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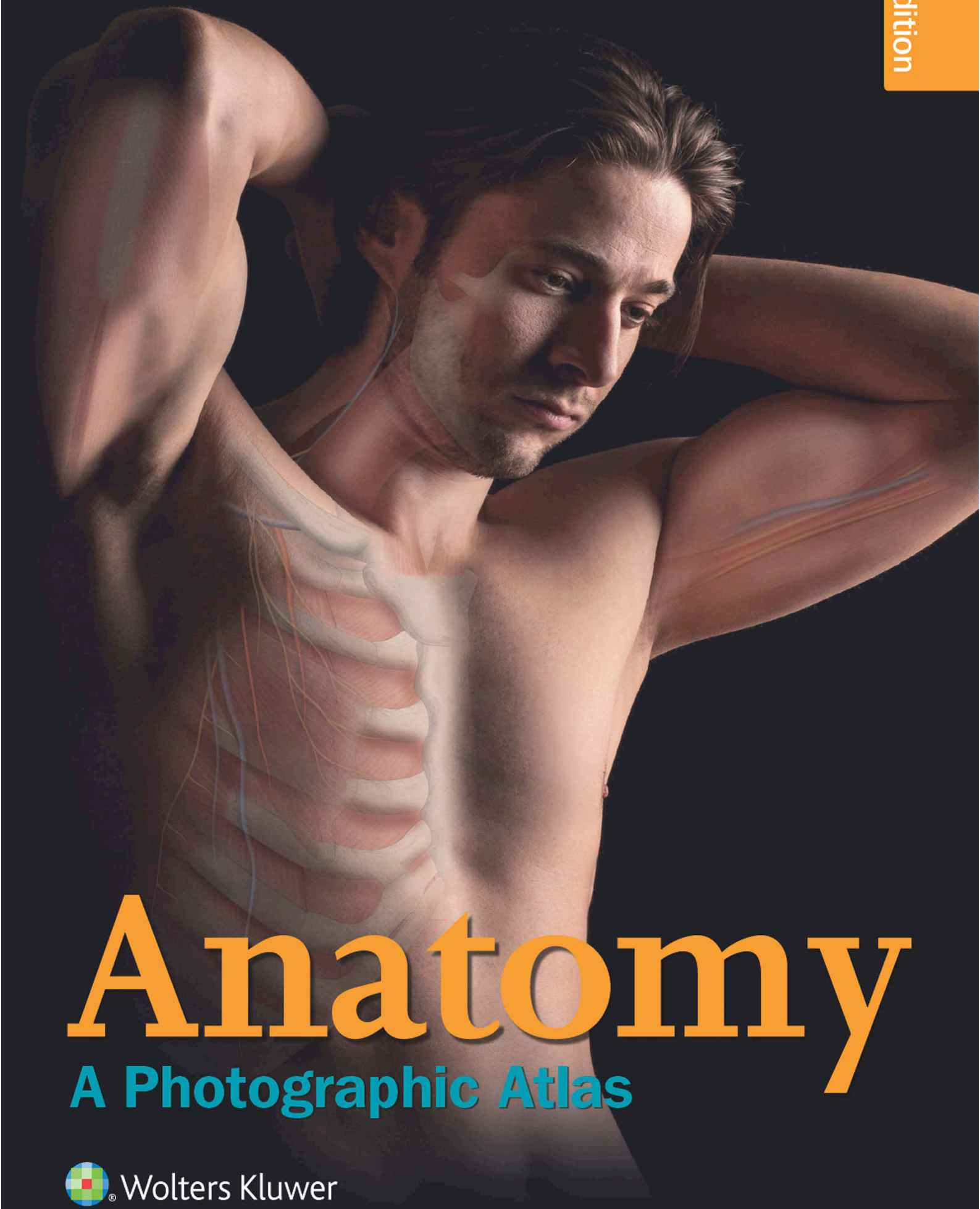

Anatomy

A Photographic Atlas

Wolters Kluwer

Johannes W. Rohen
Chihiro Yokochi
Elke Lütjen-Drecoll

Anatomy: A Photographic Atlas

Eighth Edition

Coeditions in 20 Languages

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Eighth Edition

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1096 in Color,
and 113 Radiographs, CT, and MRI Scans

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Preface to the Eighth Edition

The knowledge of the structure and topography of the various organs of the human body is a prerequisite not only for the education of medical students but also for everyone involved in diagnostic and therapy of human diseases. This knowledge can optimally be gained by dissection of the human body, with an excellent atlas by one's side. Today there exist a number of good anatomic atlases, but most of them contain mainly schematic drawings, which minimally reflect reality. In contrast, the photographs of the actual anatomic specimens have the advantage of conveying the reality of the object with its proportions and spatial dimensions in a more accurate manner.

On the other hand, schematic drawings help us to better understand the photos. Therefore, in this eighth edition, the number of drawings has greatly been increased and old drawings have been replaced by new ones specifically adapted to their accompanying photos.

The didactic purpose of this atlas is not only to help the student understand the topography of the human body. We also hope to provide a way to systematically learn the anatomical structures and functions. Therefore, the chapters of regional anatomy are consequently placed behind a systematic description of the anatomical structures – e.g., before dissecting an extremity, the student can study the systematic anatomy of the involved bones, joints, muscles, nerves, and vessels.

The correlations between clinical images like MRI and CT scans can best be learned if sections of scans can be directly compared with cadaveric anatomical sections of the same region. In this edition, a number of MRI scans have been added that have been taken in a plane of the related anatomical section. In addition, functional MRI scans of the heart and the related anatomical preparations are included, hopefully increasing the importance of the atlas for clinical purposes.

While preparing this new edition, the authors were reminded of how precisely, beautifully, and admirably the human body is constructed. If this book helps the student or physician to appreciate the overwhelming beauty of the anatomical architecture of these tissues and organs, then it greatly fulfills its task. Deep interest and admiration of these anatomical structures may create the "love for the human being," which unhesitatingly becomes the inspiration to pursue the vocation of medicine.

Erlangen, Germany; Spring 2015

J. W. Rohen
C. Yokochi
E. Lütjen-Drecoll

Acknowledgments

The preparations of the anatomical specimens shown in this atlas were time consuming and required profound knowledge. Therefore, all were prepared by anatomists or surgeons. The majority were prepared by the authors and coworkers either in the Department of Anatomy in Erlangen or in the Department of Anatomy, Kanagawa, Dental College in Tokyo. We would like to express our great gratitude to Prof. S. Nagashima, Prof. K. Okamoto, and Dr. M. Takahashi (all Japan) who worked for extended periods in Germany in the Department of Anatomy in Erlangen, and to Dr. K. Schmidt, Dr. G. Lindner-Funk (both Nuremberg), Dr. M. Rexer (Fürth), R.M. Mc Donnell (Dallas, USA), and Mr. J. Bryant (Erlangen) for dissecting specimens with great skill and knowledge.

We are also greatly indebted to Mr. H. Sommer (SOMSO Co., Coburg, Germany) who kindly provided a number of excellent bone specimens.

All the excellent macro photos of specimens newly included in this eighth edition, most notably those of the skeletal system and of the heart, were contributed by our photographer Mr. M. Gößwein, to whom we express our great gratitude.

Most important for this new eighth edition was the work of our artist Mr. J. Pekarsky. He created many new drawings specifically adapted to the photos in this edition and revised most of the old ones. We express our many thanks to him for his most excellent and time consuming work.

We are greatly indebted to our coworkers from the Department of Radiology, especially Prof. M. Uder and his colleagues (Erlangen) who took the time to perform MRI scans specifically adapted to specimens in our atlas and who added scans to the heart chapter that significantly improved our ability to elucidate the functional aspects of this organ. Also, we extend our thanks to Prof. W. J. Huk and Prof. W. Bautz (both Erlangen), Prof. A. Heuck (Munich), and Dr. Wieners (Berlin) for their excellent MRI and CT scans.

In addition, we express our many thanks to our secretary Mrs. L. Koehler for her untiring and excellent cooperation and to Dr. C. Sims-O'Neil for her careful corrections of the proofs of the new edition.

Finally, we gratefully acknowledge the head of our publisher (Schattauer Verlag, Stuttgart) Mr. D. Bergemann and his coworkers, particularly Mrs. E. Wallstein, who prepared the final layout of the Atlas and worked intensely together with the authors on the new structure of this edition.

Preface to the First Edition

Today there exist any number of good anatomic atlases. Consequently, the advent of a new work requires justification. We found three main reasons to undertake the publication of such a book.

First of all, most of the previous atlases contain mainly schematic or semischematic drawings, which often reflect reality only in a limited way; the third dimension, i.e., the spatial effect, is lacking. In contrast, the photo of the actual anatomic specimen has the advantage of conveying the reality of the object with its proportions and spatial dimensions in a more exact and realistic manner than the "idealized," colored "nice" drawings of most previous atlases. Furthermore, the photo of the human specimen corresponds to the student's observations and needs in the dissection courses. Thus he has the advantage of immediate orientation by photographic specimens while working with the cadaver.

Secondly, some of the existing atlases are classified by systemic rather than regional aspects. As a result, the student needs several books each supplying the necessary facts for a certain region of the body. The present atlas, however, tries to portray macroscopic anatomy with regard to the regional and stratigraphic aspects of the object itself as realistically as possible. Hence it is an immediate help during the dissection courses in the study of medical and dental anatomy.

Another intention of the authors was to limit the subject to the essential and to offer it didactically in a way that is self-explanatory. To all regions of the body we added schematic drawings of the main tributaries of nerves and vessels, of the course and mechanism of the muscles, of the nomenclature of the various regions, etc. This will enhance the understanding of the details seen in the photographs. The complicated architecture of the skull bones, for example, was not presented in a descriptive way, but rather through a series of figures revealing the mosaic of bones by adding one bone to another, so that ultimately the composition of skull bones can be more easily understood.

Finally, the authors also considered the present situation in medical education. On one hand there is a universal lack of cadavers in many departments of anatomy, while on the other hand there has been a considerable increase in the number of students almost everywhere. As a consequence, students do not have access to sufficient illustrative material for their anatomic studies. Of course, photos can never replace the immediate observation, but we think the use of a macroscopic photo instead of a painted, mostly idealized picture is more appropriate and is an improvement in anatomic study over drawings alone.

The majority of the specimens depicted in the atlas were prepared by the authors either in the Dept. of Anatomy in Erlangen, Germany, or in the Dept. of Anatomy, Kanagawa Dental College, Yokosuka, Japan. The specimens of the chapter on the neck and those of the spinal cord demonstrating the dorsal branches of the spinal nerves were prepared by Dr. K. Schmidt with great skill and enthusiasm. The specimens of the ligaments of the vertebral column were prepared by Dr. Th. Mokrusch, and a great number of specimens in the chapter of the upper and lower limb was very carefully prepared by Dr. S. Nagashima, Kurume, Japan.

Once again, our warmest thanks go out to all of our coworkers for their unselfish, devoted and highly qualified work.

Erlangen, Germany; Spring 1983

J. W. Rohen
C. Yokochi

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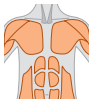
2 Head and Neck



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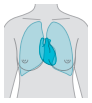

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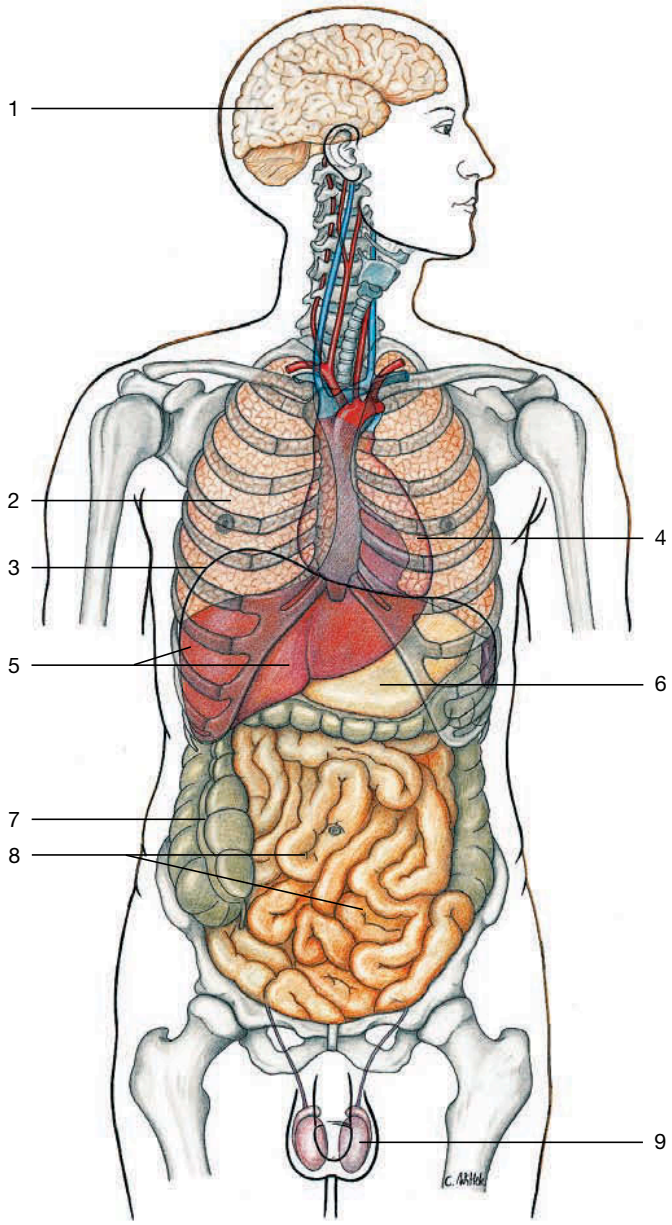
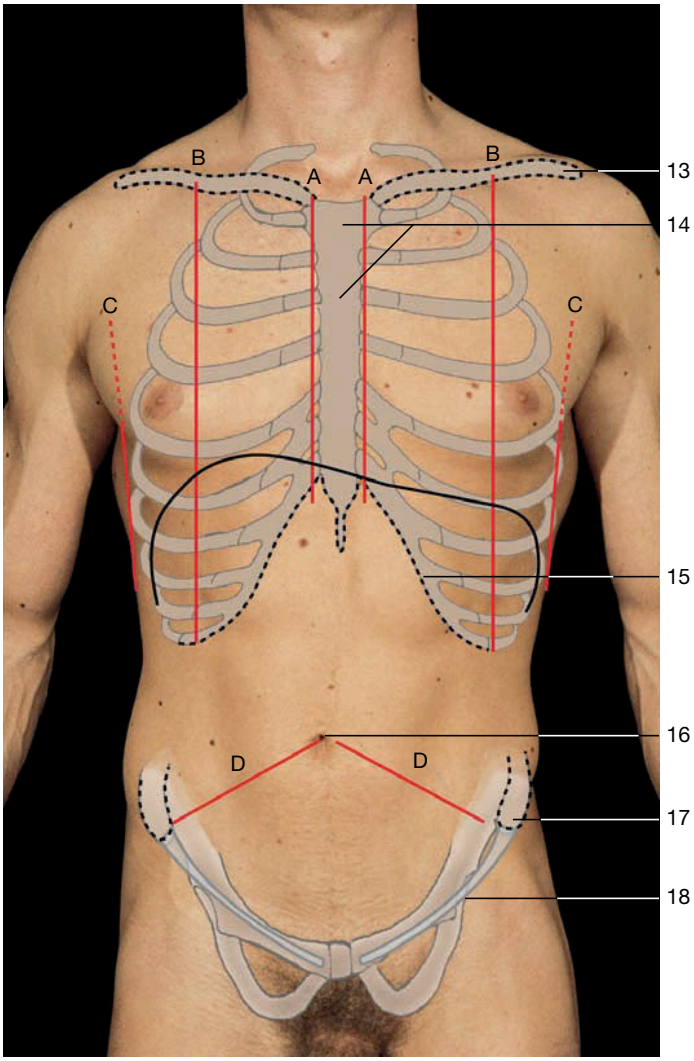
1 General Anatomy



Position of the inner organs of the human body (anterior aspect). The main cavities of the body and their contents.

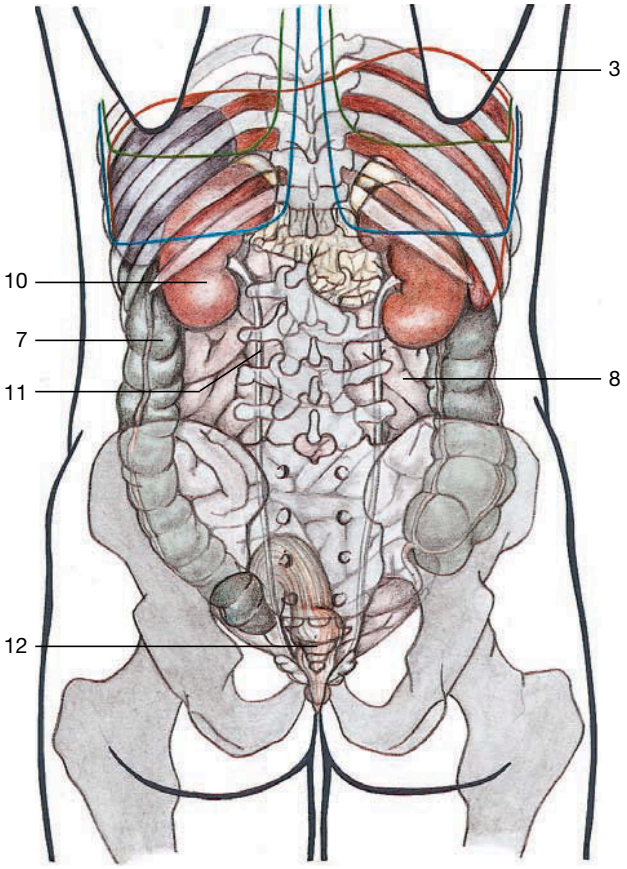


Regional lines and palpable points at the ventral side of the human body.

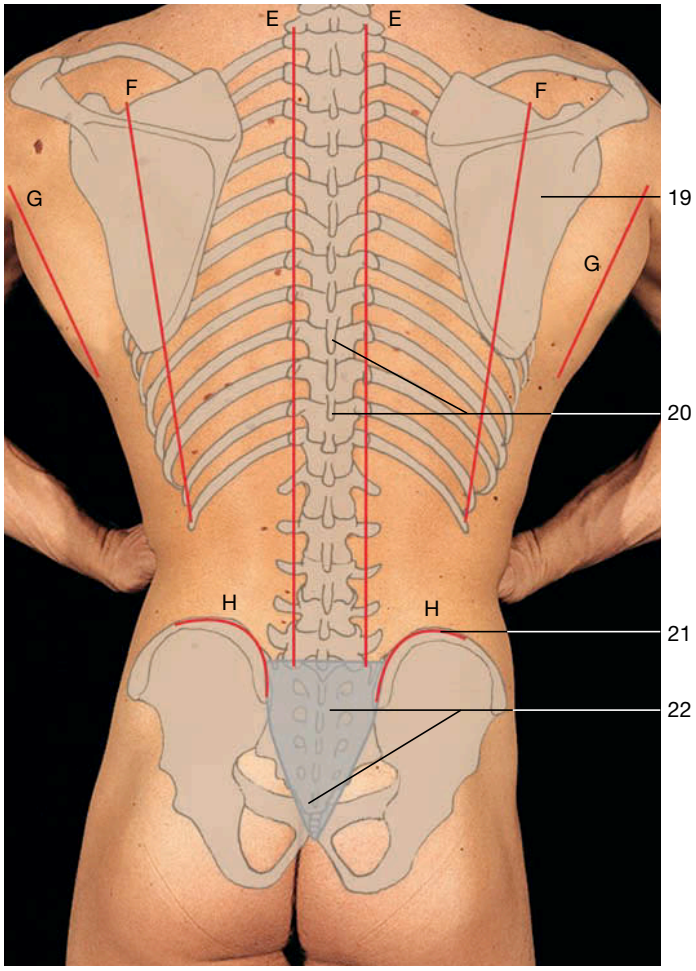
Regional lines
A = Parasternal line
B = Midclavicular line
C = Anterior axillary line
D = Umbilical-pelvic line

The bones of the skeletal system are palpable through the skin at different points. This enables physicians to localize the inner organs. On the **ventral side,** the clavicle, sternum, ribs, and intercostal spaces are palpable. Furthermore, the anterior iliac spine and the symphysis can be localized. For better orientation, several **lines of orientation** are used, e.g., the parasternal line, the midclavicular line, the anterior axillary line, the umbilical-pelvic line.

By means of these lines, the heart and the position of the vermiform process can be localized.



Position of the inner organs of the human body (posterior aspect).

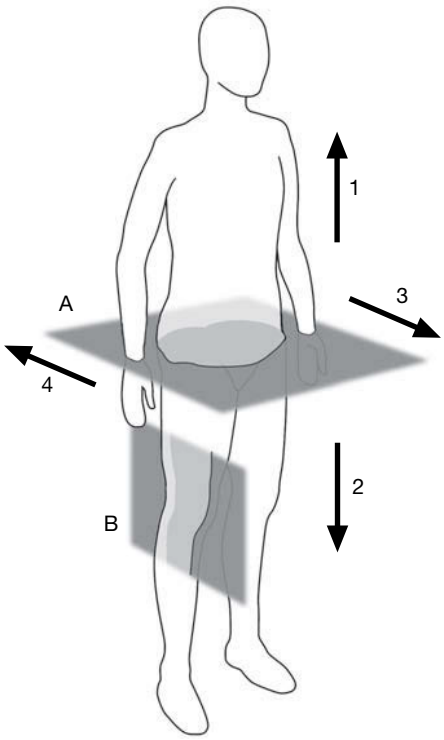


Regional lines and palpable points at the dorsal side of the human body.

Regional lines
E = Paravertebral line
F = Scapular line
G = Posterior axillary line
H = Iliac crest

1 Brain
2 Lung
3 Diaphragm
4 Heart
5 Liver
6 Stomach
7 Colon
8 Small intestine
9 Testis
10 Kidney
11 Ureter
12 Anal canal
13 Clavicle
14 Manubrium sterni
15 Costal arch
16 Umbilicus
17 Anterior superior iliac spine
18 Inguinal ligament
19 Scapular spine
20 Spinous processes
21 Iliac crest
22 Coccyx and sacrum

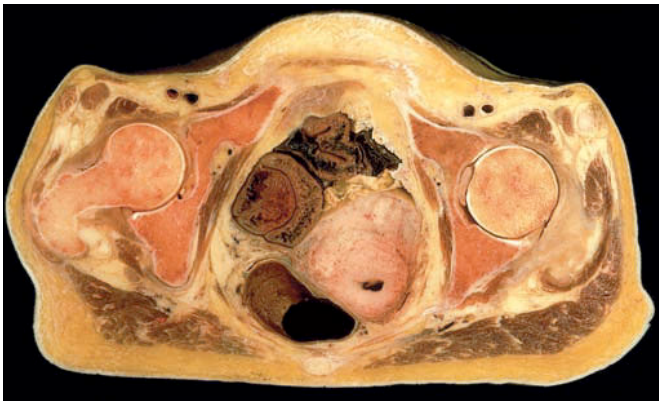
At the **dorsal side** of the body, the posterior spines of the vertebral column, the ribs, the scapula, the sacrum, and the iliac crest are palpable. **Lines of orientation** are the paravertebral line, the scapular line, the posterior axillary line, and the iliac crest.



Planes of the body:
A = Horizontal or axial or transverse plane
B = Sagittal plane (at the level of the knee joint)

Directions:

1 = Cranial	3 = Anterior (ventral)
2 = Caudal	4 = Posterior (dorsal)

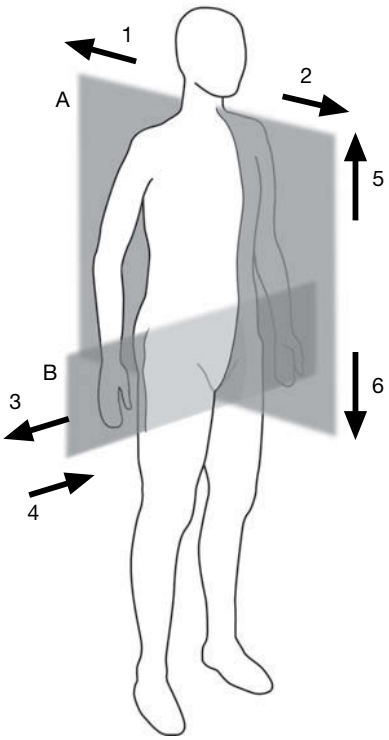


Horizontal section through the pelvic cavity and the hip joints.

MRI scan through the pelvic cavity and the hip joints (horizontal or axial or transverse plane).

Sagittal section through the knee joint.

MRI scan through the knee joint (sagittal plane).



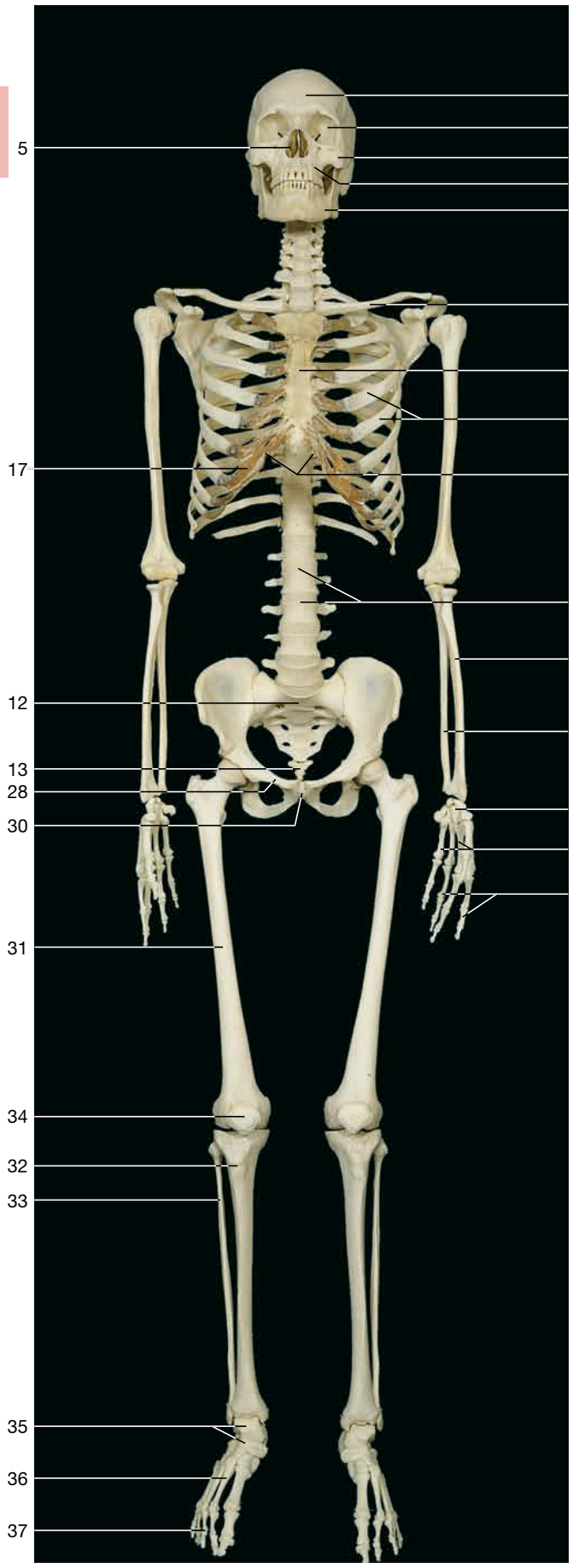
Planes of the body:
A = Midsagittal or median plane
B = Frontal or coronal plane (through the pelvic cavity)

Directions:

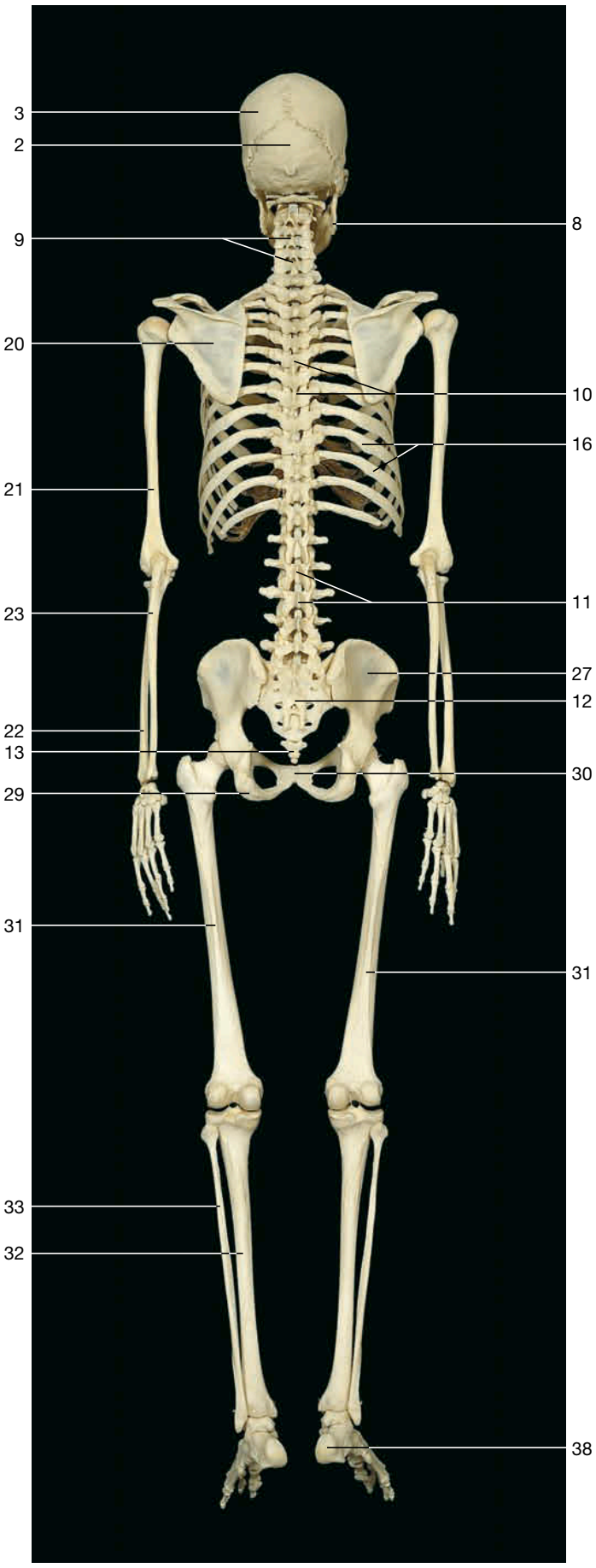
1 = Posterior (dorsal)	4 = Medial
2 = Anterior (ventral)	5 = Cranial
3 = Lateral	6 = Caudal

MRI scan through the pelvic cavity and the hip joints (frontal or coronal plane).

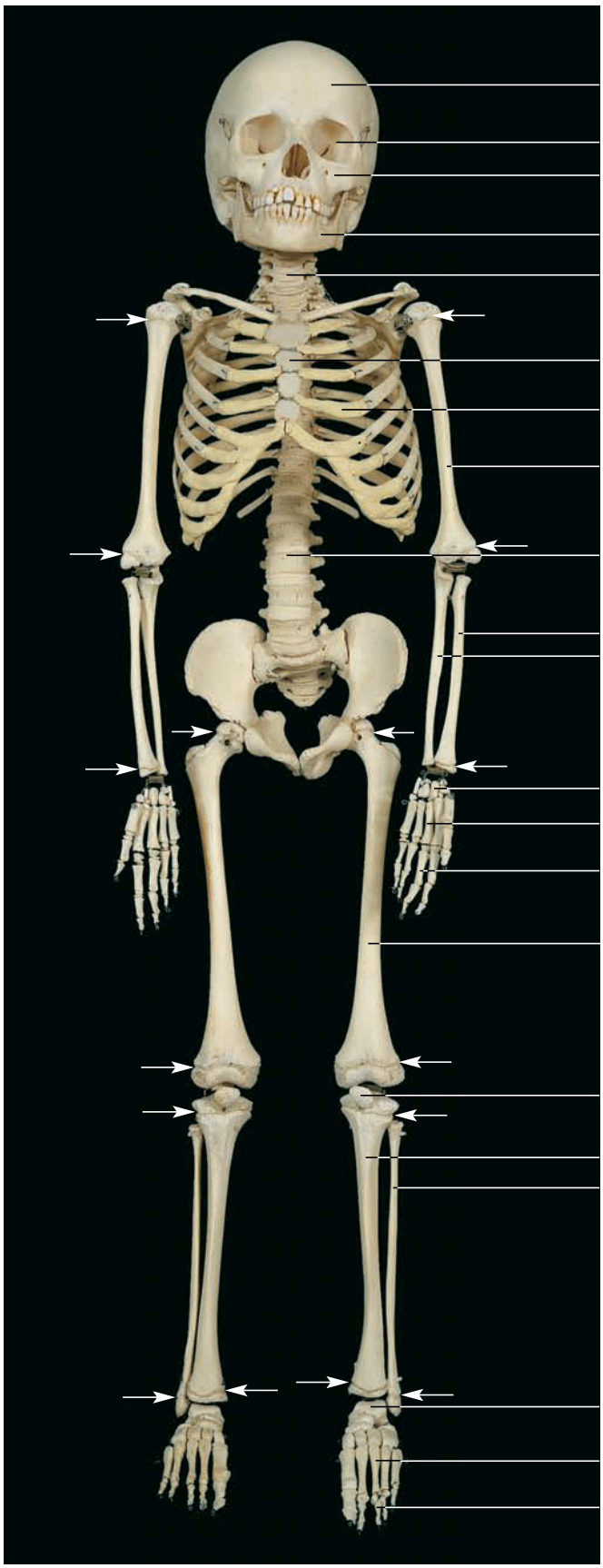
Median section through the trunk of a female.



Skeleton of a female adult (anterior aspect).



Skeleton of a female adult (posterior aspect).



Skeleton of a 5-year-old child (anterior aspect).
The zones of the cartilaginous growth plates are seen (arrows). In contrast to the adult, the ribs show a predominantly horizontal position.

Axial skeleton

Head

1 Frontal bone
2 Occipital bone
3 Parietal bone
4 Orbit
5 Nasal cavity
6 Maxilla
7 Zygomatic bone
8 Mandible

Trunk and thorax

Vertebral column

9 Cervical vertebrae
10 Thoracic vertebrae
11 Lumbar vertebrae
12 Sacrum
13 Coccyx
14 Intervertebral discs

Thorax

15 Sternum
16 Ribs
17 Costal cartilage
18 Infrasternal angle

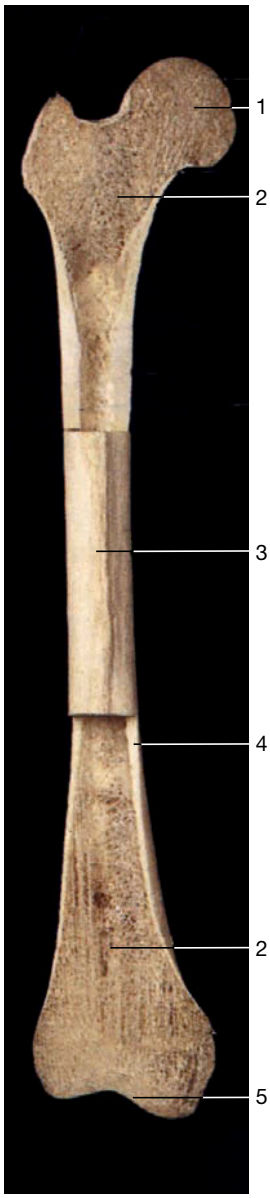
Appendicular skeleton

Upper limb and shoulder girdle

19 Clavicle
20 Scapula
21 Humerus
22 Radius
23 Ulna
24 Carpal bones
25 Metacarpal bones
26 Phalanges of the hand

Lower limb and pelvis

27 Ilium
28 Pubis
29 Ischium
30 Symphysis pubis
31 Femur
32 Tibia
33 Fibula
34 Patella
35 Tarsal bones
36 Metatarsal bones
37 Phalanges of the foot
38 Calcaneus

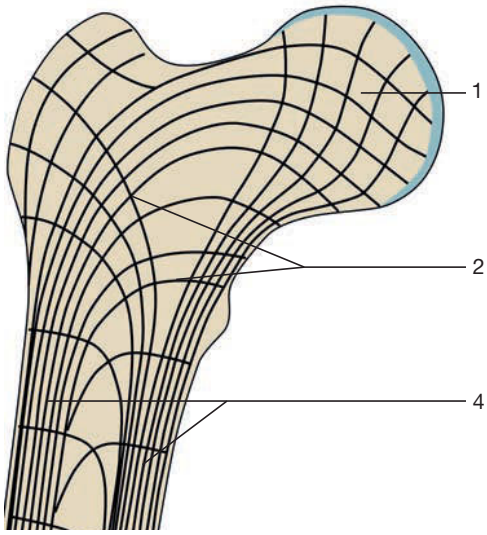


◁ **Femur of the adult.** Coronal section of the proximal and distal epiphyses displaying the spongy bone and the medullary cavity.

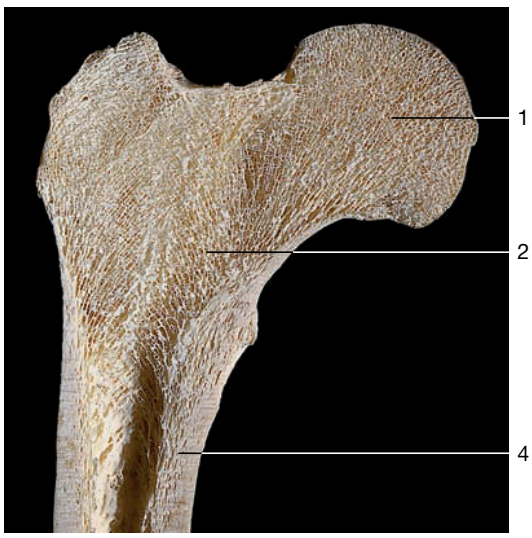
MRI scan of the right femur and hip joint (coronal section). (From Heuck et al., MRT-Atlas, 2009.)

X-ray of the right femur and hip joint (a.-p. direction).

1 Head of the femur
2 Spongy bone
3 Diaphysis of the femur
4 Compact bone
5 Articular cartilage



Three-dimensional representation on the trajectorial lines of the femoral head.

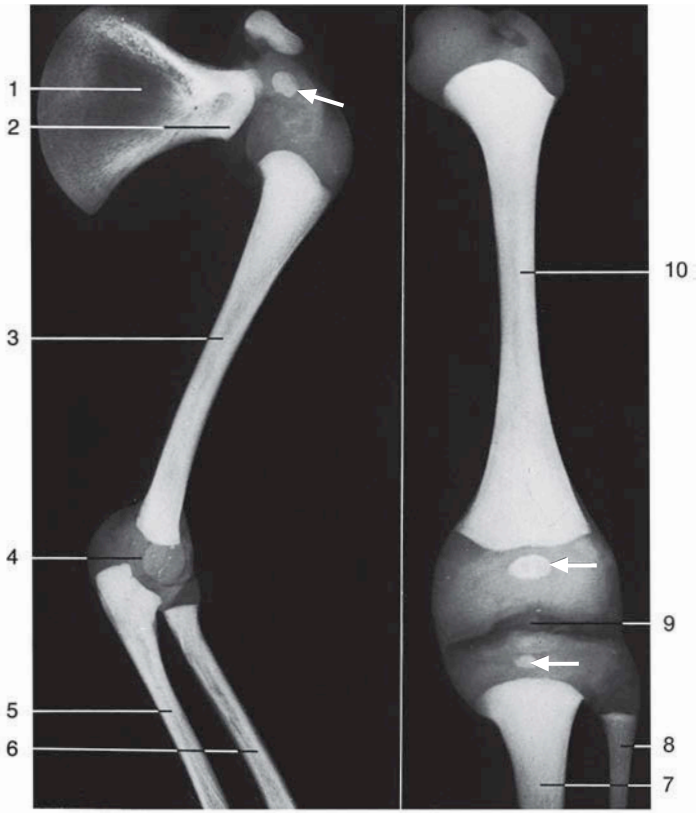


Coronal section through the proximal end of the adult femur showing the characteristic structure of the spongy bone.

Ossification of the femur (left: coronal section, right: posterior aspect of the femur). Arrows: distal epiphysis.

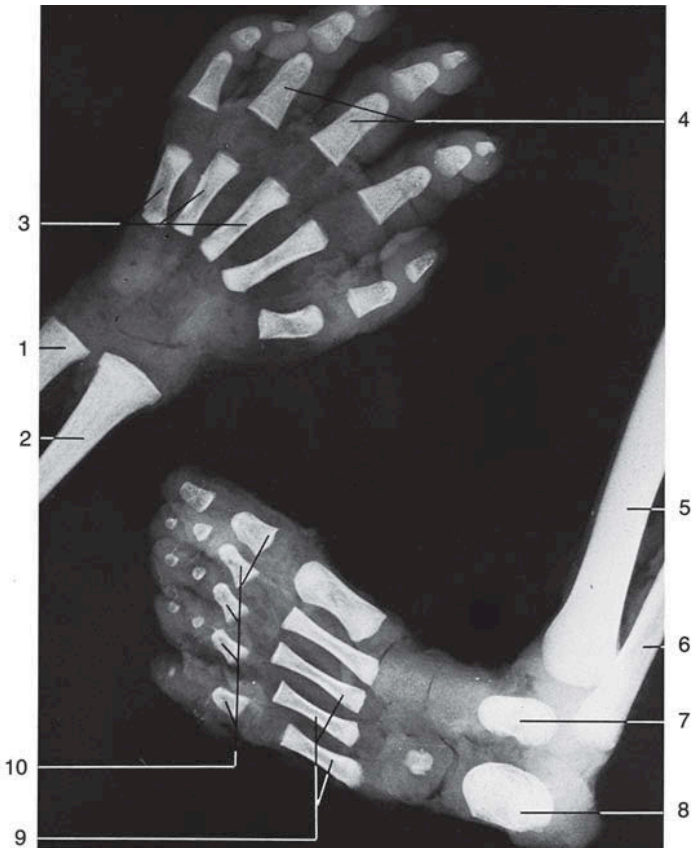
The **ossification of the bones** of the limbs starts within the ossification centers of the primary cartilagenous bones. Here, the medullary cavity develops. The ossification process of limb bones is not finished at birth.

◁ 1 Ossification center in the head of the femur
2 Greater trochanter
3 Head of the femur
4 Neck of the femur
5 Lateral condyle
6 Medial condyle
7 Intercondylar notch
8 Diaphysis



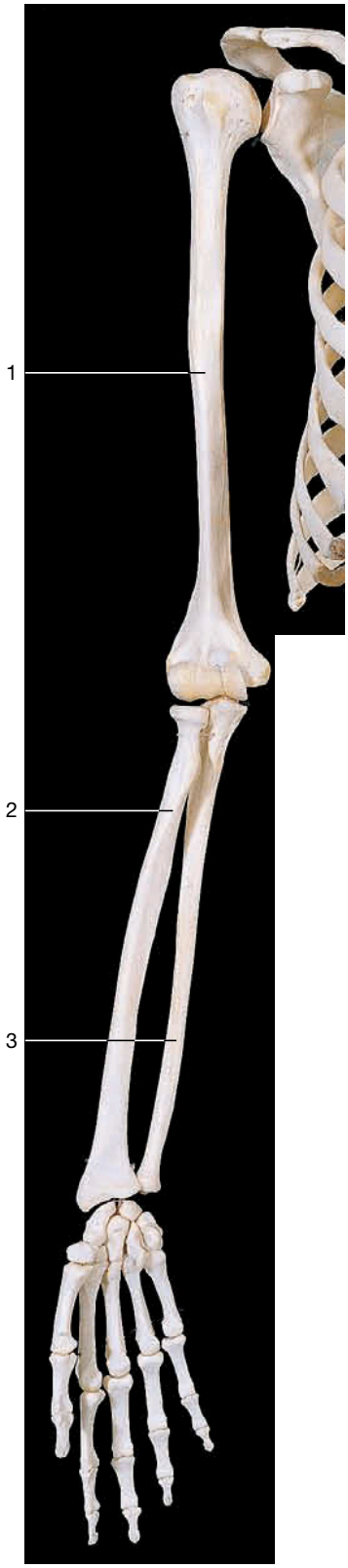
X-ray of the upper and lower limb of a newborn child (left: upper limb, right: lower limb). Arrows: ossification centers.

1 Scapula
2 Shoulder joint
3 Humerus
4 Elbow joint
5 Ulna
6 Radius
7 Tibia
8 Fibula
9 Knee joint
10 Femur

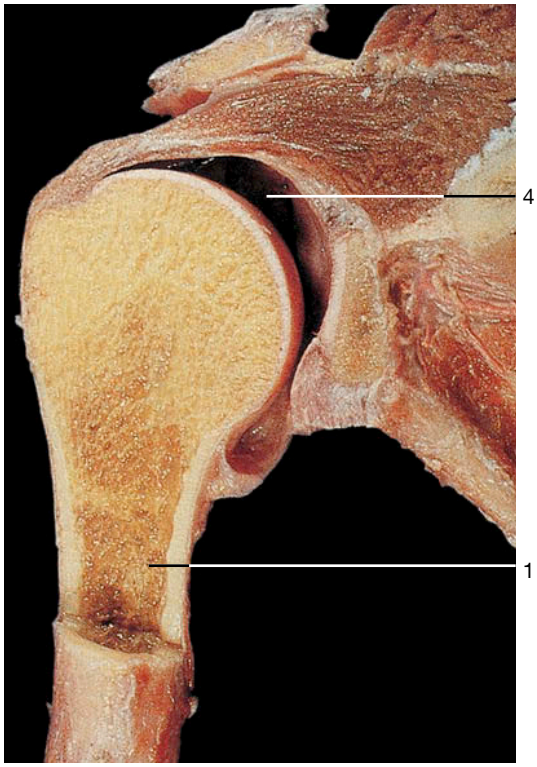


◁ 1 Ulna
2 Radius
3 Metacarpal bones
4 Phalanges
5 Tibia
6 Fibula
7 Talus
8 Calcaneus
9 Metatarsal bones
10 Phalanges

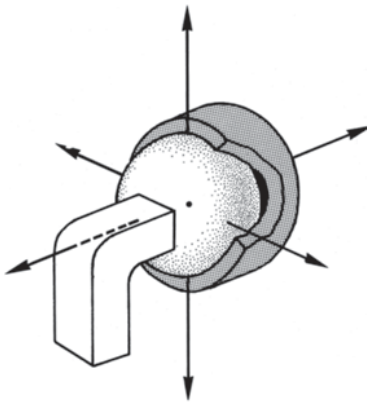
X-ray of hand and foot of a newborn.



Skeleton of the arm and shoulder girdle (anterior aspect).

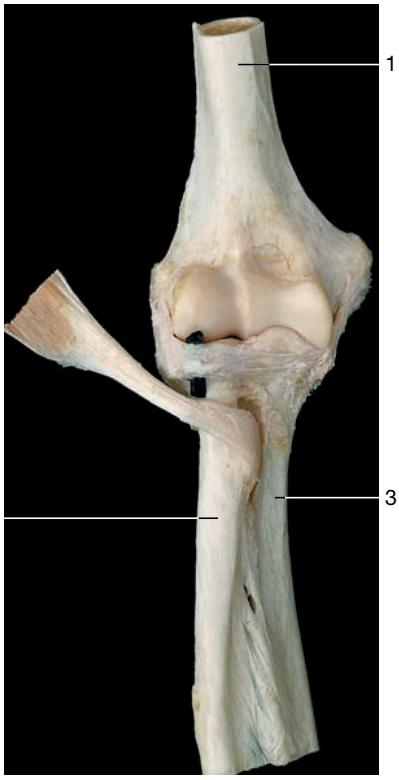


Shoulder joint as an example of a multiaxial ball-and-socket joint (coronal section).



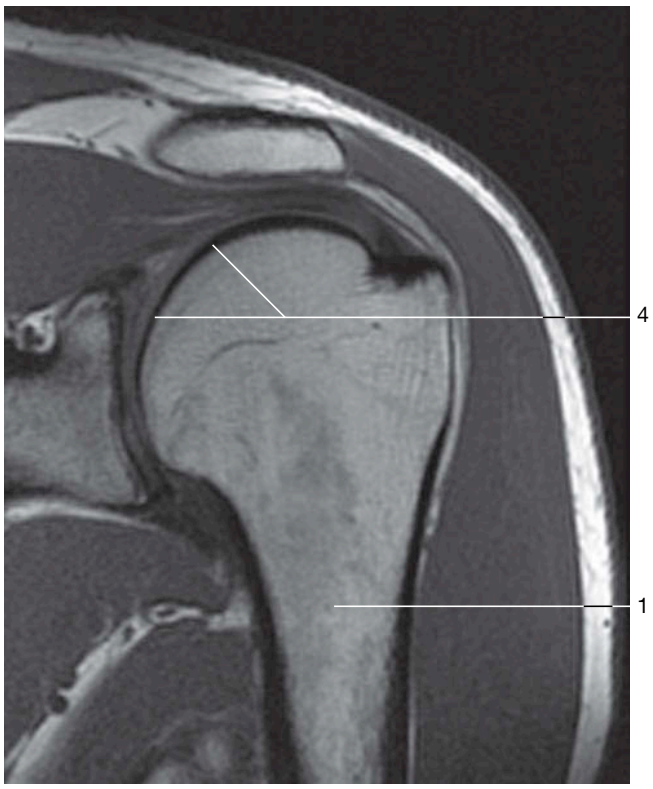
Ball-and-socket joint with its different axes. Arrows: axes of movement.

1 Humerus
2 Radius
3 Ulna
4 Articular cavity (shoulder joint)
5 Metacarpophalangeal joint
6 Joints of fingers

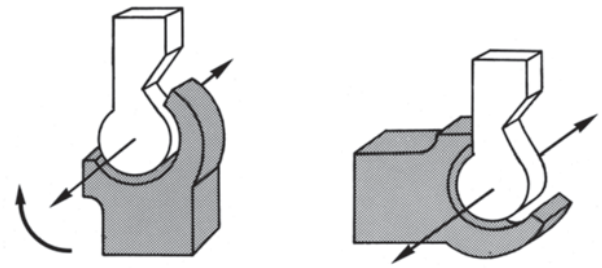


Elbow joint with ligaments as an example of a hinge joint (monaxial humero-ulnar joint) in combination with a pivot joint (monaxial radio-ulnar joint), which allows rotation.

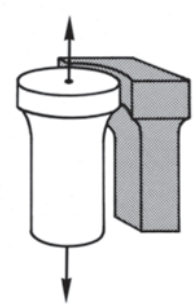
Coronal section through the elbow joint (MRI scan). (Courtesy of Prof. Heuck, Munich, Germany.) The possibilities of movement are shown in the schematic drawings on page 11.



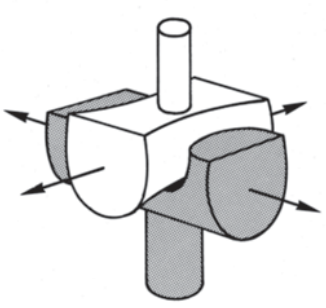
Coronal section through the shoulder joint (MRI scan).
(From Heuck et al., MRT-Atlas, 2009.)



Hinge joint
(e.g., humero-ulnar joint). Left: extension, right: flexion.
Arrows: axes of movement.



Pivot joint
(e.g., radio-ulnar joint).



Saddle joint
(e.g., carpometacarpal joint of the thumb).

Skeleton of right wrist and hand (medial aspect).
The metacarpophalangeal joints are biaxial, as is the carpometacarpal joint of the thumb (✻ in the figure). The joints of the fingers, however, are monaxial.

Joints exhibit a variety of functions. In general, mobility becomes reduced in the direction from proximal to distal. The hip joint, e.g., is multiaxial; the knee joint is biaxial, and the joints of toes and fingers are monaxial.