INTRODUCTION TO ANATOMY

1. Aims and scope of anatomy
2. Brief historical review
3. Methods of morphological examination
4. Anatomical nomenclature
5. Spatial orientation in human body
6. Norm and variations
Aims and scope of human anatomy

Anatomy – knowledge of the structure of living things

Gr. ἀνατομία anatomia = to cut apart;
from ἀνατέμνειν ana: separate, apart from, and temnein, to cut up, cut open

✓ human anatomy
✓ animal anatomy (zootomy)
✓ plant anatomy (phytotomía)

Human anatomy:

Aim: how is the human body organized?
✓ structure of living organism
✓ spatial organization of living matter

Scope (mission): why it is so organized?
✓ regularity of the structure
✓ functional approach
Anatomical fields

- Macroscopic (gross) anatomy – structures > 1 mm
- Microscopic anatomy – structures < 1 mm
  - cytology = cell biology
  - general histology
  - special histology = microscopic anatomy of the organ systems
  - molecular anatomy + molecular biology
- Embryology
  - general and special
- Descriptive (systematic) anatomy
- Experimental anatomy
- Functional anatomy (morphophysiology)
Major anatomical disciplines

- Systemic anatomy
- Topographical (regional) anatomy
- Plastic anatomy
- Clinical (applied) anatomy
- Dynamic anatomy (functional anatomy of the locomotor apparatus)
- Comparative anatomy – the study of phylogenesis
  (Gr. φυλή/φῦλον, phyle/phylon = "tribe, race"
  + genesis, “creation”, from Gr."gignesthai" = "to be born")
- Embryology – the study of ontogeny, ontogenesis
  (ontos, present participle of “to be” + genesis, “creation”)
- Anthropology – the study of human behavior
  (Gr. ἄνθρωπος, anthrōpos = "human")
- Morphology – the study of the form or shape of an organism
  (Gr. morphe, “form”)
  = anatomy + cytology + histology + embryology

NB: Morpheus (Gr. Μόρφεας, Μορφεύς, "he who forms, shapes, moulds", from the Greek morphe) is the Greek god of dreams and sleep
Systemic anatomy

- Locomotor system (apparatus) –
  - **Osteology**, scientific study of bones – *Osteologia*, Gr. *os, ossis* = bone
  - **Arthrology**, study of articulations and ligaments – *Arthrologia*, Gr. *arthros* = joint
  - **Myology**, specialized study of muscles – *Myologia*, Gr. *myos* = muscle

- Internal organs, viscera – **Splanchnology**
  - alimentary system
  - respiratory system
  - urogenital system
  - endocrine glands – endocrinology

- Cardiovascular system – **Angiology**

- Nerve system – **Neuroanatomy**
  - sensory organs and integument, skin
History of anatomy: ancient anatomy

- Egypt period – 1600 BCE
  - ancient Egyptian papyrus
  - Ebers papyrus (c. 1550 BCE)

- Greece period
  - Democritus (460-370 BCE) – materialism, ‘father of modern science’ (Gr.: Δημόκριτος, Dēmokritos, "chosen of the people")
  - Héraclitus of Ephesus (535-475 BCE) – dialectic outlook on life, doctrine of change ⇒ "You can not step twice into the same river“ (Πάντα ρέι (pánta rhéi) "everything flows")
  - Hippocrates of Kos (460-370 BCE) – ‘father of medicine’
    Humorism: four humors – blood, black and yellow bile, phlegm

- Alexandria period (3rd century BCE – 2nd century)
  - Hérophilos and Erasistratus – the first use of human cadavers for anatomical research ⇒ human vivisection
  - Aristotle – (ómne ánimal ex animáli), ‘founder of comparative anatomy and embryology’

A twelfth-century Byzantine manuscript of Hippocratic Oath, rendered in the form of a cross
History of anatomy

- **Roman period (2nd – 7th century)**
  - Claudius Galen of Pergamum (130-201) – use of direct observation, dissection and vivisection in medical training, ‘founder of experimental medicine’

- **Medieval anatomy**
  - Abu Ali al-Husain ibn Sina-e Balji (980-1037), Avicenna
    - “The Canon of Medicine”
    - “The Book of Healing”
History of anatomy

- Renaissance – after 16th century
  - Leonardo da Vinci (1452-1519) – ‘master of plastic and topographic anatomy’
  - Andreas Vesalius (1514-1564) – “De humani corporis fabrica” (1543) – ‘father of modern anatomy’
  - William Harvey (1578-1657) – “Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus” – exact description of the systemic circulation and properties of blood, ‘founder of physiology’

- Modern anatomy
Rembrandts anatomy lessons

Anatomy lesson of Dr. Nicolaes Tulp (1632)

Anatomy lesson of Dr. Joan Deijman (1656)
History of anatomy in Bulgaria

- 9th-10th century – St. Clement of Ohrid
- Joan Exarch Bulgarian – “Шестоднев” (Shestodnev)
- Dr. Petar Beron (1795-1871) – first modern Bulgarian primer, “Fish Primer” or “Рибен буквар”, 1824 in Bucharest, Romania
- Dr. Hristo Stambolski (1843–1932) – Full professor of anatomy and histology in the Medical Faculty in Tzarigrad (Istanbul), the first to translate medical terminology from Arabic to Turkish
- Dr. Vasil Beron (1824-1909) – “Човекът в сравнение с другите животни”, 1870 in Bolgrad (Bolhrad), Ukraine

NB: Beron is portrayed on the observe of the Bulgarian 10 levs banknote!
Departments of Anatomy and Histology in Bulgaria

- **Founded** in 1918 to the Medical Faculty of the Sofia University St. Kliment Ohridski
- First department heads:
  - Professor Vladimir Vorobiov – Department of Anatomy
  - Prof. Al. Mankowski – Department of Histology and Embryology
- Since 1973 in Sofia – Department of Anatomy, Histology and Embryology
- Department in Plovdiv – since 1945
- Department in Varna – since 1962
- Department of Anatomy, Histology and Cytology in Pleven – since 1975
- Department of Anatomy in Stara Zagora, Thracian University – since 1982
- Department of Anatomy, Sofia University – since 2007
Methods of morphological investigations

- Dissection, Gr. *anatemnein* = separate
- Ink injection technology
- Corrosion method
- Plastination
- Graphic and plastic reconstruction
- Methods of image analysis:
  - Roentgen anatomy
  - X-ray computer tomography (CT)
  - Magnetic resonance imaging (MRI)
- Microscopic techniques:
  - Light microscopy
  - Electron microscopy
- Experimental anatomy
Anatomical Nomenclature
Nomina Anatomica

- End of 19th century – over 50000 anatomical terms
- 1895 – Basle Nomina Anatomica (BNA): 5528 anatomical terms
- 1933 – Birmingham Revision (BR)
- 1935 – Jena Nomina Anatomica (JNA)
- 1955 – Parisiensia Nomina Anatomica (PNA, NA): 5640 anatomical terms

Revisions of Nomina Anatomica:
- 1960 – New York
- 1965 – Wiesbaden
- 1970 – Saint Petersburgs (formerly Leningrad)
- 1975 – Tokyo
- 1980 – Mexico City
- 1983 – fifth, last edition of Nomina Anatomica
- 1985 – Nomina Histologica et Nomina Embryologica
- 1998 – Terminologia Anatomica (TA): FCAT
Regional texture of the human body

- Parts of the body:
  - head, *caput*
  - neck, *collum*
  - trunk, *truncus*
    - thorax, *thorax*
    - abdomen, *abdomen*
    - pelvis, *pelvis*
  - extremities (limbs)
    - upper, *membrum superius*
    - lower, *membrum inferius*
Regional texture of the human body
Major axes and planes in the human body

Three main axes and planes:

- sagittal axis – anterior-posterior
- transversal axis – transverse
- longitudinal axis – superior-inferior

- sagittal plane – median section
- transversal plane – axial section
- frontal plane – coronal section
Spatial orientation in the human body

- Spatial terminology:
  (main axes of the human body)
  - frontal plane – *frons, tis* m.
    - *anterior, us* = *ventralis, e*
    - *posterior, us* = *dorsalis, e*
  - sagittal plane – *sagitta, ae* f.
    - *medialis, e* ↔ *lateralis, e*
    - *proximalis, e* ↔ *distalis, e*
    - median plane
      - *sinister* ↔ *dexter*
  - transversal (horizontal) plane
    - *superior, us* = *cranialis, e*
    - *inferior, us* = *caudalis, e*
Spatial orientation

Direction and location terminology:

- **head:**
  - rostralis,e → rostrum (lat.) = beak
  - frontalis,e → frons (lat.) = forehead
  - nasalis,e → nasus (lat.) = nose
  - occipitalis,e → occipitum (lat.) = occipit
  - basalis, e → basis (lat.) = base

- **extremities:**
  - proximalis,e → proximus (lat.) = proximal
  - distalis,e → distare (lat.) = distal

- **upper limb:**
  - radialis,e → radius (lat.) = ray, radius
  - ulnaris,e → ulna (lat.) = elbow, ulna
  - palmaris,e → palma (lat.) = palm
  - dorsalis,e → dorsum (lat.) = back

- **lower limb:**
  - tibialis,e → tibia (lat.) = tibia
  - fibularis,e → fibula (lat.) = fibula
  - plantaris,e → planta (lat.) = foot
Kinesiology terms

- **Movements terminology:**
  - *flexio* = flexion (bending)
  - *extensio* = extension (straightening)
  - *anteversio* = anterior flexion
  - *retroversio* = posterior flexion
  - *adductio* = adduction (movement towards the midline of the body)
  - *abductio* = abduction (movement away from the midline)
  - *elevatio* = elevation
  - *rotatio* = rotation
    - *pronatio* = medial rotation
    - *supinatio* = lateral rotation
  - *circumductio* = circumduction (compound movement of the limbs)
Morphological signs

- Signs of the structure size
- Signs of the structure shape – a basis for description
- Signs of the structure location:
  - skeletotopy
  - syntopy (somatotopy)
Morphological relationships

- Constantly relationship of the organs to their form and size
- Constantly relationship of the organs to their somatotopy
Human typology

- three main constitutional body types (Kretschmer’s human typology):
  - asthenic/leptosomic (thin, small, weak)
  - pyknic (stocky, fat)
  - athletic (muscular, large–boned)
Norm and variations

- Norm – >50% repetition of morphological signs
- Variation – individual manifestation of the signs

NB: “Individuality of expression is the beginning and end of all art”

Johann Wolfgang von Goethe

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