Introduction to the study of anatomy for students of general medicine and dentistry

Miloš Grim

winter semester 2012/2013
Welcome to the new website of the Institute of Anatomy. If you have any comments, suggestions regarding this site write to: ondrej.nanka@lf1.cuni.cz
Charles University, First Faculty of Medicine, Institute of Anatomy
U Nemocnice 3, Praha 2, 128 00, Česká Republika

Head
Prof. MUDr. Karel Smetana Jr., DrSc.

Office hours
8:30 - 9:30
13:00 - 14:00

Head of teaching
MUDr. Pavel Šnajdr, Ph.D.
Office hours Mo - Fri
8:30 - 10:00
13:30 - 15:00

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Teachers of Institute of Anatomy

Professor Emeritus
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MUDr. Oldřich Eliška, DrSc.
MUDr. Miloš Grim, DrSc.
Dr. Med. Zdenek Halata
MUDr. Pavel Petrovický, DrSc.
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MUDr. Karel Smetana ml., DrSc.

Associate professors
MUDr. Ondřej Naňka, Ph.D.
MUDr. Jan Plzák, Ph.D.
MUDr. Petr Valášek, Ph.D.

Assistant professors
MUDr. Rastislav Hromádka, Ph.D.
MUDr. Martin Chovanec, Ph.D.
MUDr. Ivana Klenáček, CSc.
Institute of Anatomy, Charles University in Prague
First Faculty of Medicine

Study room

Open:
Mo 12:00 - 17:30
Tue 11:00 - 14:14, 16:30 - 17:30
We 12:00 - 17:30
Thu 12:00 - 17:30
Fri 15:00 - 17:00

Study room of bone specimens, X-ray and CT pictures of organs

You need ID card
Open: Monday - Thursday 13:30 – 17:30h
Friday 13:30 – 15:00h

input code: practice, dissecting rooms - 2012

protective footwear for dissection room, medical coat, disposable medical gloves, anatomical forceps
First year - General Medicine

General information

• General information, requirements for credits, practicals and dissections
• Questions for final examination
• Recommended textbooks
• Schemes from Czech Books frequently used in slide tests + description of schemes

Winter semester

• Schedule of lectures from anatomy for English taught students in winter semester 2012/13
• Schedule of practical trainings and seminars from anatomy for English taught students in winter semester 2012/2013
• Anatomical dissections in winter semester

Summer semester

• Schedule of lectures from anatomy for English taught students in summer semester 2011/2012
• Schedule of practical trainings and seminars from anatomy for English taught students in summer semester 2011/12
• Anatomical dissections 2 in summer semester 2011/12
Course of Anatomy (B82238, B82239, B80617, B82240) for Students of General Medicine in the first and second semester of Academic Year 2012 – 2013. Subject Clinical Topographic Anatomy (B81312) is taught in the seventh semester.

Course Head: Prof. Karel Smetana, MD, DSc.
Head of English-taught courses: Pavel Šnajdr, MD. Ph.D.
Curricular timing: Anatomy is taught mainly in the first and second semesters containing following parts: lectures (120 hrs), practical classes (60 hrs), seminars (30 hrs) and two dissection blocks (together 58 hrs). Advanced course of clinically oriented anatomy is taught in the beginning of winter semester of the 4th year (36 hrs). Total teaching hrs: 304
Attendance to practical lessons and dissections is obligatory, attendance to lectures is recommended.
Content: Macroscopic and microscopic anatomy of organs and organ systems, their development, regional anatomy with respect to functional and clinical applications. Neuroanatomy includes both macroscopic and microscopic structures and functional pathways of the central nervous system. The list of Recommended Textbooks follows at the end of this text.
Lectures: 4 hrs per week in each of semesters according to syllabus.
First semester: Anatomical terminology, locomotor apparatus including limbs, basic anatomical concept of vessels and nerves, central lymphatic organs, regional anatomy of limbs including their blood supply and innervation, gastrointestinal system and respiratory system including their blood supply and innervation.
Second semester: Urogenital system, heart, endocrine system, central and peripheral nervous system, regional anatomy of the head and neck, sensory organs, skin.
Attendance at lectures is recommended.
Seventh semester (4th year) clinically oriented topographical (regional) anatomy.
Practical classes/seminars: 3 hrs per week in the first and second semesters according to syllabus. The main goal is demonstration of organs, evaluation of students’ knowledge by means of written tests and oral examinations. Clinically relevant seminars are given by students themselves. Attendance is obligatory; first semester is closed by the credit, second semester by the credit and final exam, seventh semester by the credit with mark.
**Gross anatomy dissection courses 1, 2:** Courses are organized in the afternoon during both semesters according to syllabus and take together 58 hours. Attendance is obligatory; each dissection course is closed by the credit (oral examination, identification and description of dissected structures). The goal of dissection is to dissect and learn all structures of the body and their topographical relations. During the courses students take turns in dissecting of different regions of the body.

Anatomic dissection 1 is focused on all anatomical limb structures and trunk muscles; anatomic dissection 2 is focused on all anatomical structures of head, neck, thorax, back, abdomen and pelvis.

**Knowledge and skills to be acquired:** Theoretical and practical knowledge of the macroscopic and microscopic anatomy of organs, their development, knowledge of topographical relations with emphases on clinical applications, knowledge of nomenclature used to describe the human body. Eligible subjects recommended for students with deeper interest in Anatomy and molecular medicine.

**New Trends in Experimental and Clinical Anatomy (B81303)**
Requirements for successfully passing the Anatomy Course
1) The study of Anatomy 1, Anatomic Dissections 1, 2 are concluded by the credit, Anatomy 2 is concluded by the credit and final exam.
2) **Requirements for receiving the credit**
   a) obligatory attendance (absences must be substituted immediately as possible)
   b) knowledge of the subject evaluated by successful passing of written and oral tests, activity at seminars.
   c) Credits: in case the credit has not been obtained at the end of a particular semester during the last practical of the semester or at the end of dissection course, the student is entitled to two re-examinations during examination period (written test - Anatomy 1, 2; oral test - Dissections)
3) **Prerequisites for the admission to the final exam**: credit from Anatomy 1 and Anatomy 2, credit from Anatomic Dissections 1 and 2, 4). **The final exam** is organized during summer examination period. It consists of three parts:
   a) written test
   b) practical part: dissection of selected region and demonstration of selected organs including their X-ray, MR and CT pictures
c) theoretical part based on the list of questions.
Satisfactory result of written test is prerequisite for the admission to other parts of
the exam. The exam can be terminated at any part without even commencing the
oral part and evaluates the student “failed”. This provision will not apply in case of a
second re-examination, when the exam continues even in case of unsatisfactory
result of the written test.
Successfully written test and practical part of the final exam is not necessary to
retake in case of re-examination, they are valid during the whole exam period,
however at longest for 4 months.
5) Students with Individual Study Plan are recommended to discuss the extent
and schedule of the subject with the Head of the Institute (Prof. Smetana) at the
beginning of particular semester.
All actual information is available on:
official board in the lobby of our Department
www.lf1.cuni.cz
Prague, September 27, 2012            Prof. Karel Smetana MD., DrSc.
Institute of Anatomy, Charles University First Faculty of Medicine 2012 - 2013

The list of questions for the final examination in microscopic and gross anatomy including organogenesis for students of general medicine.

Each question covers both microscopic and macroscopic aspects of organ structure, its syntopy, development and the most frequent birth defects

**Skeleton and its connections**
- Structure and types of bones, innervation and blood supply of bone
- Osteogenesis, ossification, remodeling and growth of bone
- Connection of bones, structure and types of joints
- The osseous nasal cavity, relations to neighboring structures
- Bony orbit - walls, relation to neighboring structures, passages
- Skull, skull of neonate and its development
- Vertebrae, vertebral column and its development, connections, curvatures and motility
- Craniovertebral joint
- Skeleton of thorax and its development, connections and motility of ribs
- Temporomandibular joint - structure and motility
- Development and growth of limb, molecular mechanisms, limb defects
- Shoulder joint – structure and movements
- Elbow joint – structure and movements
- Bones and joints of hand including reading of X-ray images
Recommended Textbooks

Anatomy
or Snell: Clinical Anatomy by systems, Lippincott Williams and Wilkins 2007

Histology

Embryology

Atlases
or Agur, Dalley: Grant’s Atlas of Anatomy, Lippincott Williams and Wilkins 2008, 12th ed.
Dissection manual
Grant's Dissector, Lippincot Williams and Wilkins 2008, 14th ed.

Complementary textbooks and Atlases
Petrovický: Basic Neuroanatomy I. and II. Praha, Karolinum 1997
Seichert: Little Anatomical Atlas. Praha 1995 Prague,

February, 2012, Prof. Karel Smetana MD., DrSc.
# Vocabulary „First aid“ for the 1st year anatomy students

<table>
<thead>
<tr>
<th>Latin Term</th>
<th>English Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>ala, ae, f.</td>
<td>wing</td>
</tr>
<tr>
<td>angulus, i, i, m.</td>
<td>angle</td>
</tr>
<tr>
<td>apex, apicis, ces, m.</td>
<td>apex</td>
</tr>
<tr>
<td>arcus, us, us, m.</td>
<td>arch</td>
</tr>
<tr>
<td>arcuatus, a, um</td>
<td>arcuate</td>
</tr>
<tr>
<td>arteria, ae, ae, f, (a., aa.)</td>
<td>artery</td>
</tr>
<tr>
<td>articulatio, onis, ones, f.</td>
<td>joint</td>
</tr>
<tr>
<td>articulus, i, i, m.</td>
<td>channel</td>
</tr>
<tr>
<td>canalis, is, es, m.</td>
<td>small channel</td>
</tr>
<tr>
<td>canaliculus, i, i, m.</td>
<td>head</td>
</tr>
<tr>
<td>caput, itis, ita, n.</td>
<td>small head</td>
</tr>
</tbody>
</table>
# Anatomy 1 (B80597) for students of general medicine

Syllabus of lectures in winter semester 2012/2013

## Small lecture hall

<table>
<thead>
<tr>
<th>Week</th>
<th>Date Range</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1.10.–5.10.</td>
<td>Introduction to the study of microscopic and macroscopic anatomy and development of organ systems. General anatomy of bones and joints. G, Sm + +</td>
</tr>
<tr>
<td>2.</td>
<td>8.10.–12.10.</td>
<td>The limb and joint development. The joints of the upper limb, joint movements. Šn, Šn + +</td>
</tr>
<tr>
<td>3.</td>
<td>15.10.–19.10.</td>
<td>The pelvis, joints of the lower limb, joint movements. Šn, Šn +</td>
</tr>
<tr>
<td>5.</td>
<td>29.10.–2.11.</td>
<td>Muscles of the upper limb, osteofascial compartments, vessels and nerves II. Muscles of the lower limb, osteofascial compartments, the survey of the vessels and nerves I. G, G + +</td>
</tr>
<tr>
<td>6.</td>
<td>5.11.–9.11.</td>
<td>Muscles of the lower limb, osteofascial compartments, vessels and nerves II. Vertebrae, ribs, sternum. Connections on the vertebral column and thorax. Development of axial skeleton. Sd, Dr + +</td>
</tr>
<tr>
<td>7.</td>
<td>12.11.–16.11.</td>
<td>Muscles of the thorax. Muscles of the abdomen, inguinal canal. Surgical approaches to the abdominal cavity. Vessels and nerves of abdominal wall. Muscle groups of the back, development of</td>
</tr>
</tbody>
</table>
# Anatomy 1 (B82238) for Students of General Medicine

## Schedule of Practices and Seminars - 1st semester 2012/2013

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.10.–5.10.</td>
<td>Anatomical nomenclature, planes and directions. Upper limb skeleton I.</td>
</tr>
<tr>
<td>2</td>
<td>8.10.–12.10.</td>
<td>Upper limb skeleton II. Skeleton of lower limb I.</td>
</tr>
<tr>
<td>3</td>
<td>15.10.–19.10.</td>
<td>Skeleton of lower limb II. Joints and connections of upper limb. S1: vessels and innervation of bones; growth and healing of bones; ossification of bones and bone age. <strong>Test 1: general anatomy of bones and joints, skeleton of upper limb.</strong></td>
</tr>
<tr>
<td>5</td>
<td>29.10.–2.11.</td>
<td>Muscles, main vessels and nerves of the upper limb. <strong>Test 3: Joints of limbs.</strong> S3: Innervation of muscle; muscular atrophy; varicose veins of lower extremity.</td>
</tr>
<tr>
<td>6</td>
<td>5.11.–9.11.</td>
<td>Muscles, main vessels and nerves of the lower limb. S4: the vessels of extremities – palpation, pressure points, punctures; palsy of median, ulnar, radial and common peroneal nerves; limb defects.</td>
</tr>
<tr>
<td>7</td>
<td>12.11.–16.11.</td>
<td>Vertebrae, costae, sternum, connections on vertebral column and thorax. <strong>Test 4: Muscles of limbs.</strong> S5: bone marrow;</td>
</tr>
</tbody>
</table>
Objectives: to show importance of the anatomy in practice. Seminars are focused on the presentation of the anatomic background applied on selected clinical cases. (Diagnosis and treatment methods are not object of these presentations). It is recommended to discuss seminar lecture with course teacher.

Form: spoken lecture performance (10 min maximum). Method: diagrams drawn on the board, power-point projection, back projection, videoprojection, practical demonstration of the specimens, X-ray pictures. Active participation in the seminars is one of the aspects to grant a semester credit.

<table>
<thead>
<tr>
<th>WEEK</th>
<th>TOPIC</th>
</tr>
</thead>
</table>
| 3.   | 15.10. – 19.10.  
S1: Innervation and vessels of bones.  
Growth and healing of bones.  
Ossification of bones and bone age. |
| 4.   | 22.10. – 26.10  
S2: Synovial joint.  
Biomechanics of knee joint.  
Developmental dysplasia of the hip (DDH). |
| 5.   | 29.10. – 2.11.  
S3: Innervation of muscle,  
muscular atrophy,  
varicose veins of lower extremity. |
| 6.   | 5.11. – 9.11.  
S4: The vessels of extremities – palpation, pressure points, punctures; palsy of median, ulnar, radial and common peroneal nerves; |
The building of the Institute of Anatomy of the Charles – Ferdinand University from 1874 – 7
Extension of the building in 1924 - 5 (3rd floor)
Abb. 5.—Hörsaal des anatomischen Institutes mit dem Projektionsapparat nach Kaiserling
Ekumenická bohoslužba slova
rekviem za dárce těl pro studium anatomie
bude sloužena
bratrem Zdeňkem Susou
za Českobratrskou církev evangelickou
bratrem Josefem Špíchallem, SDB,
za Církev římskokatolickou
v kostele Nejsvětější Trojice v Podskalí
Praha 2, Trojická ul
ve čtvrtek dne 27. května 2010 v 16:30
úvodní slovo: Miloš Grim, Anatomický ústav
proslovy posluchačů 1. lékařské fakulty
Harmonia Mozartiana Pragensis

The Ecumenical Service of the Word
Requiem for the Donors of the Bodies
for Students of Anatomy
will be celebrated by
Brother Josef Špíchal, SDB
for the Roman Catholic Church,
Brother Zdeněk Susa
for the Evangelic Church
of the Czech Brothers,
in the Church of The Holy Trinity
in Prague 2, Trojická Street
on Thursday, May 27, 2010 at 4:30 p.m.
Introductory Word: Miloš Grim, Institute of Anatomy
Addresses from the Students of the First Medical Faculty
Harmonia Mozartiana Pragensis
To the memory of those who donated their bodies for the education of medical students in anatomy.
Vesalius, Andreas (1514-1564): *De humani corporis fabrica libri septem* (Jan Stephanus Calcar), Basel: Joannes Oporinus, 1543

Iohannis Jessenii
Anatomiae, Pragae,
Anno M.D.C., abs se fo-
lenriter administrata historia.
Accessit ensalem de ossibus tractatus.

VITÆBERGÆ,
Exe[udo]bat Laurentius Senberlich,
Impensis Samuelis Selbstich,

Anno 1601.

He[ro] 25 Mal. 15
Christian Sebastian a Zeidlern
(1620 ? – 1689)

Johann Georg Ilg (1771 – 1836)
W. Staněk created Czech anatomical terminology
Atlas of anatomical dissection
Wáclav Staněk (1804 – 1871), Prague 1840
Prof. Dr. Vaclav Steffal, the first head of The Institute of Anatomy of the Czech Medical Faculty 1883 - 1894
Terminology used in descriptive anatomy

- Vertical
- Horizontal
- Median
- Coronal
- Sagittal
- Right
- Left
- Intermediate
- Medial
- Lateral
- Anterior
- Posterior
- Ventral
- Dorsal
- Frontal
- Occipital
- Superior
- Inferior
- Cranial
- Caudal
- Rostral
- Apical
- Basal
- Basilar
- Middle
- Transverse
- Transverse
- Longitudinal
- Axial
- External
- Internal
- Luminal
- Superficial
- Deep
- Proximal
- Distal
- Central
- Peripheral
- Radial
- Ulnar
- Fibular;
- Peroneal
- Tibial
- Palmar;
- Volar
- Plantar
- Flexor
- Extensor
Planes and directions
General anatomy
General Terms
Principal Planes, Principal Axis,
Directions in Space,
Direction of Movements
Parts of the Body

Frontal planes
Coronal planes
Median plane
Sagittal planes
Transverse planes
What is Anatomy:
Dissection or the separation of the body into its parts. However, it is not sufficient to name the parts. Contemporary anatomy integrates the normal structure with the normal function for better understanding of human body. It serves the needs of surgeon and physicians and contributes to development of new diagnostic and therapeutic methods. Much of adult anatomy can only be understood by know its prenatal history.
Research activities
Research is focused on cell and developmental biology, tissue engineering, experimental morphology, experimental medicine, neurosciences and clinical anatomy.

More specifically, research is focused on genes influencing limb and musculature patterning, on the epithelial-mesenchymal transition in the neural crest, on isolation and characterization of neural crest stem cells, on the influence of hypoxia on developing vessels and heart.

Further research studies the phenotype including glycophenotype. The epidermal stem cells as well as their epithelial-mesenchymal interactions are investigated under normal conditions, during wound healing and in cancer.

The development of the heart including the pathogenesis of embryonic heart failure is studied under both normal and altered hemodynamic conditions.

On the clinical side we are focused on development of ligamentous apparatus and its relation to growing skeleton.

Neuroscience topic deals with volumetry of basal ganglia in normal anatomical preparations and in MRI of patient with Parkinson disease, Alzheimer disease and carotid artery occlusion. Especially amygdala is in the focus of attention
Research activities:

Research is focused on cell and developmental biology, tissue engineering, experimental morphology, experimental medicine, neurosciences and clinical anatomy.

More specifically, research is focused on genes influencing limb and musculature patterning, on the role of c-Myb transcription factor in regulation of the epithelial-mesenchymal transition in the neural crest, on isolation and characterization of neural crest stem cells from adult human hair follicles, on the role of Shh signaling in branchial vessel formation and remodeling, on the influence of hypoxia on developing vessels and heart and on the role of Plzf expression in limb development.

Keywords/topics:

stem cells, neural crest cells, tumor microenvironment, epithelial-mesenchymal interaction, tissue engineering, angiogenesis, endogenous lectin, sugar code, Merkel nerve ending, myogenesis, c-Myb, limb patterning, basal ganglia, neuroimaging, heart development, cardiac conducting system, cardiomyocyte, heart failure, lymphology, in-stent restenosis

Cell and Developmental Biology / Buněčná a vývojová biologie


Allometric growth in humans  
Postnatal growth of the skull
Adult male skeleton: anterior and posterior view
Ossification, classification of bones (long, short, flat irregular, pneumatized)

Ossification of a long bone

Diaphysis of the femur
Endosteum, Periosteum
Fibrous joints (sutures, gomphosis)

Synovial joint (hip joint)
Skeleton of neonatal infant

Section of primary of cartilaginous
Radiograph of the right hand at 11 years (female). Epiphyses are separated from diaphyses by epiphyseal growth plate.
Pelvis - its joints and ligaments
Anteroposterior radiograph of adult female pelvis
Dorsal aspect of bones of the right foot; transverse section to show joints
Lateral views of head and neck to show surface anatomy, bones of the skull, facial musculature, parotid gland, branches of the facial nerve and branches of the carotid artery.
Sagittal section of the skull; anatomical illustration of individual bones
Lateral radiograph of adult skull
Frontal views of head to show surface anatomy, facial musculature and bones of the skull.
How to illustrate the anatomical structures
Frontal views of trunk to show surface anatomy and skeleton
Frontal views of trunk to show musculature and projection of some thoracic and abdominal organs
Projections of organs on the anterior body wall
Different types of anatomic illustrations

Duodenum, pancreas, aorta, bile duct, inferior vena cava
endoneurium
perineurium
epineurium
Stavba bronchů, septum interalveolare
tunica mucosa, tunica fibromusculocartilaginea
tunica adventitia (peribronchium)
Syntopie pars cervicalis tracheae
Female genital system

Internal genital organs
Ovary, Uterine tube
Salpinx), Uterus (Metra, Hystera), Vagina

External genital organs
Pudendum (vulva)
Mons pubis
Labium majus
Labium minus
Pudendal cleft
Labium minus
Vestibule
Bulb of vestibule
Clitoris
Magnetic resonance image of female pelvis in sagittal plane
Illustration of distribution of motoneurons innervating individual muscle groups
Obr. 16.20. Průřez mesencephalem (dole)

AM – aquaeductus mesencephali
BCS – brachium colliculi sup.
CS – colliculus superior
DTD – deccusatio tegmenti dorsalis
DTV – deccusatio tegmenti ventralis
EW – nucleus oculomotorius accessorius (ncl. Edinger-Westphali)
GM – corpus geniculatum mediale (metathalamus)
LM – lemniscus medialis
n. III – odstup n. III
ncl. III – ncl. n. oculomotorii
NR – nucleus ruber
RF – jádra retikulární formace
SGC – substantia grisea centralis
SNC – substantia nigra, pars reticularis
SNr – substantia nigra, pars compacta
pyr – tr. corticospinalis (pyramidová dráha)
F-Po – tr. frontopontinus
POT-Po – tr. parietooccipitotemporopontinus
fossa interpeduncularis

metathalamus
tegmentum
crura cerebri (pedunculi cerebri)
Catani a,M. et al.: 

Capsula interna

FIG. 14. The internal capsule is composed of fibers running from the cerebral cortex to the midbrain nuclei, cerebellum, and spinal cord (motor projections) and of thalamic fibers running from the cerebellum and spinal cord to the thalamus and from the thalamus to the cerebral cortex. The portion of fibers that runs from the pedunculus cerebri to the cortex forms the corona radiata.
Professors Emeriti
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MUDr. Martin Chovanec, Ph.D.
MUDr. Ivo Klepáček, CSc.
MUDr. Jiří Klempíř, Ph.D.
RNDr. Hana Kolesová, Ph.D.
Ing. Eliška Krejčí, Ph.D.
MUDr. Lukáš Lacina, Ph.D.
MUDr. Veronika Němcová, CSc.
MUDr. Pavel Šnajdr, Ph.D.

Assistants, Ph.D. Students
MUDr. Jiří Beneš (PhDs)
MUDr. Jana Dudová
MUDr. Zdeněk Fík (PhDS)
Dr. Ayesha Haque
MUDr. Ondřej Kodet (PhDS)
MUDr. Zdeňka Nováková
MUDr. Živorad Peševski (PhDS)
MUDr. David Stehlík (PhDS)
Mgr. Pavol Szabo
Mgr. Barbora Šaňková (PhDS)

Scientists
MUDr. Zdeněk Čada, Ph.D.
RNDr. Barbora Dvořáková, Ph.D.
Ivan Helekal, akademický malíř
Mgr. Jan Kacvinský
Mgr. Alena Kvasilová
Mgr. Markéta Pleschnerová
MUDr. Petr Valášek, Ph.D.

Lecturers – students of 1. LF
27 studentů