



Kognitive Neuropsychologie



03.11. Geschichte der kognitiven Neurowissenschaft

10.11. Funktionelle Neuroanatomie

17.11. Methoden der kognitiven Neuropsychologie I

24.11. Methoden der kognitiven Neuropsychologie II

01.12. Visuelle Wahrnehmung

08.12. Objekterkennung

15.12. Auditive Wahrnehmung

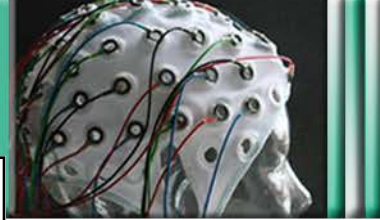
05.01. Sprache

12.01. Aufmerksamkeit und Selektion

19.01. Kognitive Kontrolle

26.01. Gedächtnis & Lernen

02.02. Kognitives Altern



Brain Tutor (3.0)
Brainvoyager.com

Desktop Versions

&

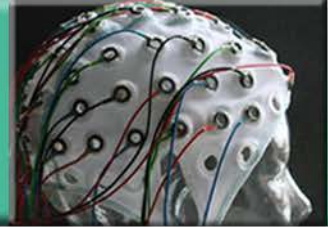
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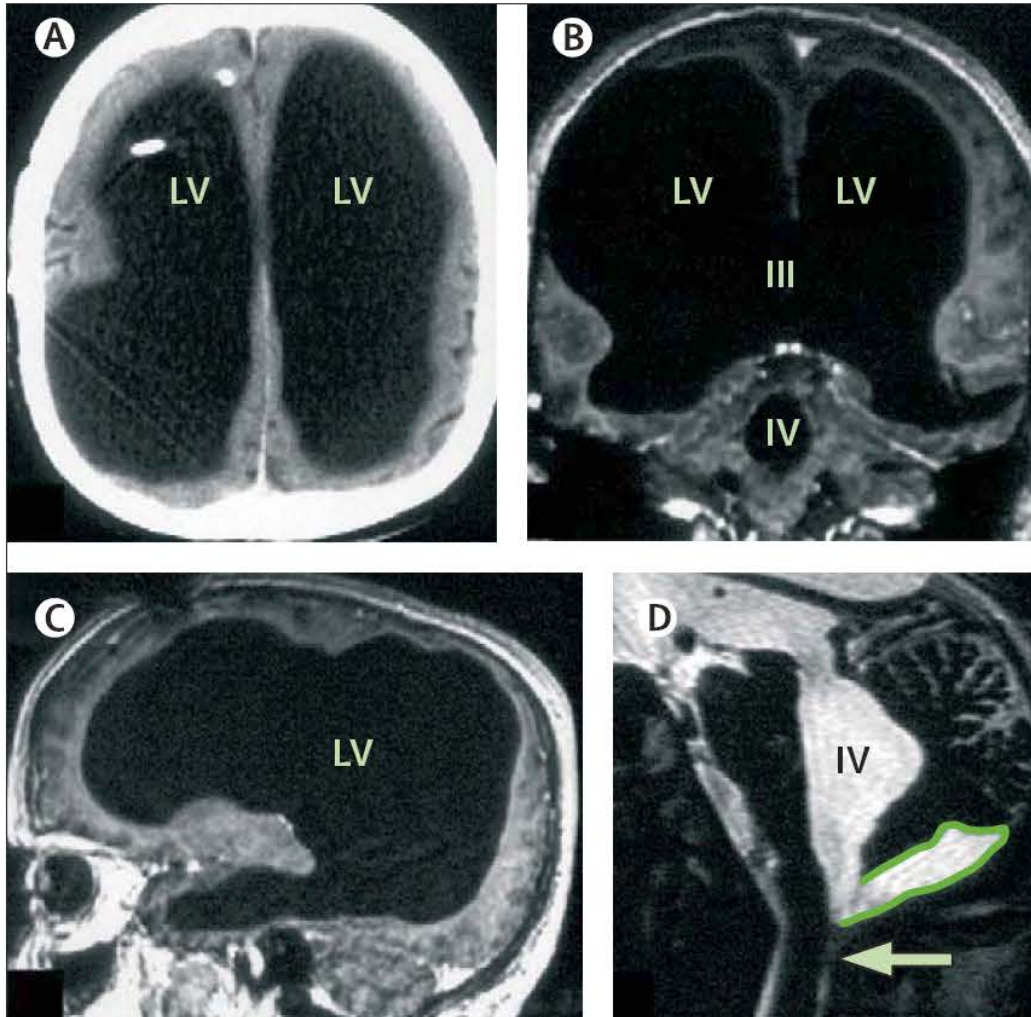


Patient RB



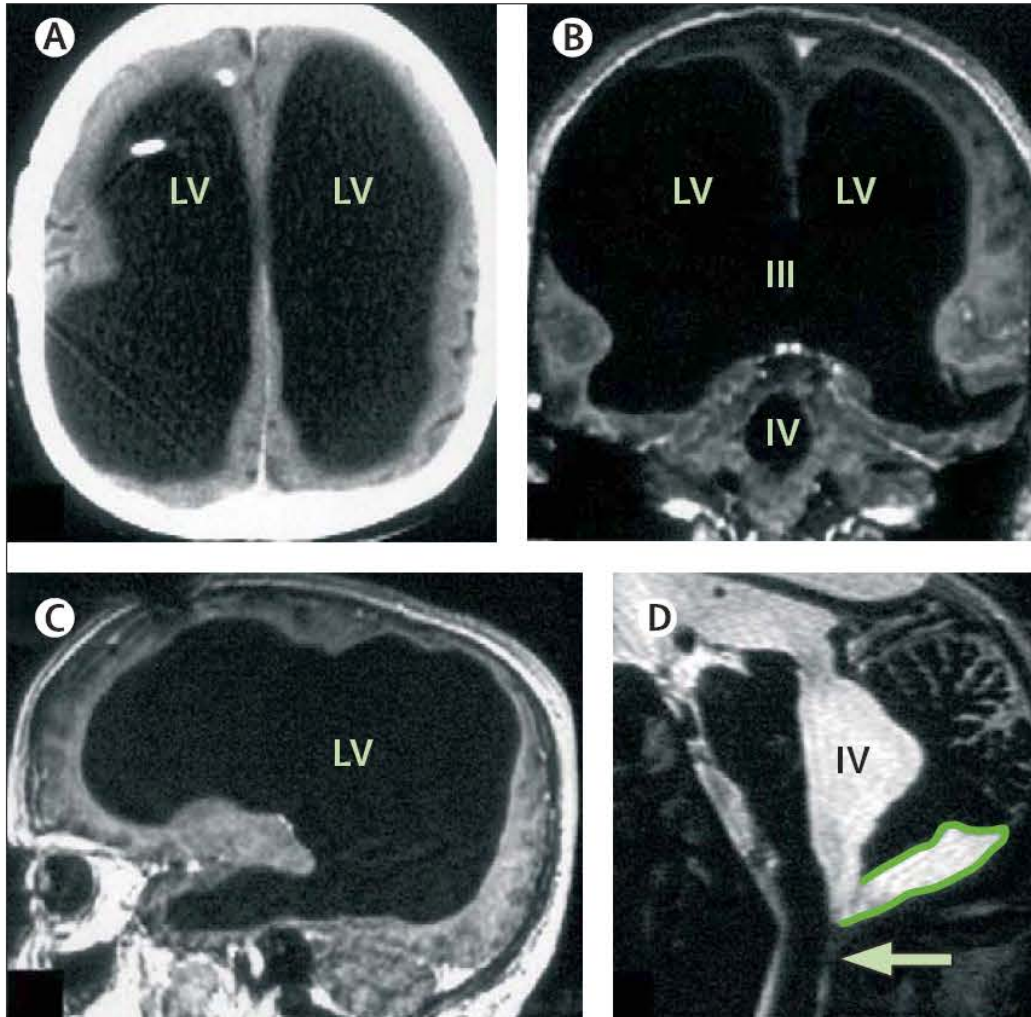


44 jähriger Mann ...





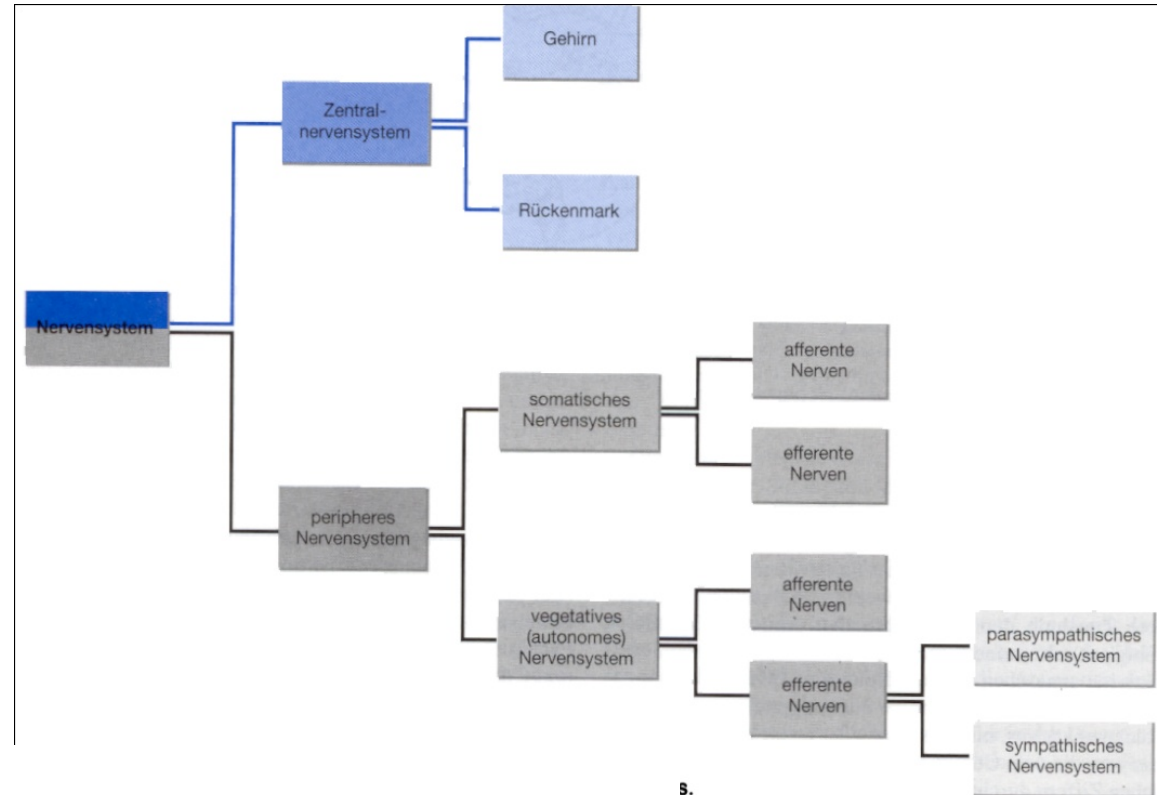
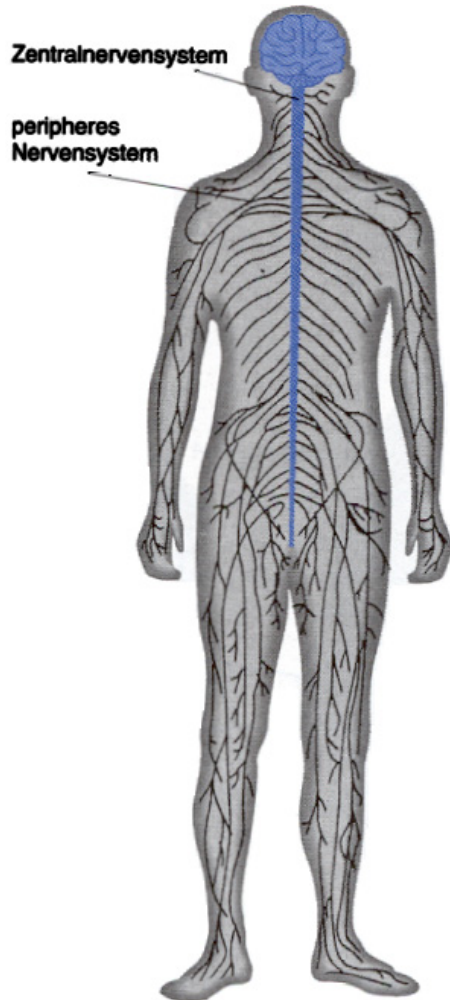
44 jähriger Mann ...



- T2 gewichtetes MRT
- 6 Monate: Hydrozephalus / shunt
- 14 Jahre: Ataxie
- Normale neurologische Entwicklung
- Beamter; 2 Kinder
- Verbaler IQ: 84
- Handlungs IQ: 70
- Beinschwäche



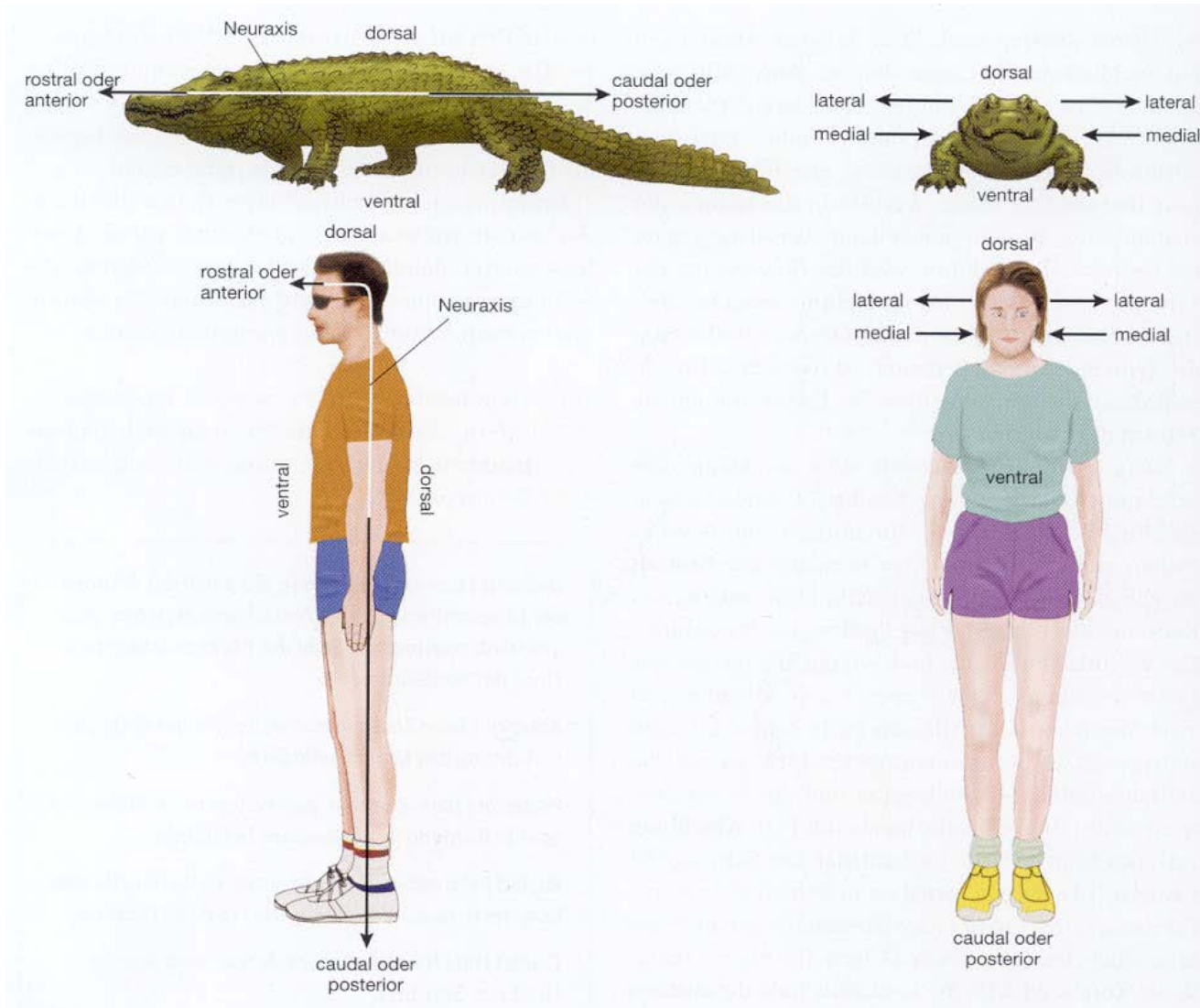
Zentrales und peripheres Nervensystem



3.1 Das menschliche Zentralnervensystem (ZNS) (blau) und das periphere Nervensystem (PNS) (schwarz).



Die Bezeichnung anatomischer Richtungen





Die Bezeichnung anatomischer Richtungen

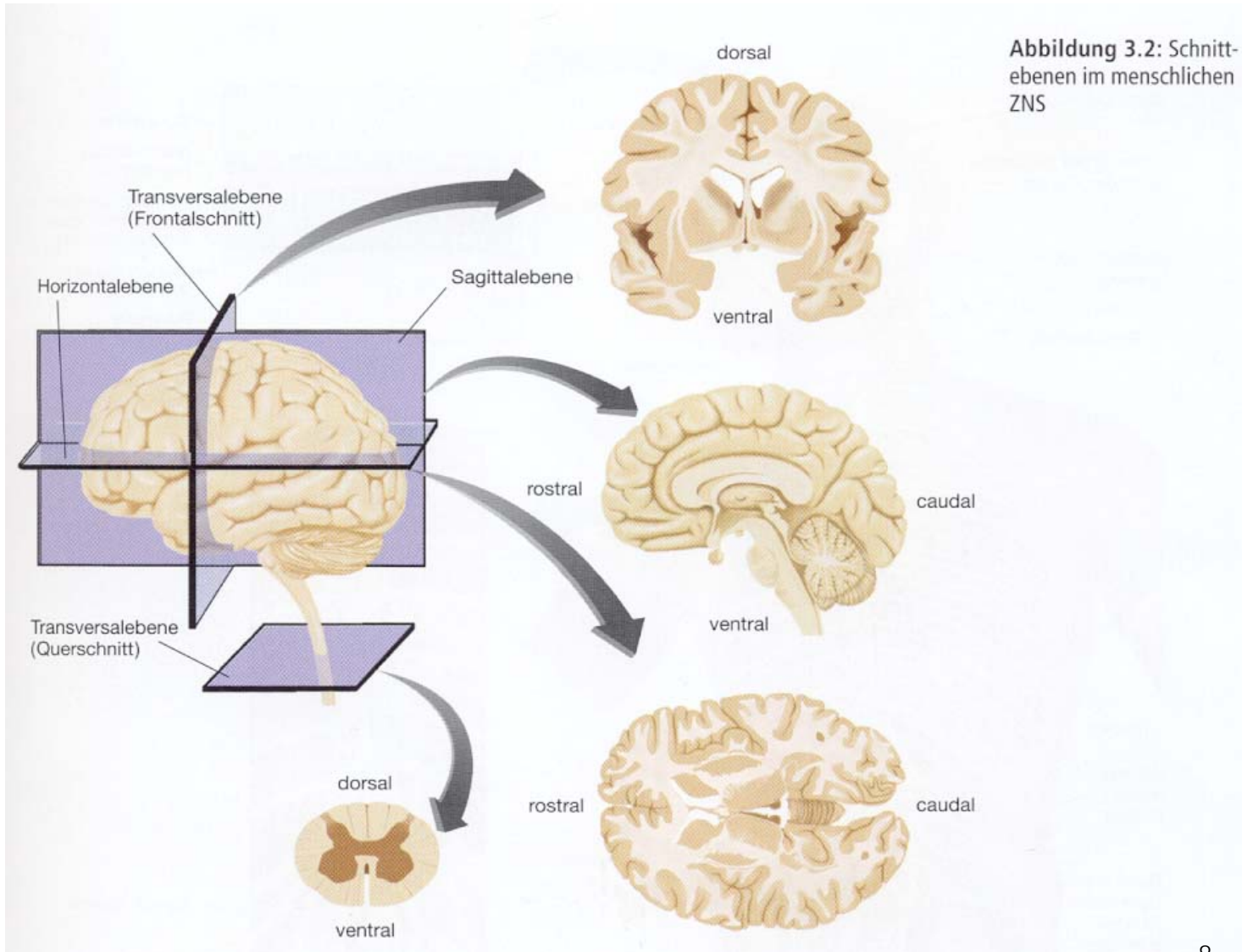


Abbildung 3.2: Schnittebenen im menschlichen ZNS



Hirnhäute – Ventrikel – Cerebrospinalflüssigkeit

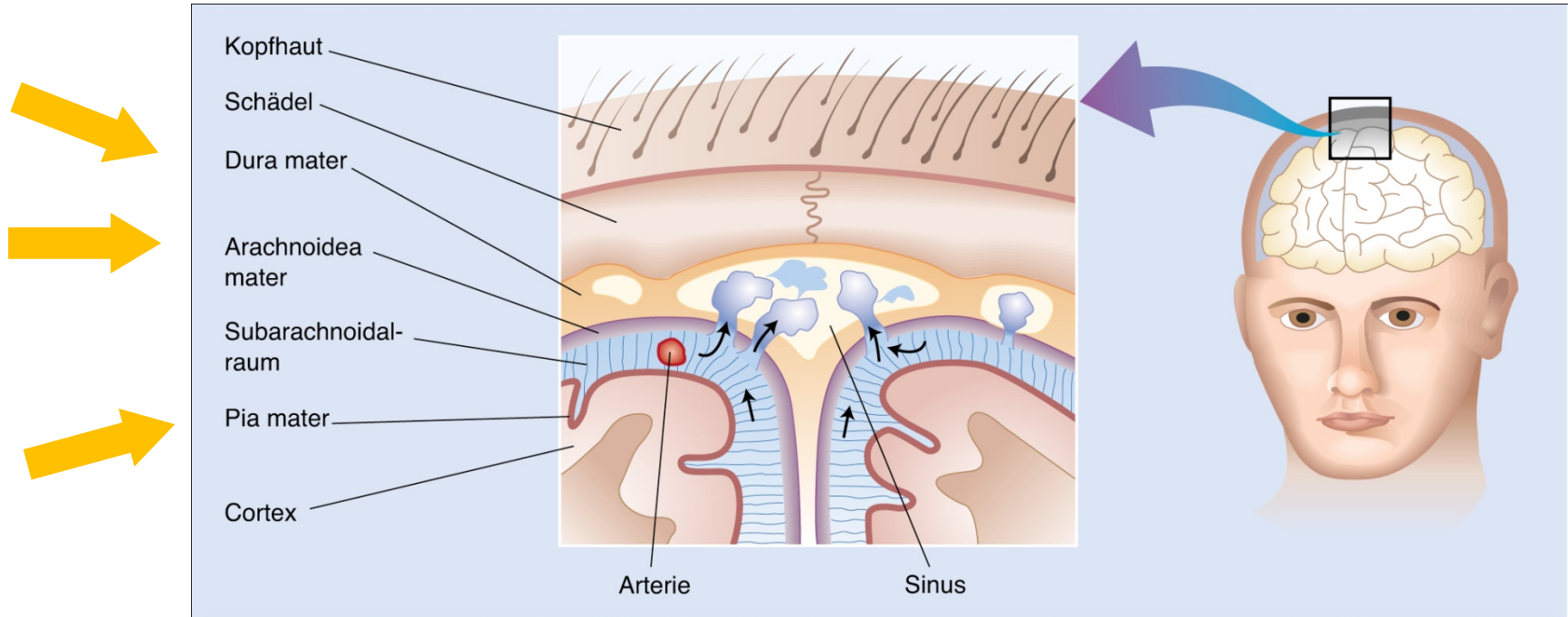


Abbildung 3.4: Die Absorption der Cerebrospinalflüssigkeit aus dem Subarachnoidalraum (blau) in einen großen Sinus. Beachten Sie die drei Meningen.



Die Hirnkammern (Ventrikel)

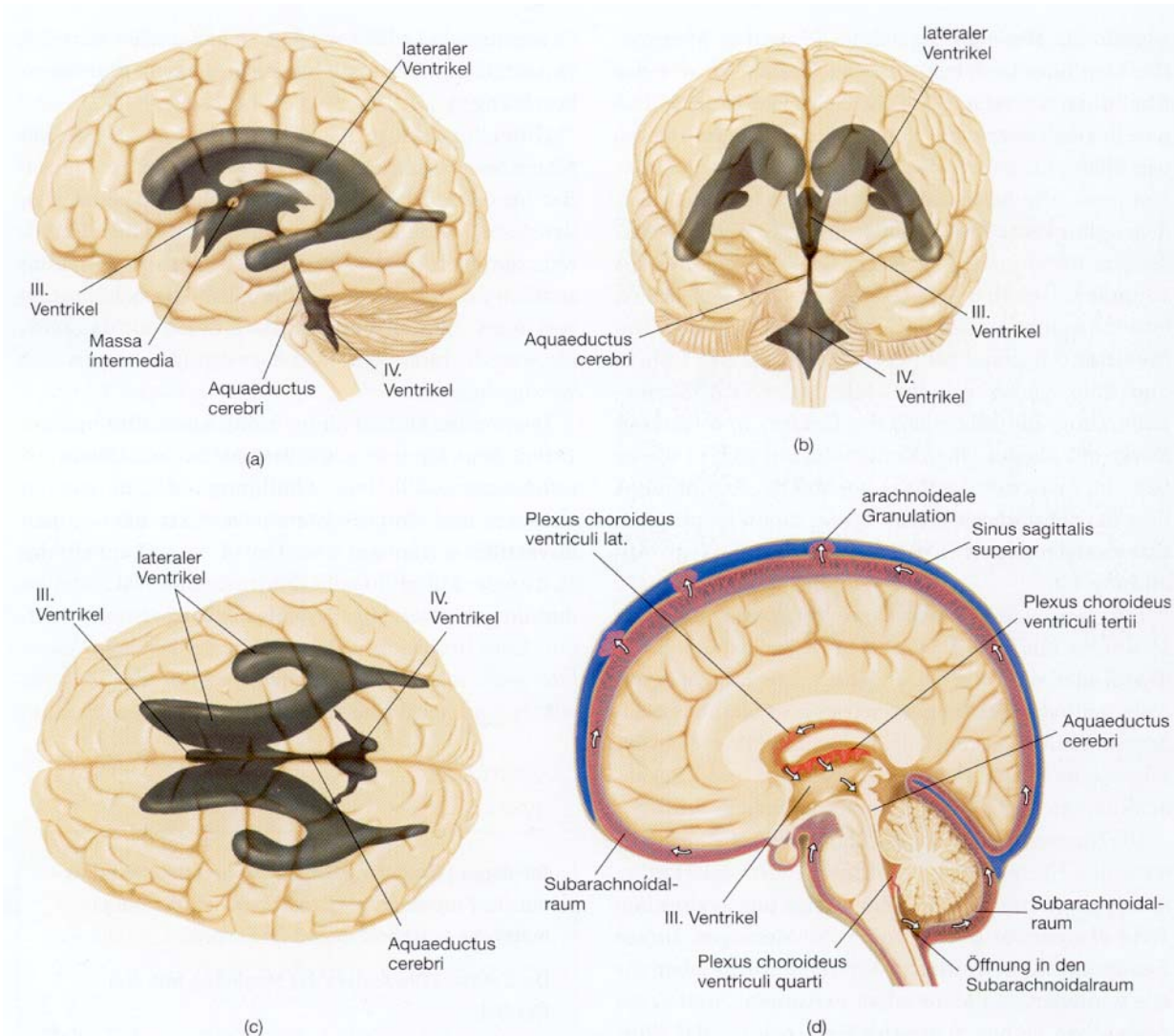
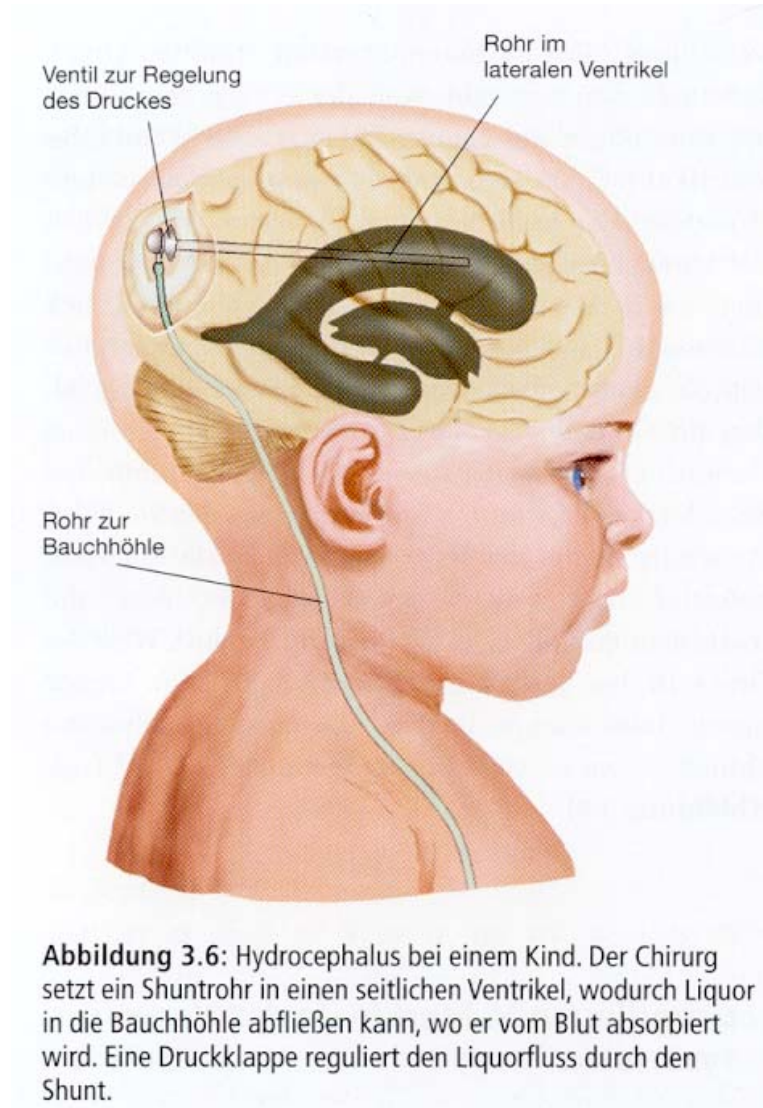
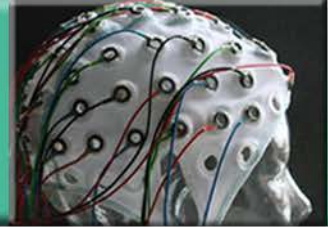


Abbildung 3.4: Das Ventrikelsystem des Gehirns. (a) Laterale Ansicht der linken Hirnseite. (b) Frontale Ansicht. (c) Dorsale Ansicht. (d) Die Produktion, Zirkulation und Reabsorption des Liquor.



Hydrocephalus





Die Blut-Gehirn-Schranke



Abbildung 2.11: Die Blut-Hirn-Schranke. (a) Zwischen den Zellen, aus denen die Kapillarwände im Körper außerhalb des Gehirns gebildet werden, gibt es Spalten, die eine freie Passage von Substanzen in das Blut und aus ihm heraus erlauben. (b) Die Zellen der Kapillarwände im Gehirn sind ganz fest miteinander verbunden.



Nervenzellen (Neurone)

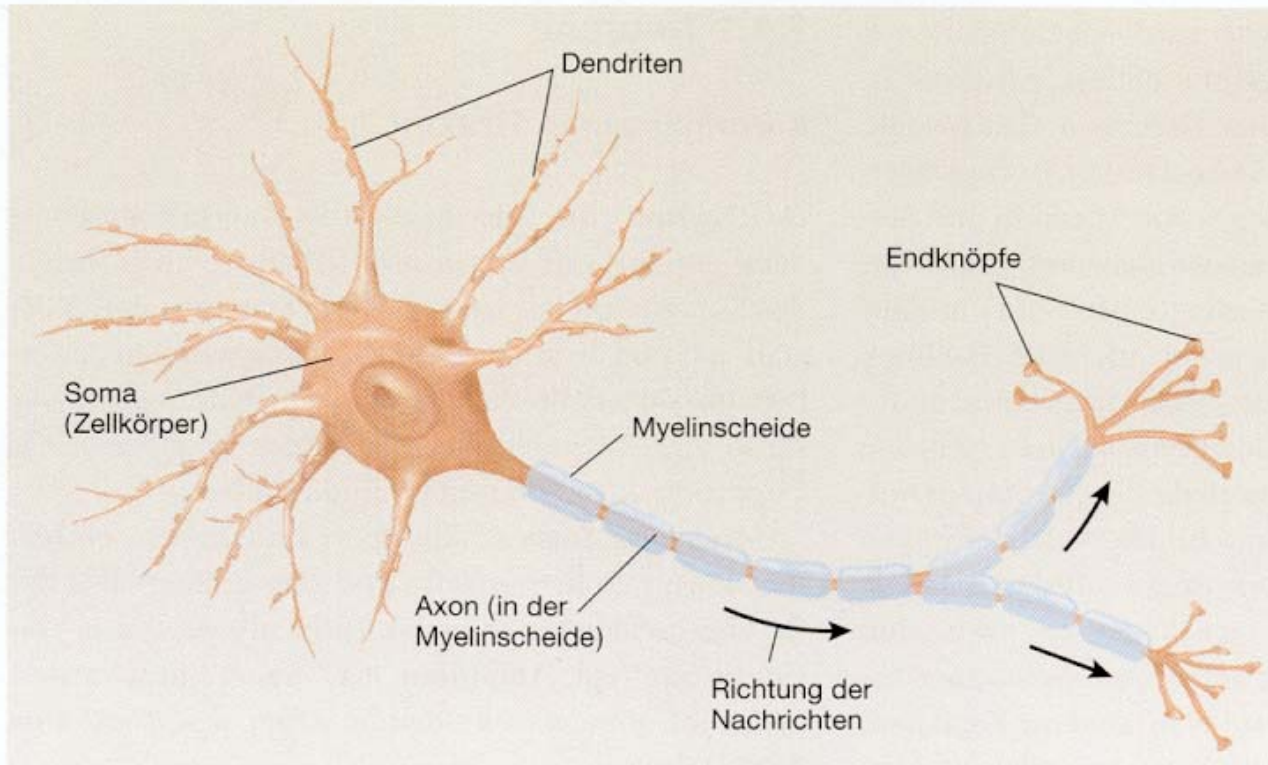


Abbildung 2.1: Die prinzipiellen Komponenten eines multipolaren Neurons



Neuronentypen

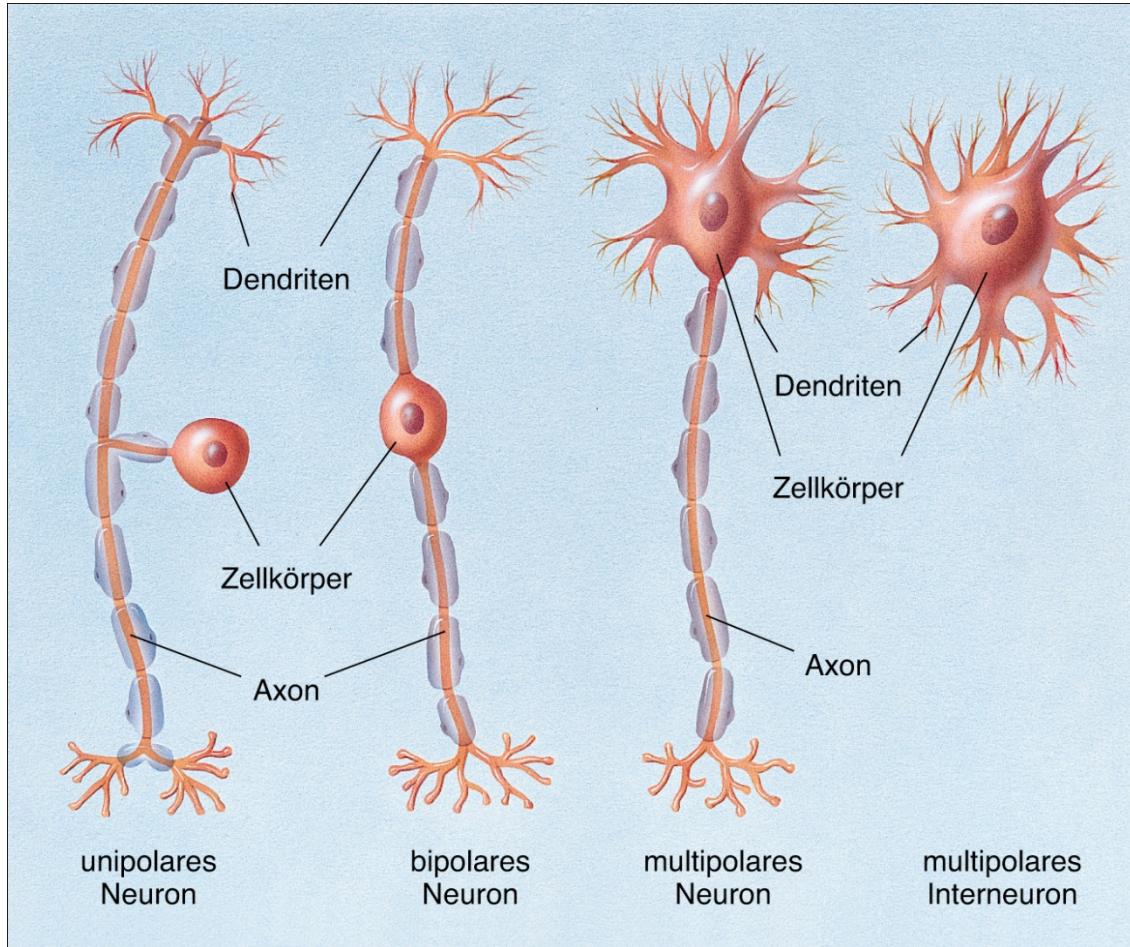


Abbildung 3.8: Ein unipolares Neuron, ein bipolares Neuron, ein mutipolares Neuron und ein Interneuron.



Kerne (ZNS) / Ganglien (PNS) Tractus (ZNS) / Nerv (PNS)

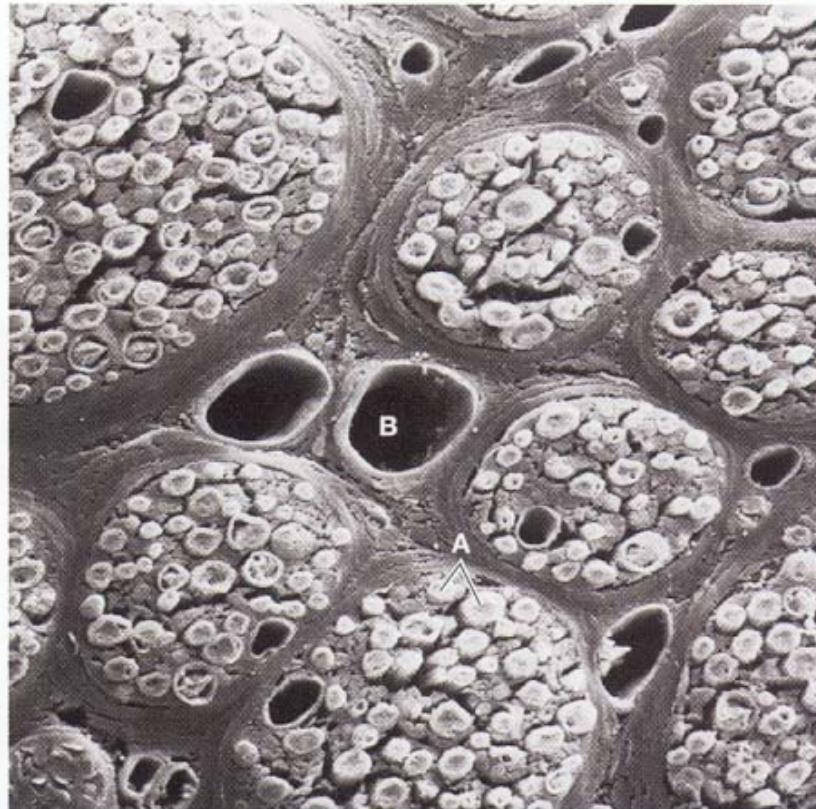


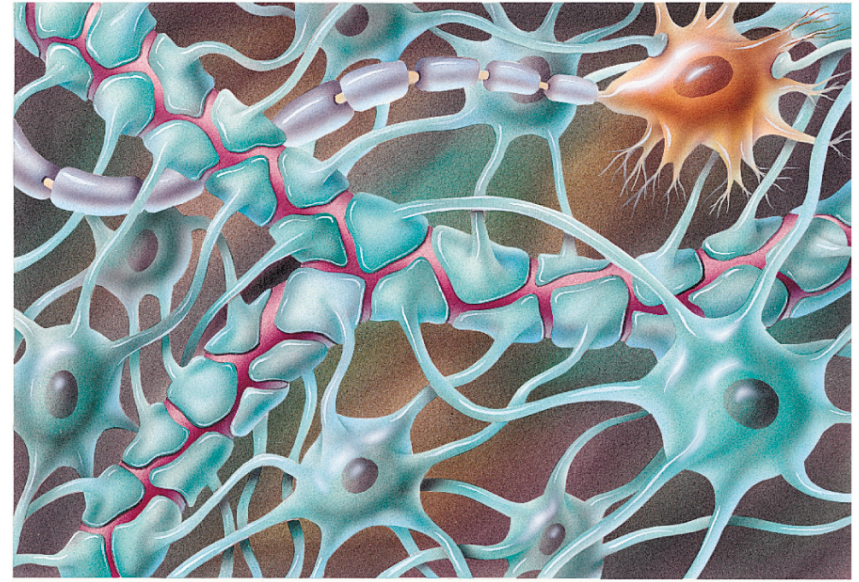
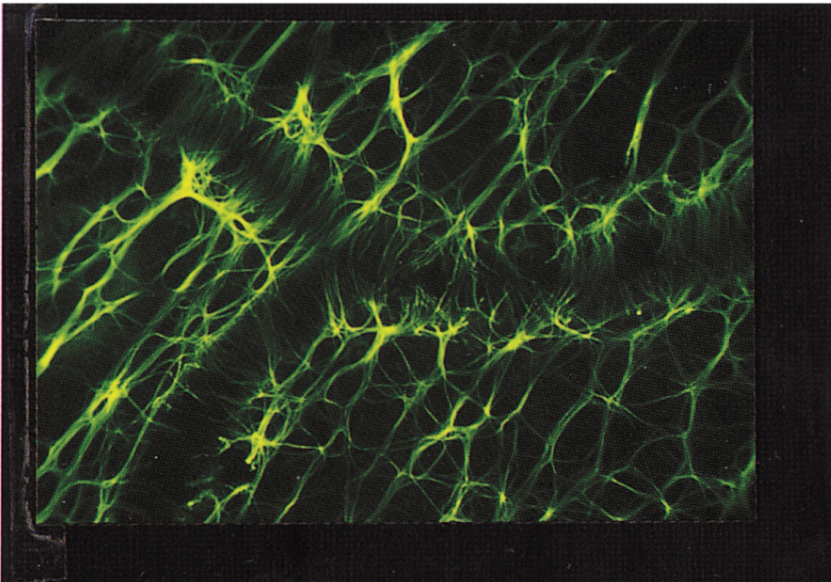
Abbildung 2.3: Nerven. Ein Nerv besteht aus einer Gewebescheide, die ein Bündel von einzelnen Nervenfasern (auch als Axone bekannt) umhüllt. B = Blutgefäße; A = einzelne Axone. (Aus *Tissues and Organs: A Text-Atlas of Scanning Electron Microscopy*, von Richard G. Kessel und Randy H. Kardon. Copyright © 1979 von W. H. Freeman and Co.)



Gliazellen (Neuroglia) ZNS Satellitenzellen (PNS)



Sternzellen (Astrocyten)



3.9 Sternzellen (Astrocyten). Astrocyten weisen eine enge Verbindung zu Blutgefäßen auf und bilden eine stützende Matrix für Neurone. Die Aufnahme links zeigt Hirngewebe, das mit einem Gliafarbstoff behandelt wurde; die ungefärbten Kanäle sind Blutgefäße (etwa dem Verlauf der Blutgefäße in der Abbildung rechts entsprechend). Die Abbildung rechts zeigt, wie die Astrocytenfortsätze (blau) Blutgefäße bedecken und Kontakt zu Neuronen (rechts oben, grau) aufnehmen. (Wiedergabe der Aufnahme mit freundlicher Genehmigung von T. Chan-Ling.)



Oligodendroglia (Oligodendrocyten) (ZNS)



Myelinisierung im zentralen Nervensystem

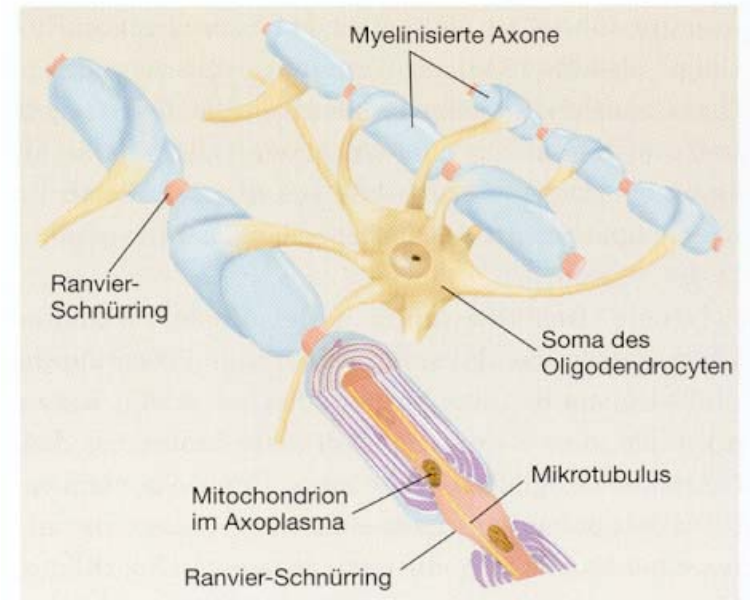
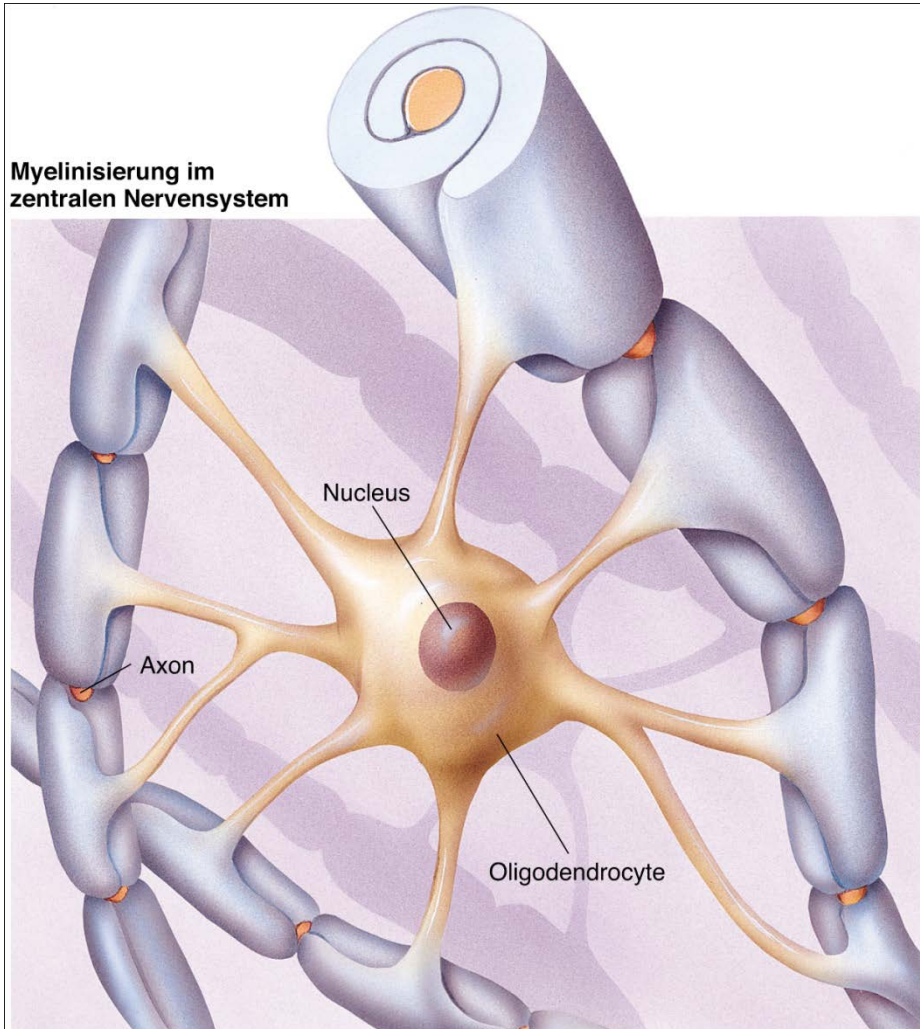
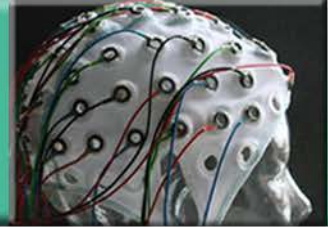


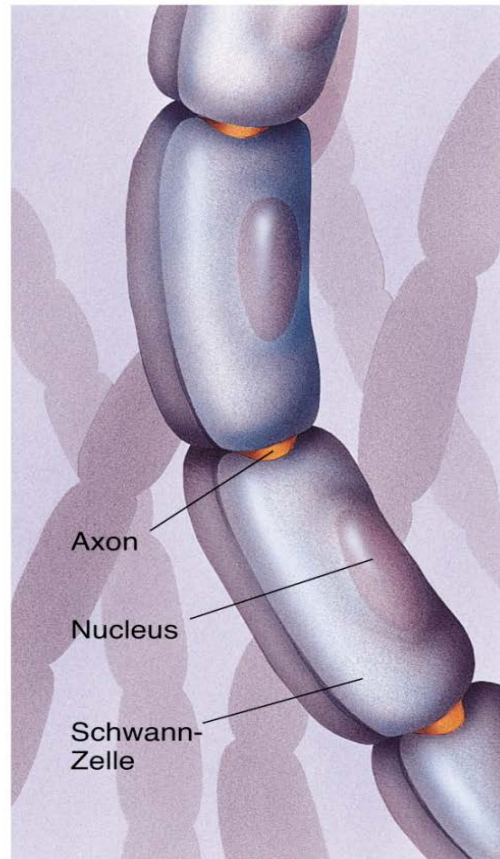
Abbildung 2.9: Ein Oligodendrocyt, der das Myelin bildet, das viele Axone im Zentralnervensystem umgibt. Jede Zelle bildet ein Myelinsegment bei mehreren benachbarten Axonen aus.



Schwannzellen (PNS)



Myelinisierung im peripheren Nervensystem



Das Rückenmark

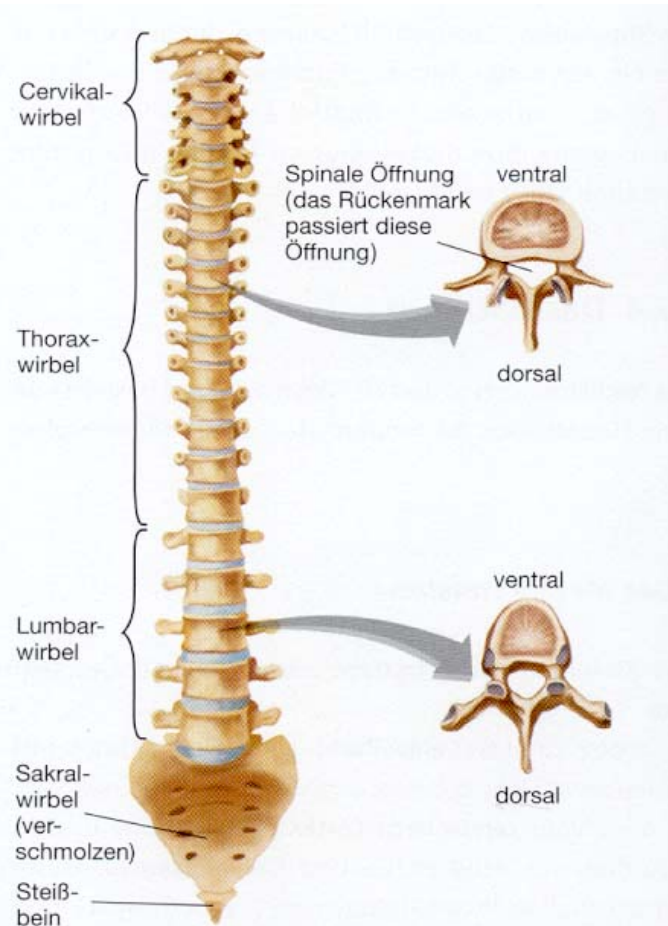
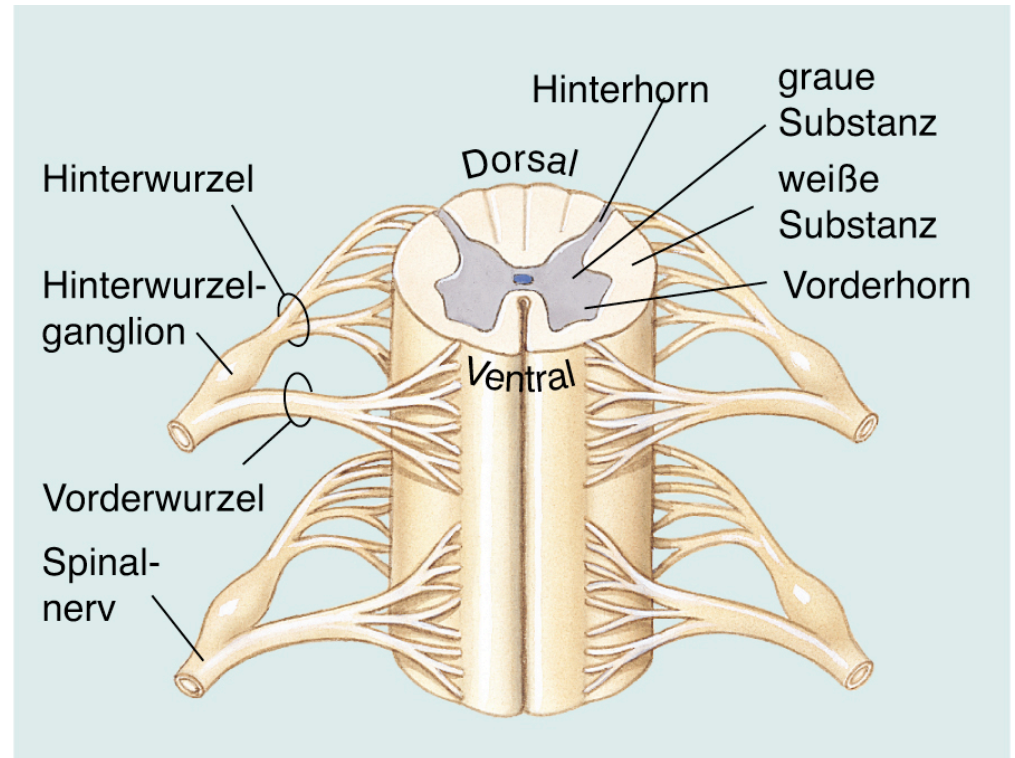


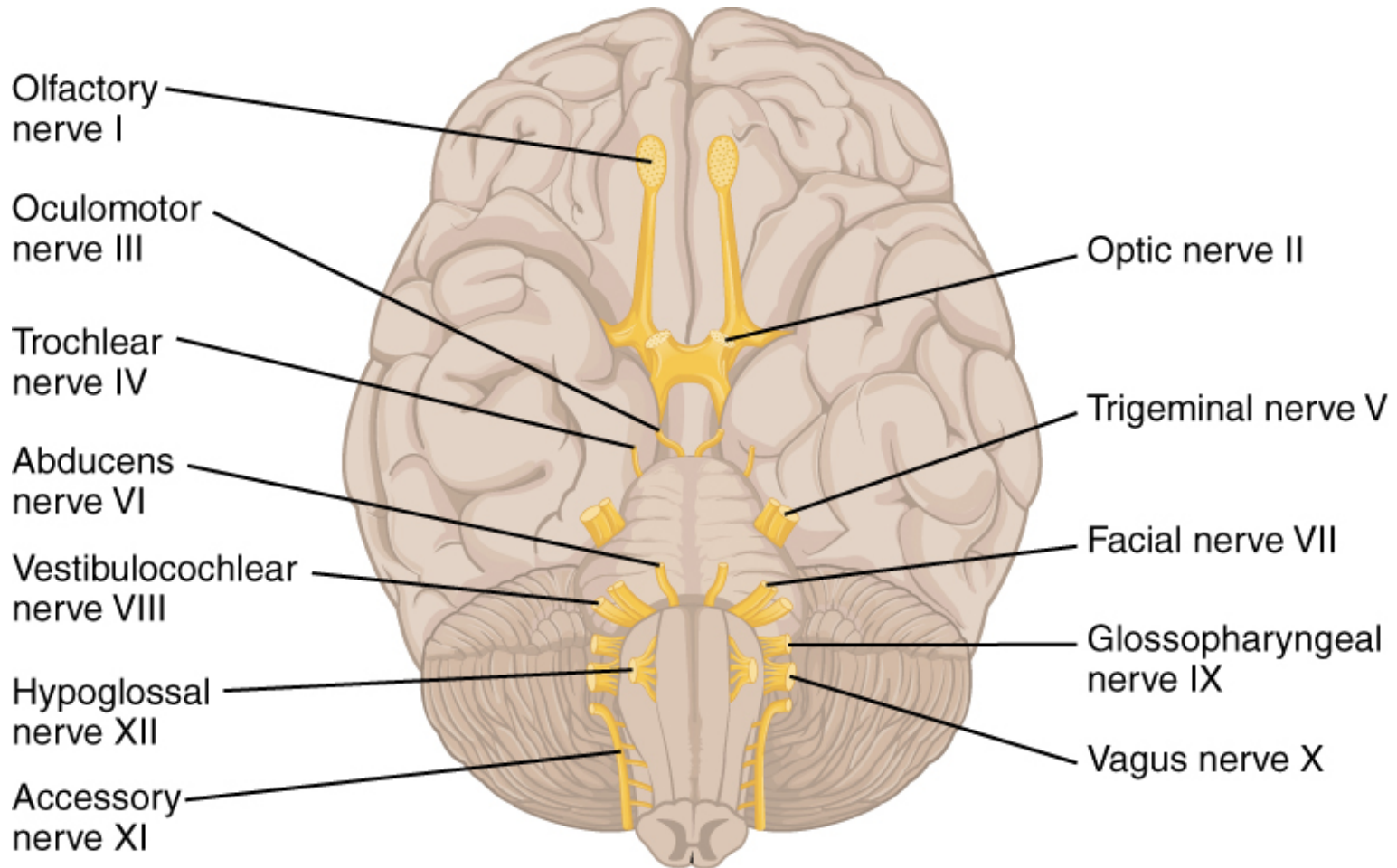
Abbildung 3.22: Ventrale Ansicht der Wirbelsäule des Menschen. Die Detailbilder veranschaulichen den Bau der Wirbel.



3.19 Hinter- und Vorderwurzeln des Rückenmarks.

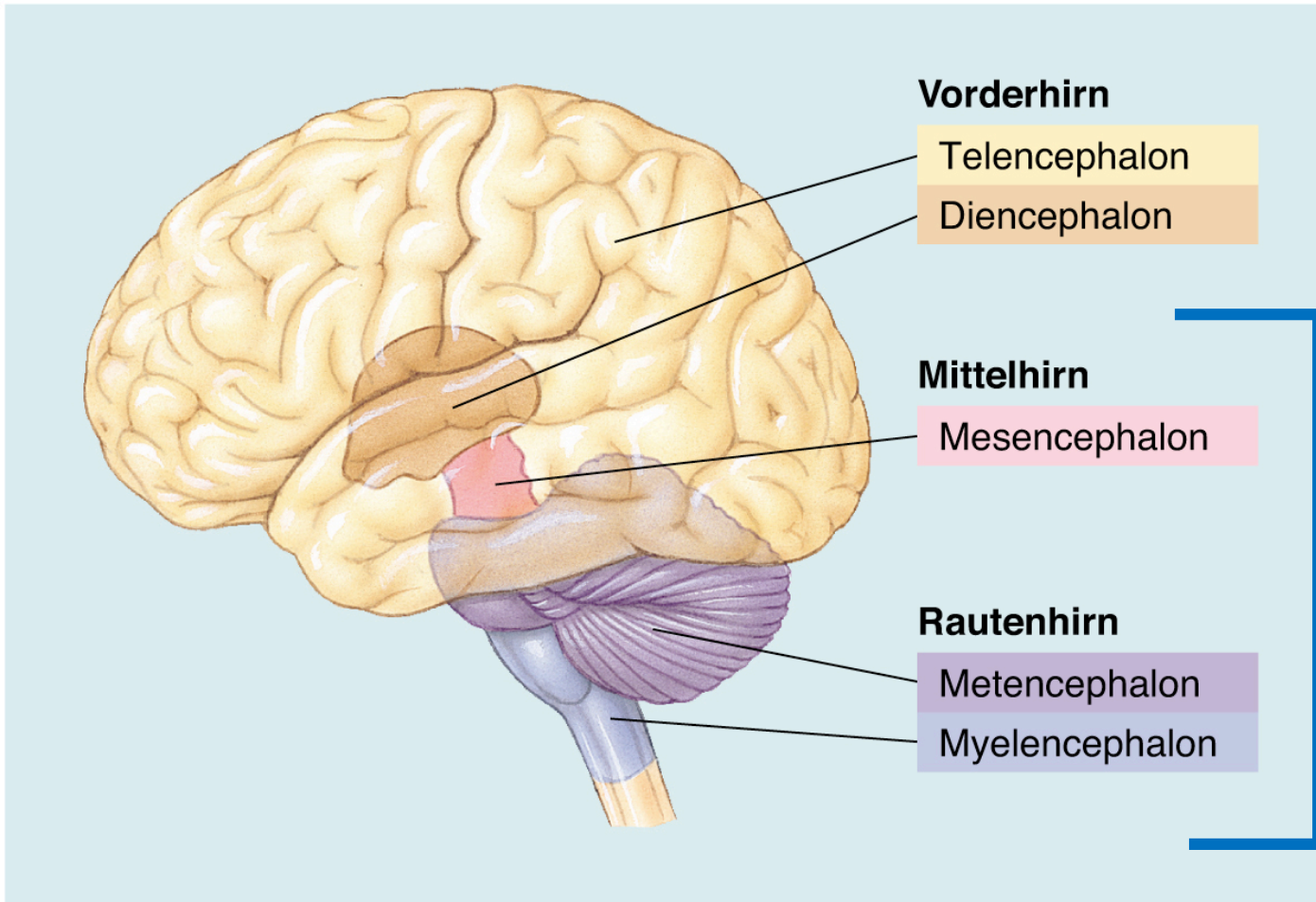


12 paarige Hirnnerven



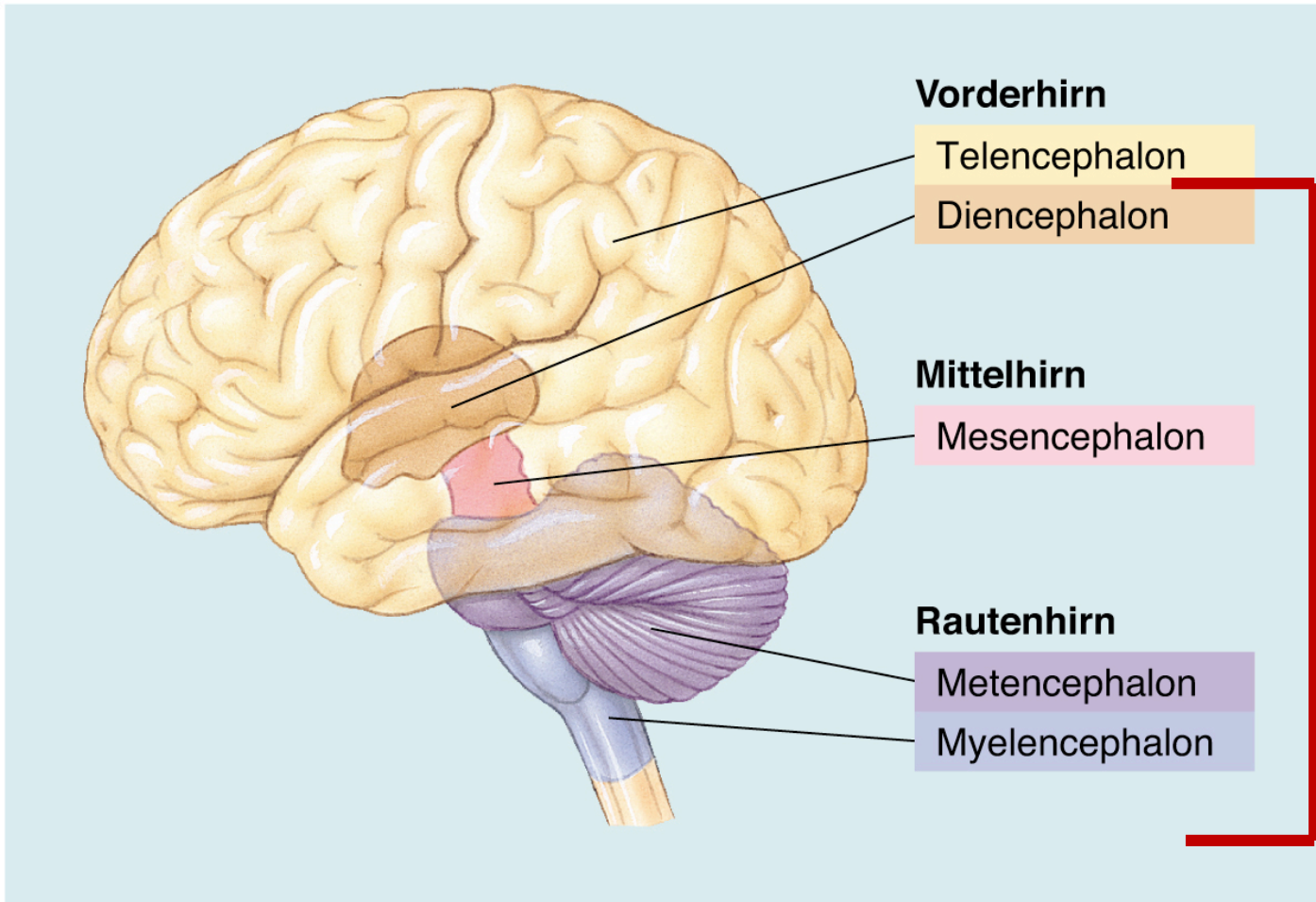


Die fünf Gehirnteile





Die fünf Gehirnteile



Stammhirn



Die fünf Gehirnteile

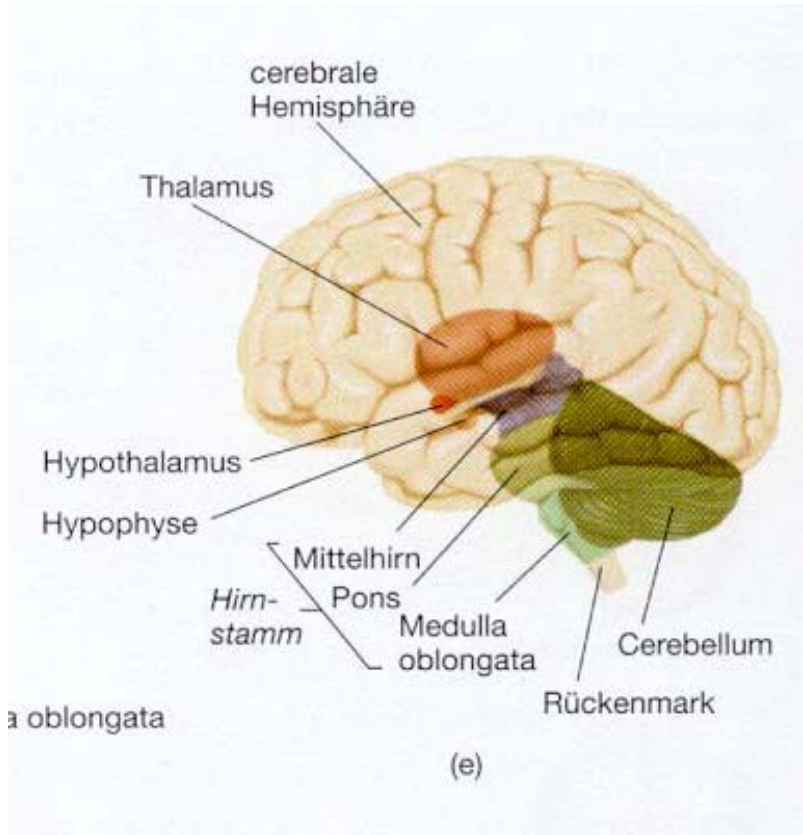


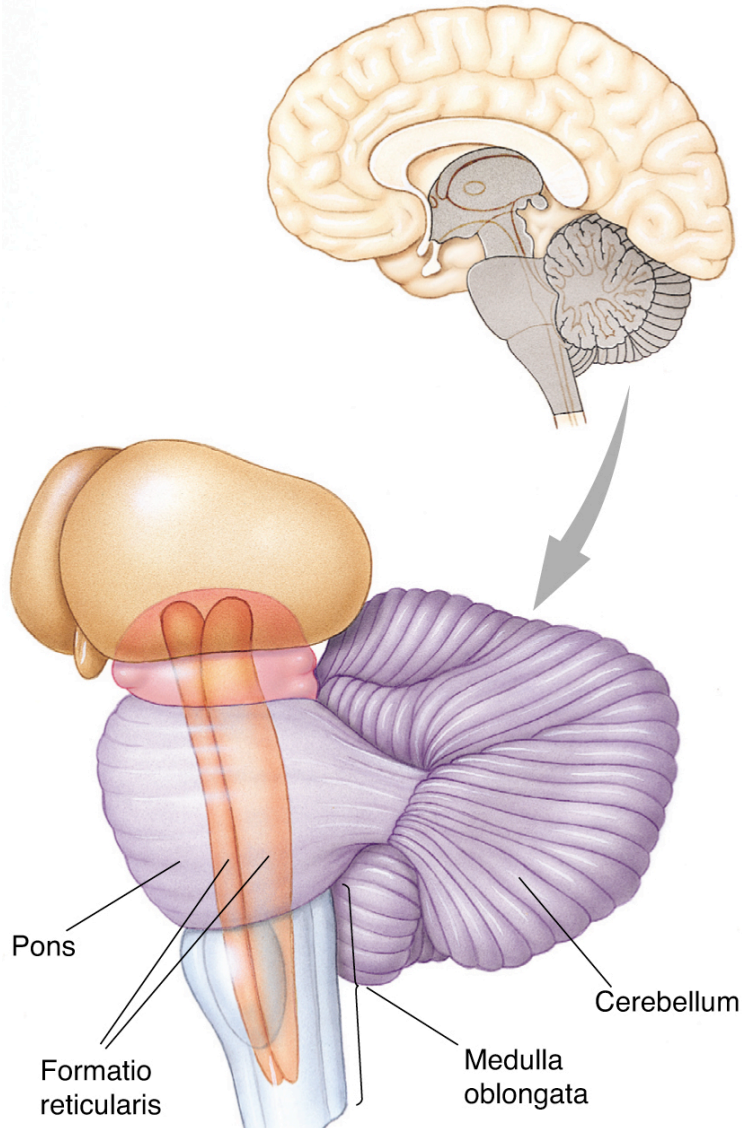
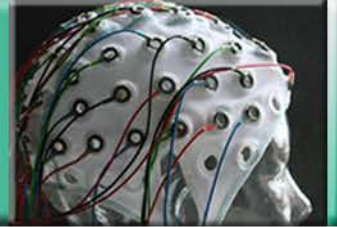
Tabelle 3.2

Anatomische Untergliederung des Gehirns

anatomische Unterteilung des Gehirns			
Hauptkategorien	Ventrikel	Unterkategorien	Hauptstrukturen
Vorderhirn	lateral	Telencephalon	Cerebraler Cortex Basalganglien limbisches System
	III.	Diencephalon	Thalamus Hypothalamus
Mittelhirn	Aqueductus cerebri	Mesencephalon	Tectum Tegmentum
Hinterhirn	IV.	Metencephalon	Cerebellum Pons
		Myelencephalon	Medulla oblongata



Myelencephalon / Metencephalon



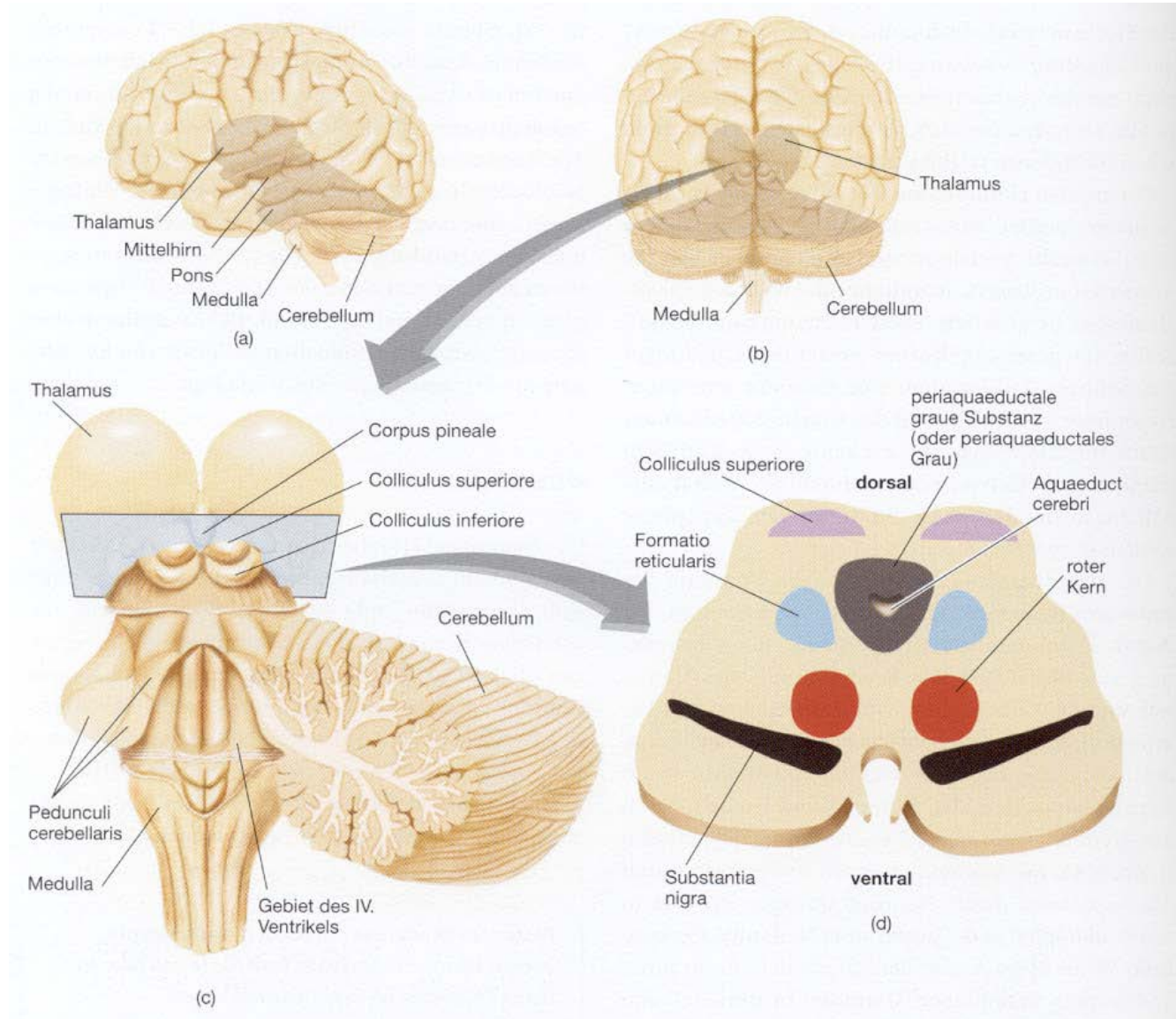
■ Formatio Reticularis

- Beginnt im Myelencephalon, Endet im superioren Teil des Mesenzephalons
- Komplexes Geflecht aus hundert kleinen Kerngebieten
- ARAS
Aktivierungsvorgänge / Schlafsteuerung

■ Metencephalon: Cerebellum & Pons

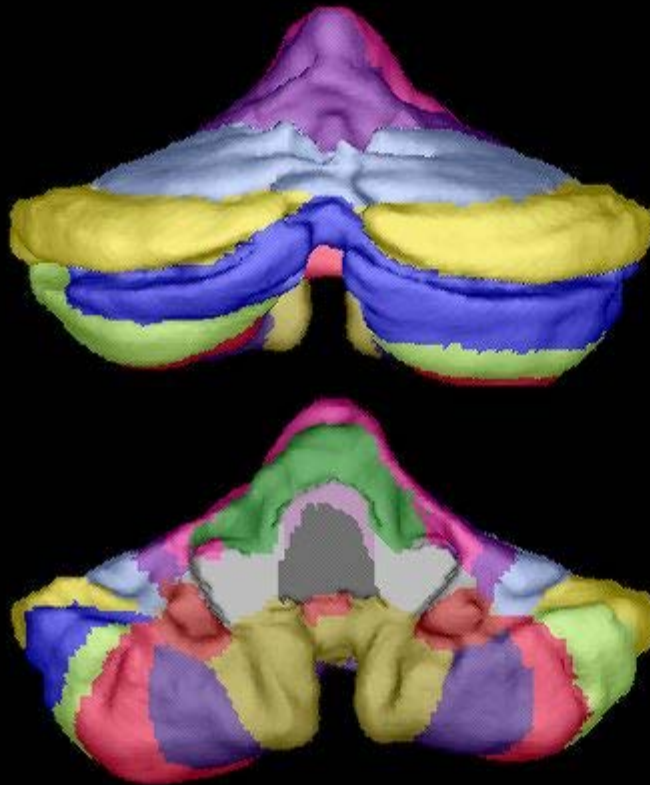


Cerebellum und Mesencephalon



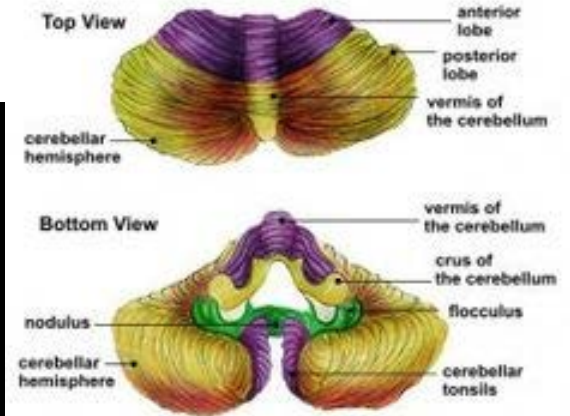


Anatomie des Cerebellums



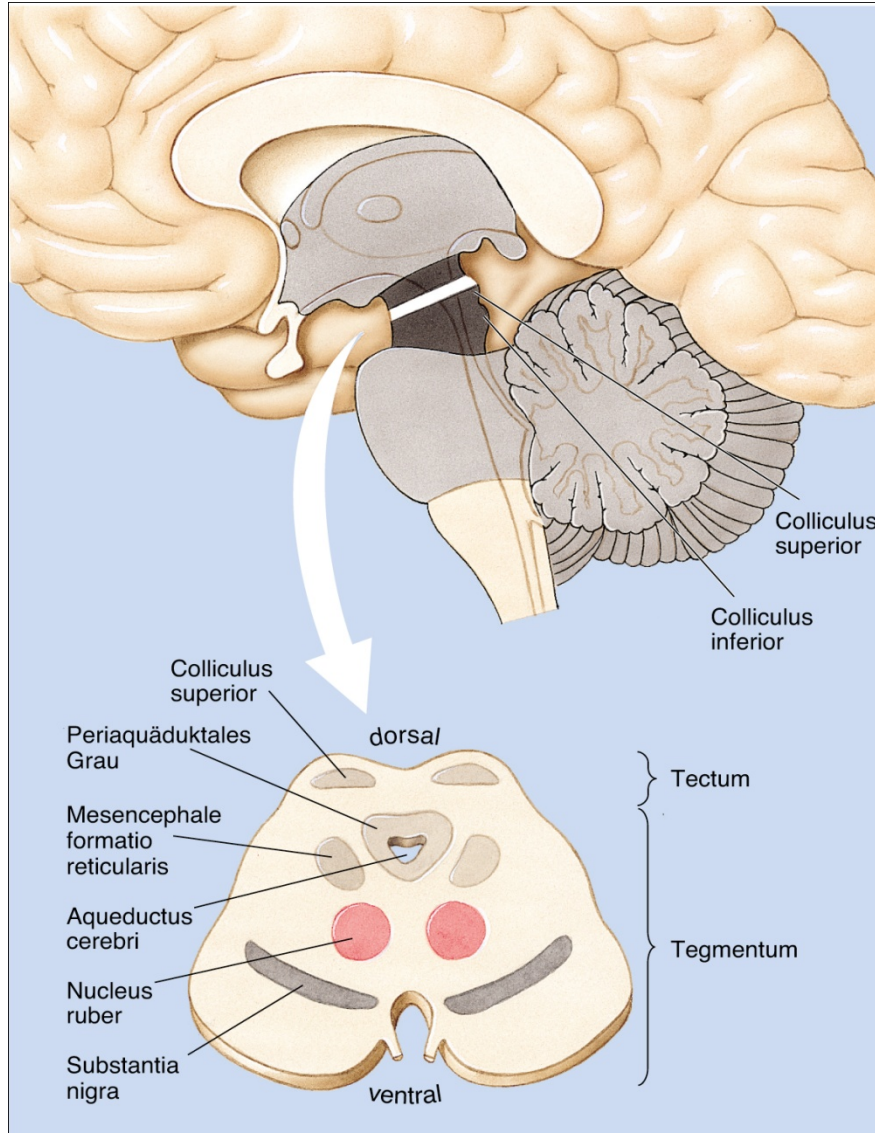
- Lobe I & II
- Lobe III
- Lobe IV
- Lobe V
- Lobe VI
- Lobe CR I & VII Af
- Lobe CR II & VII At
- Lobe VII B
- Lobe VIII A
- Lobe VIII B
- Lobe IX
- Lobe X

- White matter / brainstem
- Fourth ventricle





Das Mesencephalon



Das menschliche Mesencephalon (Mittelhirn).



Das Diencephalon

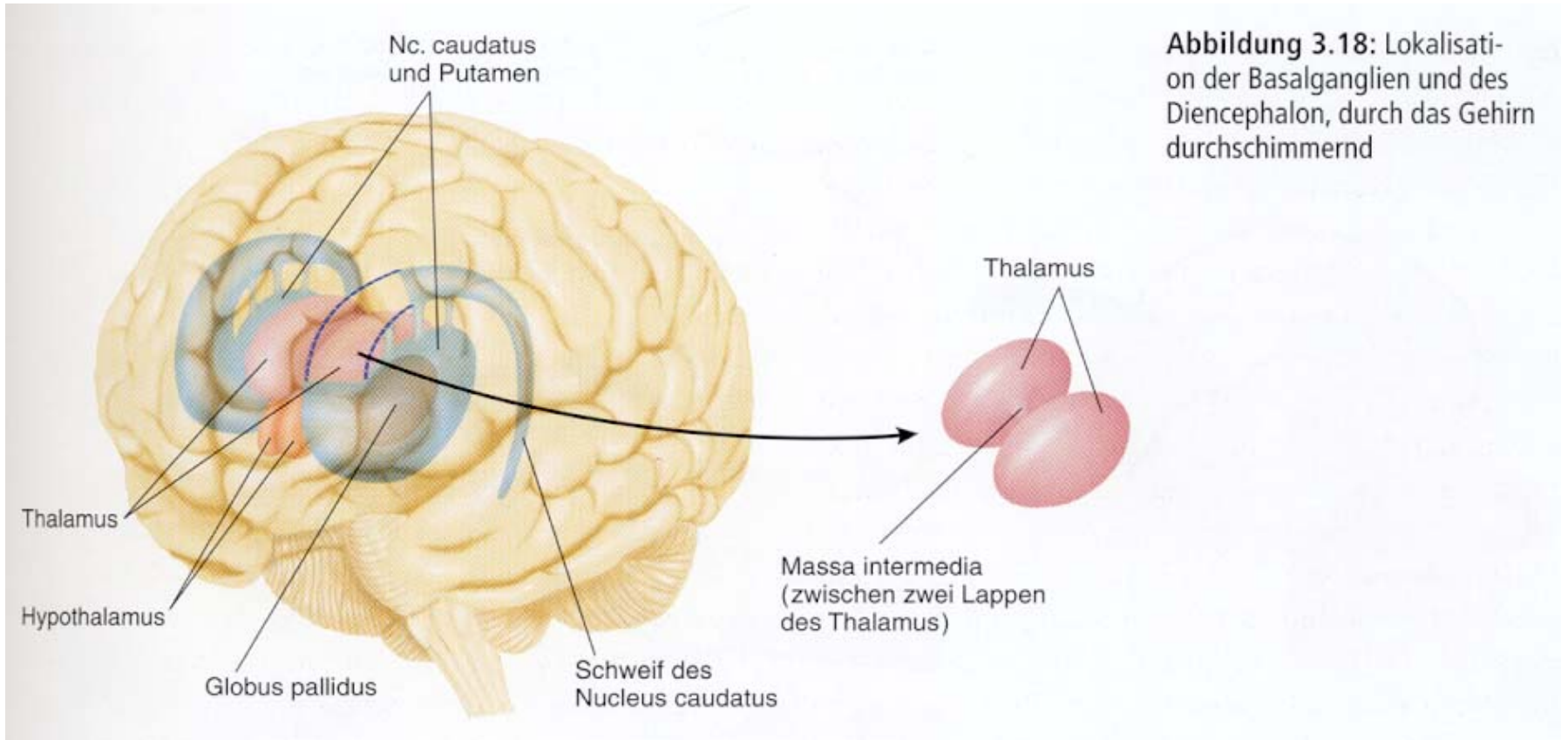


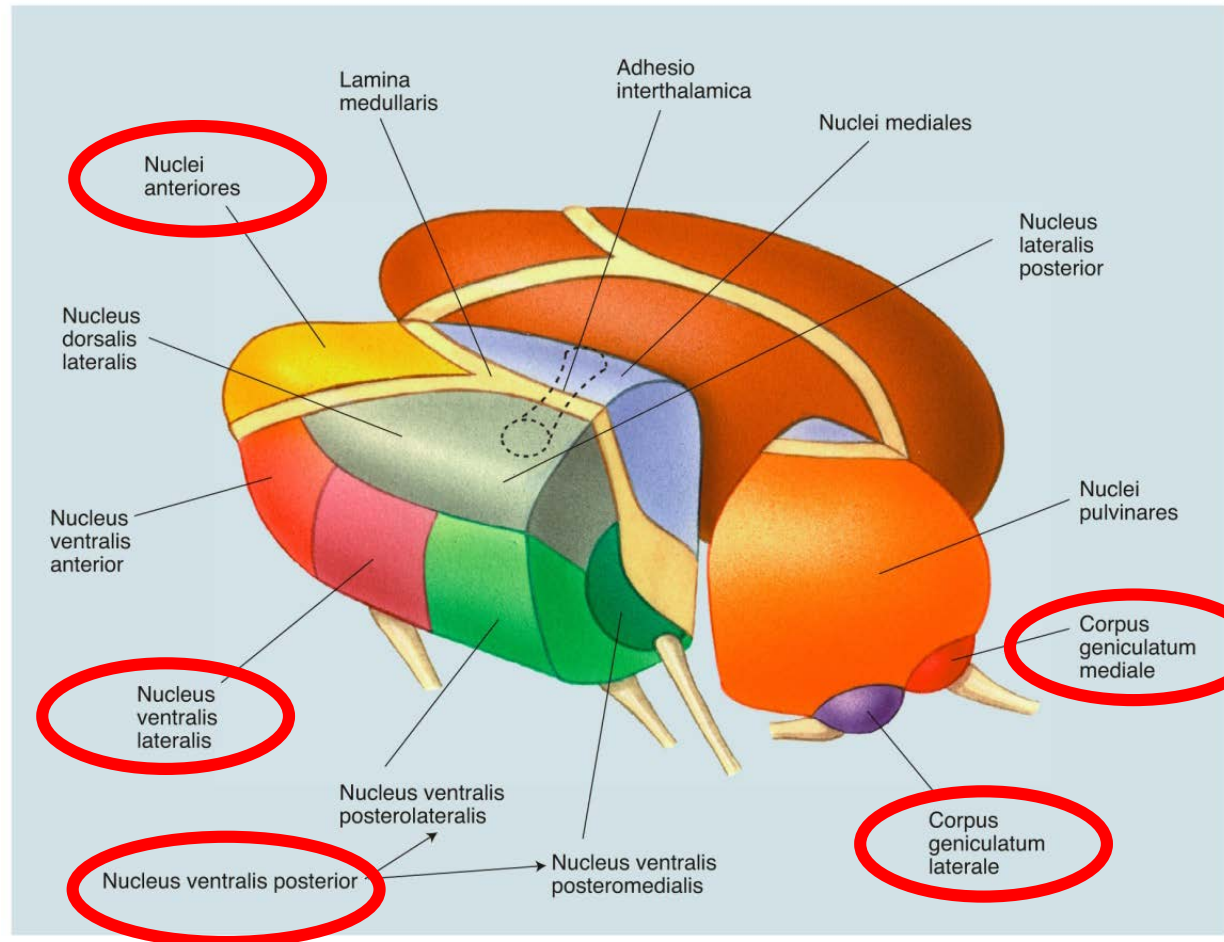
Abbildung 3.18: Lokalisation der Basalganglien und des Diencephalon, durch das Gehirn durchschimmernd



Der Thalamus



- Zentrale Relaisstation
- Spezifische und unspezifische Projektionssysteme
- Corpus geniculatum laterale
- Corpus geniculatum mediale
- Nucleus ventralis posterior
- Nucleus ventralis lateralis (Efferenzkopie)





Der Hypothalamus

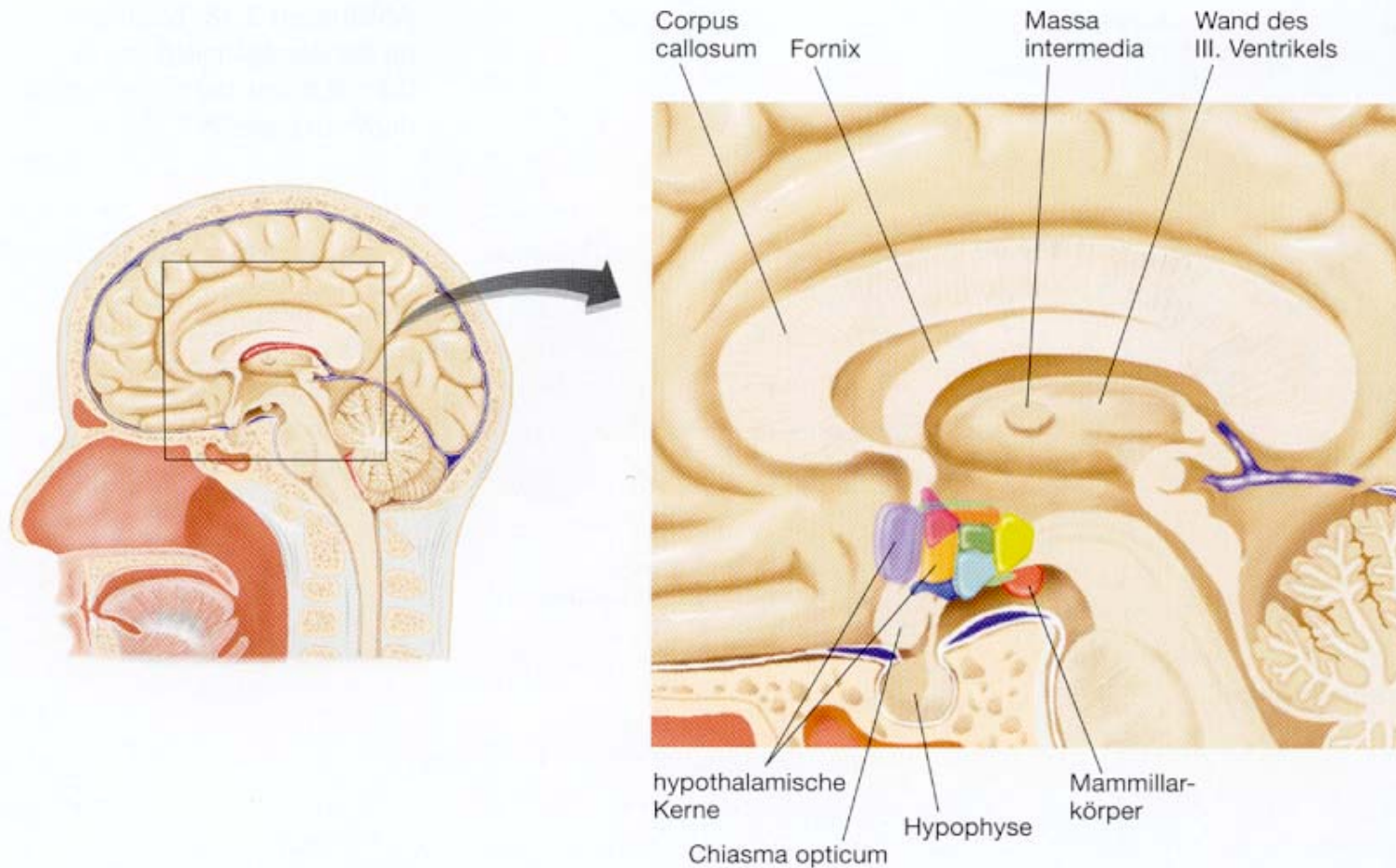
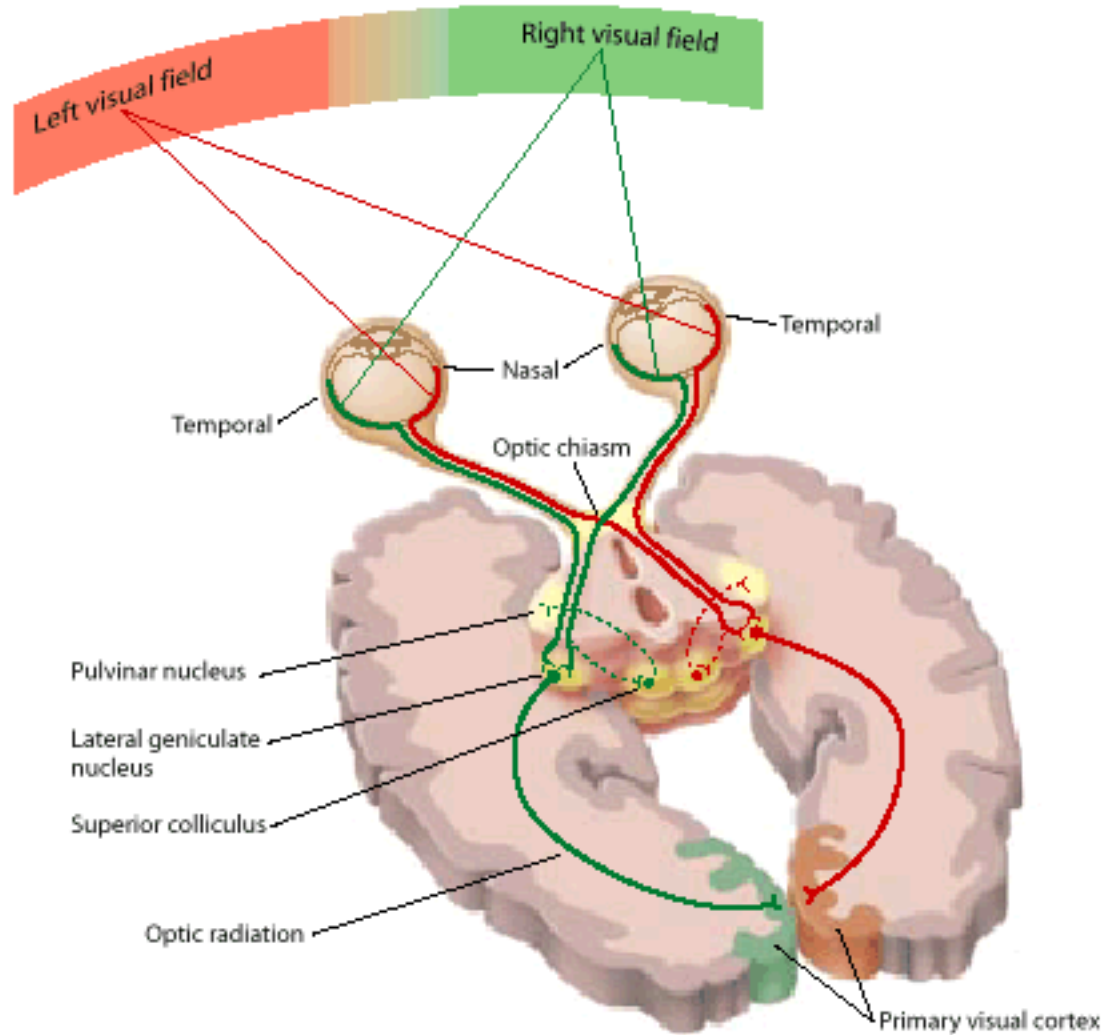
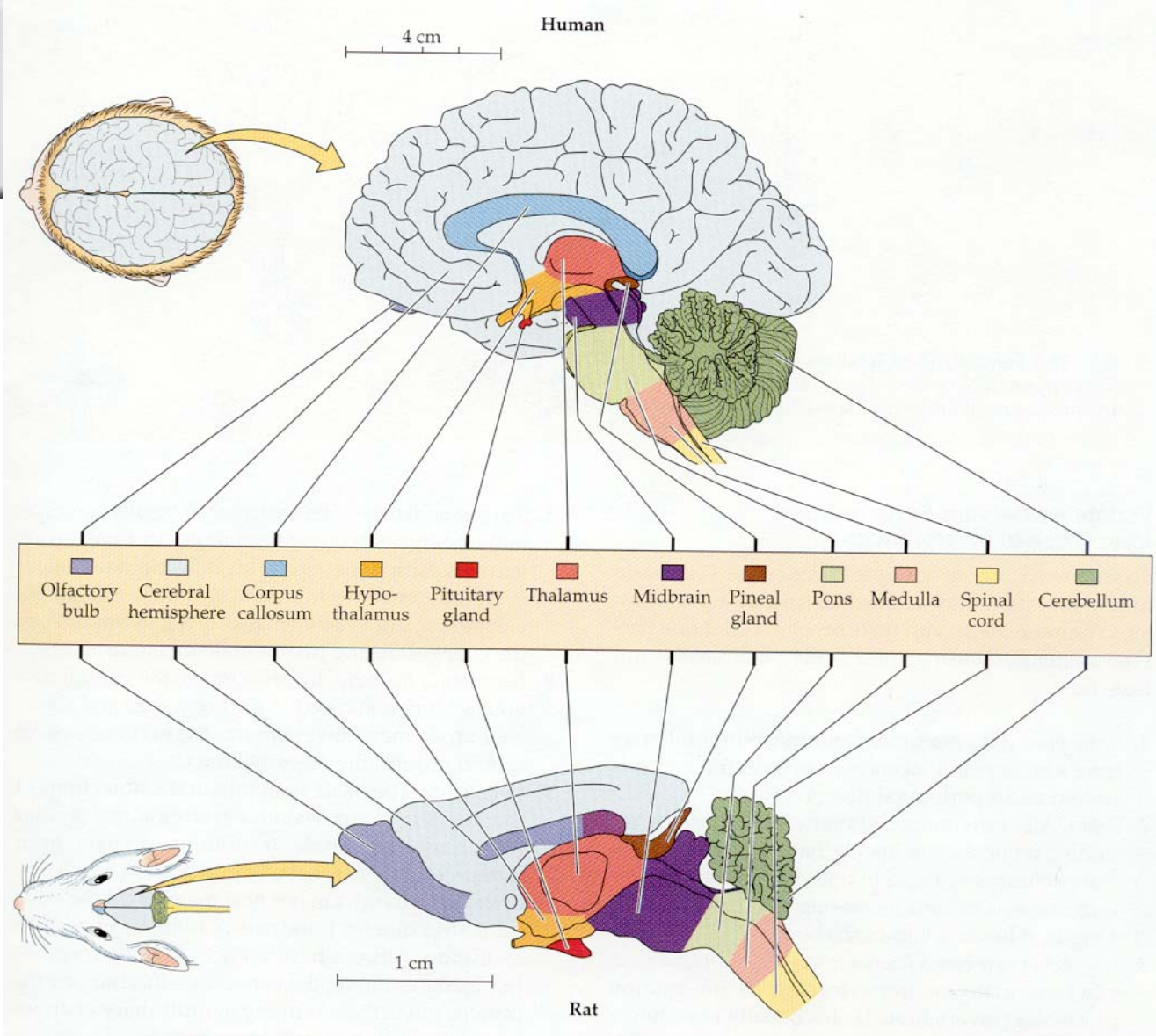


Abbildung 3.19: Mediale Ansicht eines Teiles des Gehirns, die einige Kerne des Hypothalamus zeigt. Die Kerne befinden sich an der äußeren Seite der Wand des III. Ventrikels.



Chiasma Opticum (Ipsi- und kontralaterale Nervenbahnen)





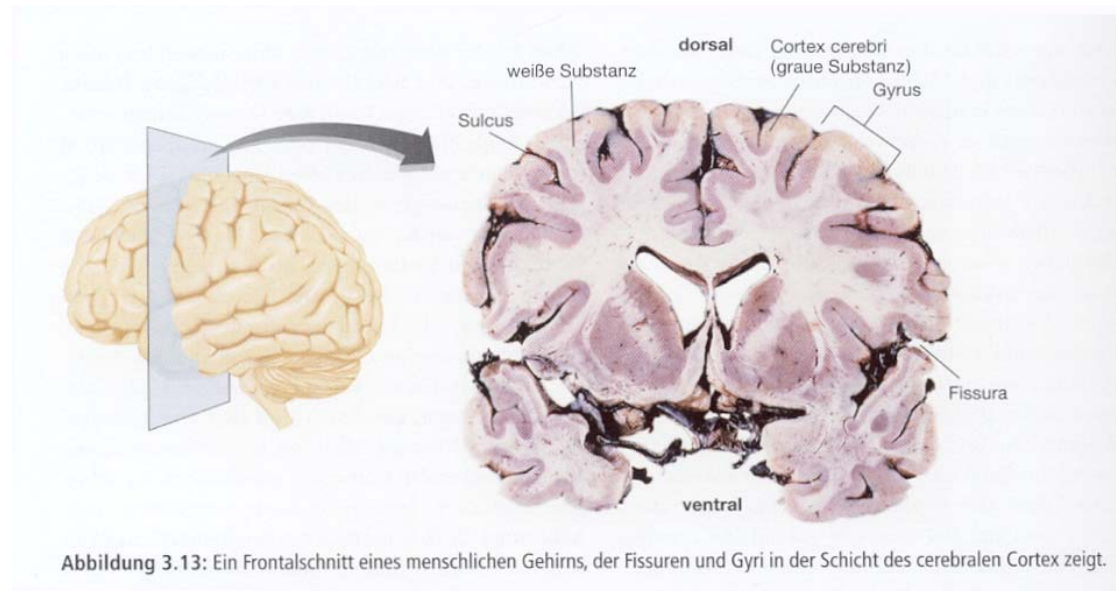
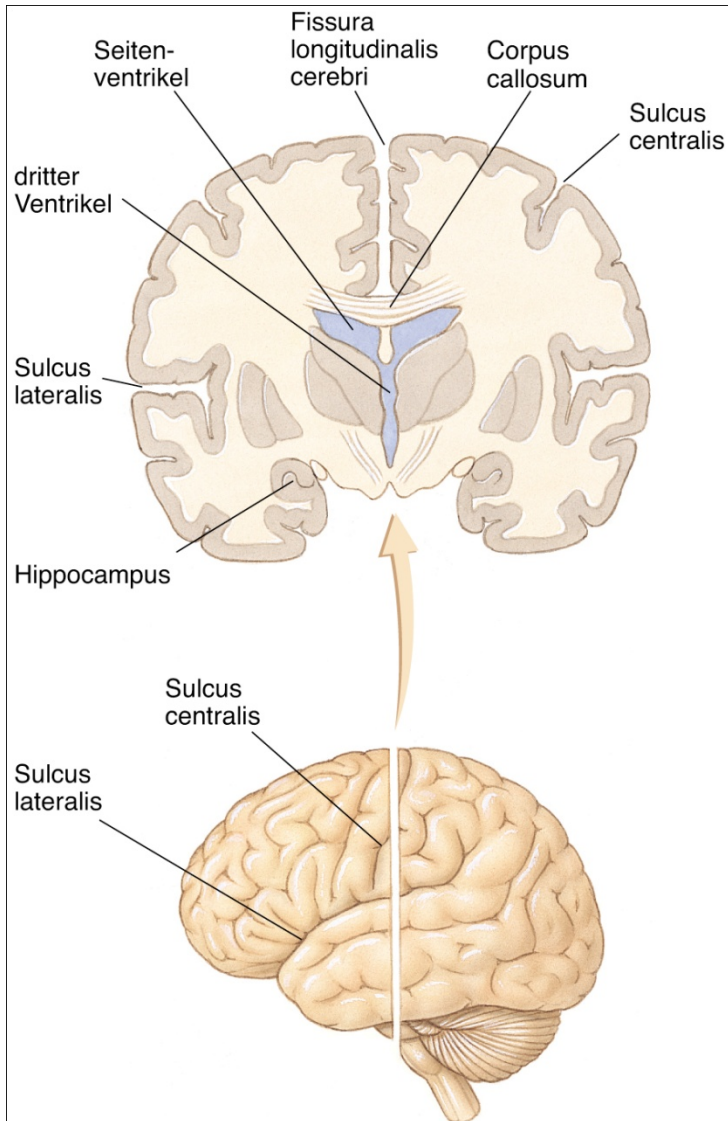
6.8 Human and Rat Brains Compared

Midsagittal views of the right hemisphere of human and rat brains; the rat brain has been enlarged about six times in linear dimensions in relation to the human brain. In both brains, the main structures are the same, and they have the same topological relations to each other. Note, however, that the cerebral hemispheres are relatively much larger in the human brain, whereas the rat has a relatively larger midbrain and olfactory bulb.



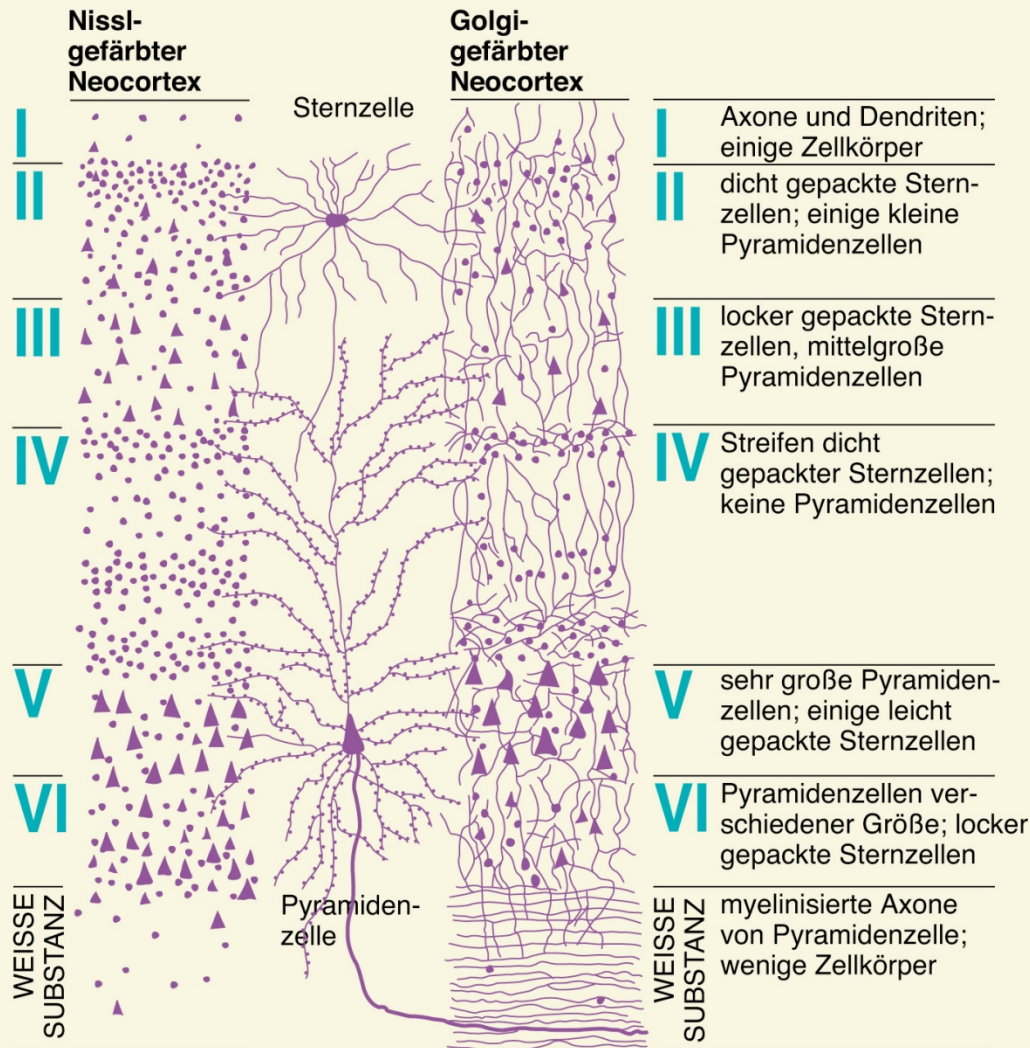
Das Telencephalon

Cortex Cerebri / Limbisches System / Basalganglien





Die sechs Schichten des Neocortex: Isocortex (6 S) / Allocortex (3 S)



Drei Merkmale des Neocortex:

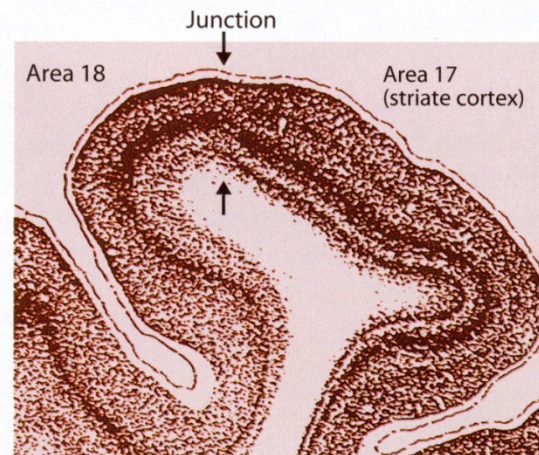
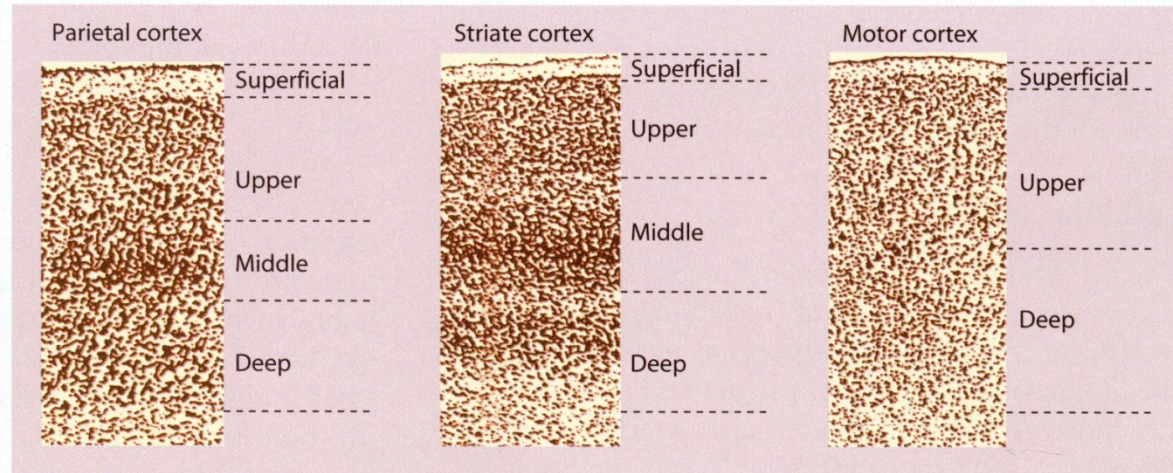
- Zwei Neuronentypen (Pyramidenzellen, Sternzellen)
- Schichten haben unterschiedliche Ausdehnung und Zellkörperdichte
- Säulenartige Organisation



Cytoarchitektur



Figure 3.6 The gray matter of the cerebral cortex is composed of unmyelinated cell bodies that give a layered appearance as a function of the different cell types and their groupings in cross-sectional views (cortical surface at top). As shown in these examples from the macaque monkey, across different cortical areas, the density and layering of the cell types vary (**top**). Brodmann used these variations in density to define the boundaries between different cortical areas. An example shows a cross-section through the visual cortex (**bottom**). The arrows show the border between two cytoarchitectonically defined Brodmann areas: Note the change in the pattern of layering. Adapted from McClelland and Rummelhart (1986).

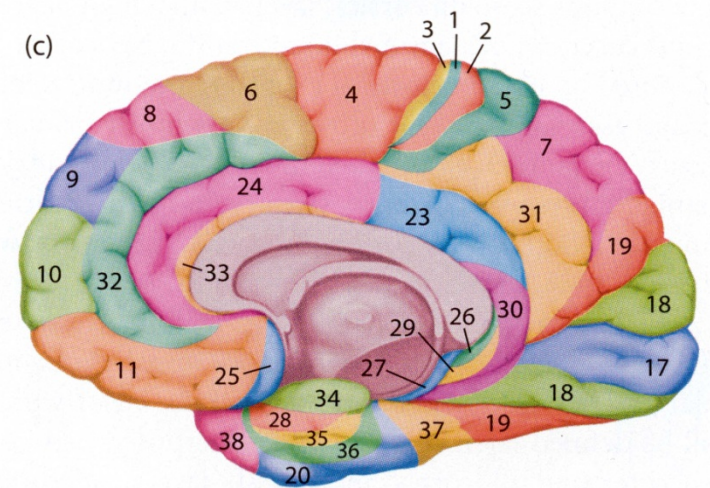
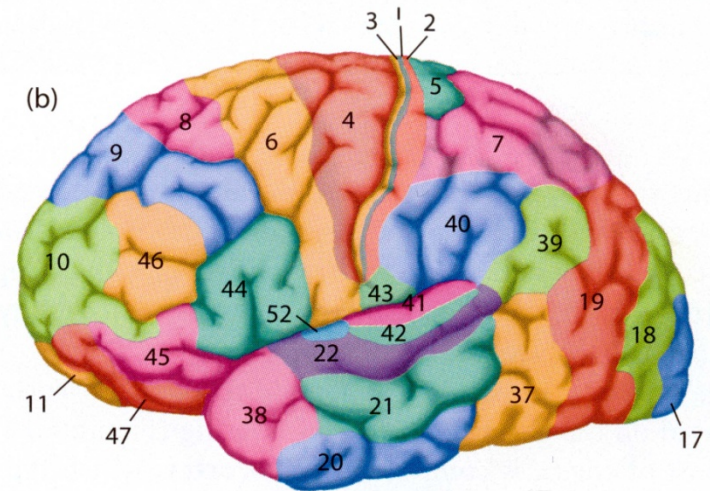
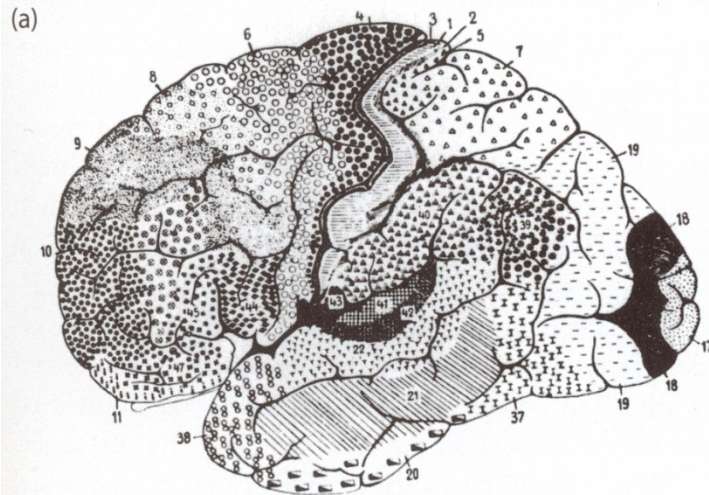




Brodmann Areale



Figure 3.10 (a) Brodmann's original cytoarchitectonic map from his work around the turn of the twentieth century. Different regions of cortex have been demarcated by histological examination of the cellular microanatomy. Brodmann divided the cortex into about fifty-two areas. (b) Lateral view of the left hemisphere showing Brodmann areas. Over the years, the map has been modified, and the standard version no longer includes some areas. (c) Medial view of the right hemisphere showing Brodmann's areas. Brodmann's areas are mostly symmetrical in the two hemispheres.





Die vier Lappen des Neocortex: Primärer Cortex & Assoziationscortex

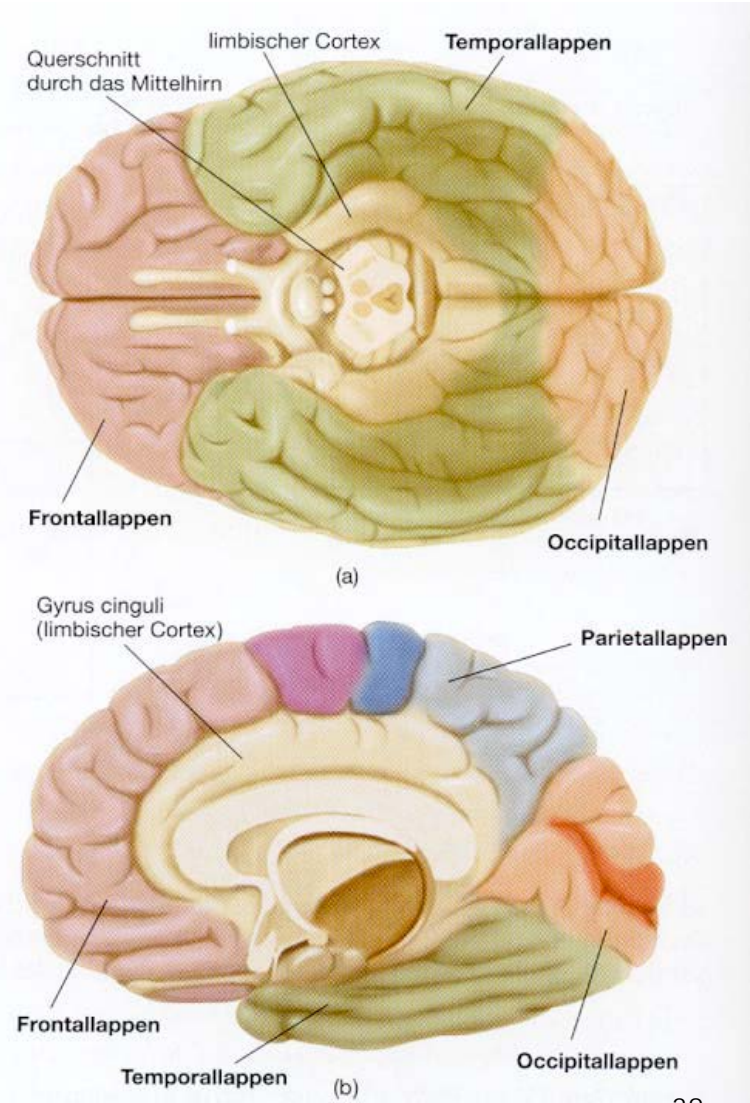
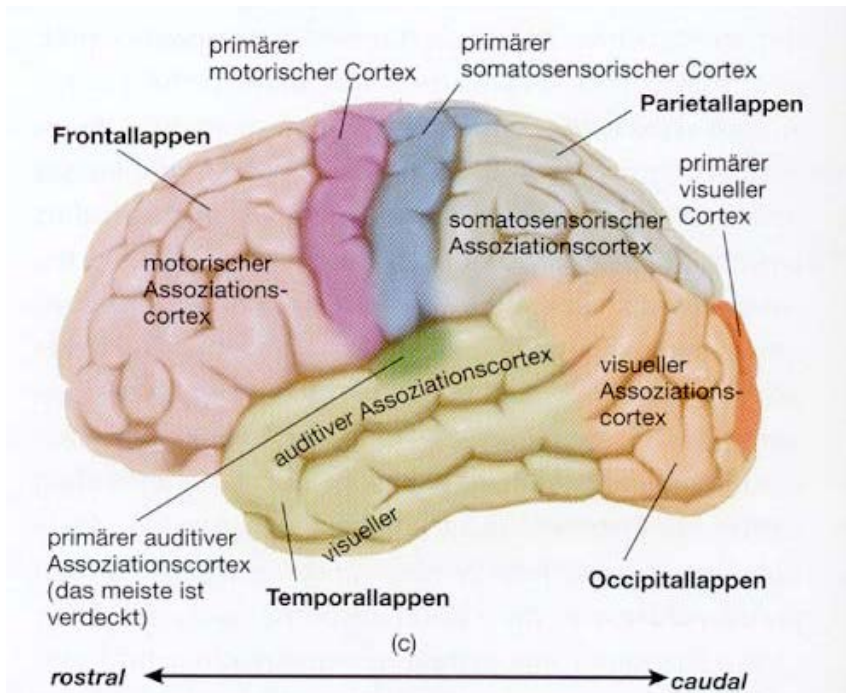


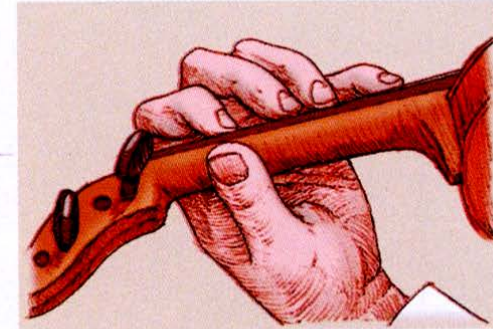
Abbildung 3.15: Die vier Lappen des cerebralen Cortex; primärer sensorischer und motorischer Cortex und Assoziationscortex. (a) Ventrale Ansicht, von der Hirnbasis her. (b) Mediane Ansicht, wobei Cerebellum und Hirnstamm entfernt wurden. (c) Laterale Ansicht.



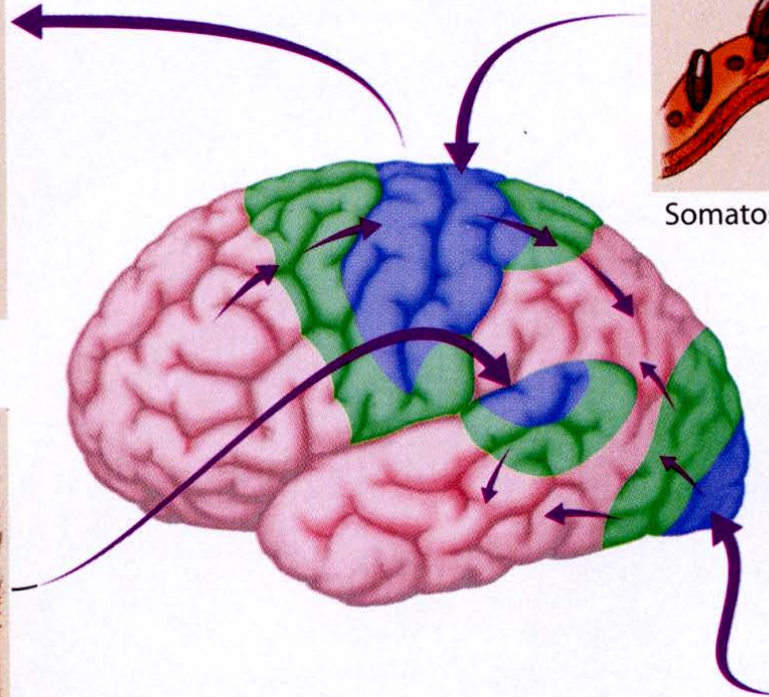
Funktionelle Neuroanatomie: Sensorische und motorische Cortices



Motor



Somatosensory



Audition



Vision



Die Hauptwindungen des Neocortex I Lateralsicht

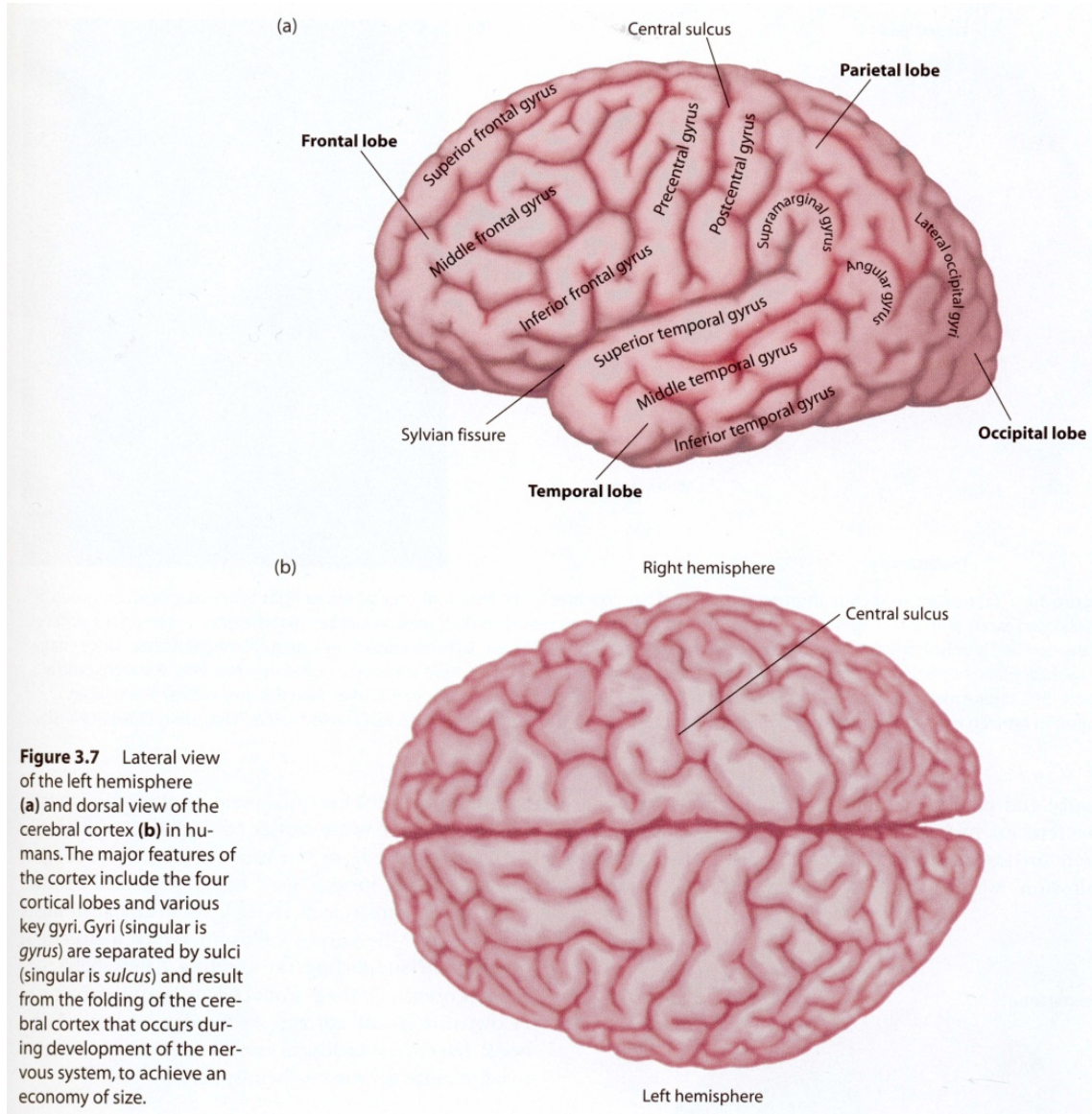
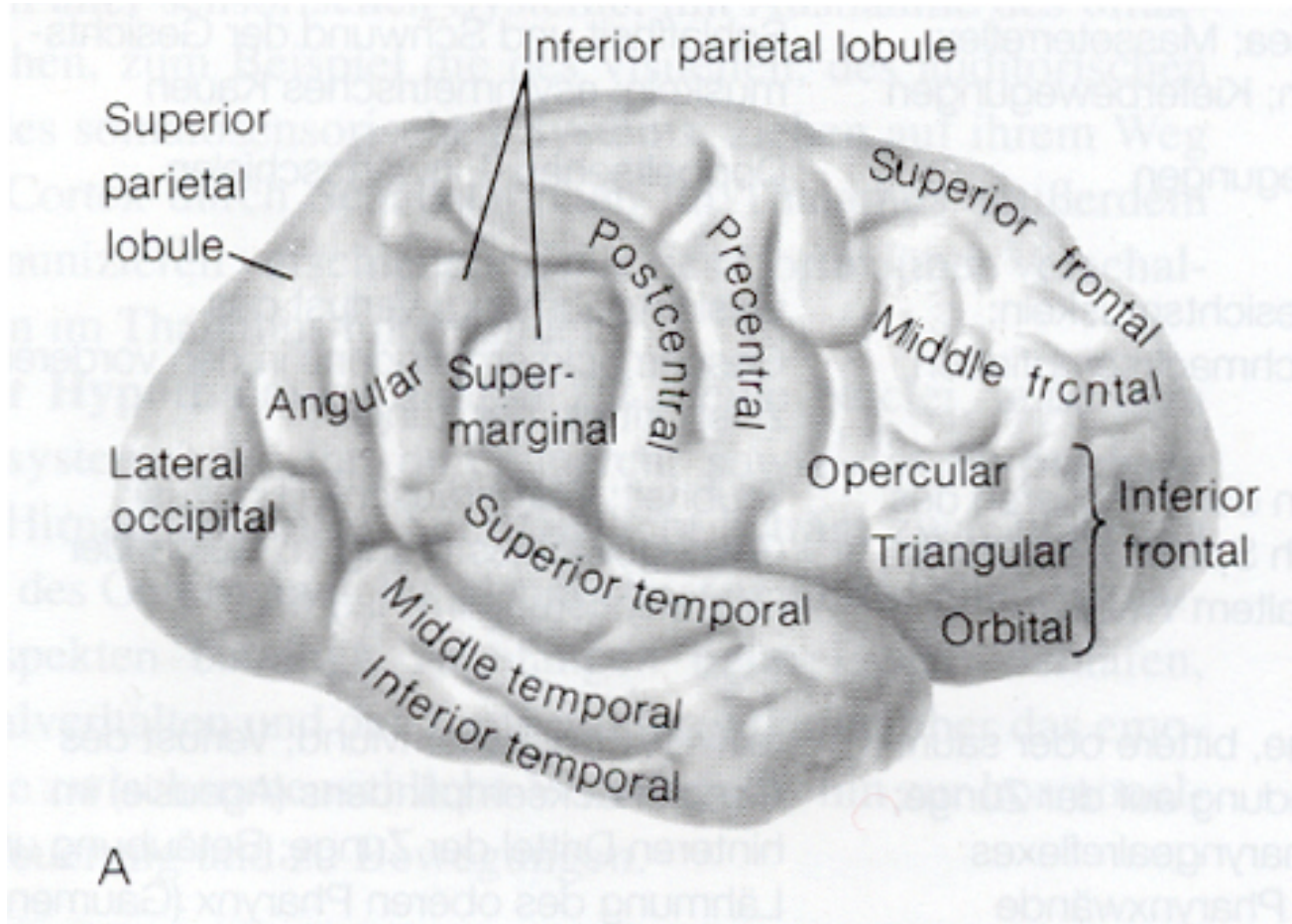


Figure 3.7 Lateral view of the left hemisphere (a) and dorsal view of the cerebral cortex (b) in humans. The major features of the cortex include the four cortical lobes and various key gyri. Gyri (singular is *gyrus*) are separated by sulci (singular is *sulcus*) and result from the folding of the cerebral cortex that occurs during development of the nervous system, to achieve an economy of size.

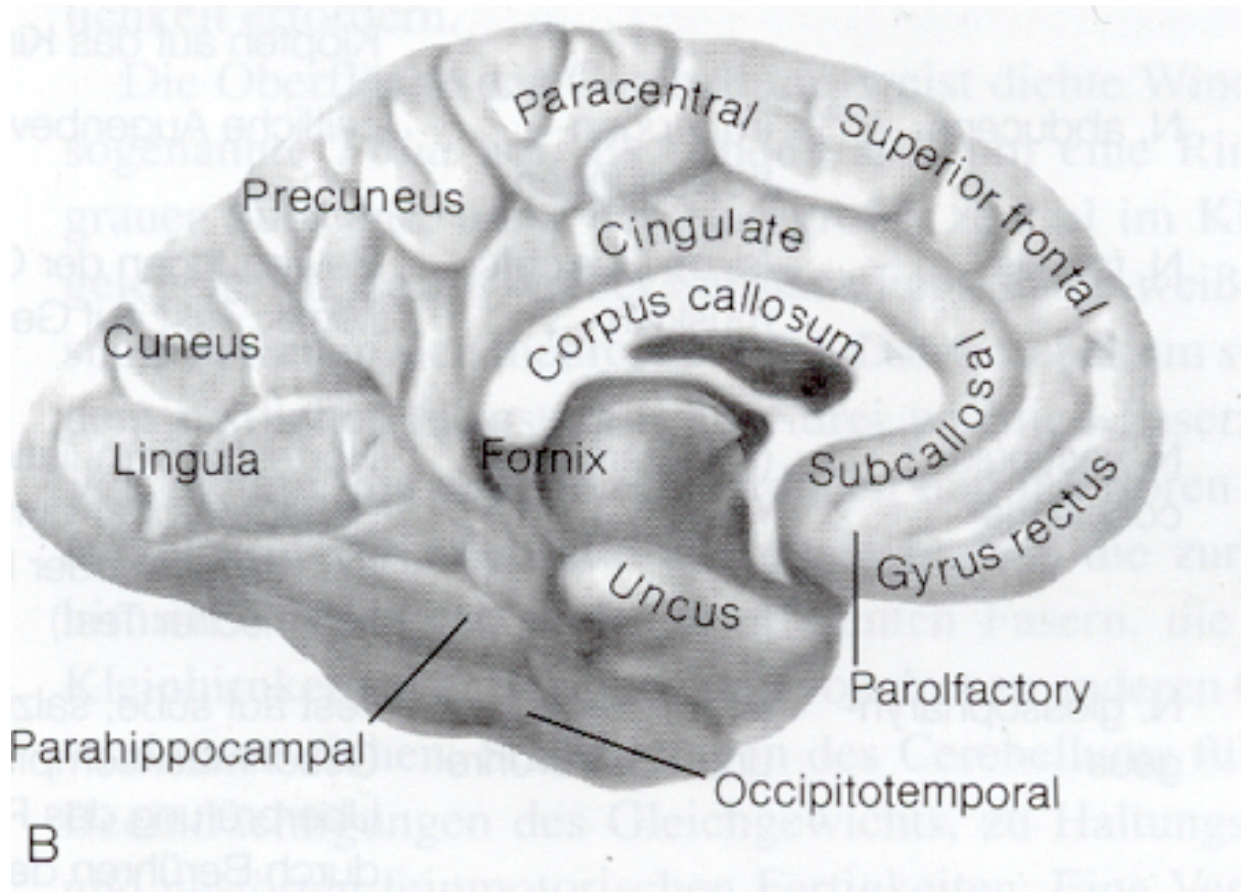


Die Hauptwindungen (Gyri) des Neocortex I (Lateralsicht)





Die Hauptwindungen (Gyri) des Neocortex II (Medialsicht)

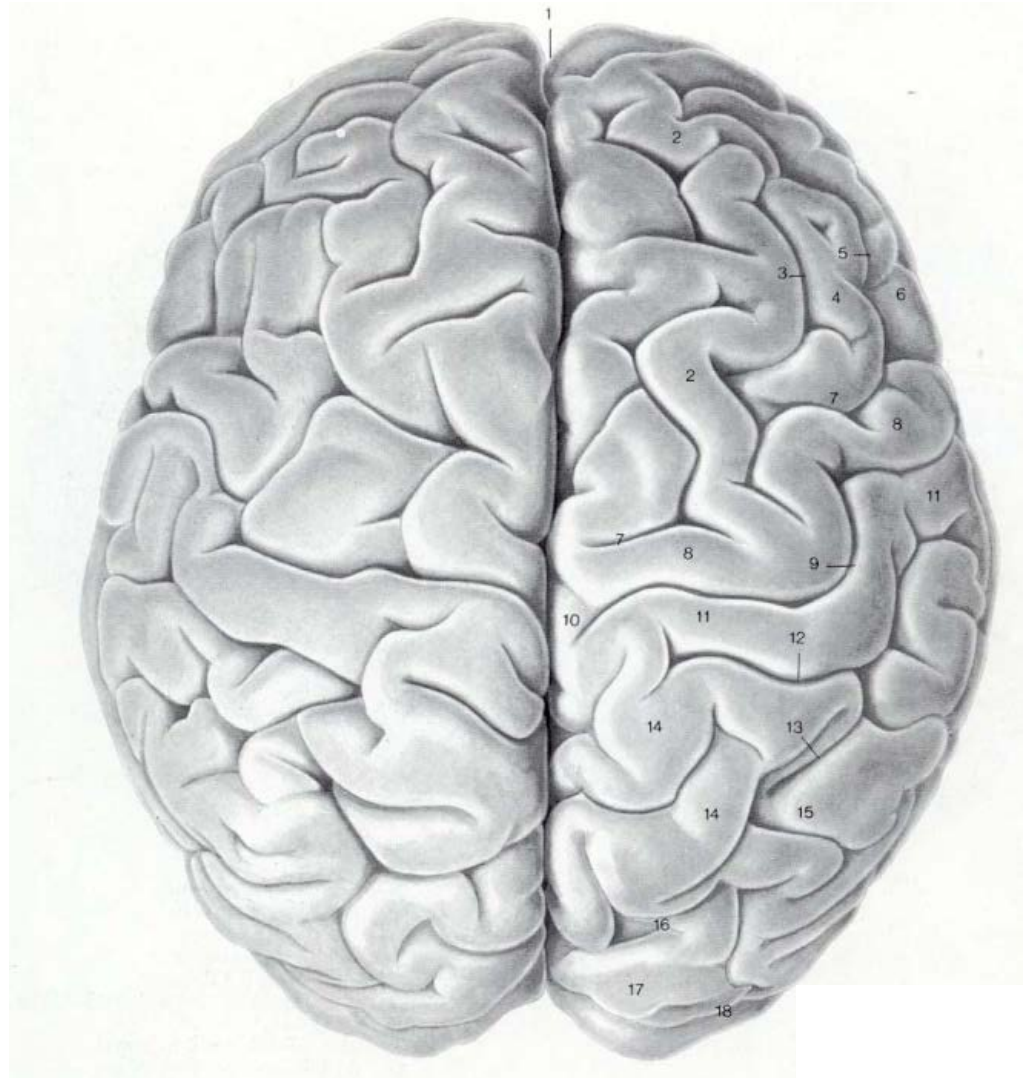




Zooming in ...



- 1 Fissura longitudinalis cerebri
- 2 Gyrus frontalis superior
- 3 Sulcus frontalis superior
- 4 Gyrus frontalis medius
- 5 Sulcus frontalis inferior
- 6 Gyrus frontalis inferior
- 7 Sulcus precentralis
- 8 Gyrus precentralis
- 9 Sulcus centralis
- 10 Lobulus paracentralis
- 11 Gyrus postcentralis
- 12 Sulcus postcentralis
- 13 Sulcus intraparietalis
- 14 Lobulus parietalis superior
- 15 Lobulus parietalis inferior
- 16 Sulcus parieto-occipitalis
- 17 Gyri occipitales
- 18 Sulci occipitales

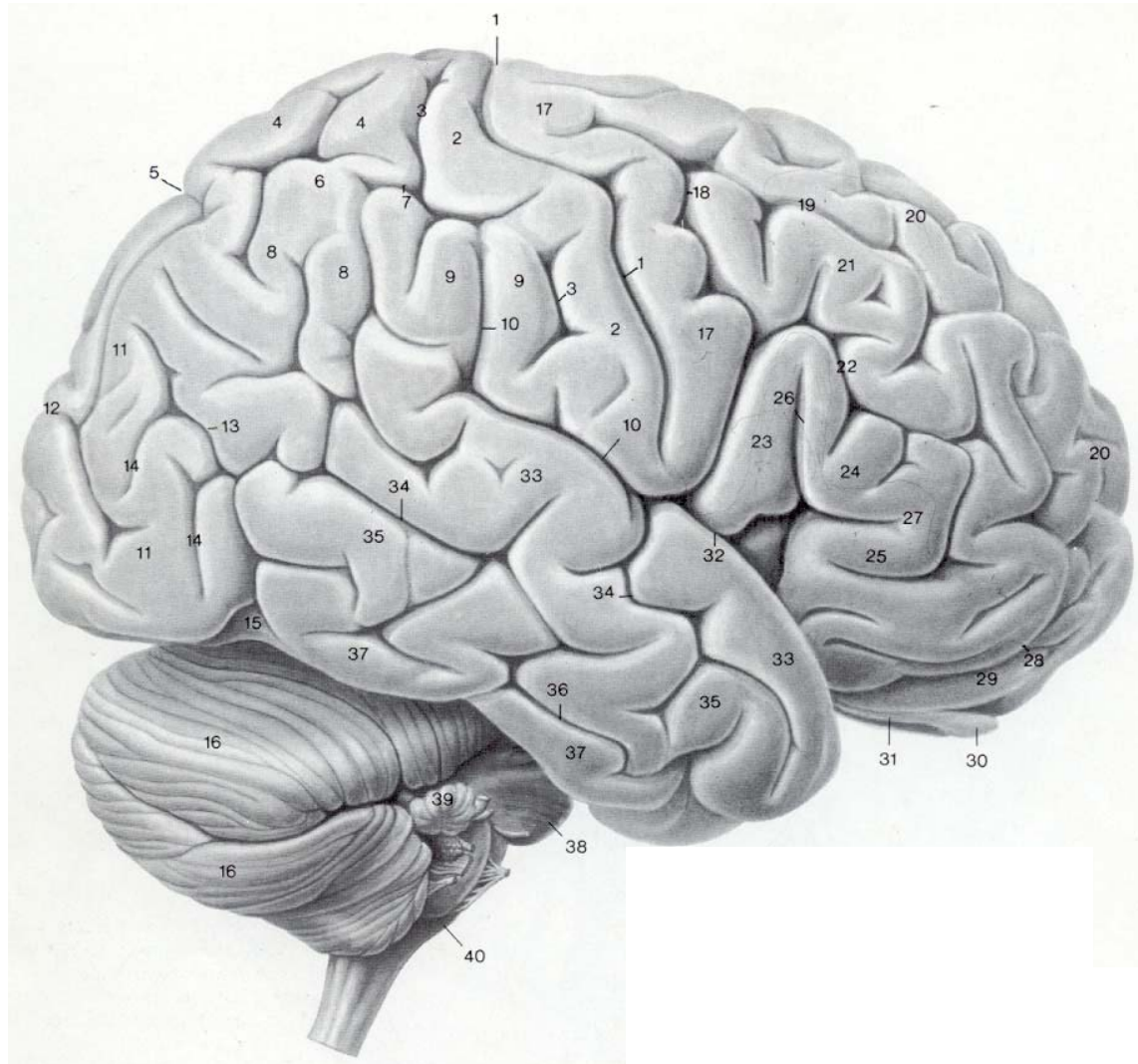


Zooming in ...



- 1 Sulcus centralis
- 2 Gyrus postcentralis
- 3 Sulcus postcentralis
- 4 Lobulus parietalis superior
- 5 Sulcus parieto-occipitalis
- 6 Lobulus parietalis inferior
- 7 Sulcus intraparietalis
- 8 Gyrus angularis
- 9 Gyrus supramarginalis
- 10 Sulcus lateralis, ramus posterior
- 11 Gyri occipitales
- 12 Sulcus lunatus
- 13 Sulcus occipitalis anterior
- 14 Sulci occipitales
- 15 Incisura preoccipitalis
- 16 Hemispherium cerebelli

- 17 Gyrus precentralis
- 18 Sulcus precentralis
- 19 Sulcus frontalis superior
- 20 Gyrus frontalis superior
- 21 Gyrus frontalis medius
- 22 Sulcus frontalis inferior
- 23 Pars opercularis } Gyrus frontalis inferior
- 24 Pars triangularis }
- 25 Pars orbitalis }
- 26 Sulcus lateralis, ramus ascendens
- 27 Sulcus lateralis, ramus anterior
- 28 Sulci orbitales
- 29 Gyri orbitales
- 30 Bulbus olfactorius
- 31 Tractus olfactorius
- 32 Sulcus lateralis
- 33 Gyrus temporalis superior
- 34 Sulcus temporalis superior
- 35 Gyrus temporalis medius
- 36 Sulcus temporalis inferior
- 37 Gyrus temporalis inferior
- 38 Pons
- 39 Flocculus
- 40 Medulla oblongata

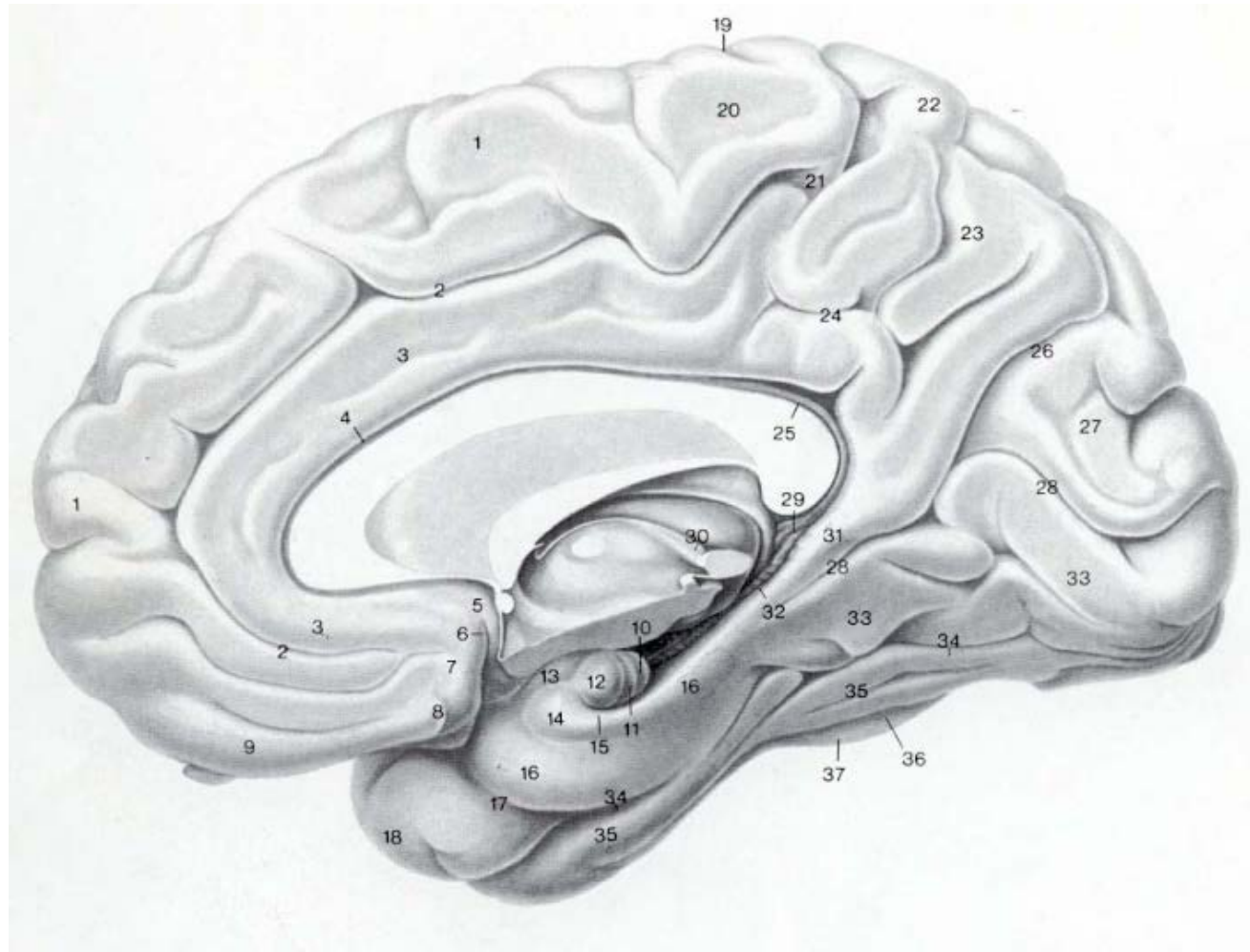


Zooming in ...



- 1 Gyrus frontalis superior
- 2 Sulcus cinguli
- 3 Gyrus cinguli
- 4 Sulcus corporis callosi
- 5 Gyrus paraterminalis
- 6 Sulcus parolfactorius posterior
- 7 Area subcallosa
- 8 Sulcus parolfactorius anterior
- 9 Gyrus rectus
- 10 Gyrus intralimbicus
- 11 Limbus Giacomini
- 12 Gyrus uncinatus
- 13 Gyrus semilunaris
- 14 Gyrus ambiens
- 15 Incisura unci
- 16 Gyrus parahippocampalis
- 17 Sulcus rhinalis
- 18 Gyrus temporalis superior

- 19 Sulcus centralis
- 20 Lobulus paracentralis
- 21 Sulcus cinguli, pars marginalis
- 22 Lobulus parietalis superior
- 23 Precuneus
- 24 Sulcus subparietalis
- 25 Indusium griseum
- 26 Sulcus parieto-occipitalis
- 27 Cuneus
- 28 Sulcus calcarinus
- 29 Gyrus fasciolaris
- 30 Taenia thalami
- 31 Isthmus gyri cinguli
- 32 Gyrus dentatus
- 33 Gyrus occipitotemporalis medialis
- 34 Sulcus collateralis
- 35 Gyrus occipitotemporalis lateralis
- 36 Sulcus occipitotemporalis
- 37 Gyrus temporalis inferior



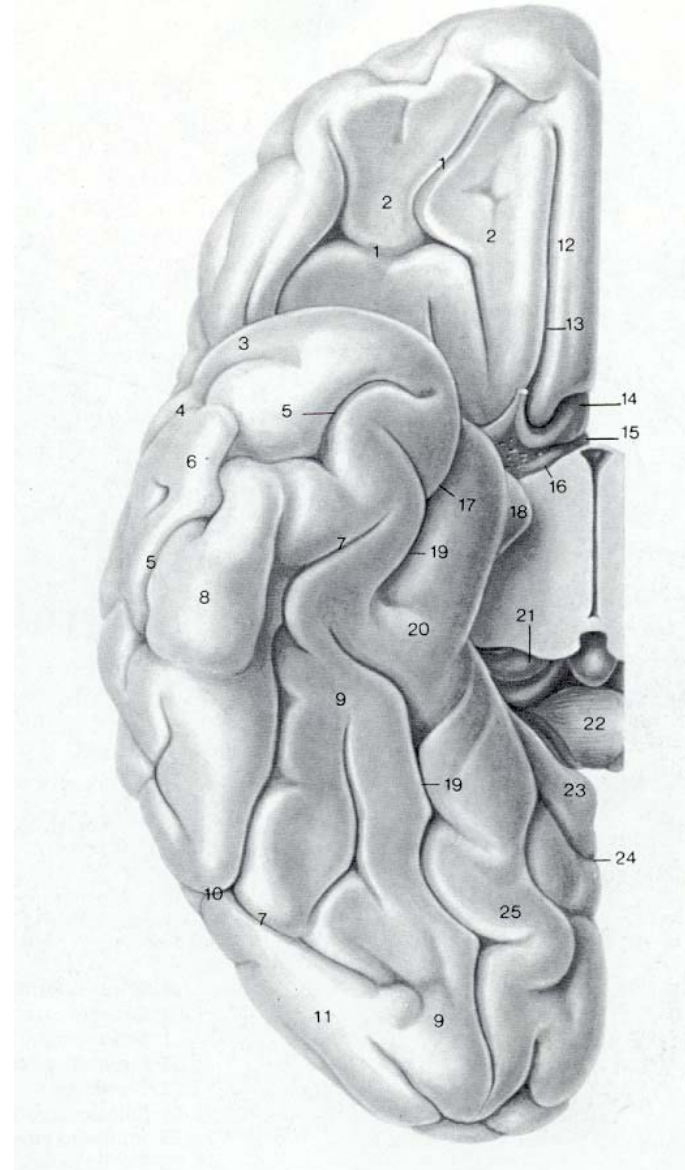


Zooming in ...



- 1 Sulci orbitales
- 2 Gyri orbitales
- 3 Gyrus temporalis superior
- 4 Sulcus temporalis superior
- 5 Sulcus temporalis inferior
- 6 Gyrus temporalis medius
- 7 Sulcus occipitotemporalis
- 8 Gyrus temporalis inferior
- 9 Gyrus occipitotemporalis lateralis
- 10 Incisura preoccipitalis
- 11 Gyri occipitales

- 12 Gyrus rectus
- 13 Sulcus olfactorius
- 14 Area subcallosa
- 15 Gyrus paraterminalis
- 16 Gyrus diagonalis
- 17 Sulcus rhinalis
- 18 Gyrus ambiens
- 19 Sulcus collateralis
- 20 Gyrus parahippocampalis
- 21 Pulvinar thalami
- 22 Splenium corporis callosi
- 23 Isthmus gyri cinguli
- 24 Sulcus calcarinus
- 25 Gyrus occipitotemporalis medialis





Das Telenzephalon: Das limbische System

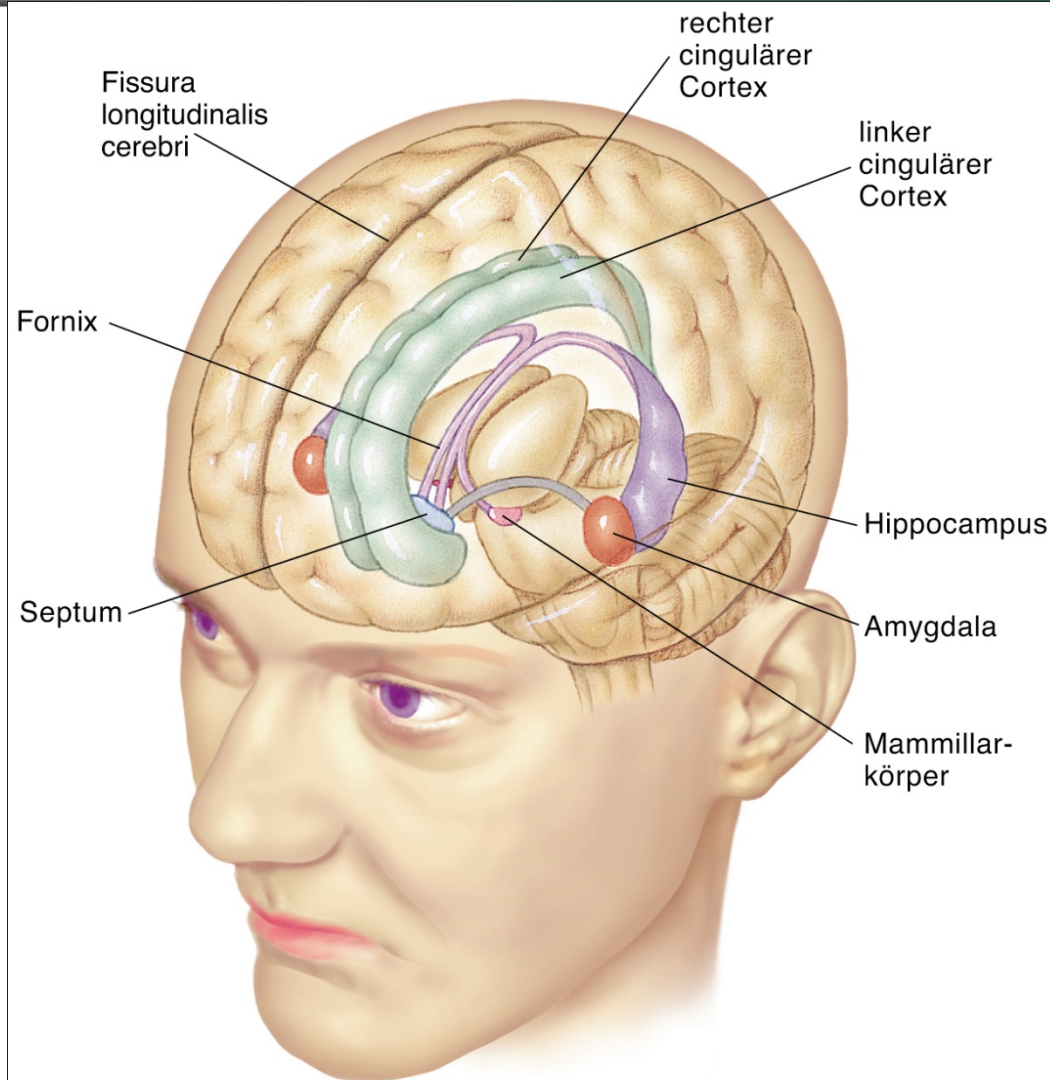


Abbildung 3.28: Die Hauptstrukturen des limbischen Systems: Amygdala, Hippocampus, cingulärer Cortex, Fornix, Septum und Mammillarkörper.

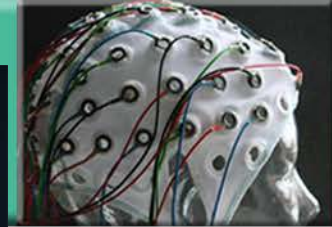
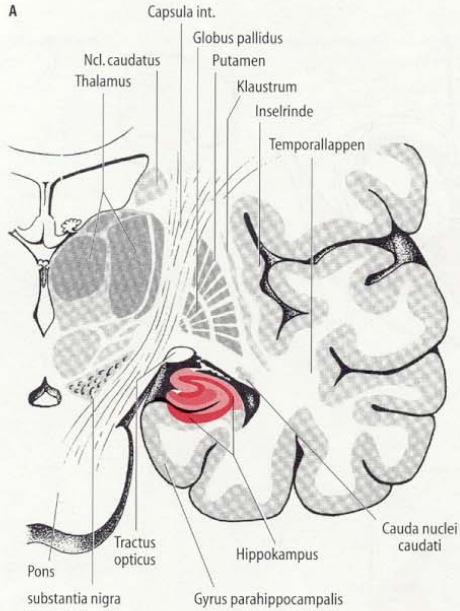


Abb.20-14. Die Hippokampusformation. A Ansicht im Frontalschnitt (rechts unten der Temporallappen). B Obere (superiore) und untere (inferiore) Abschnitte des Hippokampus und Einteilung in die verschiedenen CA-Felder. (Nach [6])

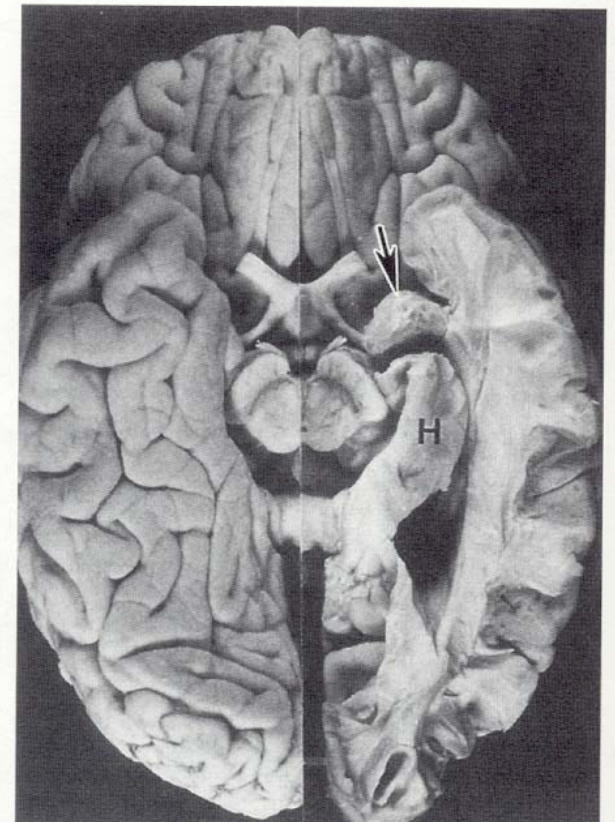
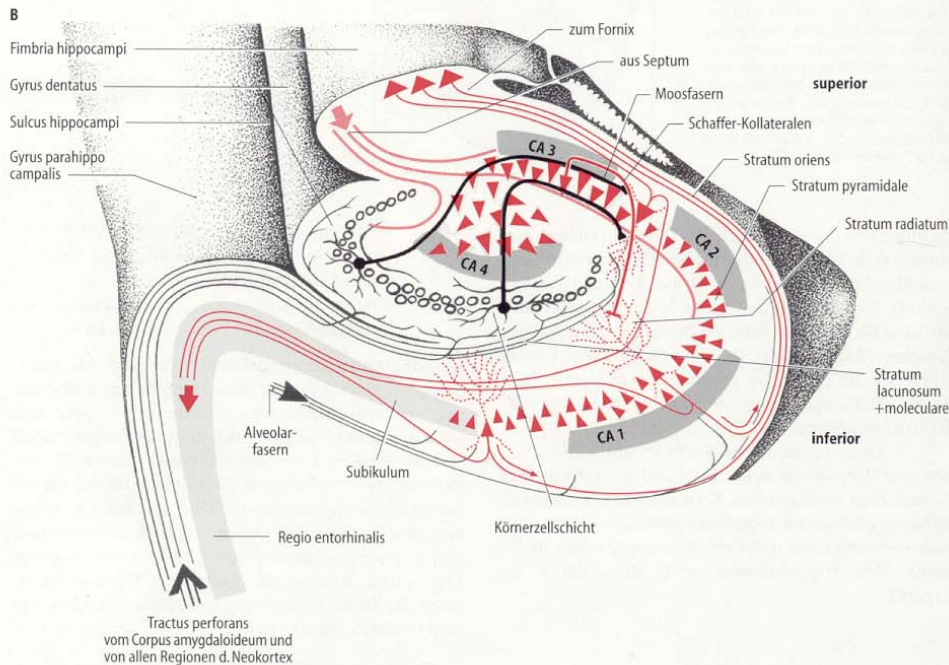
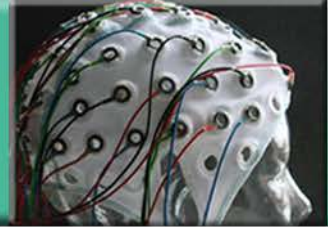


Abb.20-12. Amygdala (Pfeil) und Hippokampus (H) von der ventralen Seite nach Entfernung des vorderen Temporallappens (links). (Aus [6])







Hippocampus (Formation)

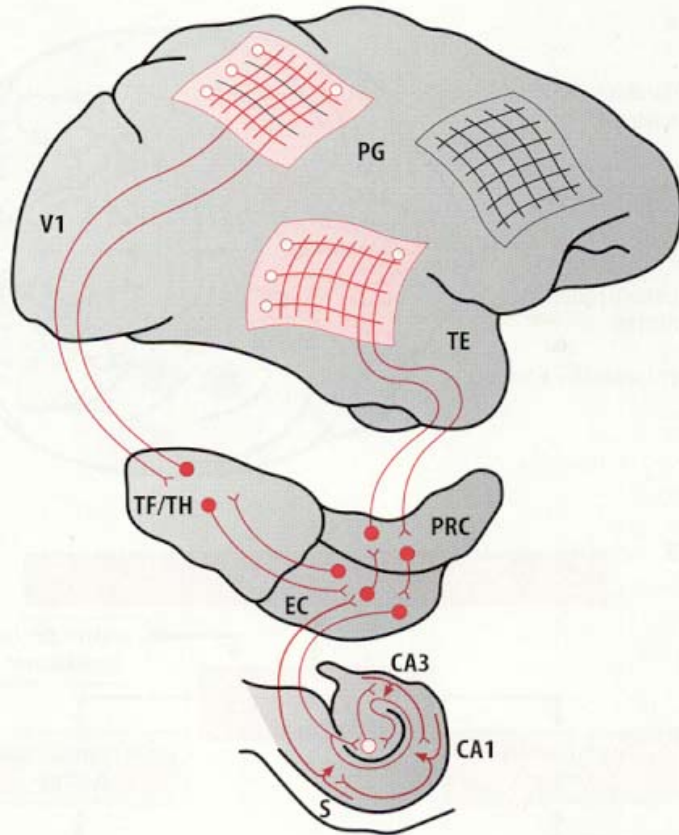
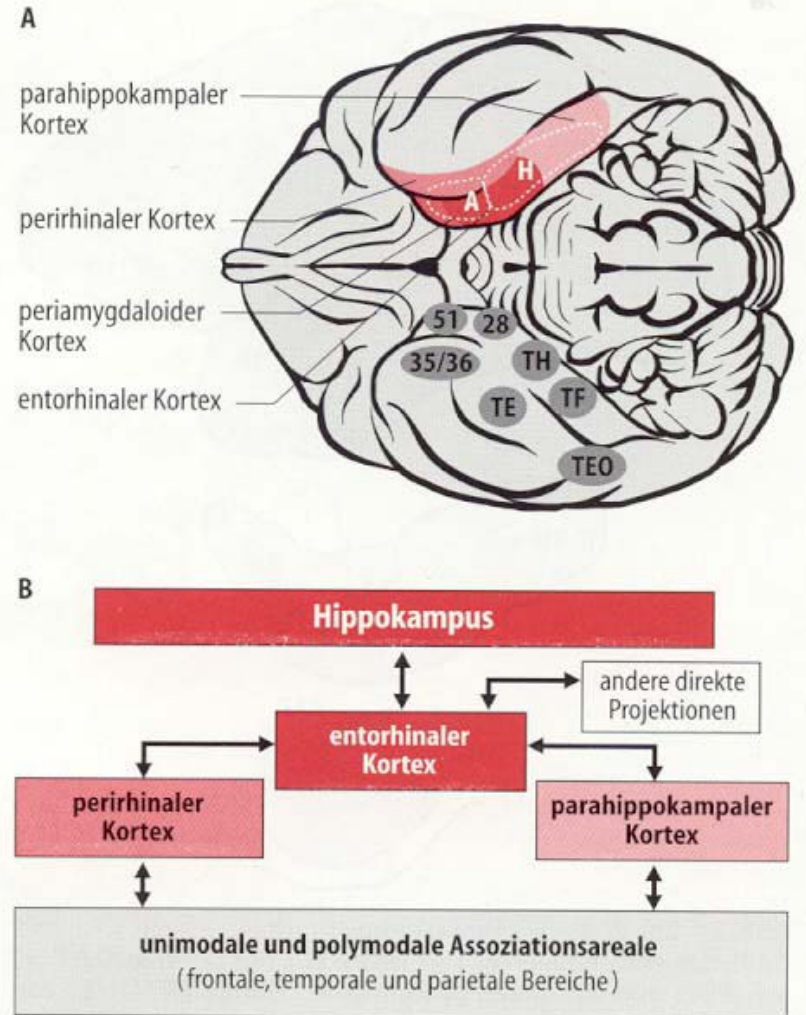
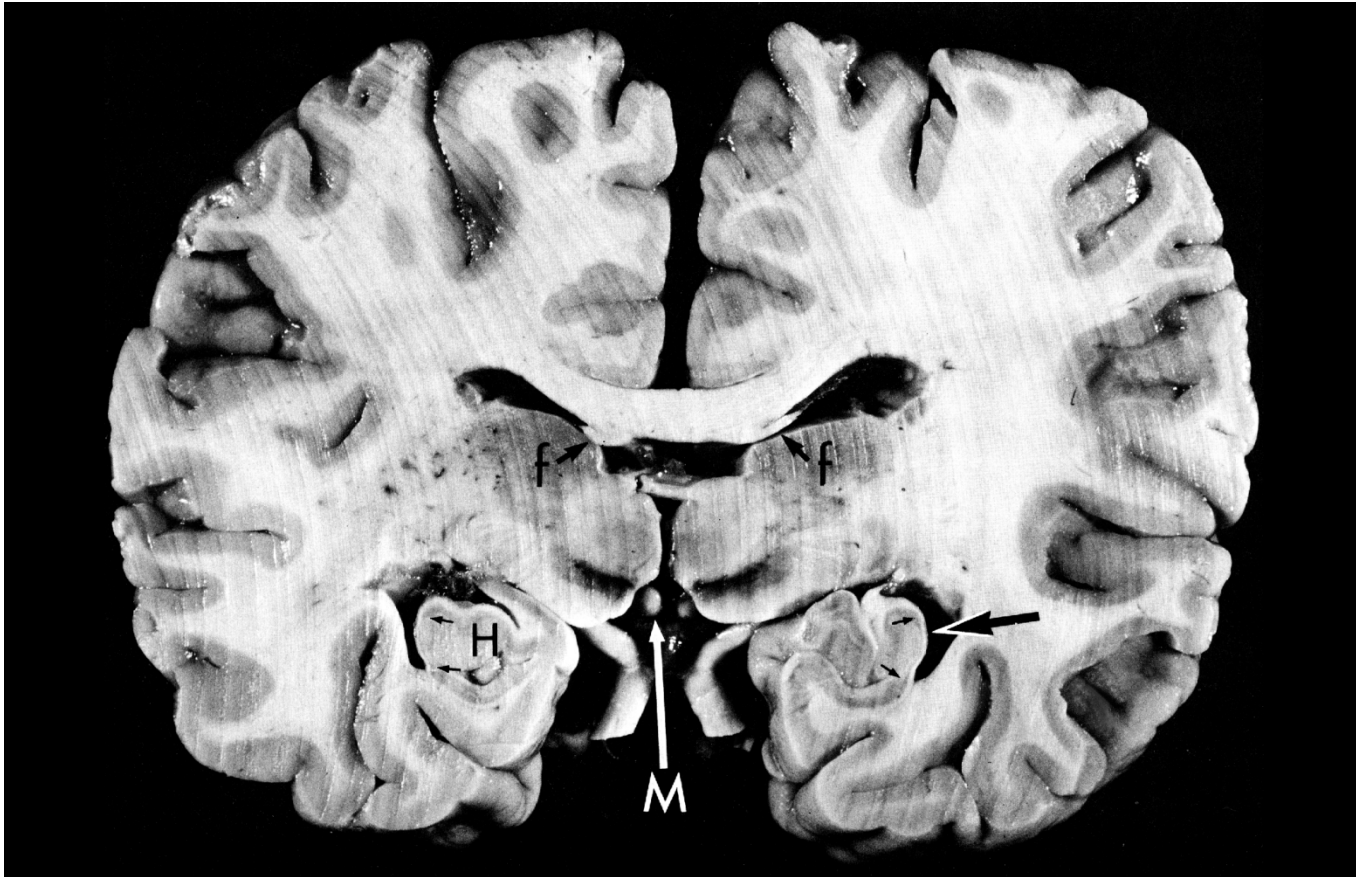


Abb. 24–28. Rolle des Hippocampus (unten: Schicht CA1 und CA3), des entorhinalen Kortex (Mitte: EC), des perirhinalen Kortex (PRC) und des parahippokampalen Kortex (TF/TH) in der Verknüpfung von Kontexten in verschiedenen Kortextarealen (V1, primärer visueller Kortex; PG, Gyrus postcentralis; TE, temporalen Kortex). Siehe auch Abb. 24–29 u. Text. (Modifiziert nach [16] mit freundlicher Genehmigung)



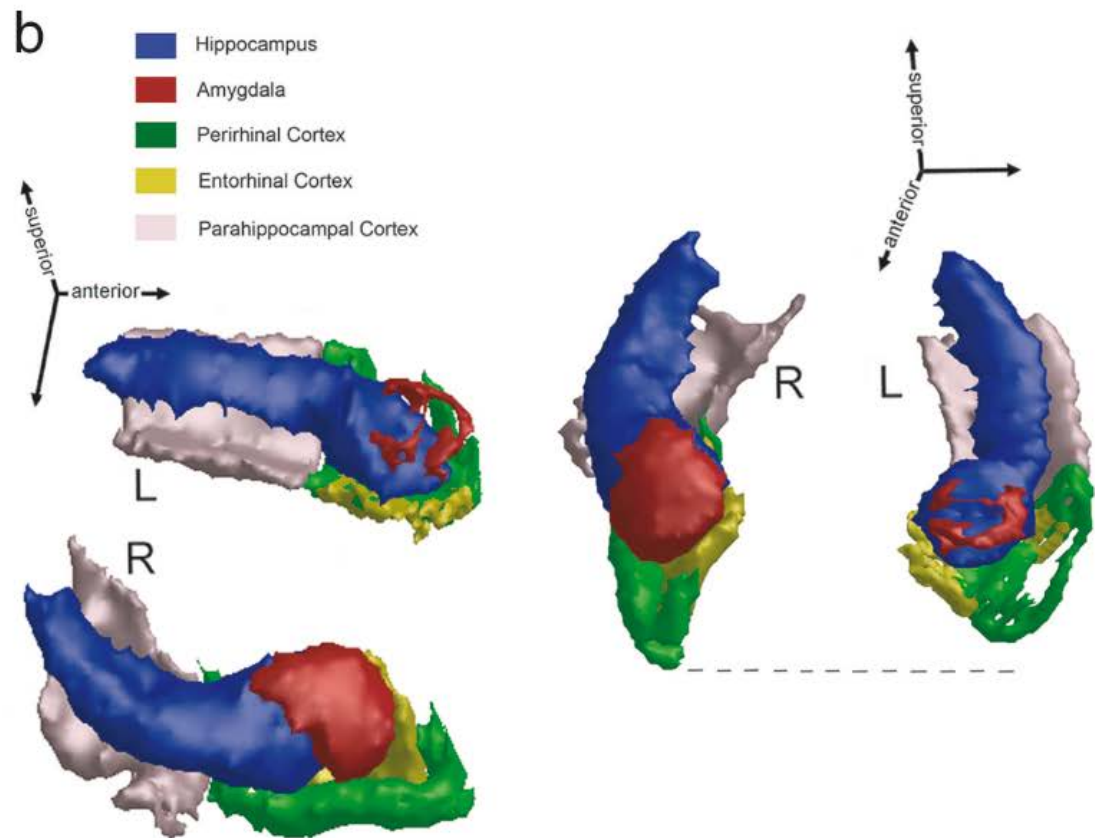
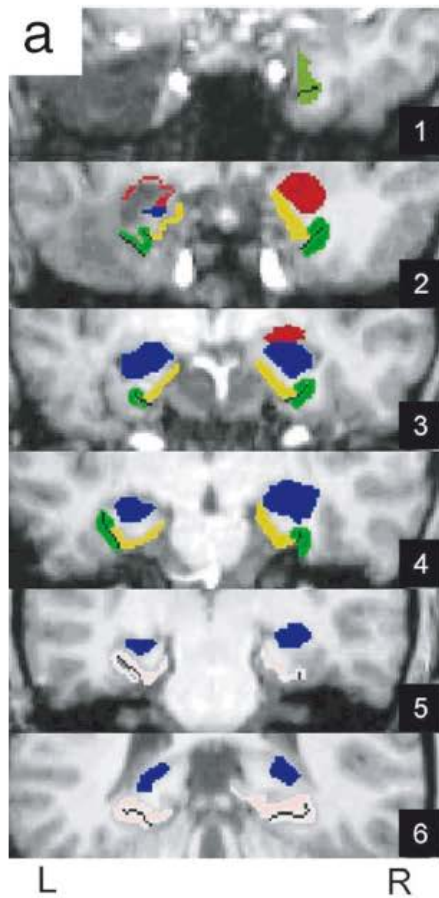


Patient RB



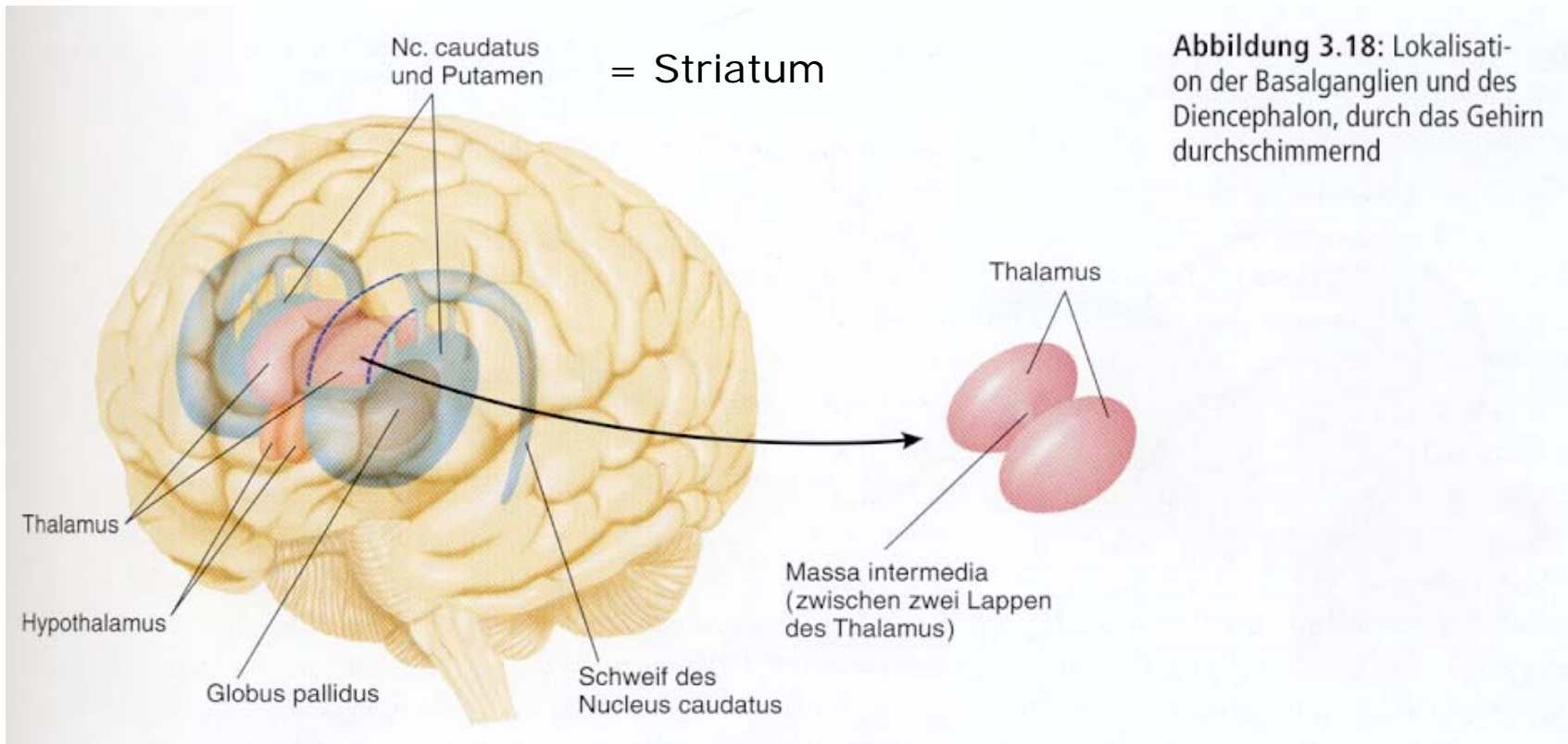


Patientin NB





Das Telenzephalon: Die Basalganglien





Die Basalganglien und motorische Kontrolle

Figure 11.40 Wiring of the basal ganglia. Inputs from the cortex primarily project to the striatum. From here, processing flows along two pathways. The direct pathway goes to the output nuclei, the internal segment of the globus pallidus (GPi) and pars reticulata of the substantia nigra (SNr). The indirect pathway includes a circuit through the external segment of the globus pallidus (GPe) and the subthalamic nucleus (STN), and then to the output nuclei. The output projections to the thalamus are relayed to the cortex, frequently terminating close to the initial source of input. The dopaminergic projections of the pars compacta of the substantia nigra (SNc) modulate striatal activity by facilitating the direct pathway via the D₁ receptors and inhibiting the indirect pathway via the D₂ receptors. Adapted from Wichmann and DeLong (1996).

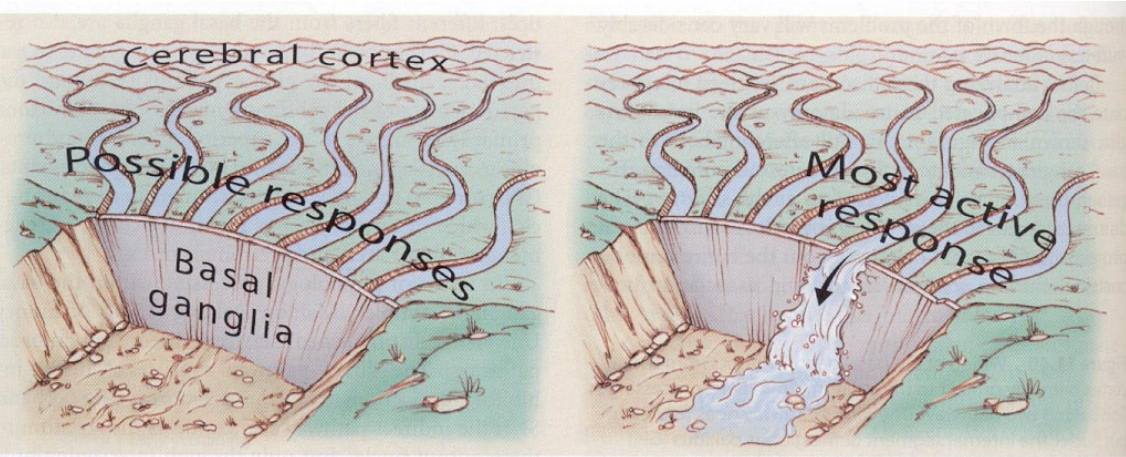
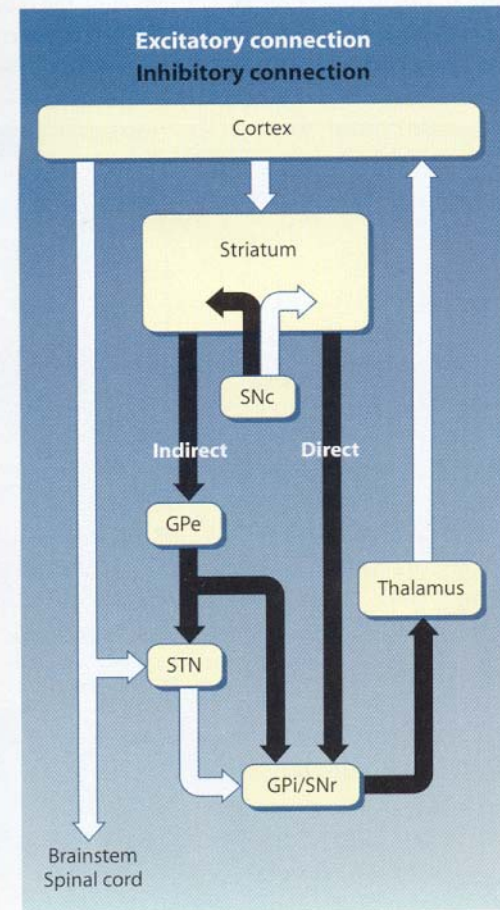
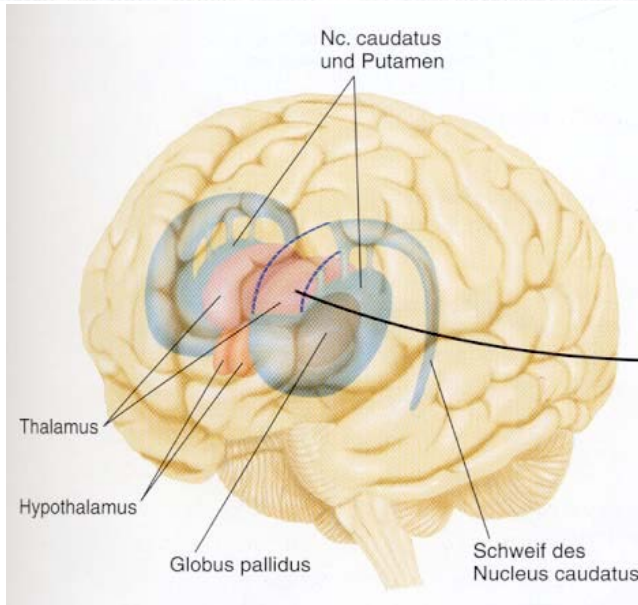


Figure 11.41 The basal ganglia play a critical role in movement initiation. Potential responses are held in check until the basal ganglia provides a triggering response.





Parkinson-Erkrankung

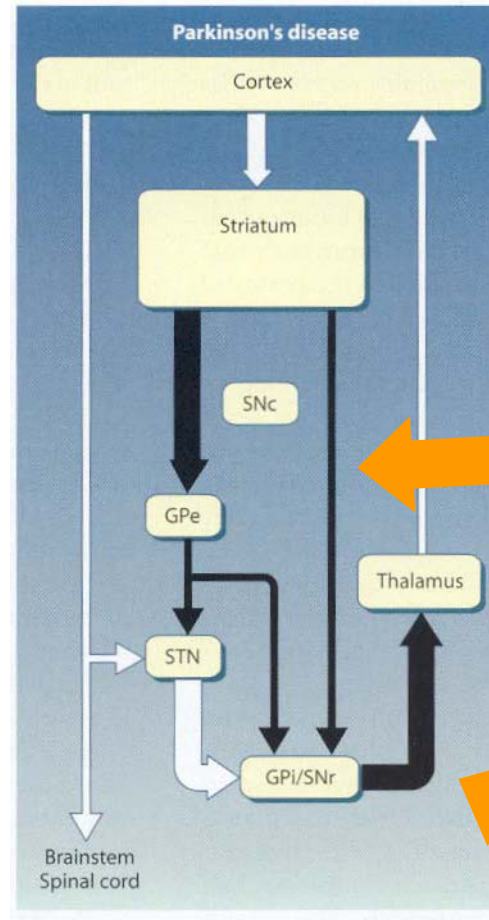
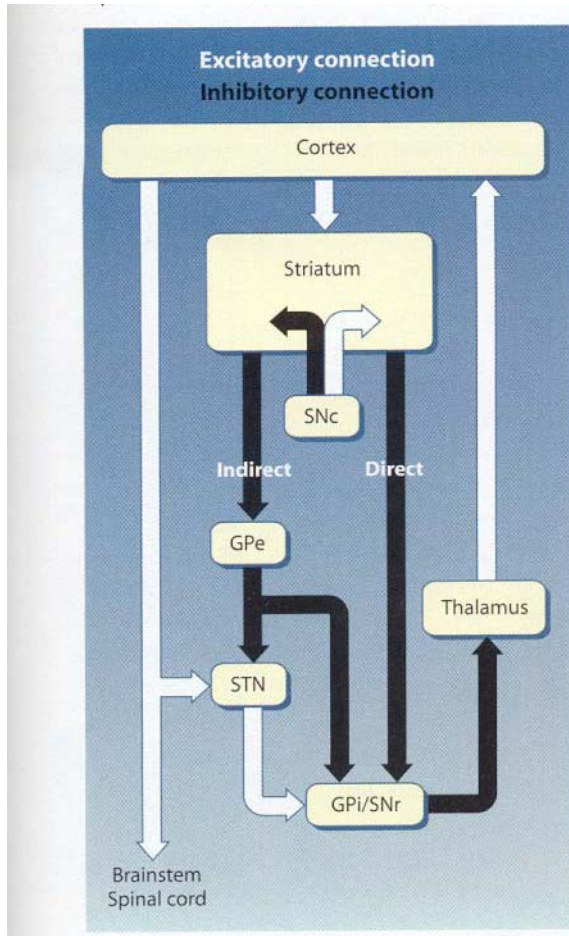
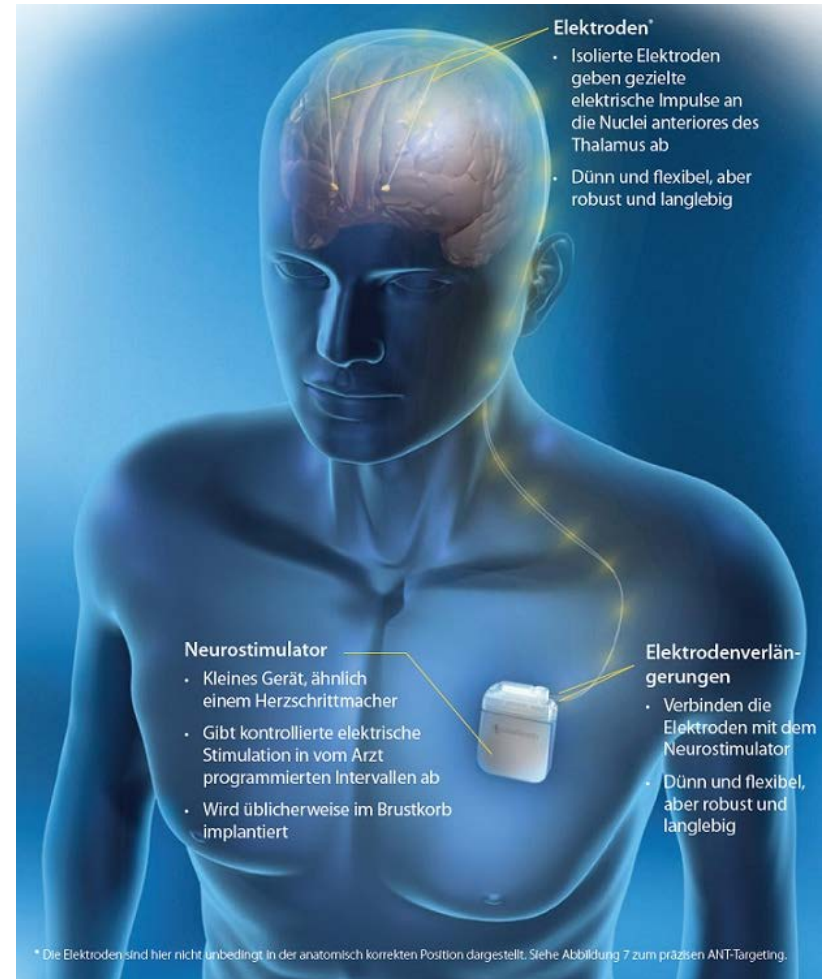


Figure 11.43 Differential neurochemical alterations in Huntington's and Parkinson's diseases. In Huntington's disease, the inhibitory projection along the indirect pathway from the striatum to the external segment of the globus pallidus (GPe) is reduced. The net consequence of this is reduced inhibitory output from the globus pallidus and thus an increase in cortical excitation and movement. Parkinson's disease primarily reduces the inhibitory activity along the direct pathway. This produces increased inhibition from the globus pallidus to the thalamus and thus a reduction in cortical activity and movement. Adapted from Wichmann and DeLong (1996).



Hirnstimulation bei Parkinson-Erkrankung





Danke für Ihre
Aufmerksamkeit!



Das Koordinatensystem von Talairach & Tournoux

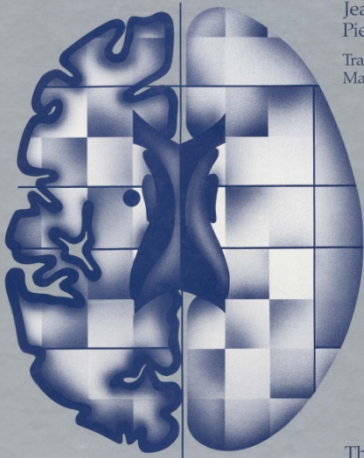


Co-Planar Stereotaxic Atlas of the Human Brain

3-Dimensional Proportional System: An Approach to Cerebral Imaging

Jean Talairach
Pierre Tournoux

Translated by
Mark Rayport



Thieme

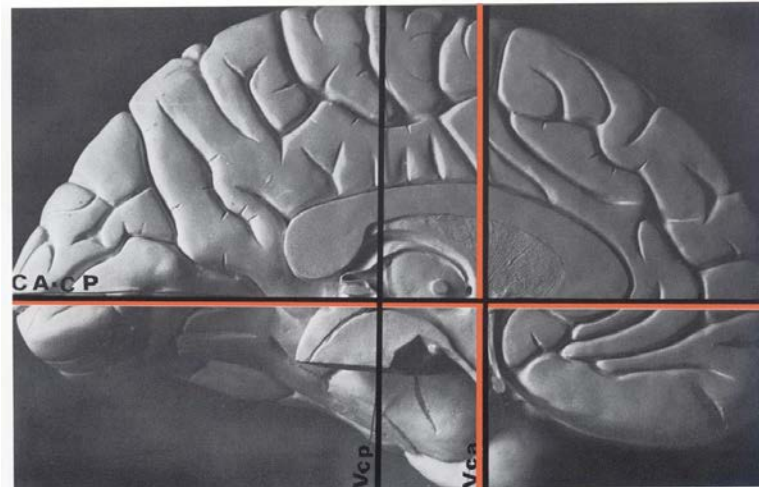


Figure 4 Basic Reference System. The three dimensions are:
 - CA-CP line (anterior commissure-posterior commissure) = horizontal plane
 - Vertical line VCA = vertical coronal plane
 - Midline = sagittal plane

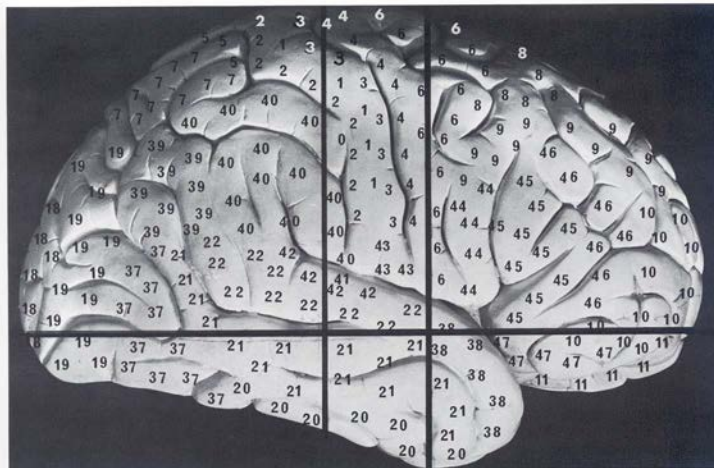


Figure 10 Right hemisphere (lateral surface). Areas of Brodmann and basal lines.

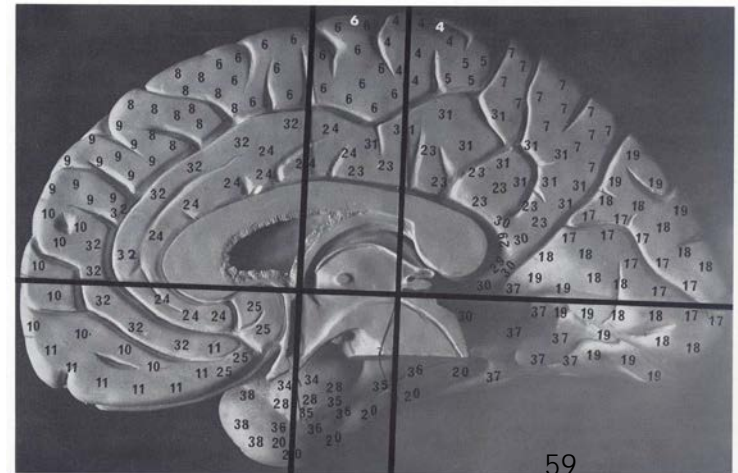


Figure 9 Right hemisphere (medial surface). Areas of Brodmann and basal lines.



x:34 , y:-12, z:-16 mm

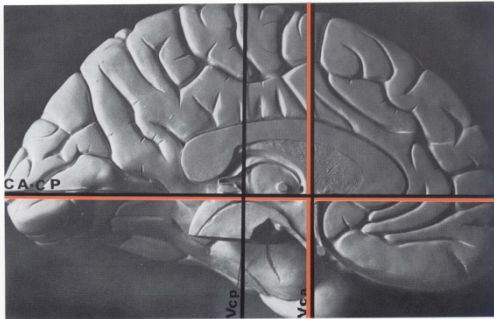
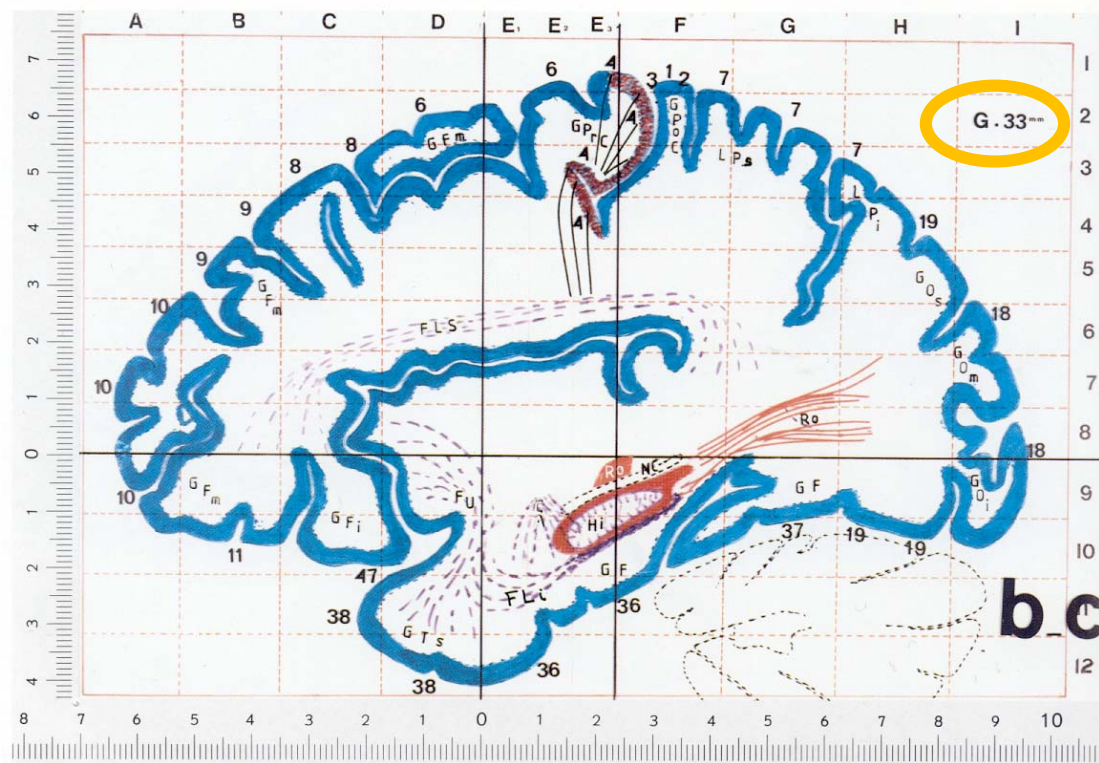
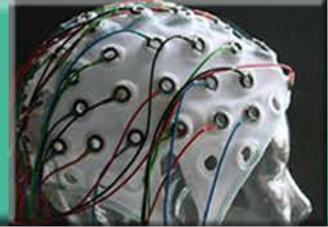


Figure 4. Basic Reference System. The three dimensions are:
 - Vertical line VCA = vertical plane
 - CA-CP line (anterior commissure-posterior commissure) = horizontal plane
 - Midline = sagittal plane

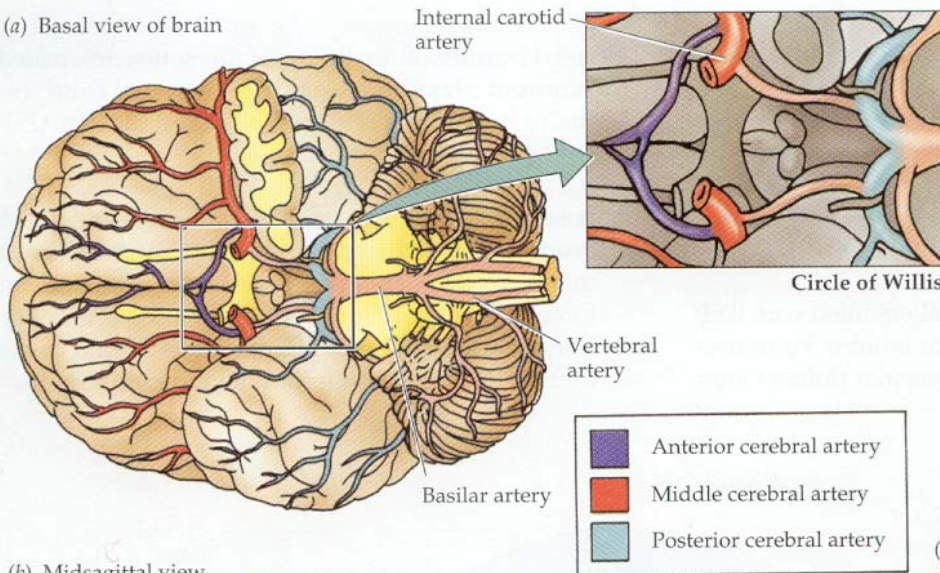




Die Blutversorgung des Vorderhirns



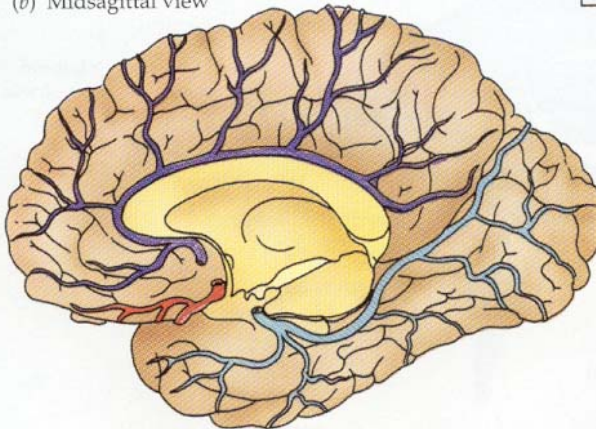
(a) Basal view of brain



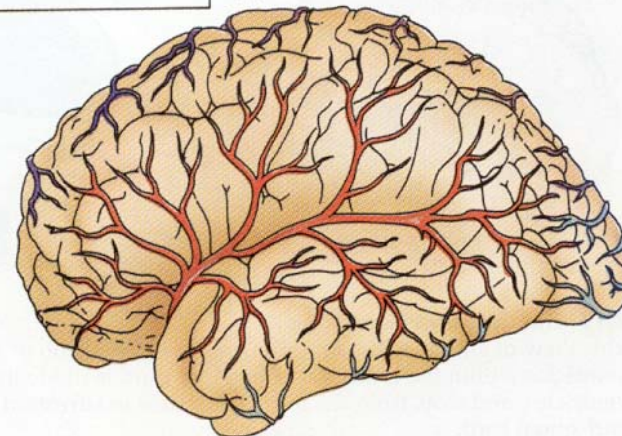
2.20 The Blood Supply of the Human Brain

The anterior, middle, and posterior cerebral arteries—the three principal arteries that provide blood to the cerebral hemispheres—are depicted here in views of the basal (a), midsagittal (b), and lateral (c) surfaces of the brain. The basilar and internal carotid arteries form a circle at the base of the brain known as the circle of Willis.

(b) Midsagittal view

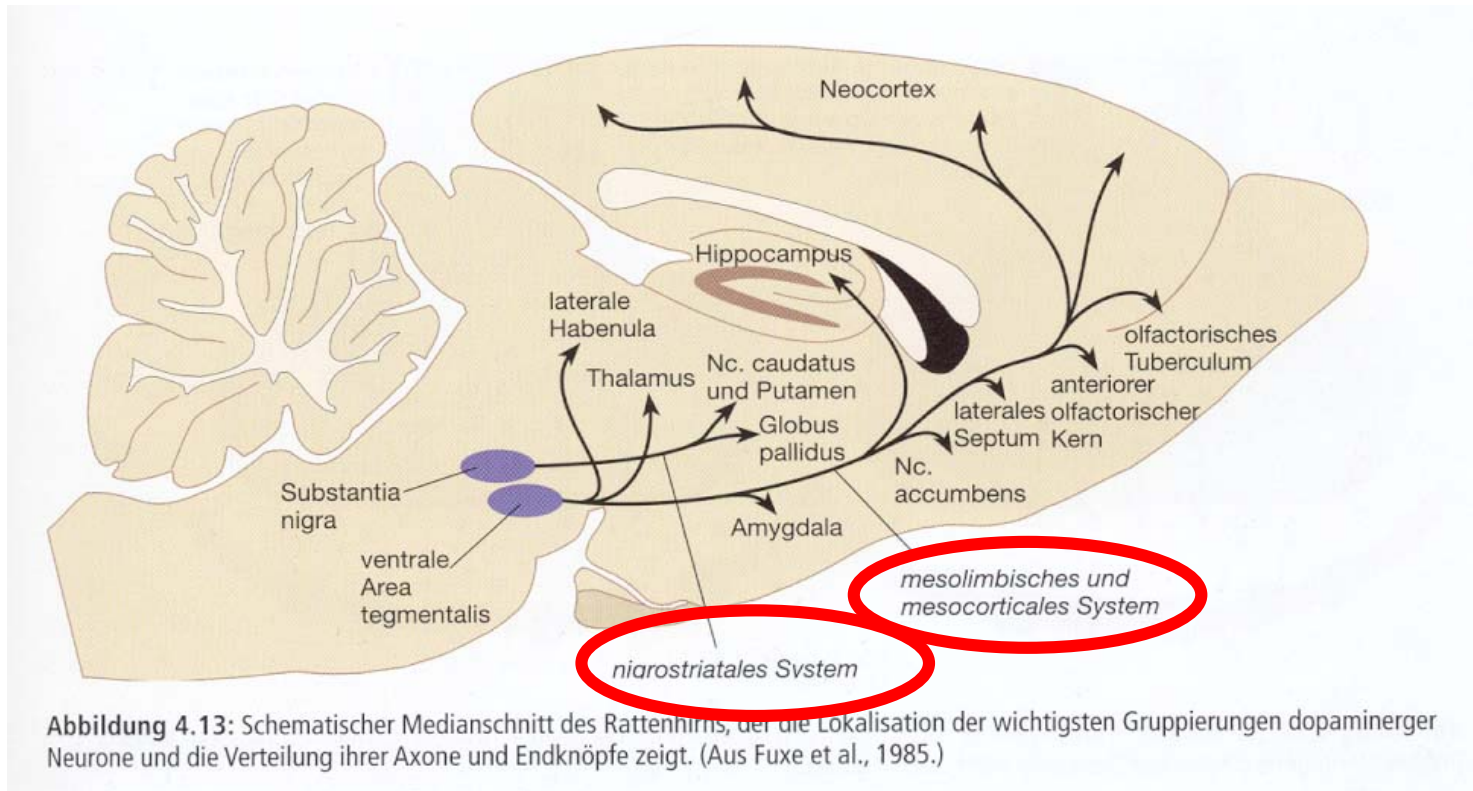


(c) Lateral view





Katecholamine: Dopamin





Adrenalin / Noradrenalin

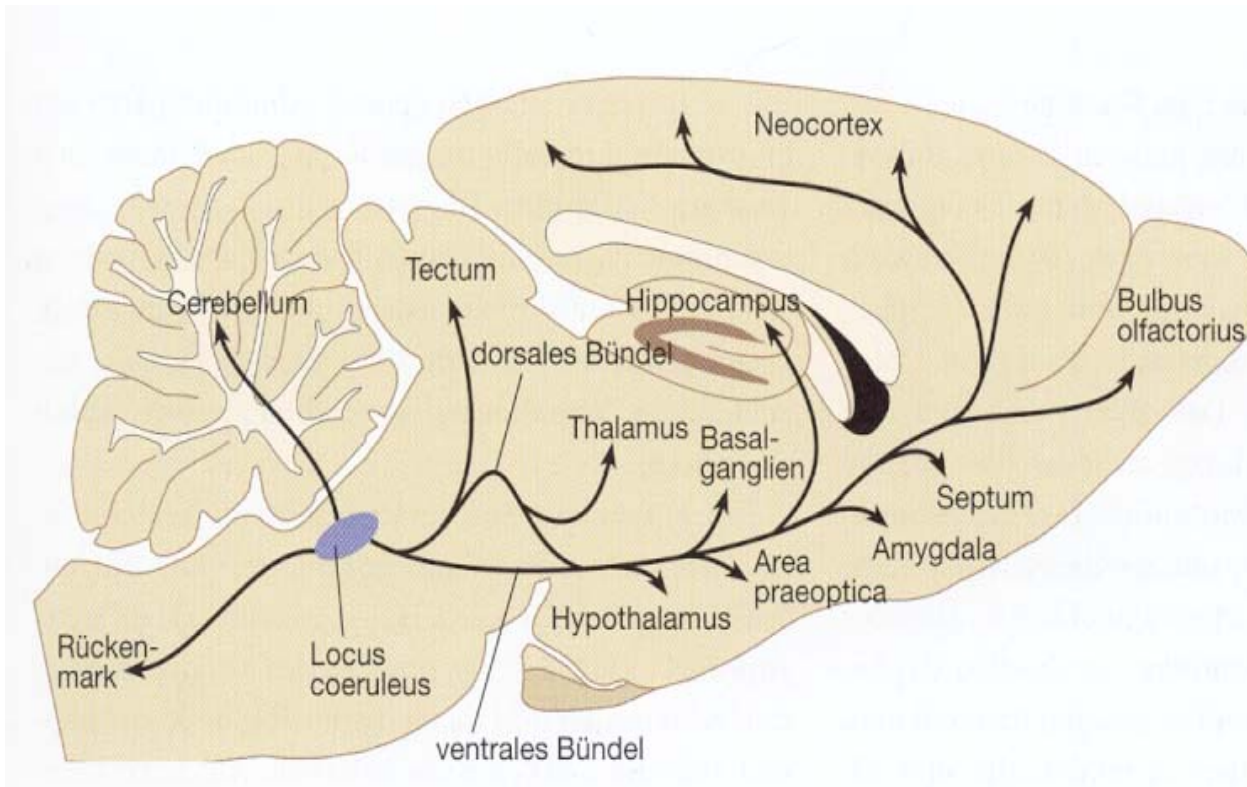


Abbildung 4.16: Schematischer Median-schnitt eines Rattenhirns, der den Lokalisationen der wichtigsten Gruppierungen noradrenerger Neurone zeigt und die Verteilung ihrer Axone und Endknöpfe markiert. (Aus Cotman & Mc-Gaugh, 1980.)



Serotonin

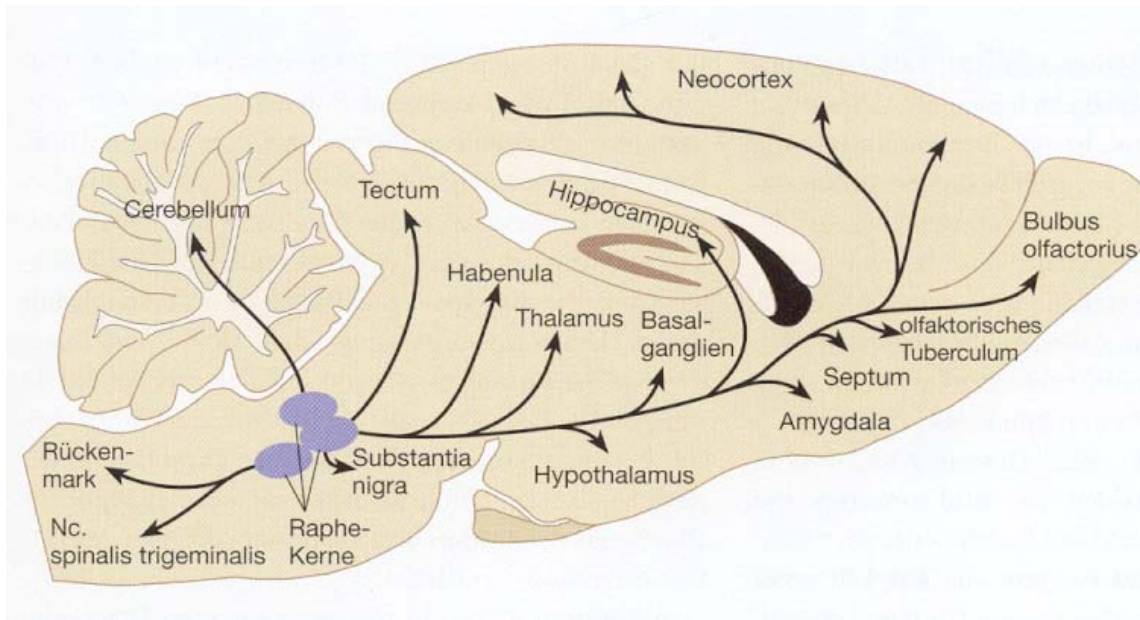


Abbildung 4.18: Schematischer Median-schnitt eines Rattenhirns, der die Lokalisation der wichtigsten Gruppierungen serotonerger Neurone zeigt und die Verteilung ihrer Axone und Endknöpfe markiert. (Aus Consolazione & Cuello, 1982.)