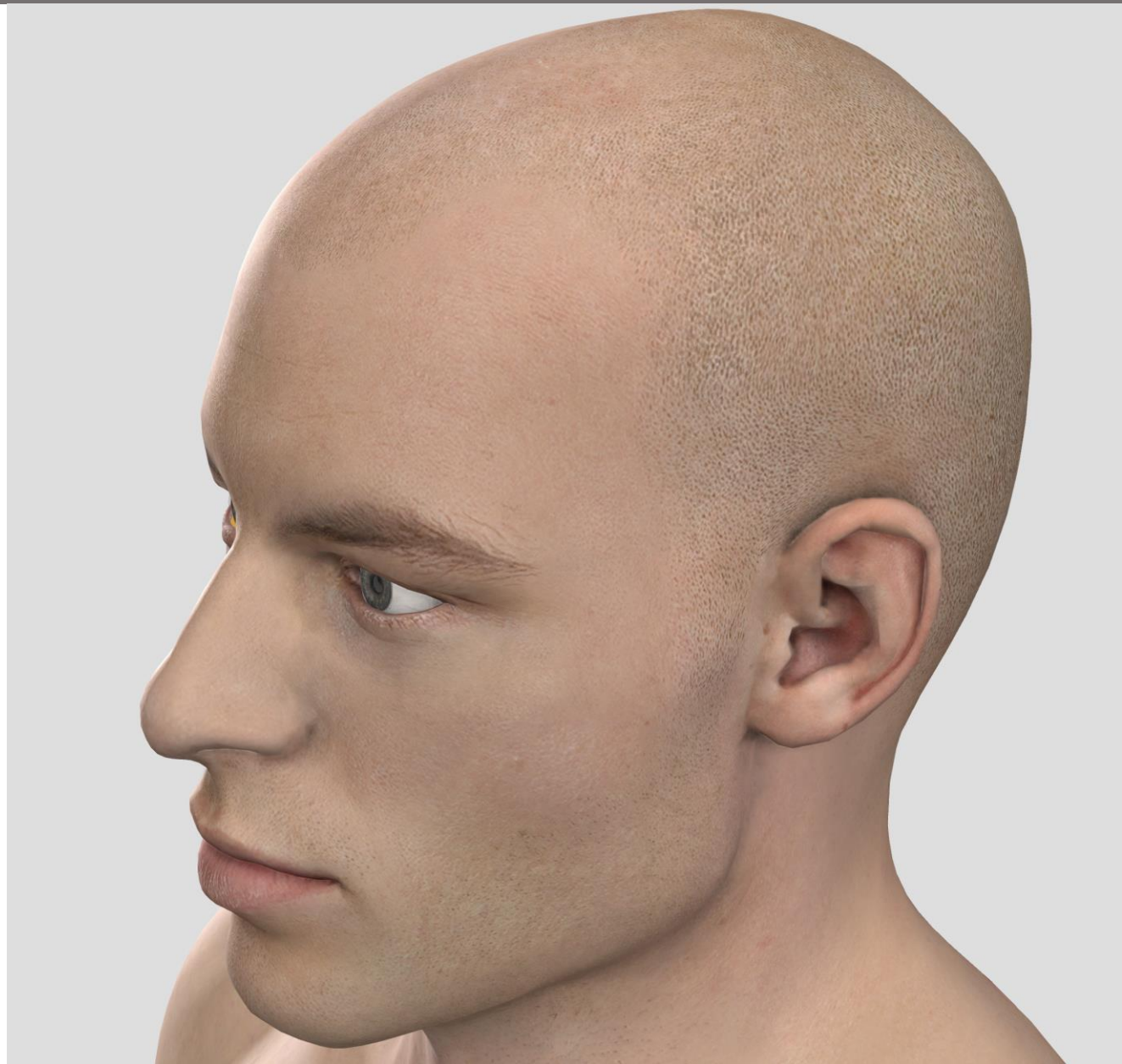






Head - caput

- *Caput*
- *Cranium*
- *Frons*
- *Occiput*
- *Vertex*
- *Facies*
- *Auricula*
- *Nasus*
- *Supercilia*
- *Rima palpebrarum*
- *Oculus*
- *Rima oris*
- *Labium superius, inferius*
- *Processus mentalis*



Membrum superius

- *Cingulum pectorale*
- *Axilla*
- *Brachium*
- *Cubitus*
- *Antebrachium*
- *Manus*
- *Carpus*
- *Metacarpus*
- *Palma (vola) manus*
- *Dorsum manus*
- *Digiti manus*
- *Pollex*

Membrum inferius

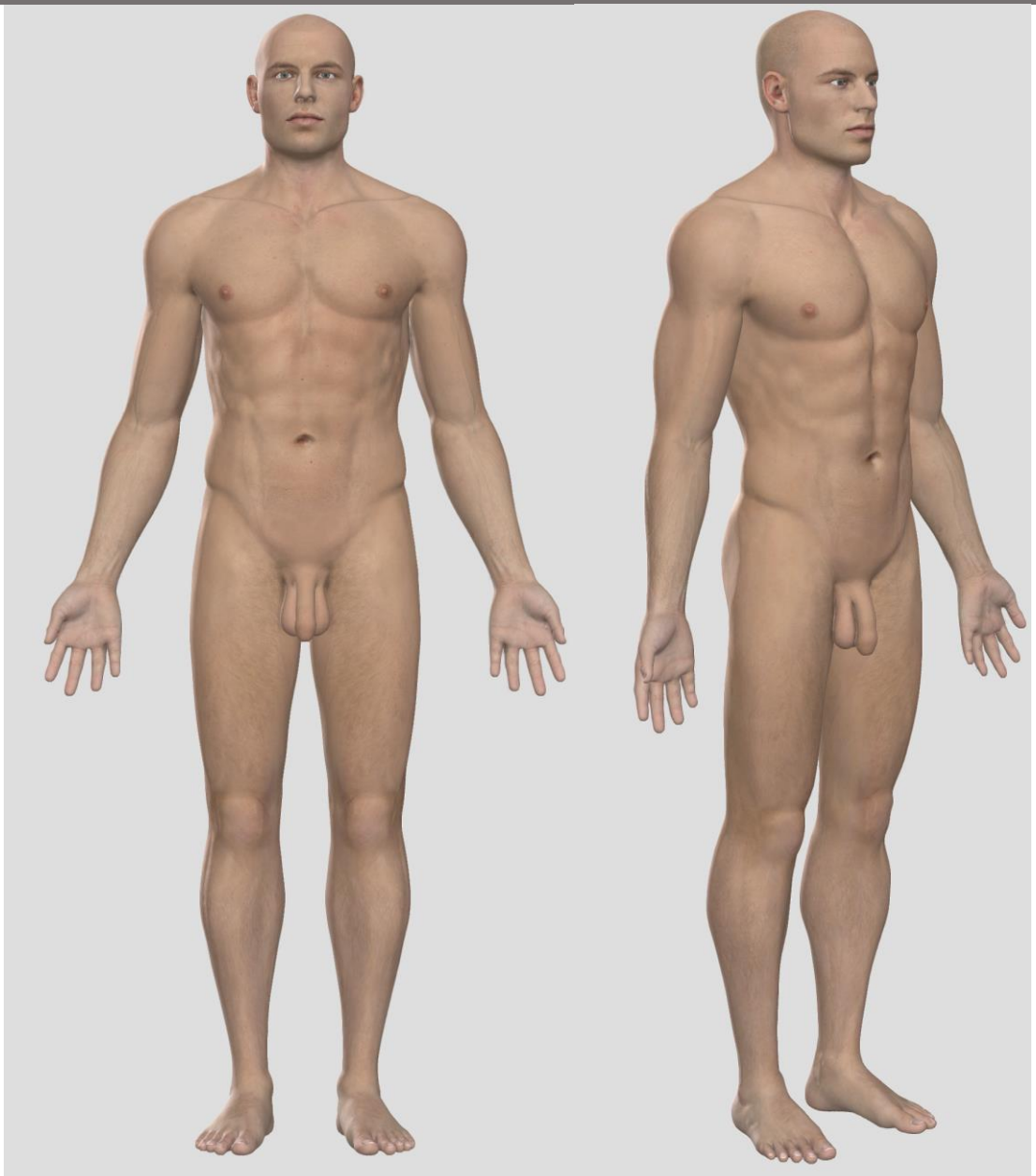
- *Cingulum pelvicum*
- *Clunis*
- *Coxa*
- *Femur*
- *Genu*
- *Poples*
- *Crus*
- *Sura*
- *Pes*
- *Calx*
- *Tarsus*
- *Metatarsus*
- *Planta*
- *Dorsum pedis*
- *Digiti pedis – hallux etc.*

Fingers, digits - digiti

- *Digitus primus manus - pollex, policis*
- *Digitus primus pedis - hallux, hallucis*
- *Digitus secundus (manus) - index, indicis*
- *Digitus tertius - digitus medius*
- *Digitus quartus (manus) – digitus annularis*
- *Digitus quintus – digitus minimus*

Planum, plana = plane , planes

- *Planum frontale (coronalium),* ***frontal, coronary***
- *Planum transversale (axiale),* ***transversal, axial***
- *Planum sagittale (plana sagittalia),* ***sagital***
- *Planum mediale,* ***medial***



Directio, direction; positio, position

- *Dexter - right*
- *Sinister - left*
- *Superior (cranialis) - upper, cranial*
- *Inferior (caudalis) – lower, caudal*
- *Anterior (ventralis) – anterior, ventral*
- *Posterior (dorsalis) – posterior, dorsal*
- *Rostralis - rostral*
- *Medialis - medial*
- *Lateralis - lateral*
- *Internus - internal*
- *Externus - external*
- *Profundus - deep*
- *Superficialis - superficial*

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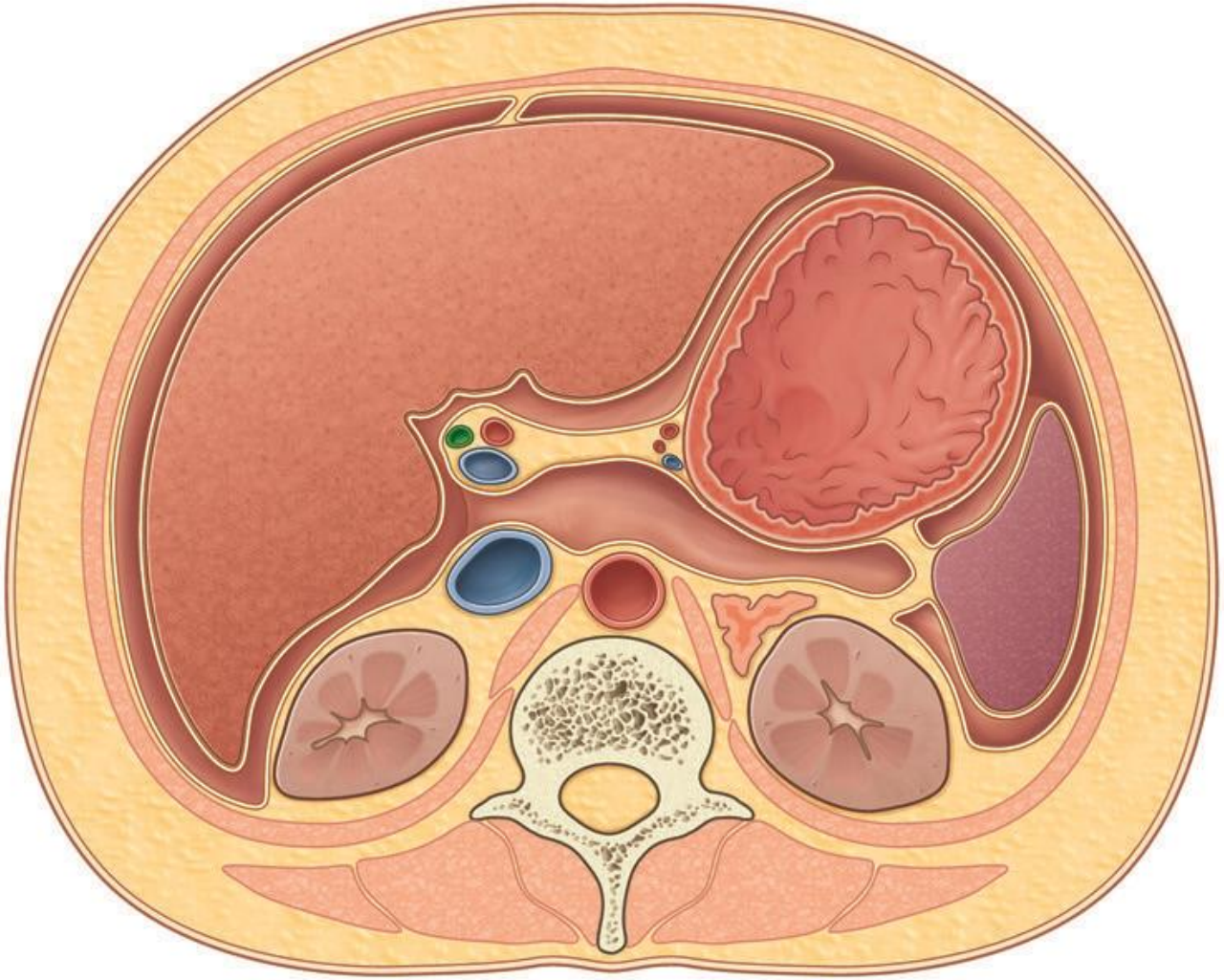


Directions positions – upper limb

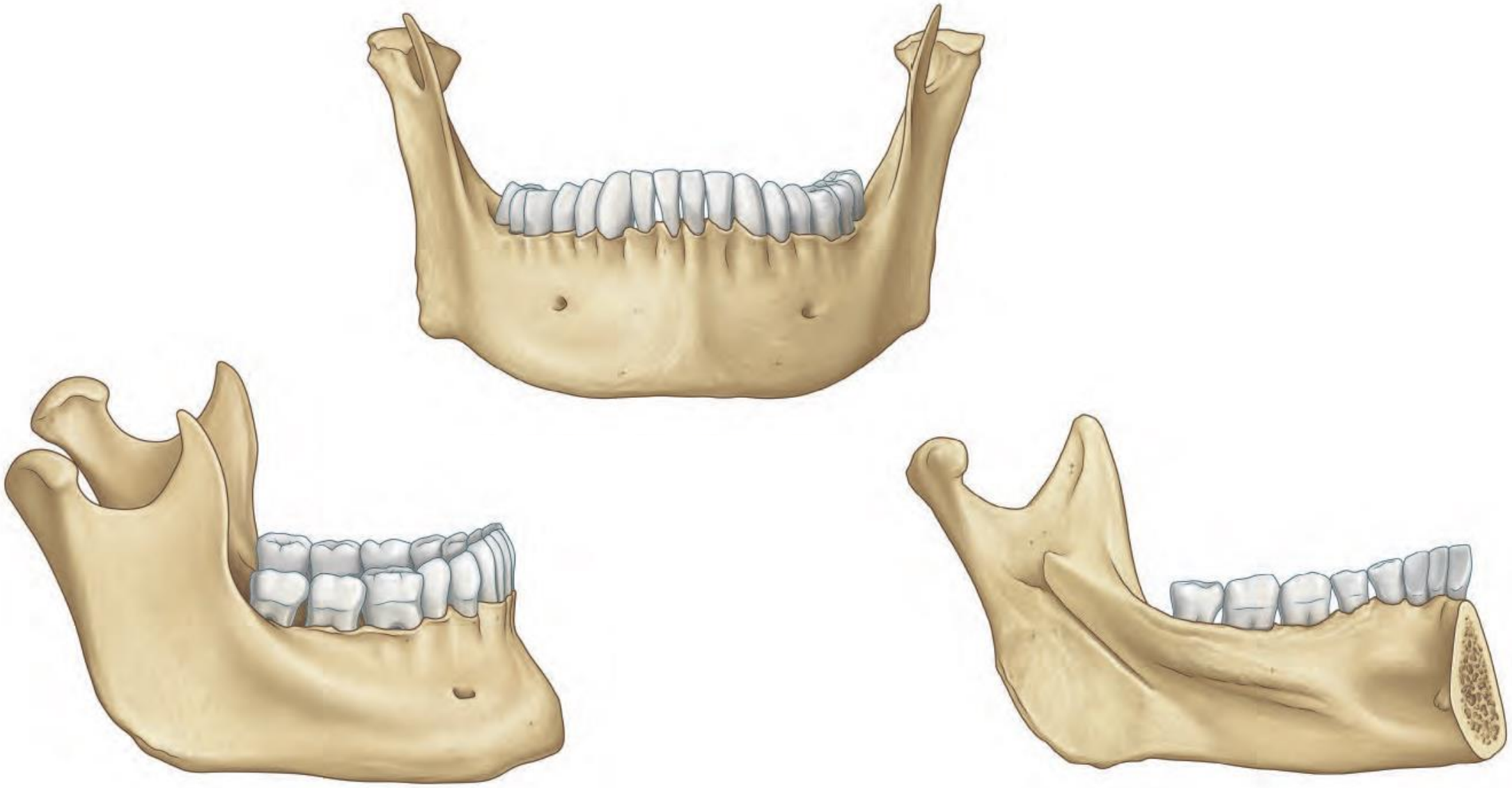
- **Seu extremitas proximalis**
- *Proximal*
- *Distal*
- *Radial = lateral*
- *Ulnar = medial*
- *Palmar (volar) = ventral*
- *Dorsal*

Directions, positions – lower limb

- ***Seu extremitas distalis***
- *Proximal*
- *Distal*
- *Fibular = lateral*
- *Tibial = medial*
- *Plantar = inferior*
- *Dorsal*

Directions, positions – mandibula et maxilla

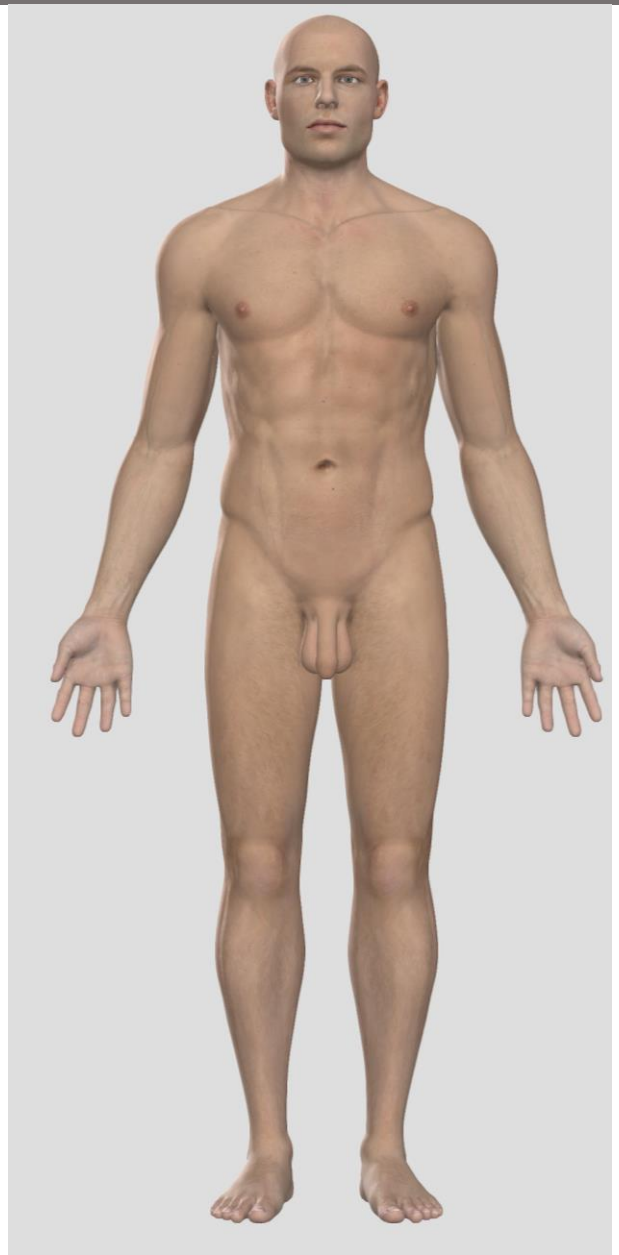
- *Mesial*
- *Distal*
- *Buccal*
- *Labial*
- *Lingual*

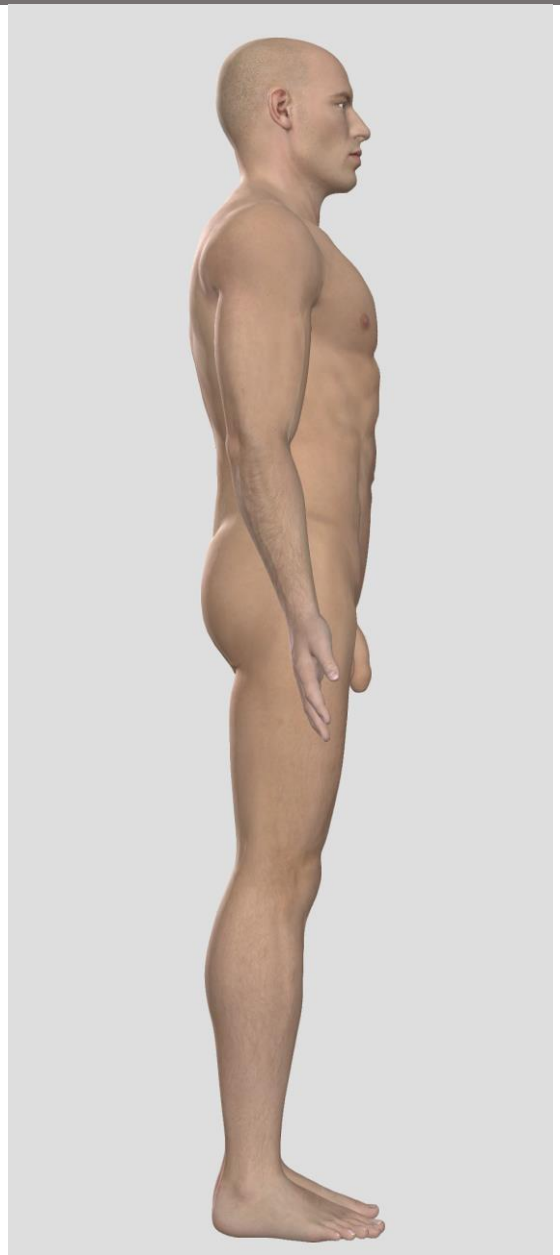


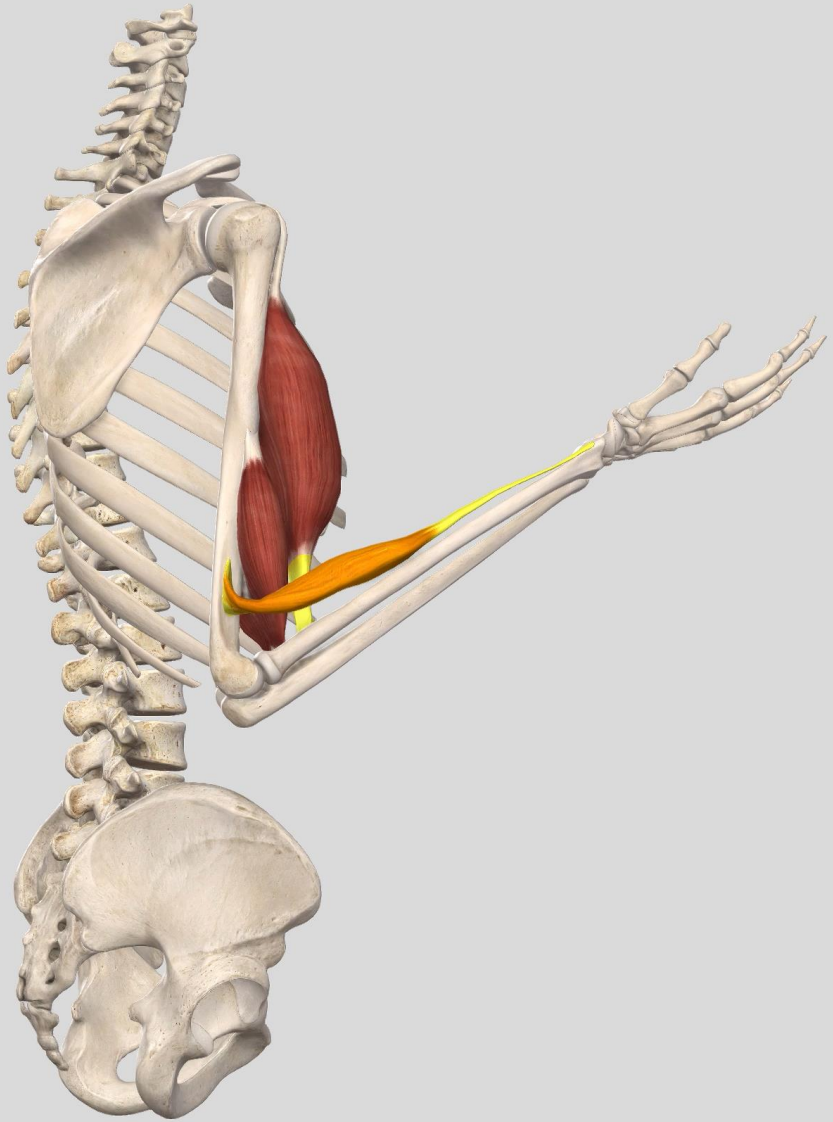
S. Standring, Gray´s Anatomy, 41st ed. Elsevier 2020

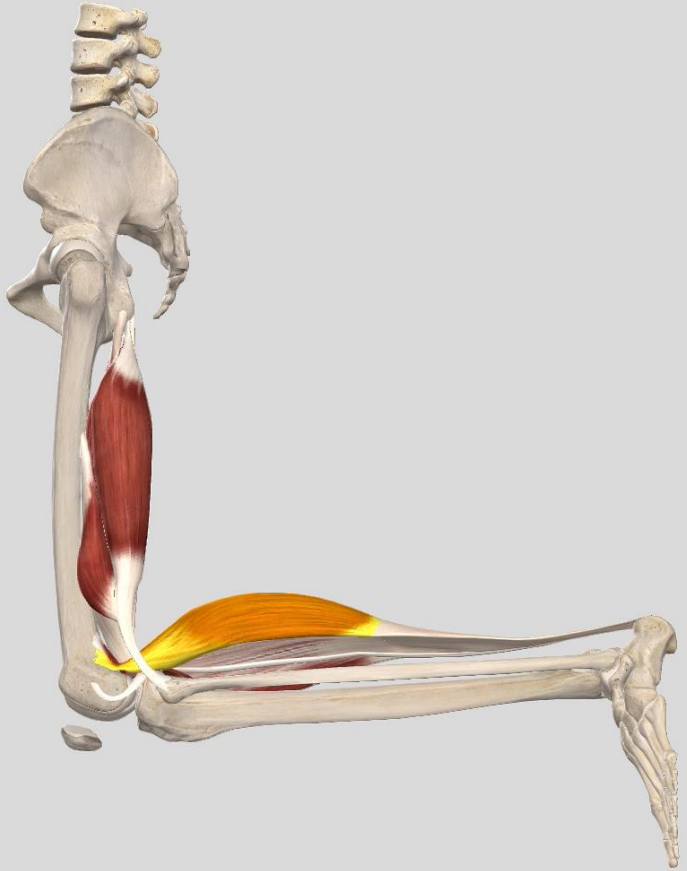
Movements, motions

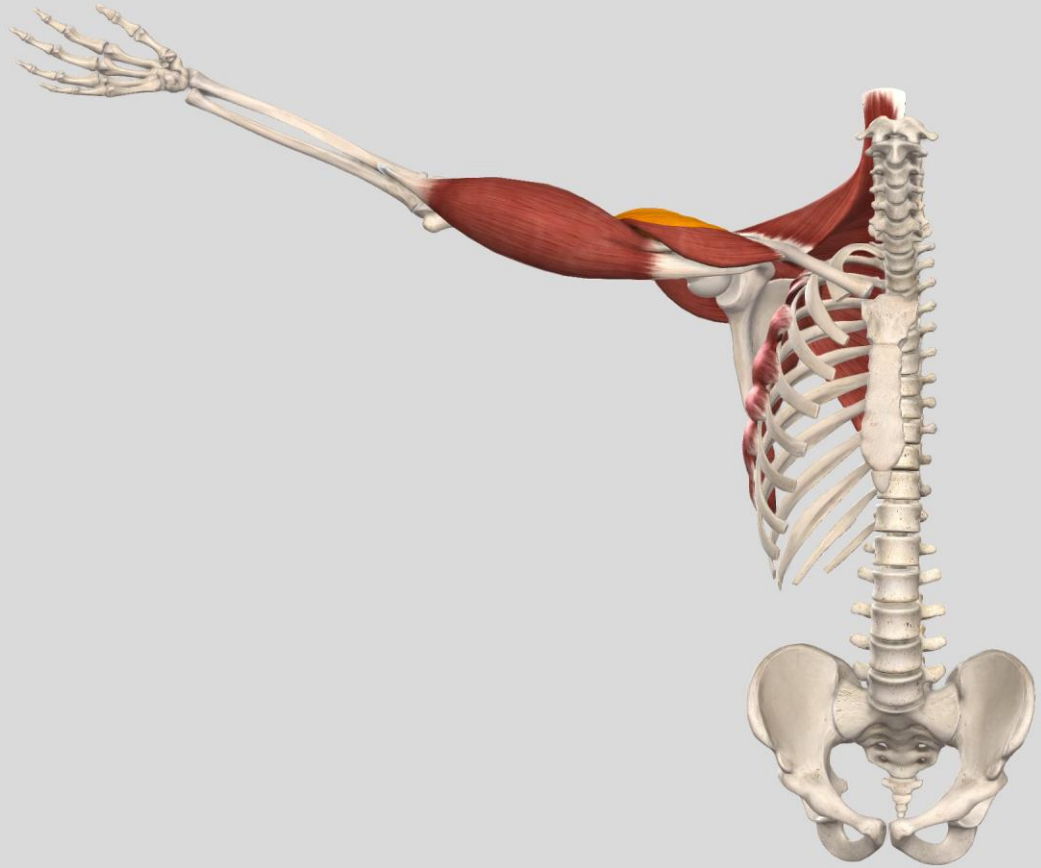
- *Flexion*
- *Extension*
- *Adduction*
- *Abduction*
- *Rotation*
- *Circumduction*
- *Pronation*
- *Supination*





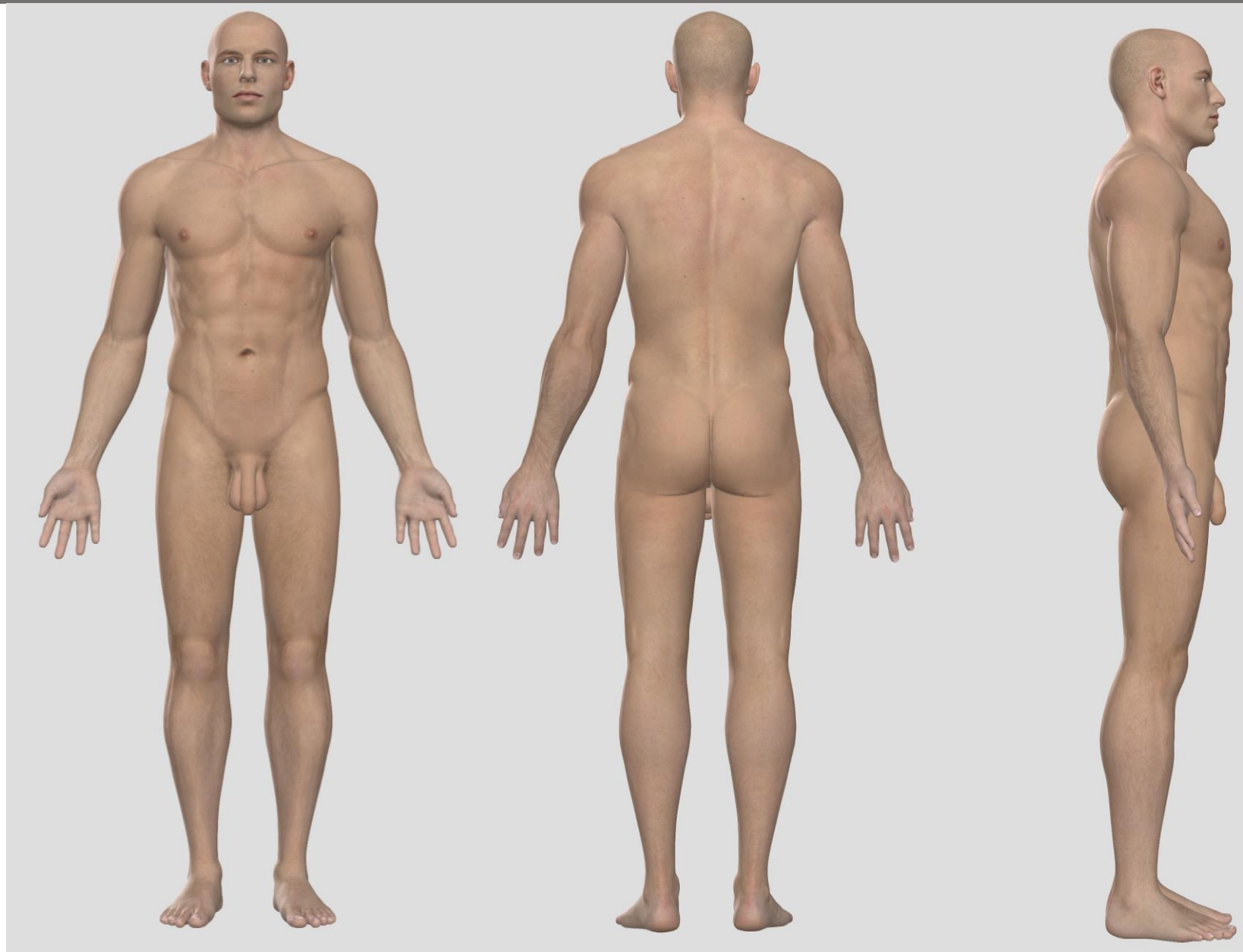






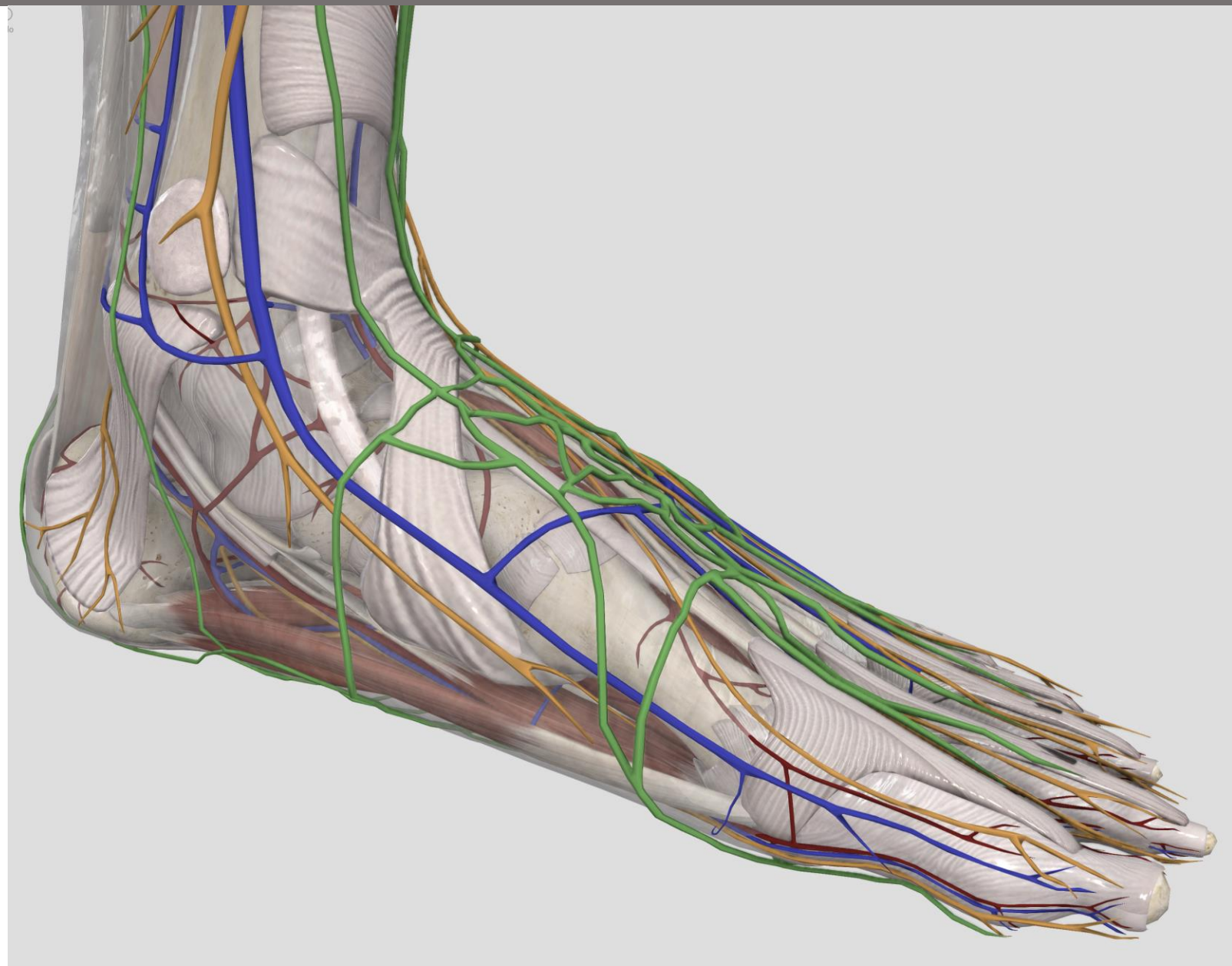
Lineae - lines

- *Median anterior line*
- *Sternal line*
- *Parasternal line*
- *Medioclavicular line*
- *Anterior axillary line*
- *Medial axillary line*
- *Posterior axillary line*
- *Scapular line*
- *Paravertebral line*
- *Median posterior line*



Colors

- Ossa/ossa
- Musculi
- Arteriae
- Venae
- Vasa et nodi lymphatici
- Nervi



Organismus

- **Signs of the life**
  - Metabolism
  - Motion
  - Ritability, excitability
  - Reproduction *(as well as tissue)*
- **Cell – cellula**
  - Plasmalemma
  - Protoplasma
  - Nucleus
- Extracellular matrix
- Cellular shapes
  - Spheric, cylindric, flattened, multipolar, spermatozoa
- Size – micrometers (1μm = 10^{-6} m)
  - Ovum (egg) 250 μm , erythrocyte (red blood cell) 7,2 μm
  - Motoneurons of precentral gyrus – 70 cm, sensoric neurons of posterior root 120 cm

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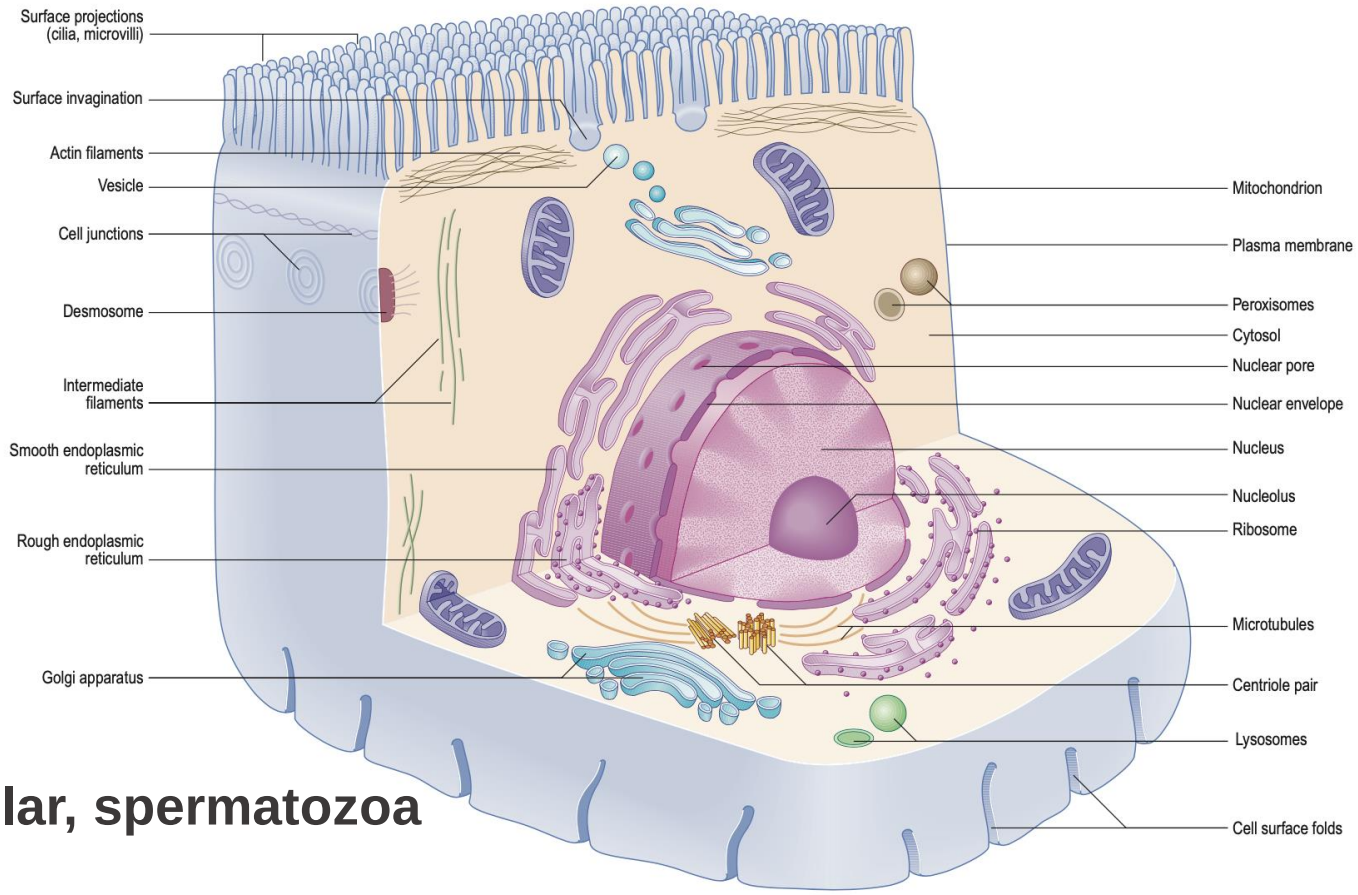
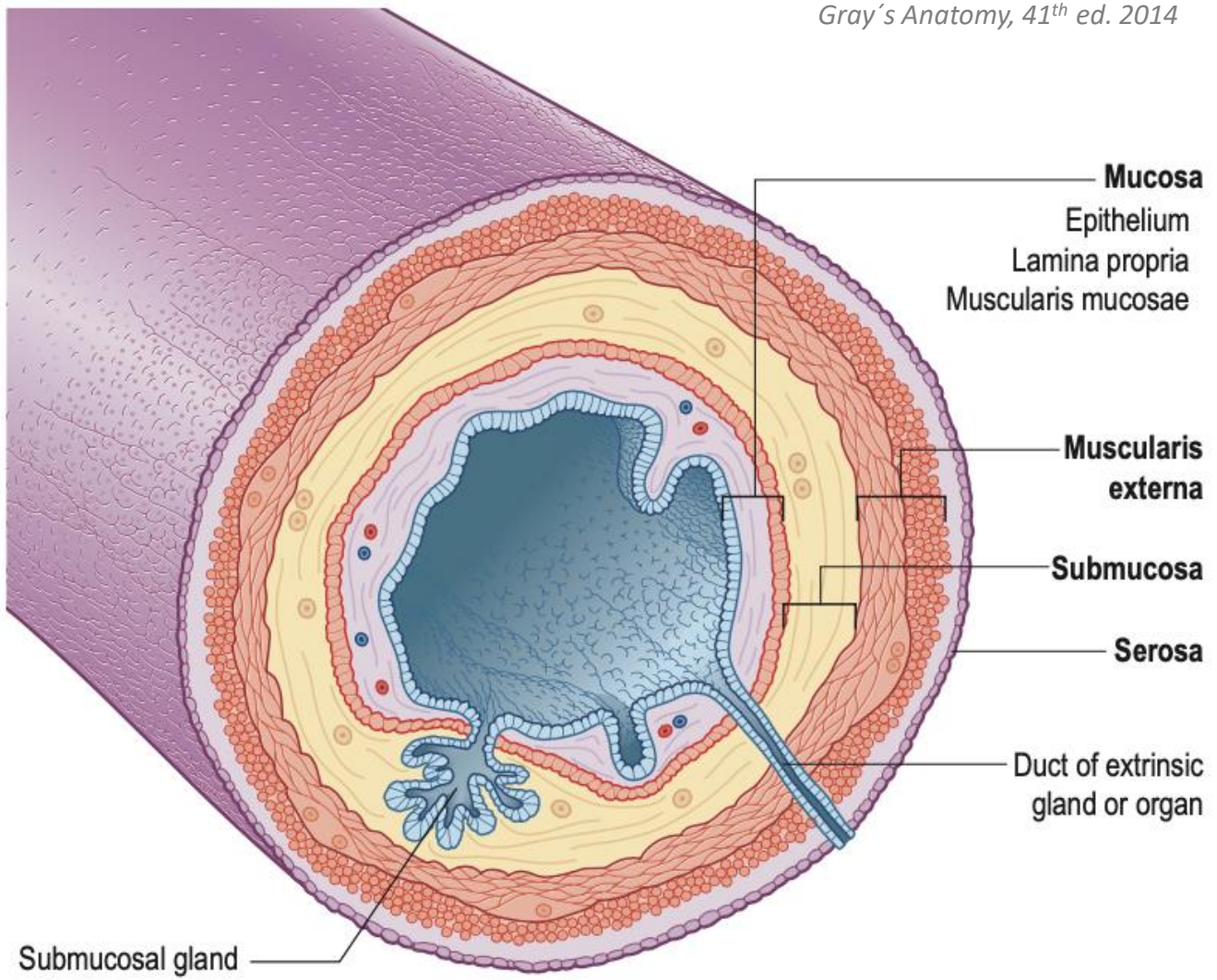


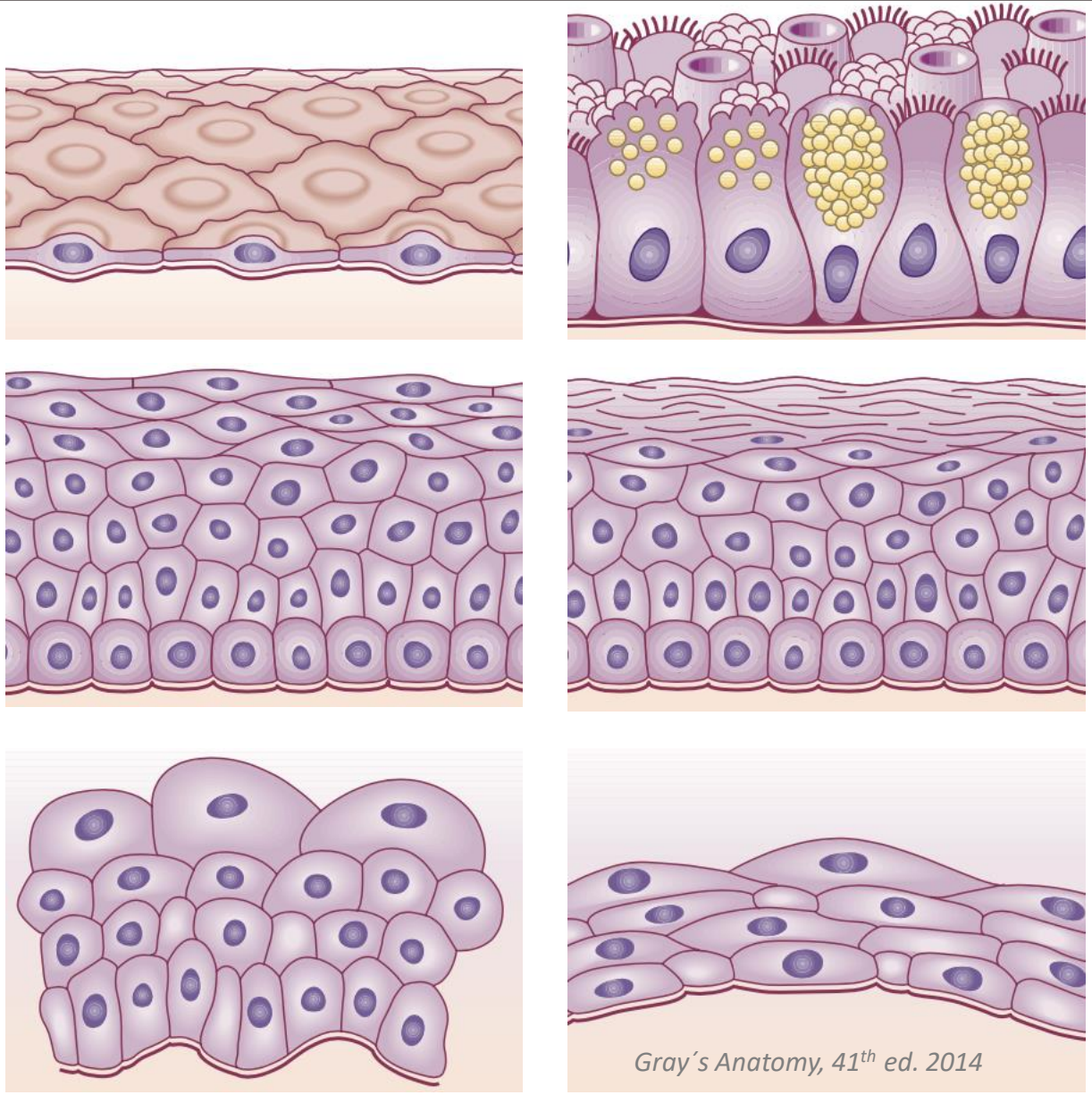
Tissues, organs, organ systems, organism

- Cells of the same origin
  - Microekosystem
  - Microstructure
- Epithelium
- Connective tissue
- Muscles
- Nervous tissue
- **Functional assemble of tissues**
- **Organon**
- **Organ system**
- **Organismus**



Epithelium

- structure and function
  - *Protective and secretory*
- **Single-layered**
  - Flattened
  - Cubic
  - Cylindric
- **Multi-layered**
  - Squamous
    - Non-keratinized
    - Keratinized
  - Transitional - urothelium
  - Cylindric multilayered
  - Pseudo-multi-layered – GIT
  - Reticular - thymus
  - Trabecular - liver



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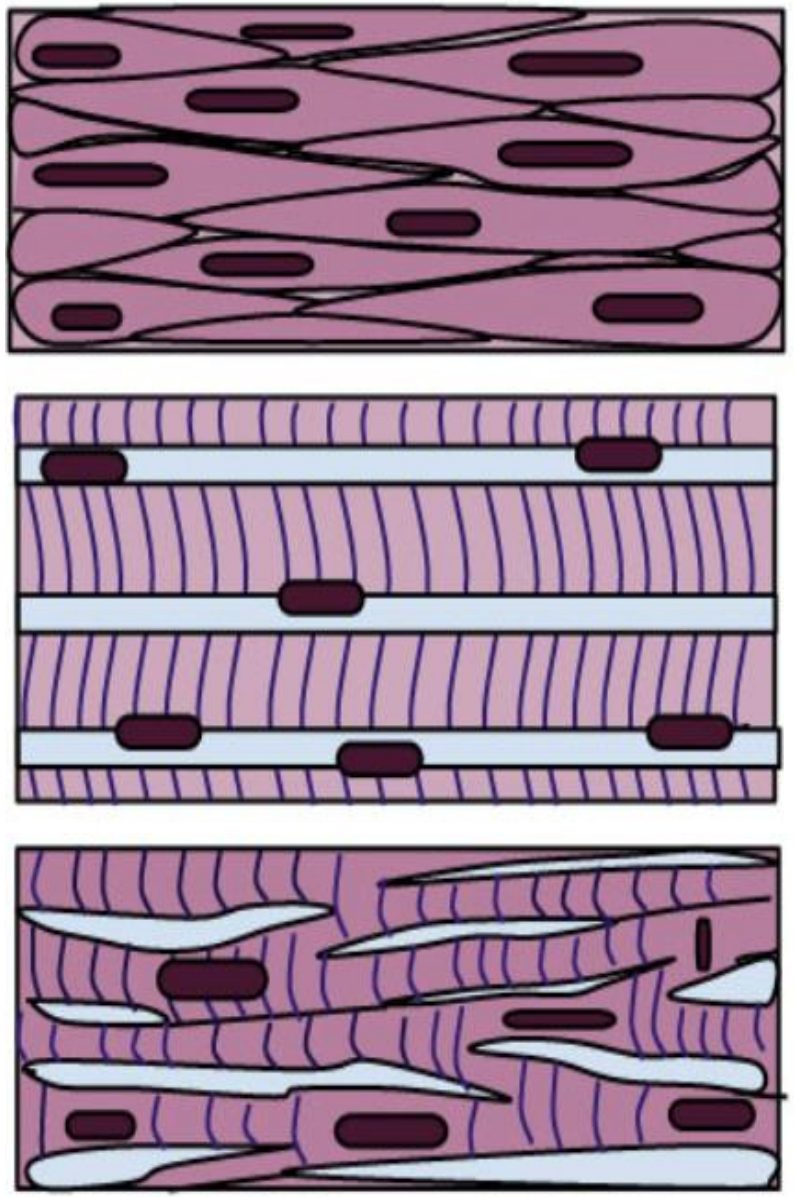
Muscles

- **Smooth muscles – single cells**
  - Sarcolemma
  - Sarcoplasma - myofibrils
  - Nucleus
  - Autonomous inervation – *sympathetic, parasympathetic*
  - Slow contraction, but long-lasting
- **Stripped muscles - syncytium**
  - Sarcoplasma
  - Myofibrils – isotropic/anisotropic stripes
  - Cerebrospinal inervation
  - Fast contraction, but fast tired
- **Myocardial muscle**
  - striped
  - intercalar discs – intercellular borderline
  - bridges
  - Autonomous continuous work, autonom. inervation



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Nervous tissue

- **Neurones, supplemental cells**
- **Neuron = elementar structure of neural network function**
  - *Neuron theory – Waldmayer 1891*
  - **Body - soma**
  - **Centripetal processes - dendrites**
  - **Centrifugal process - neurit**
    - *longer neurit - axon*
  - **Shapes**
    - **Bipolar, pseudounipolar**
    - **Pyramidal**
    - **Purkynje cells**
- **Supplemental cells**
  - **Macroglia (astrocytes)**
  - **Oligodendroglia**
  - **Ependyma**
  - *Microglia (macrophages)*

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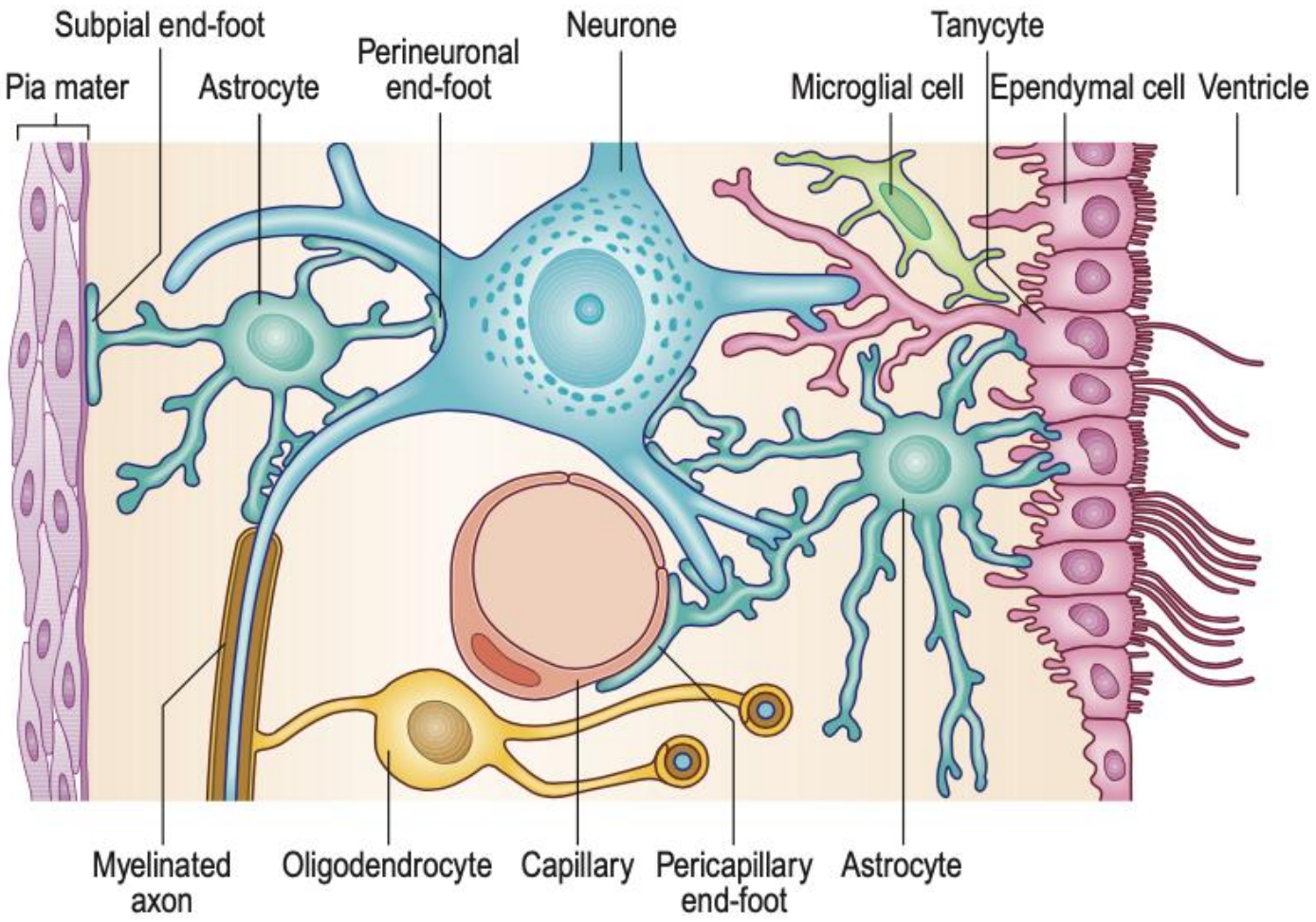


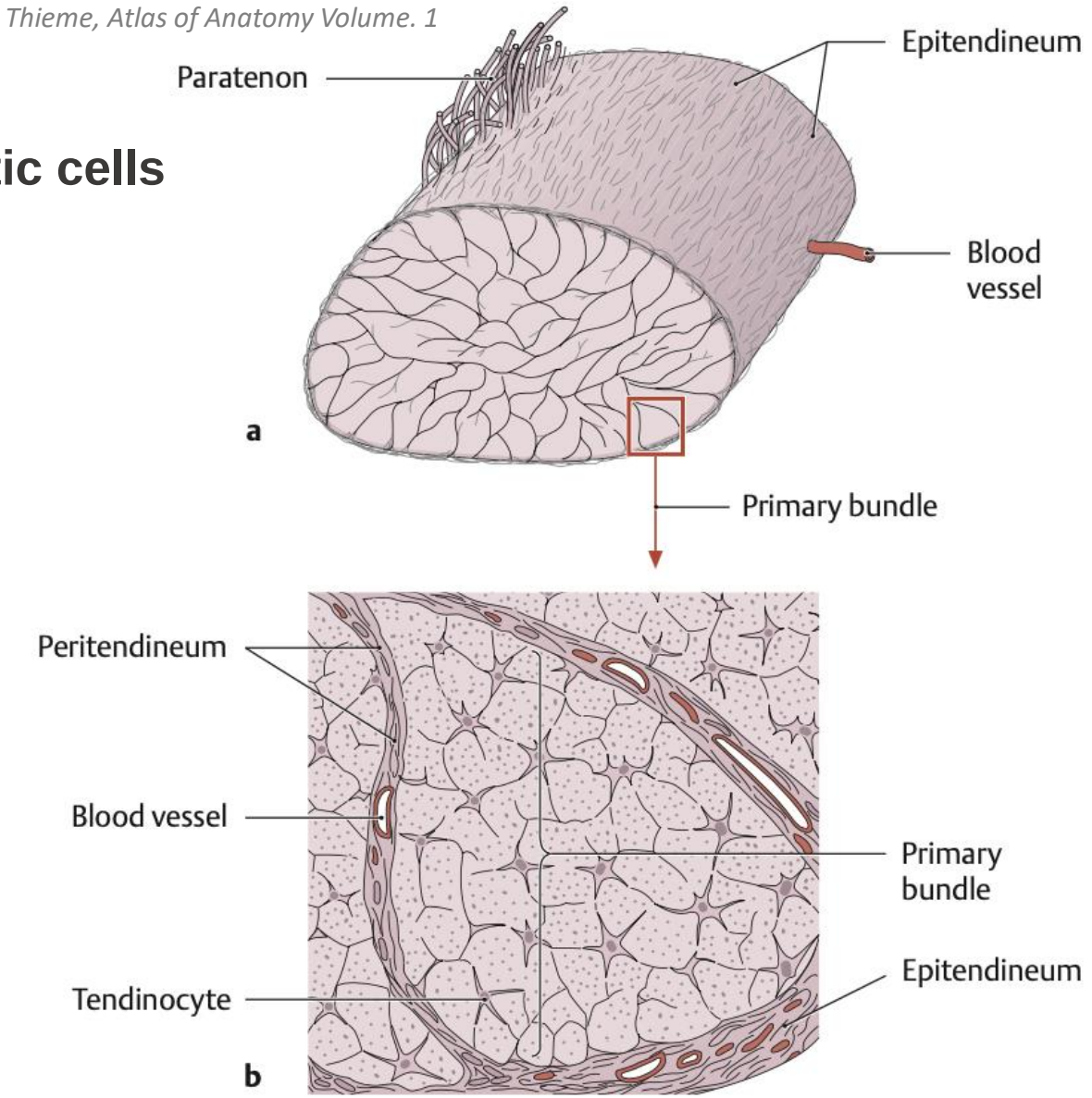
Connective tissue

- Cells and extracellular matrix are causing properties of tissues
- Connective tissue
- Cartilage
- Bone

Connective tissue

- Collagene and elastic fibres
- cells
  - fibrocytes, histiocytes, mastocytes, plasmatic cells
- **Mezenchyma**
  - *Primitive connective tissue*
- **Gelatinous**
  - *Umbilical cord*
- **Reticular**
  - *Bone marrow*
- **Collagenous**
  - Fibrillary – loose, interstitial
  - Fibrose – stiff – ligamenta, tenda
- **Elastic**
  - Ligamenta flava
- **Fatty**

Thieme, Atlas of Anatomy Volume. 1

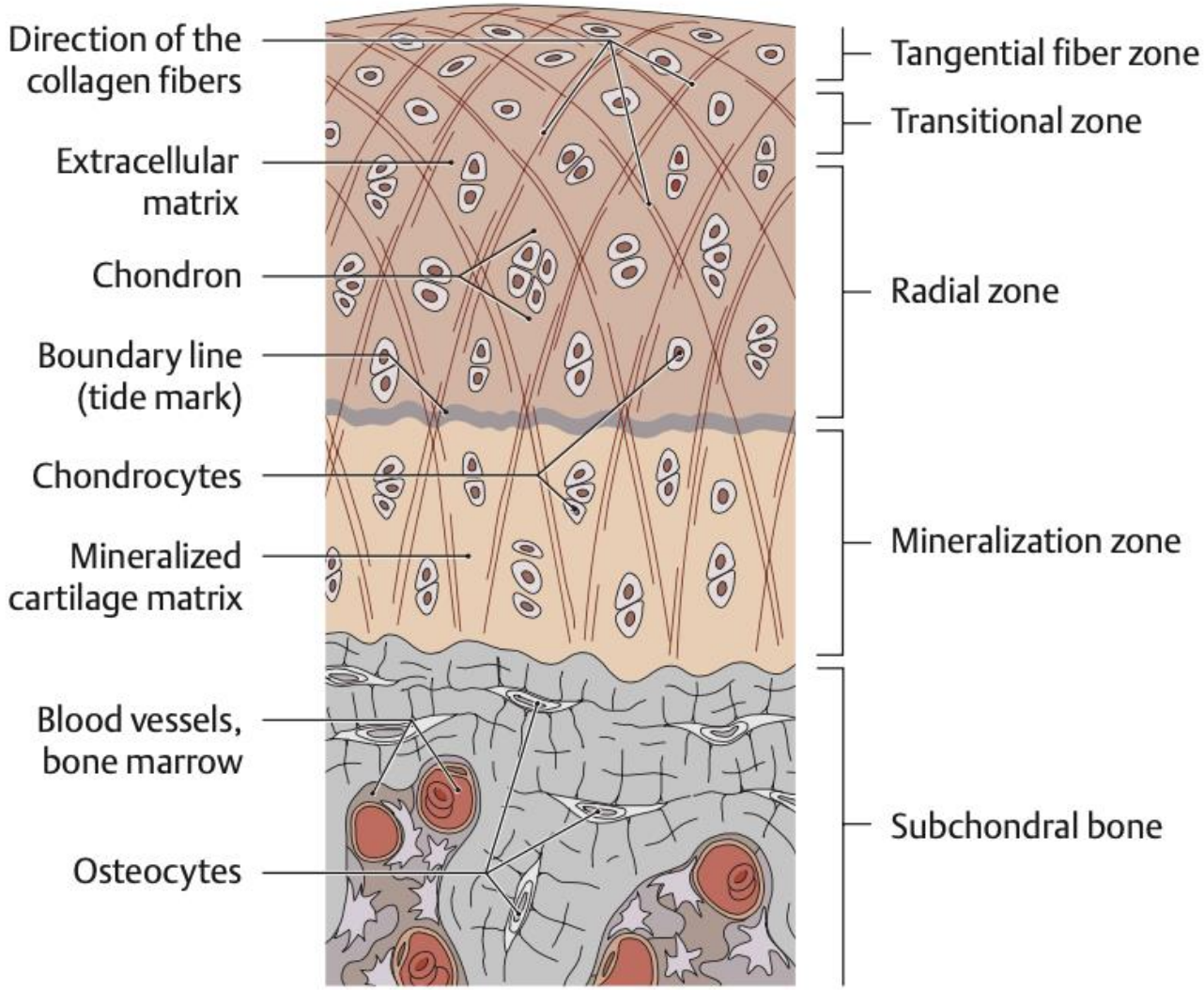


Cartilago

- **Perichondrium**
- **Fibriles**
- **Spindle fibrocytes**
- **Chondrocytes**

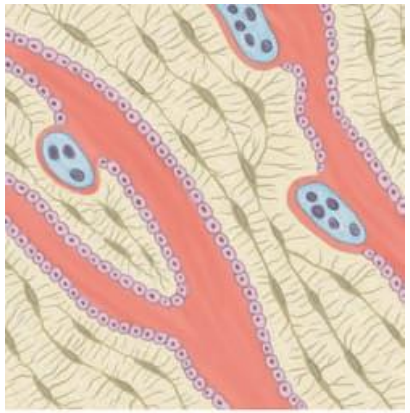
- **Cellular, parenchymatous**
  - *Embryonal, adult in bat auricle*
- **Glass form – hyalinous**
  - *Masked fibrils, glossy surface*
- **Fibrous**
  - *Intervertebral discs*
  - *Intraarticular discs, meniscs*
- **Elastic**
  - *auricula, epiglottis*

Thieme, Atlas of Anatomy Volume. 1



bone; os, ossium

- **Os, ossis**
- *Osteocytes, osteoblasts, osteoclasts*
- **Intercellular matrix**
- ***Anorganic part – hardness***
  - Removed by chemicals, acids, hydroxides
  - ***85% $Ca_3(HPO_4)_2$ – hydroxyapatite***
  - *10% $CaCO_3$ – calcit*
  - *5% other salts*
- ***Organic part – elasticity***
  - Removable by burning
  - ***Ossein***
  - *52% childhood*
  - *40% adulthood*
  - *30% senium*



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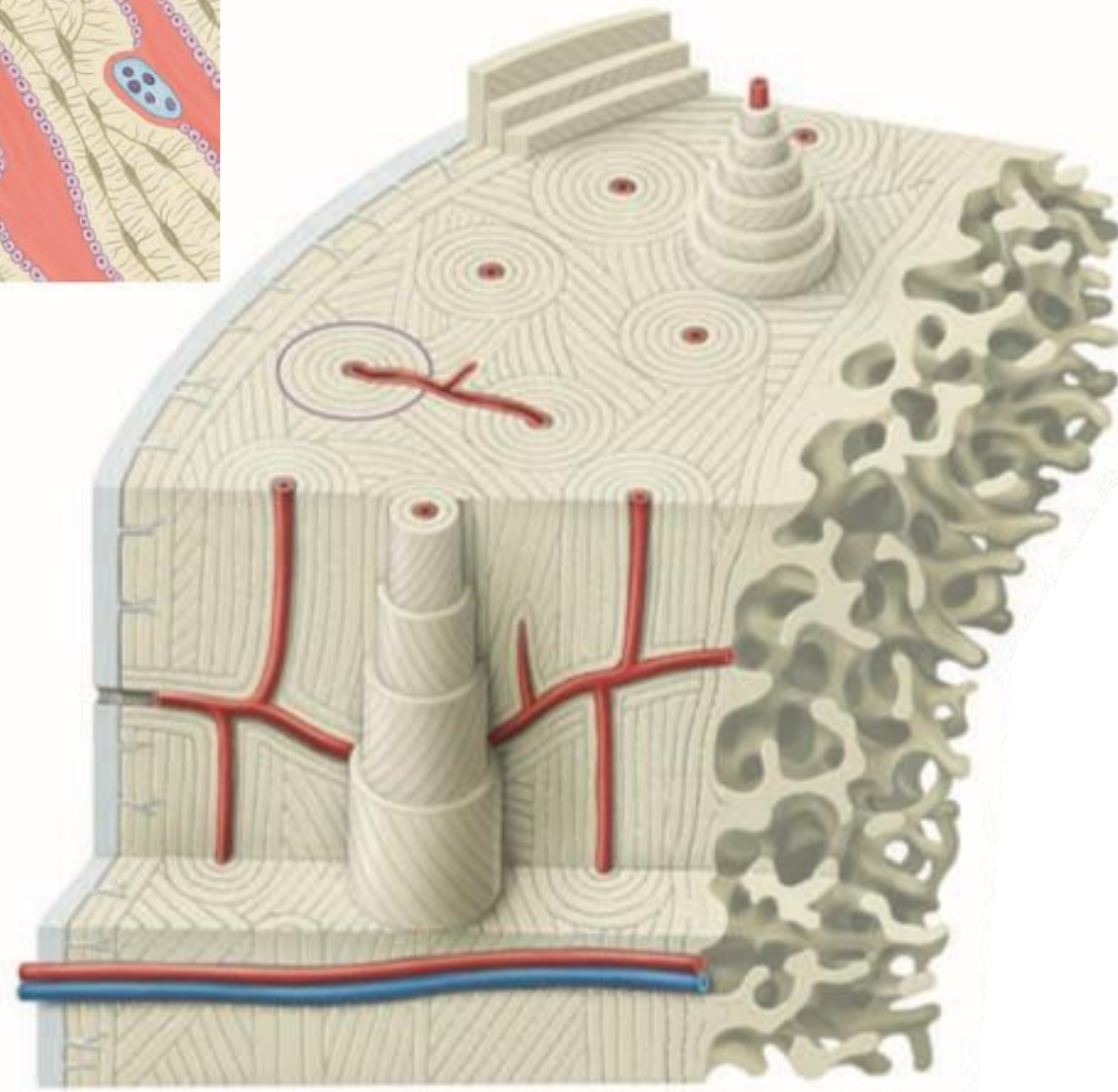


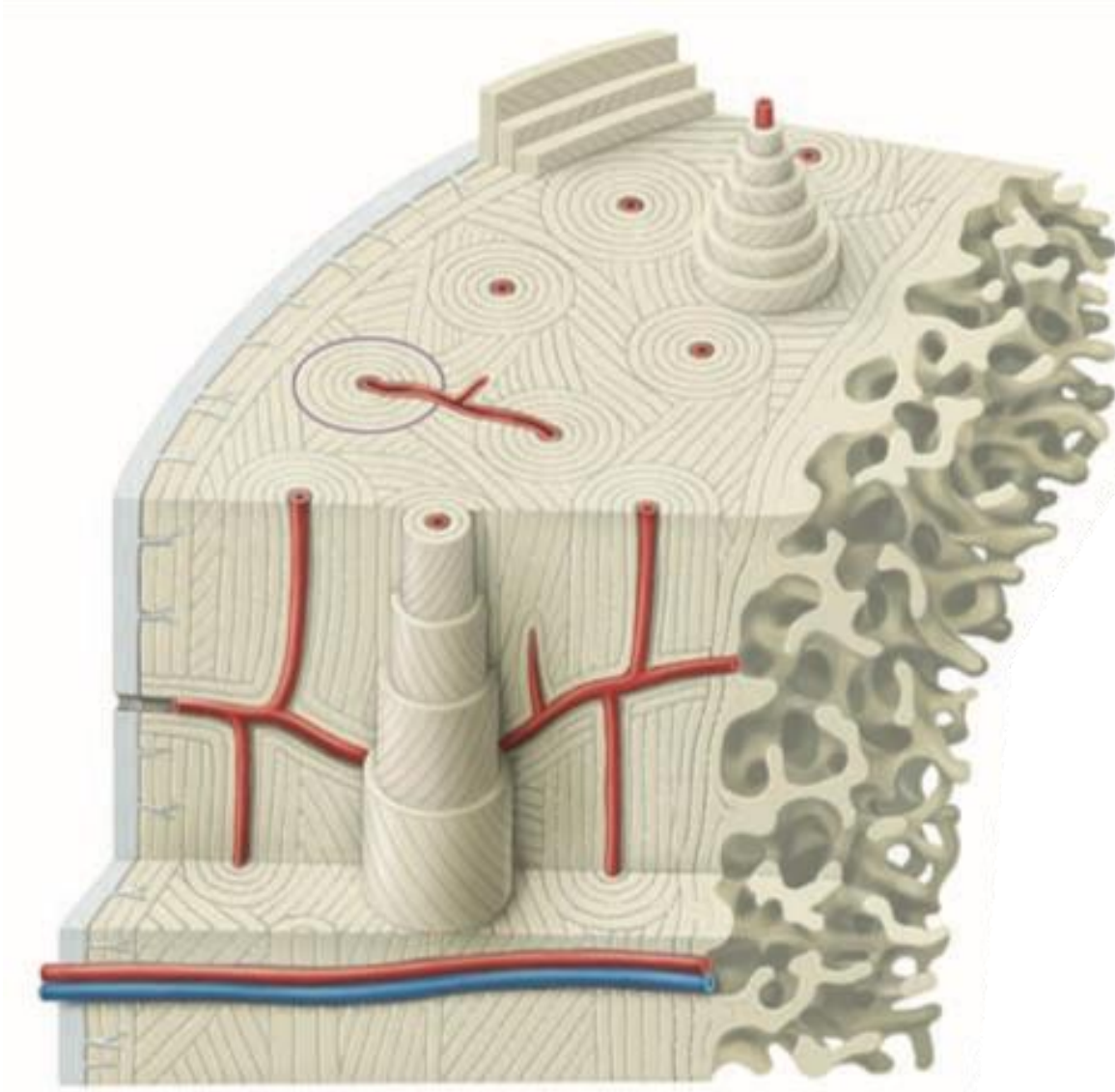
Bone structure

- Lamels
- Perpendicular orienttion
- Substantia compacta – compaq bone
- Substantia spongiosa – spongiform bone

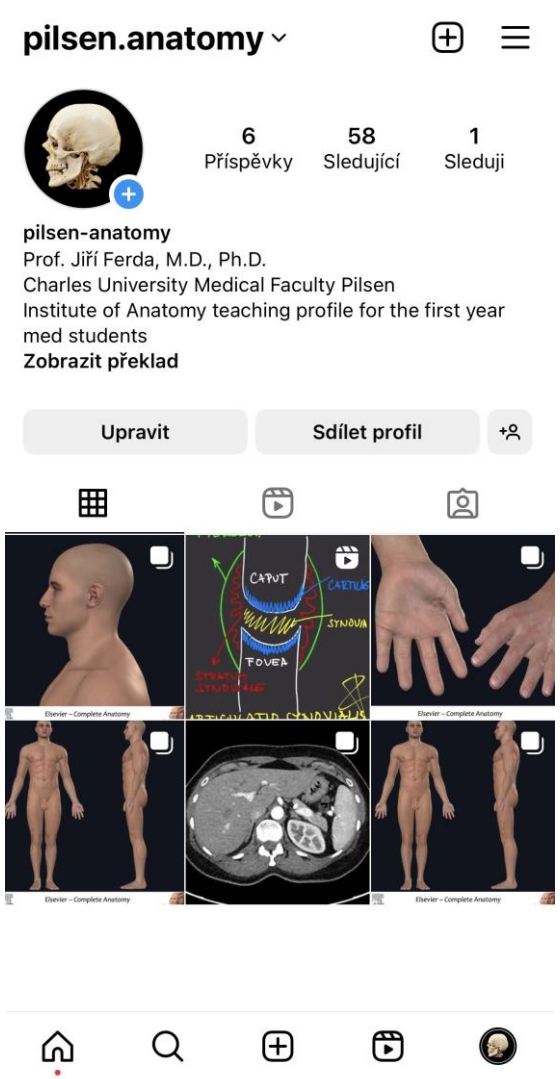
- **Periosteum**

- **Osteon**
- Havers channel
- Volkmann channel
- Surface lamels – outer, inner
- Intersticial lamels

Thieme, Atlas of Anatomy Volume. 1



Anatomy



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General anatomy 1.