CENTRÁLNÍ NERVOVÝ SYSTÉM

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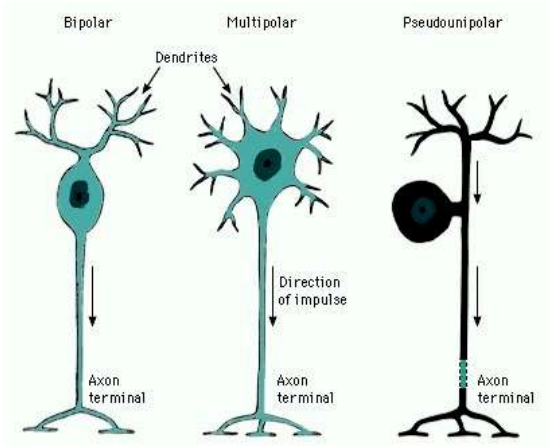
OPPA PRAHA PRAGUE PRAGA PRAG EVROPSKÁ UNIE

HISTOLOGIE CNS

NEURONY- DĚLENÍ

Podle počtu výběžků:

- multipolární (nejčastější)
- bipolární
- pseudounipolární

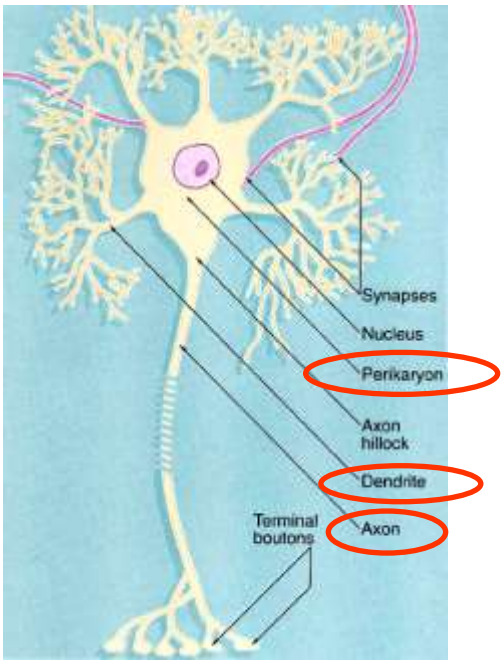


NEURONY- DĚLENÍ

Podle délky axonu:

- **projekční** (Golgi typ I.)
  - dlouhý axon přesahující dendritický strom
  - např. Purkyňovy buňky
- **lokální** (Golgi typ II.)
  - kontakty s blízkými neurony
  - jejich podíl fylogeneticky stoupá
  - např. hvězdicovité neurony

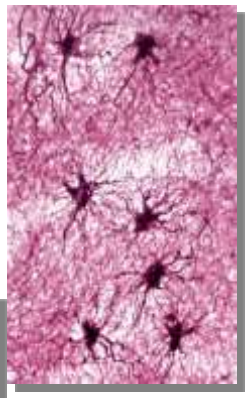
NEURONY- STAVBA



NEUROGLIE

- **10-50 x více než neuronů**
- **tvoří více než ½ objemu CNS**
- **vytvářejí myelin**
- **funkce nutritivní a fagocytární**
- **barvení: impregnace Ag, Au**
- **morfologicky 4 typy**
- **nejsou elektricky excitovatelné, avšak mohou se účastnit přenosu signálu**
- **astrocyty mají receptory pro některé neuromediátory a po jejich aktivaci dochází ke změnám koncentrace Ca2+ v cytosolu, které se mohou přenášet na další astrocyty i na okolní neurony.**

ASTROCYTY



největší
vaskulární pedikly – *membrana limitans gliae perivascularis et spf.*
mechanická opora neuronů
vytvářejí gliovou jizvu

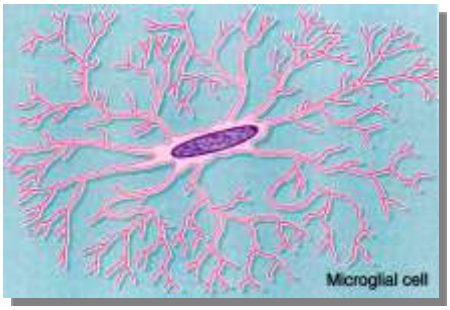
A. protoplazmatické
granulární cytoplazma
obalují neurony, cévy
B. fibrilární
delší výběžky
zejména bílá hmota
gliální fibrilární kys. protein

OLIGODENDROCYTY

- **menší, ↓vláken, tmavší jádra**
- **vytvářejí obaly nervových vláken – myelinovou pochvu**
- **šedá i bílá hmota**
- **odpovídají Schwannovým b.**
- **počet fylogeneticky stoupá**

MIKROGLIE

- **pohyblivé, fagocytují**
- **nejmenší glie**
- **tmavá protáhlá jádra**
  - ostatní glie mají kulatá jádra
- **pokryté ostnitými výrůstky – trnitý vzhled**



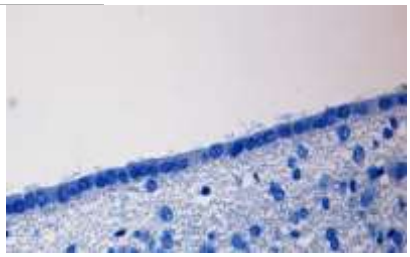
EPENDYM

epitelové uspořádání
- **pozůstatek neuroepitelu neurální trubice**

vystýlá dutiny CNS

pohyblivé řasinky (cilie)

tanycyty

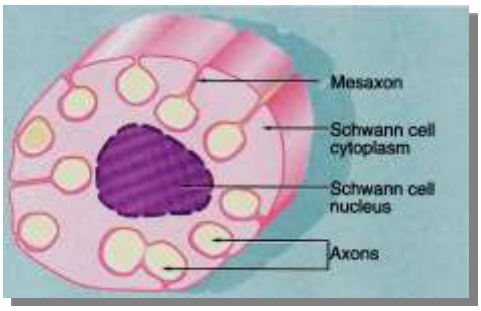


NERVOVÁ VLÁKNA

- **axony opatřené speciálními obaly ektodermového původu**
- **jejich svazky vytvářejí:**
  - v CNS dráhy (oligodendrocyty)
  - v periferním NS nervy (Schwannovy bb.)
- **vlákna:**
  - **nemyelinizovaná**
  - **myelinizovaná** (axony silnějšího kalibru)

NERVOVÁ VLÁKNA NEMYELINIZOVANÁ

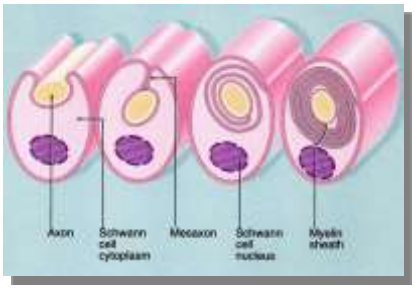
- **CNS – leží volně mezi výběžky neuronů a glií**
- **periferie – leží v jednoduchých štěrbinách Schwannových bb.**
- **nemají Ranvierovy zářezy**



NERVOVÁ VLÁKA MYELINIZOVANÁ

myelinizace:

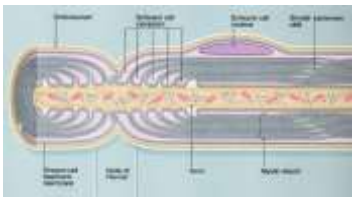
- **zanoření axonu do žlábku obalové buňky**
- **mezaxon** – nabaluje se na osové vlákno (10-150x)
- **myelin je tvořen vrstvami modifikovaných cytopl. mem.**



Ranvierovy zářezy

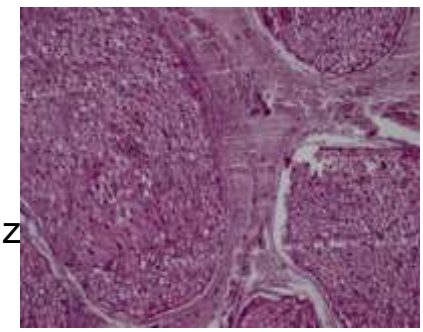
- **internodia** (1-2 mm)

Schmidt-Lantermanovy náručky



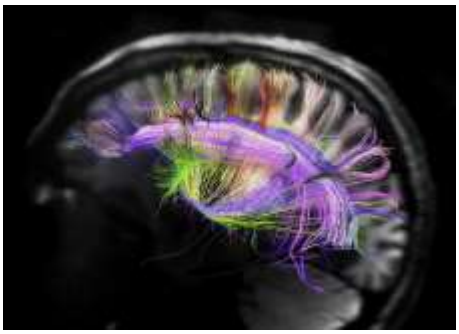
PERIFERNÍ NS

- nervy
  - nervová vlákna spojená ve svazky
  - vazivové obaly:
    - **epineurium**
    - **perineurium**
    - **endoneurium**

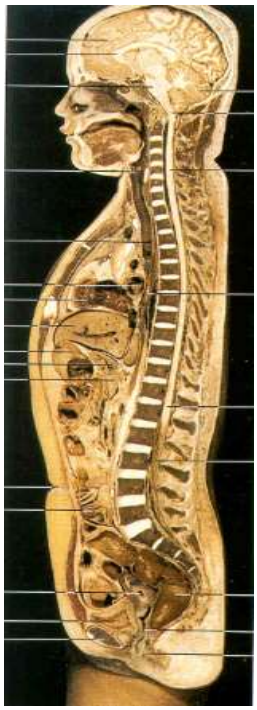


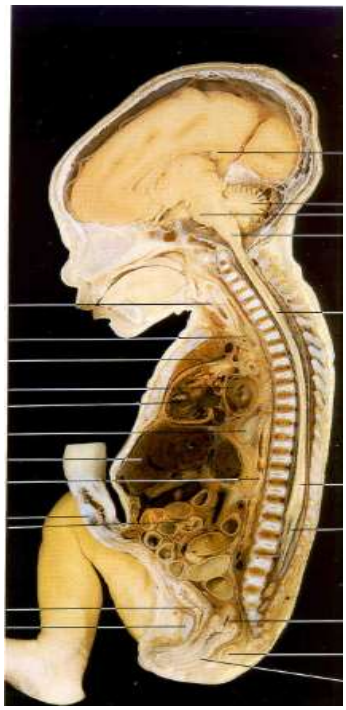
- ganglia
  - nakupení nervových bb.
  - ovoidní struktura, pouzdro z hustého vaziva
  - **satelitové buňky**

ANATOMIE CNS

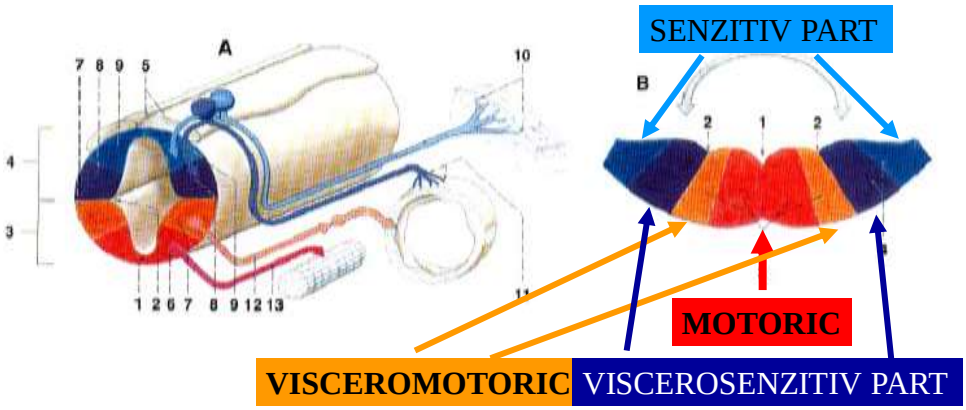


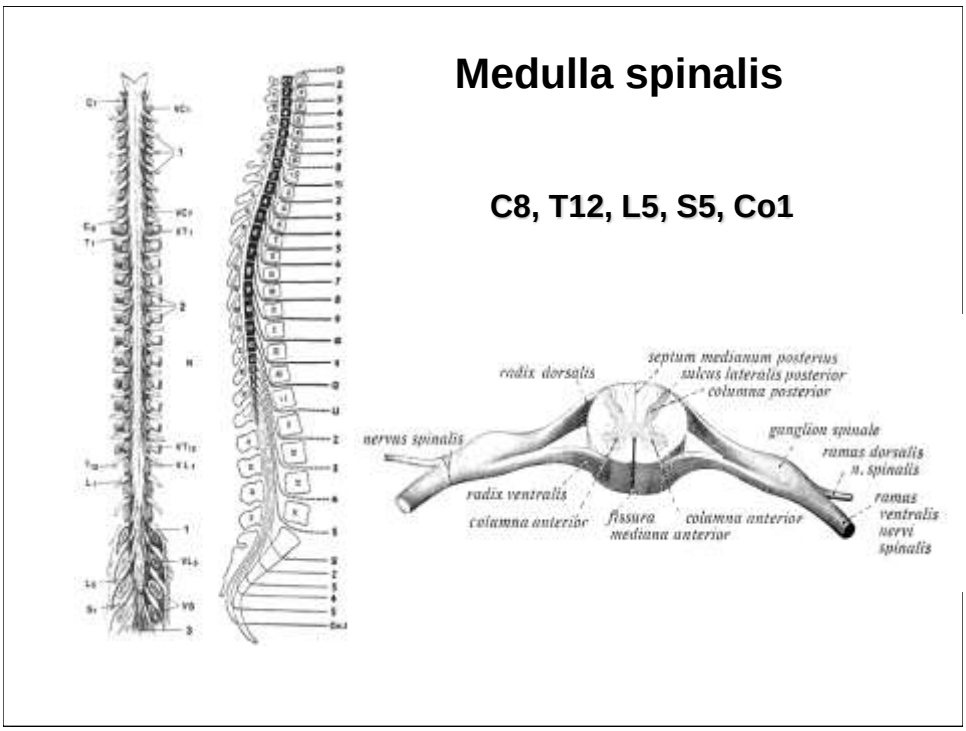
MEDULLA SPINALIS

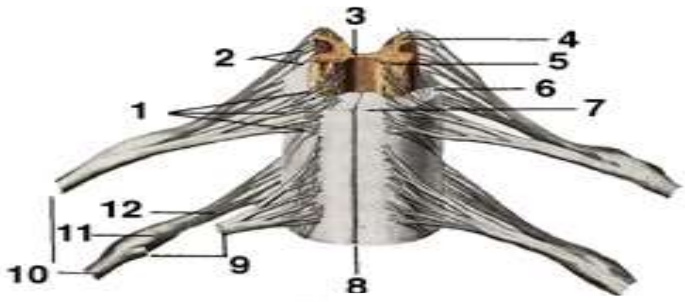




DEVELOP OF NEURAL TUBE


A
B
SENZITIV PART
MOTORIC
VISCEROMOTORIC
VISCEROSENZITIV PART


Medulla spinalis
C8, T12, L5, S5, Co1
radix dorsalis
septum medianum posterius
sulcus lateralis posterior
columna posterior
ganglion spinale
ramus dorsalis n. spinalis
nervus spinalis
radix ventralis
columna anterior
fissura mediana anterior
columna anterior
ramus ventralis nervi spinalis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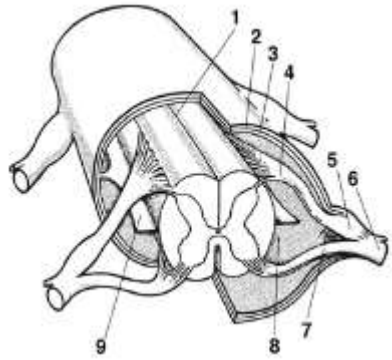
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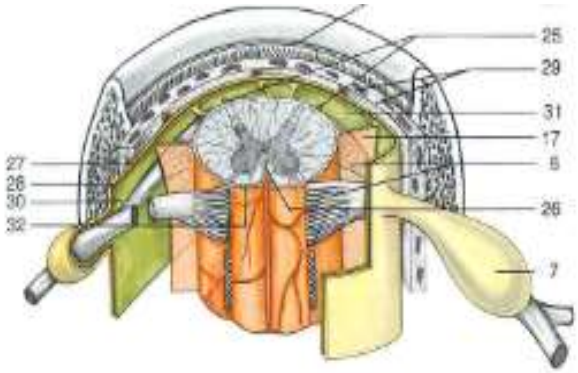
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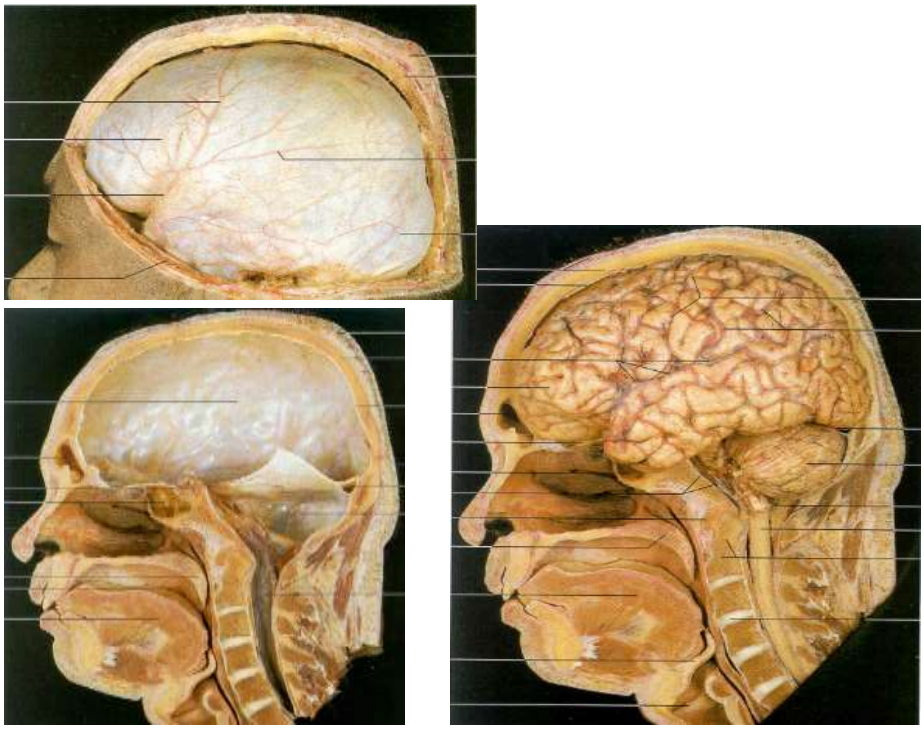
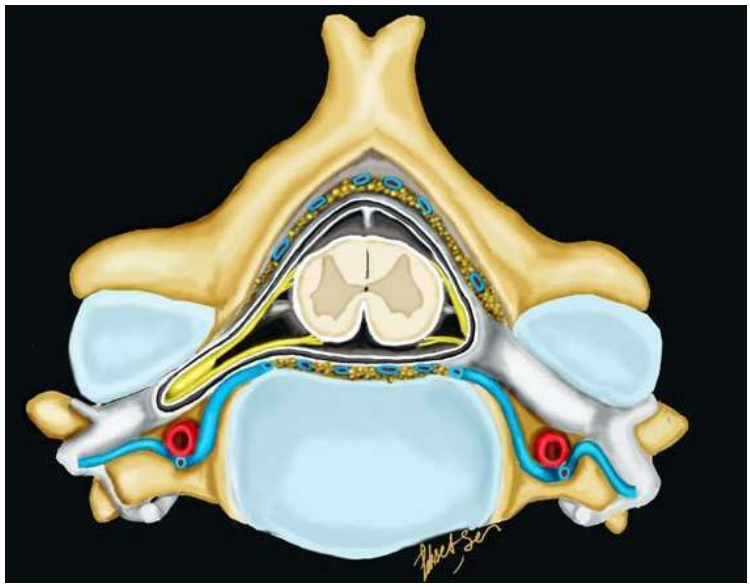
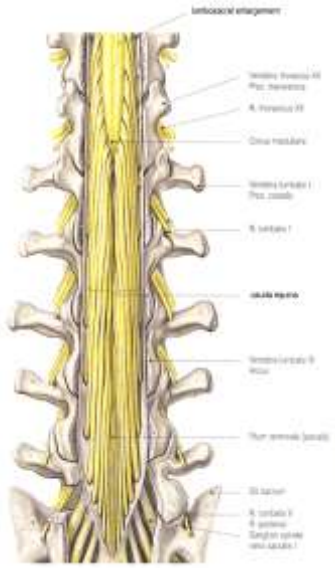
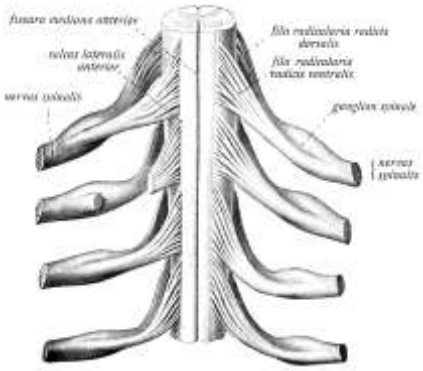




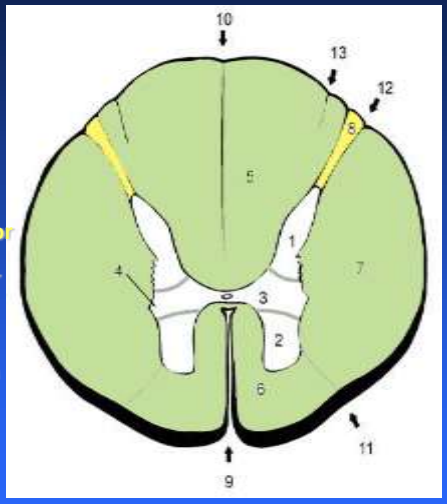


Conus Medullaris (L1-2)
Cauda Equina

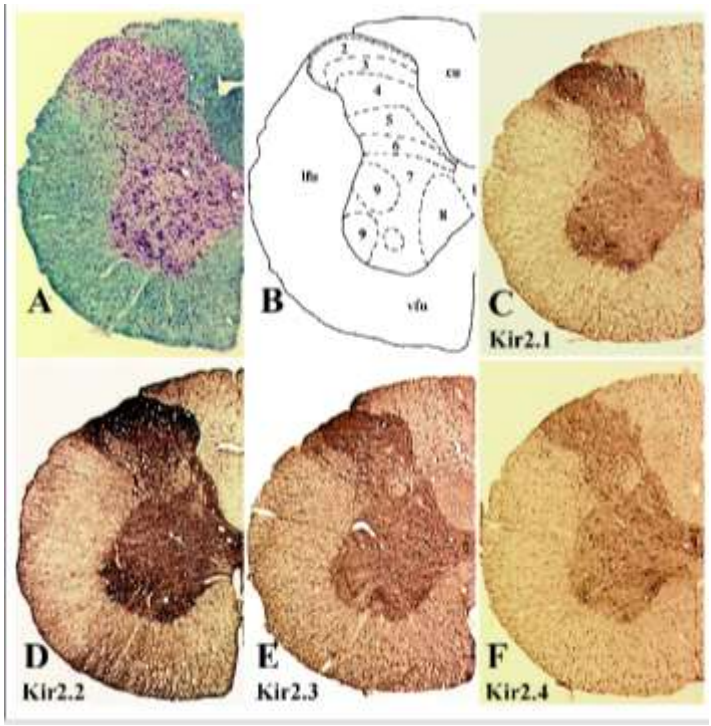
Fissura mediana anterior
Fissura anterolateralis / posterolateralis
Sulcus medianus posterior

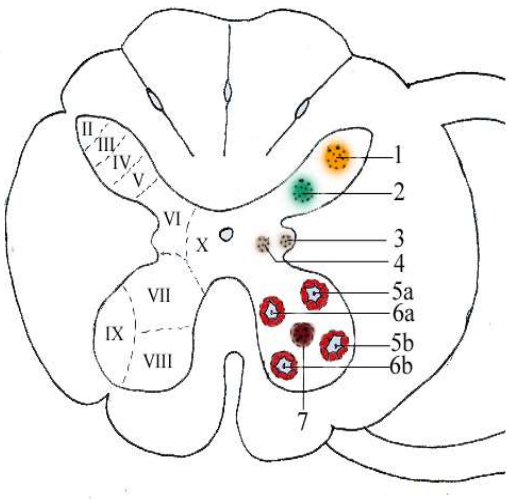


1. Cornu posterior
2. Cornu anterior
3. střední zóna
4. Cornu lateralis
5. funiculus posterior
6. funiculus anterior
7. funiculus lateral
8. Lissauerova zóna

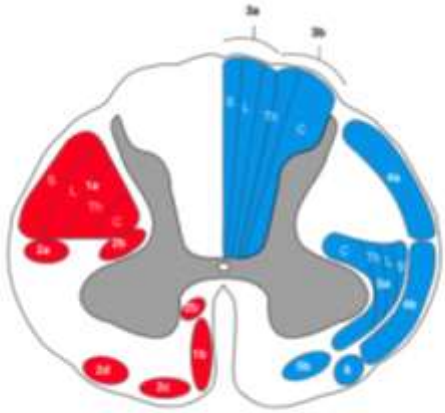


9. fissurea mediana anterior
10. sulcus medianus posterior
11. sulcus anterolateralis
12. sulcus posterolateralis
13. sulcus intermedianus posterior

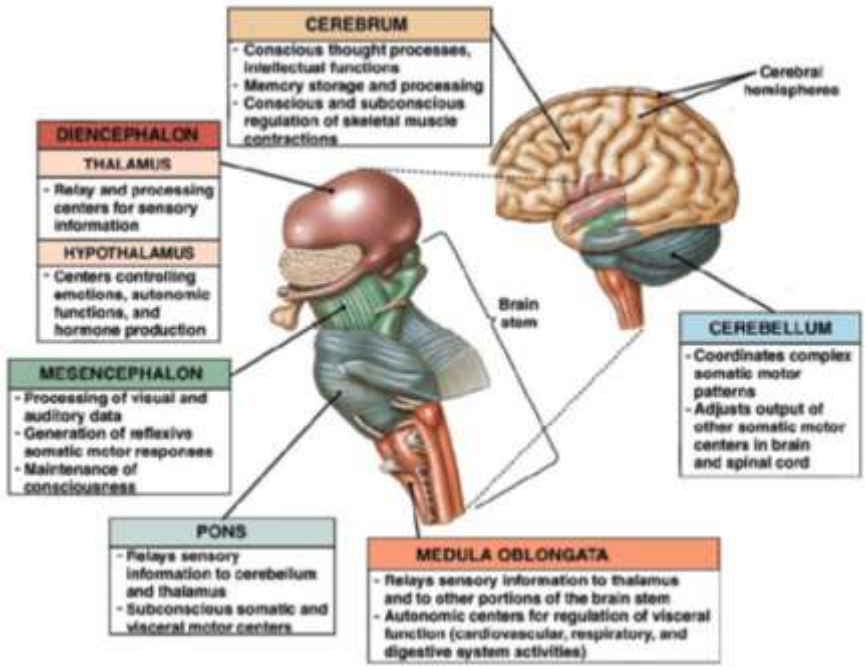




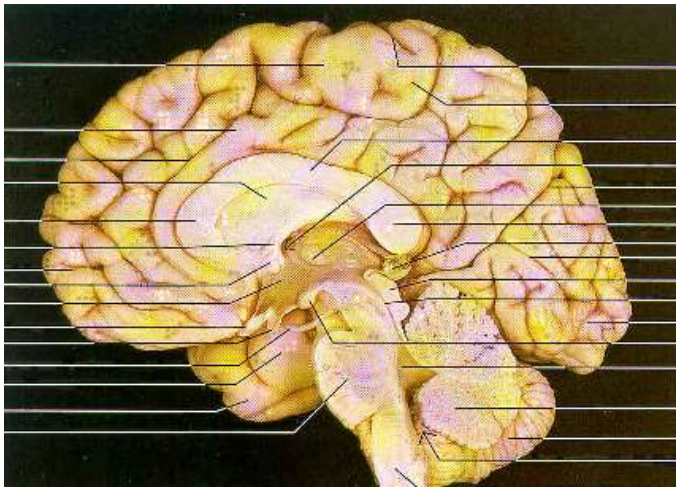
1 - nucleus proprius columnae posterioris
(začátek tractus spinothalamicus a spinotectalis)
2 - nucleus thoracicus posterior */Stilling-Clark/*
(začátek tractus spinocerebellares)
3 - nucleus intermediolateralis
4 - nucleus intermediomedialis
5a - nucleus posterolateralis
(alfa-neurony pro hypaxiální svalstvo)
5b - nucleus anterolateralis
(alfa-neurony pro hypaxiální svalstvo)
6a - nucleus posteromedialis
(alfa-neurony pro epaxiální svalstvo)
6b - nucleus anteromedialis
(alfa-neurony pro epaxiální svalstvo)
7 - gama neurony (pro svalová vřeténka)



Motorische bzw. absteigende Bahnen (links, rot)	Sensible bzw. aufsteigende Bahnen (rechts, blau)
1. Pyramidenbahn	**3. Hinterstrangbahnen**
1a. Tractus corticospinalis lateralis	3a. Fasciculus gracilis
1b. Tractus corticospinalis anterior	3b. Fasciculus cuneatus
2. Extrapyramidale Bahnen	**4. Kleinhirnseitenstrangbahnen**
2a. Tractus rubrospinalis	4a. Tractus spinocerebellaris posterior
2b. Tractus reticulospinalis	4b. Tractus spinocerebellaris anterior
2c. Tractus vestibulospinalis	**5. sensible Vorderseitenstrangbahnen**
2d. Tractus olivospinalis	5a. Tractus spinothalamicus lateralis
	5b. Tractus spinothalamicus anterior
Somatotopische Gliederung:	
S: Fasern aus Sakralmark, **L:** aus Lumbalmark	6. Tractus spinoolivaris
Th: aus Thorakalmark, **C:** aus Zervikalmark	

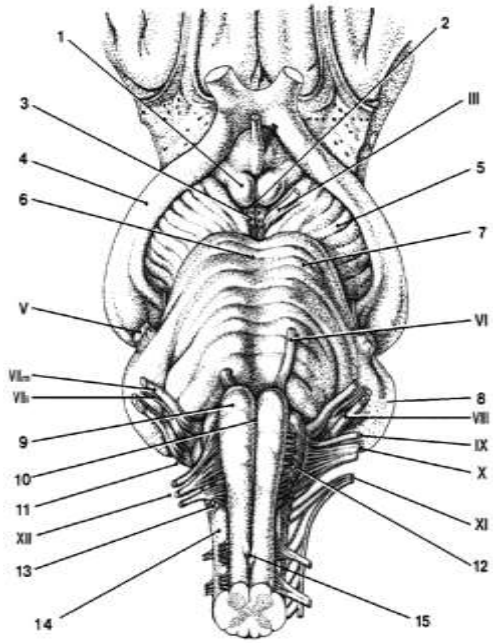


BRAIN STEM



MEDULLA OBLONGATA

PONS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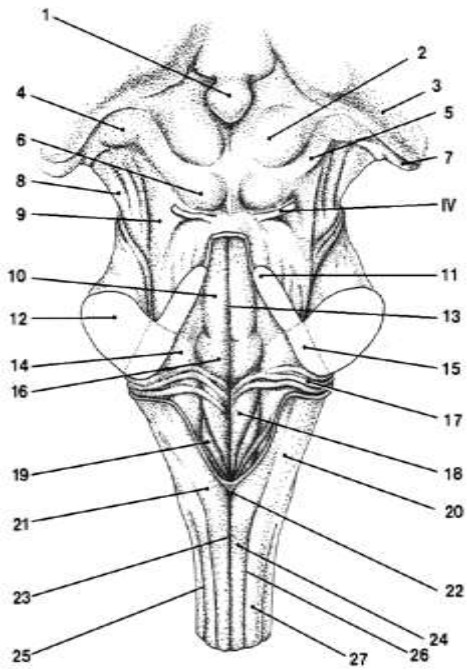
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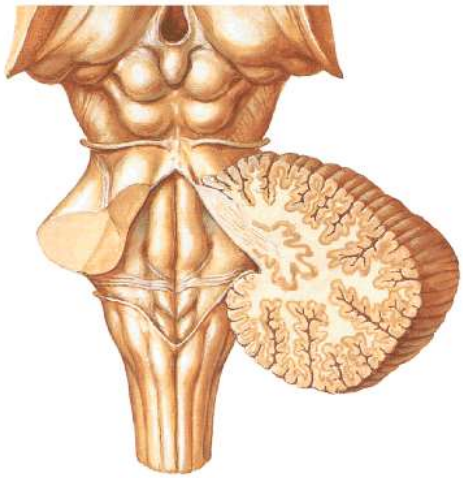
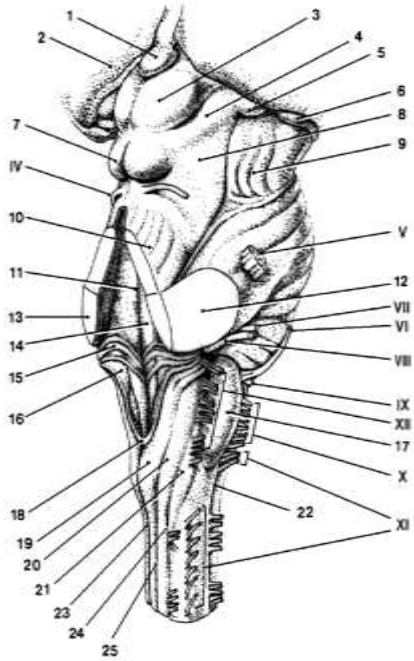
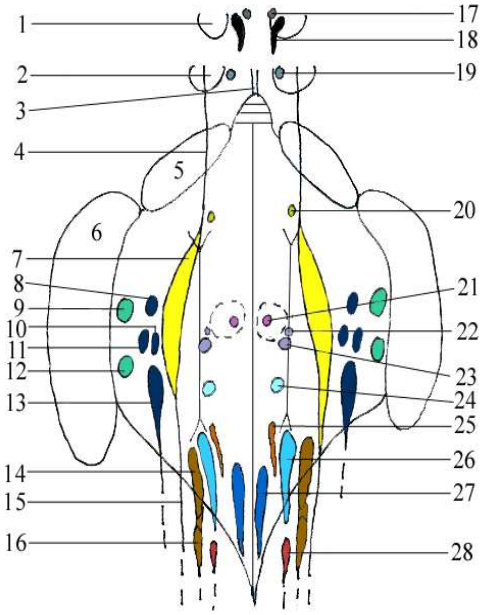
Fourth Ventricle and Cerebellum

Posterior View

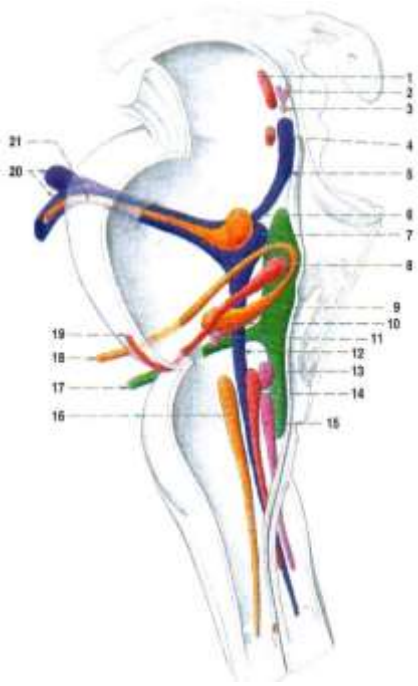




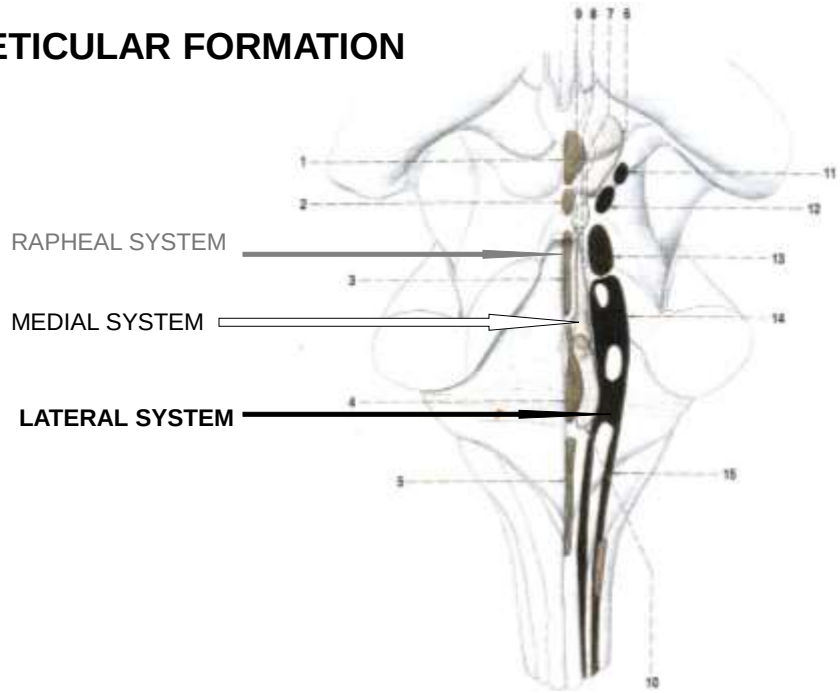
Brainstem
Posterolateral View



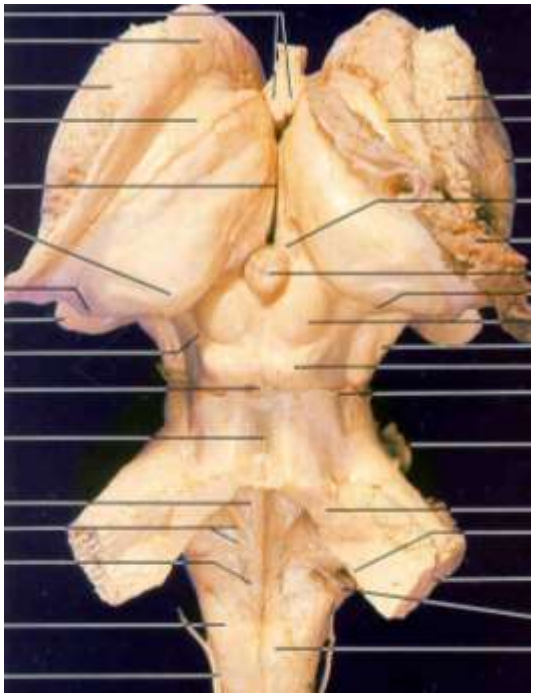
1 - colliculus superior
2 - colliculus inferior
3 - frenulum veli medullaris superioris
4 - tractus mesencephalicus n. V.
5 - pedunculus cerebellaris superior
6 - pedunculus cerebellaris medius
7 - nucleus principalis n. V.
8 - nucleus vestibularis superior /*Bechtěrev*/
9 - nucleus cochlearis posterior
10 - nucleus vestibularis medialis /*Schwalbe*/
11 - nucleus vestibularis lateralis /*Deiters*/
12 - nucleus cochlearis anterior
13 - nucleus vestibularis inferior /*Roller*/
14 + 16 - nuclei tractus solitarii
15 - tractus spinalis n.V.
17 - nucleus accessorius n. III. /*Edinger-Westphal*/
18 - nucleus n III.
19 - nucleus n. IV.
20 - nucleus motorius n. V.
21 - nucleus n. VI.
22 - nucleus salivatorius superior
23 - nucleus n. VII.
24 - nucleus salivatorius inferior
25 - nucleus posterior (dorsalis) n. X.
26 - nucleus ambiguus
27 - nucleus n. XII.
28 - nucleus n. XI. (= součást ncl. ambiguus a retroambiguus)

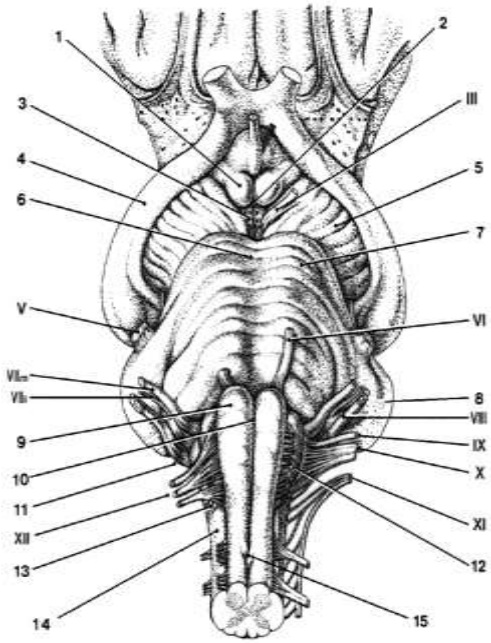


RETICULAR FORMATION



MEZENCEPHALON

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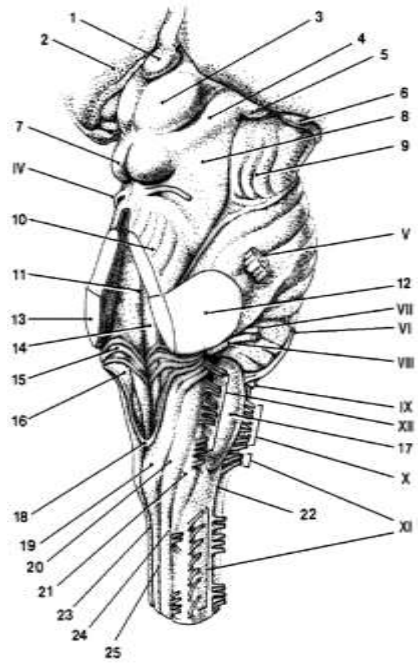
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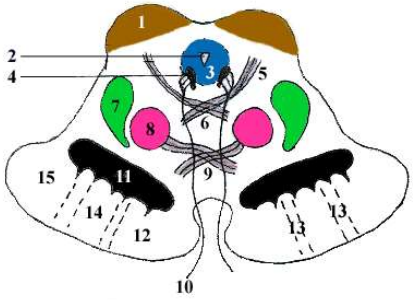
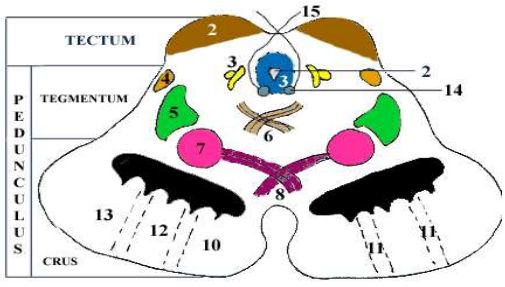
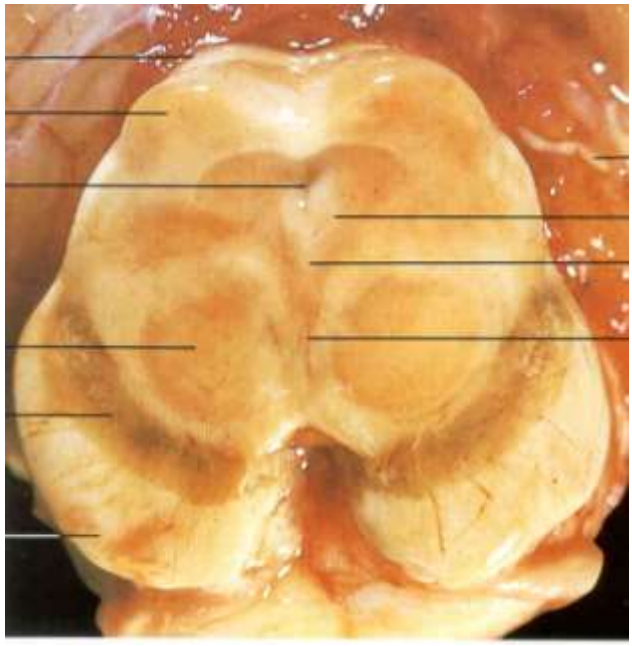
Brainstem

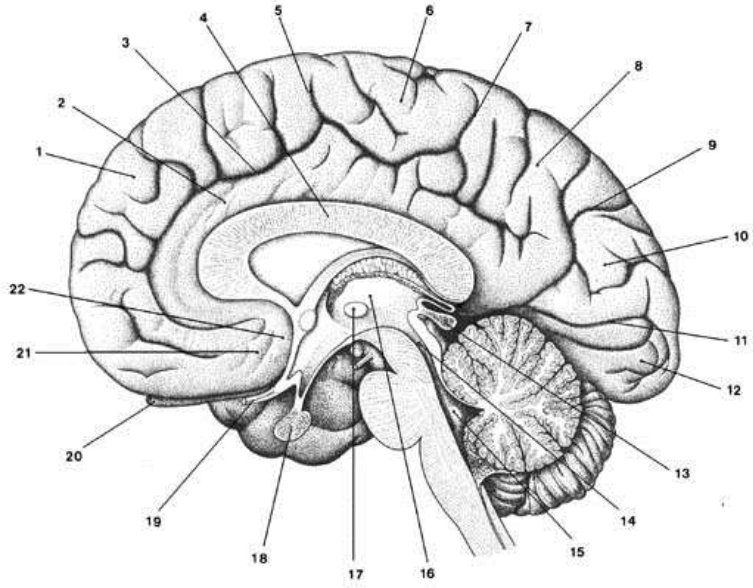
Posterolateral View







CEREBELLUM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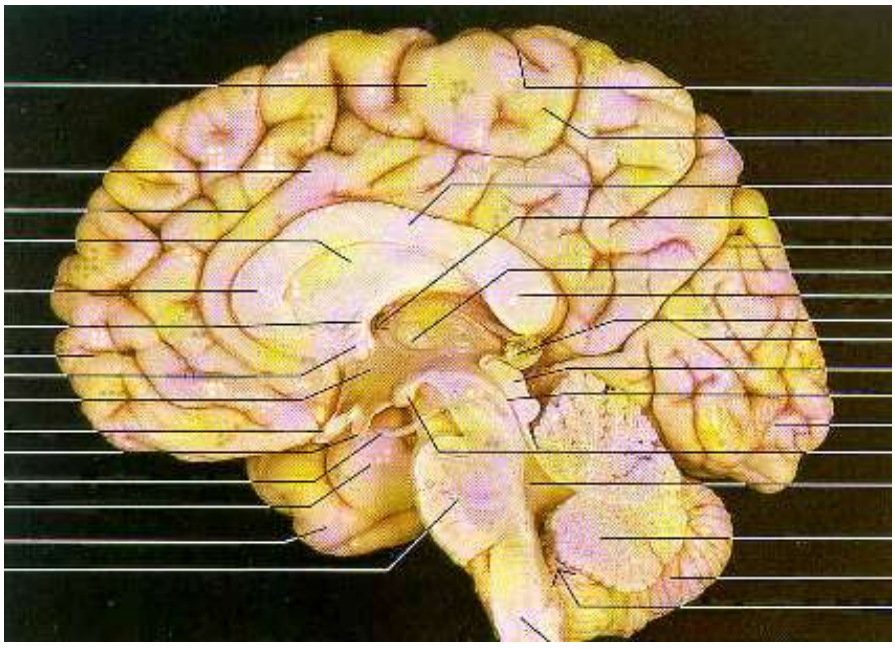

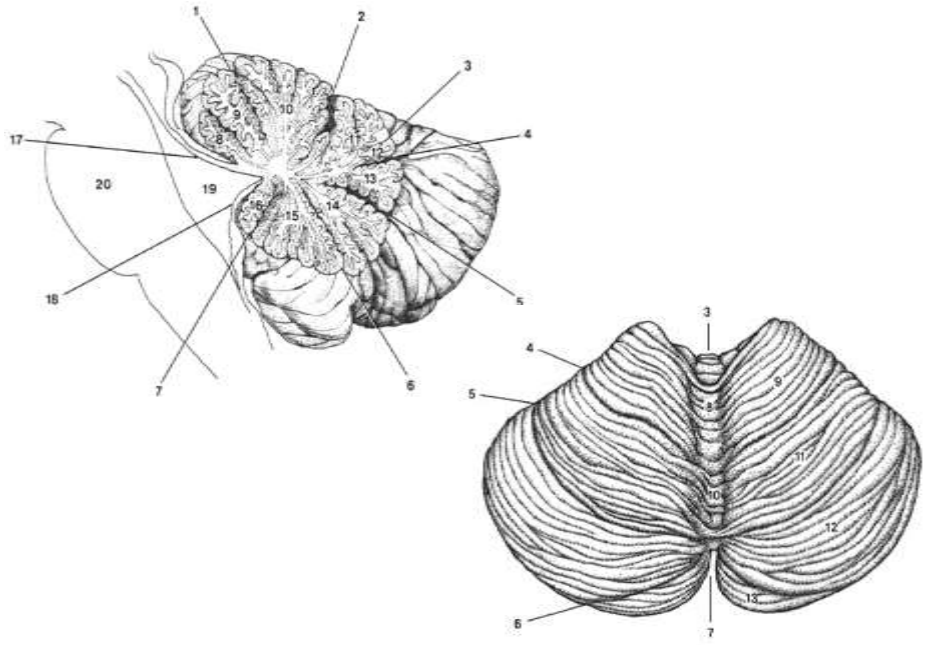
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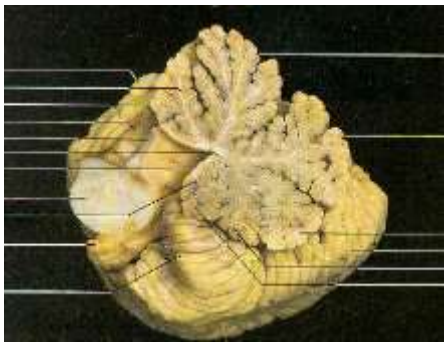
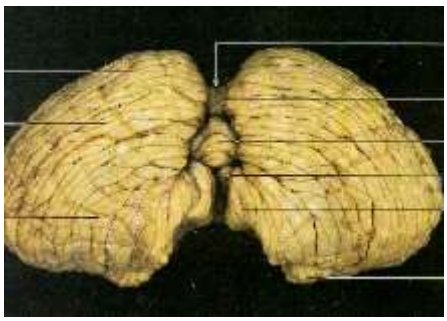
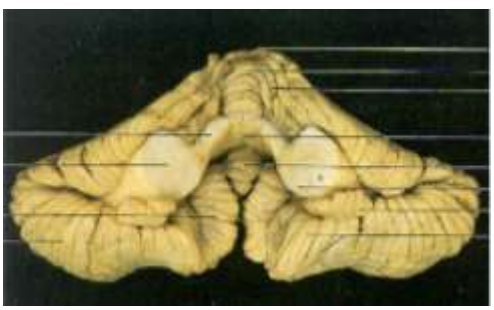
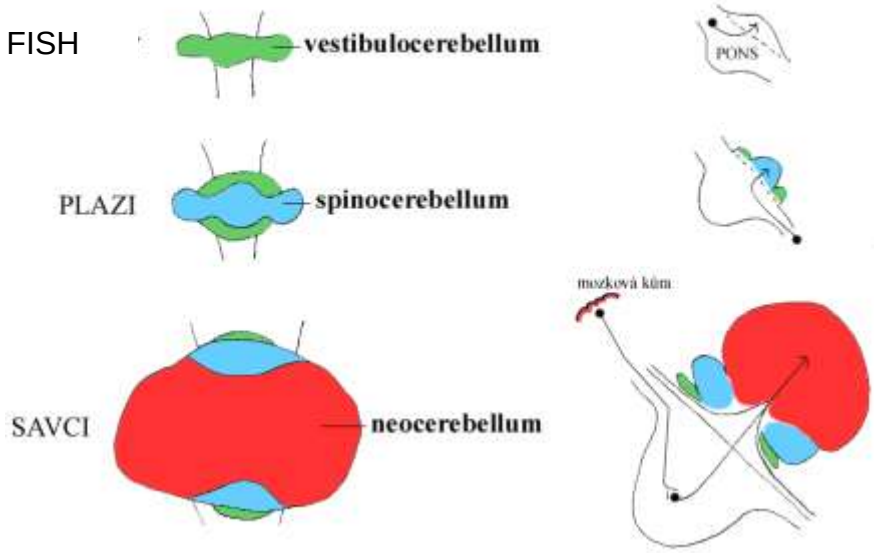


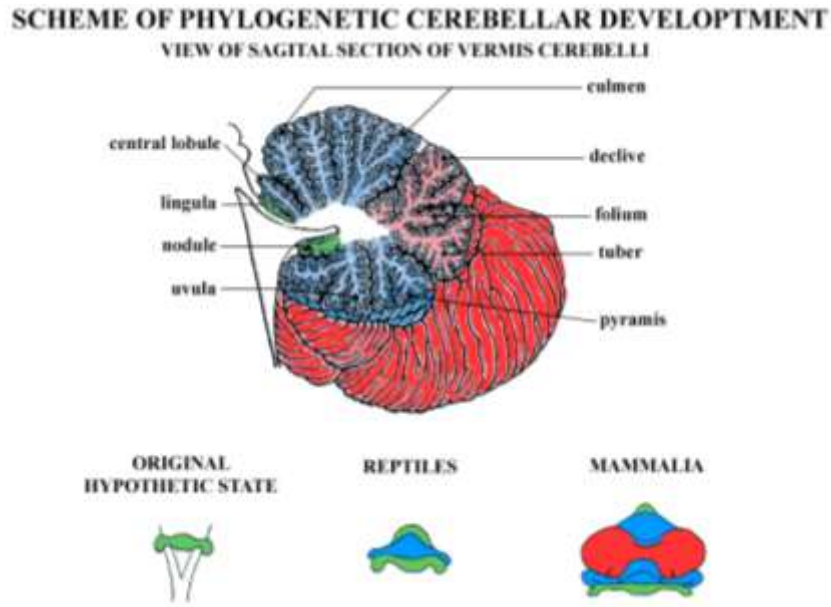


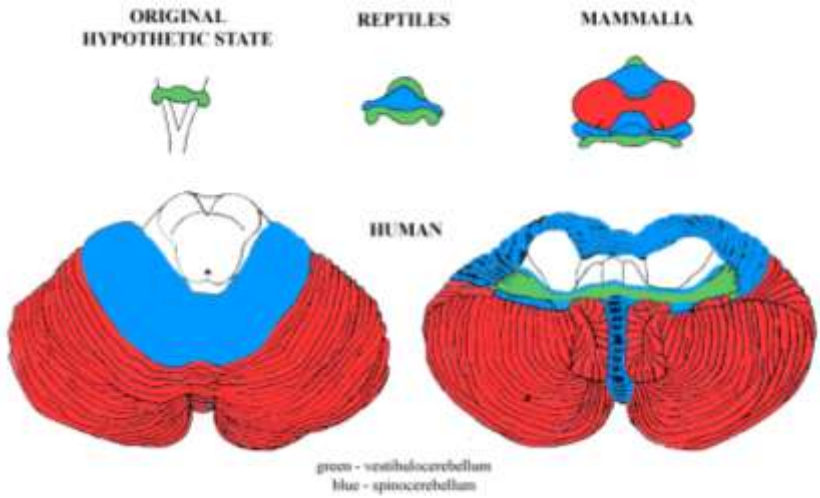


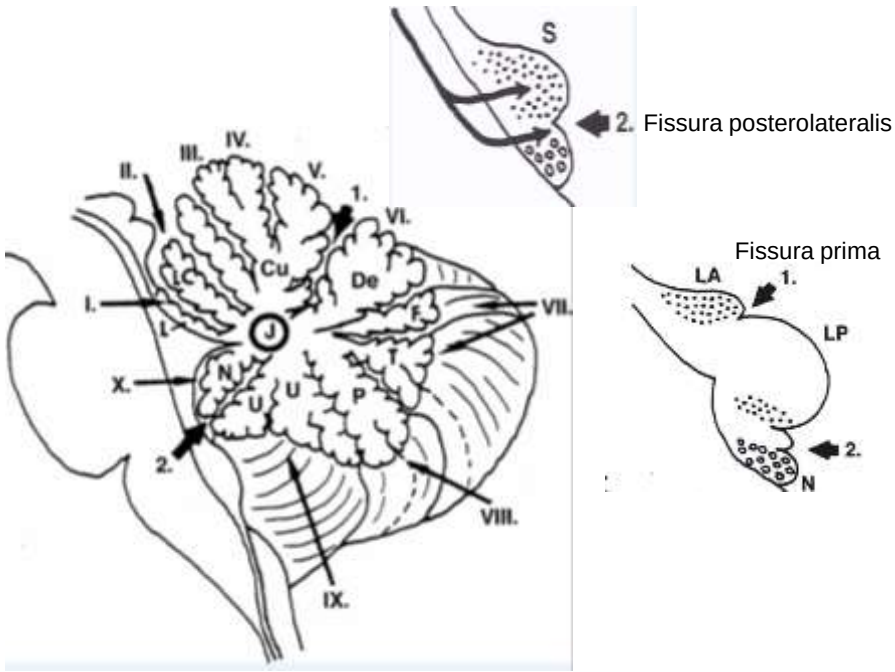
CEREBELLUM

DORSAL WIEW **LATERAL WIEW**






ORIGINAL
HYPOTHETIC STATE
REPTILES
MAMMALIA
HUMAN
green - vestibulocerebellum
blue - spinocerebellum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Fissura posterolateralis
II.
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Fissura prima
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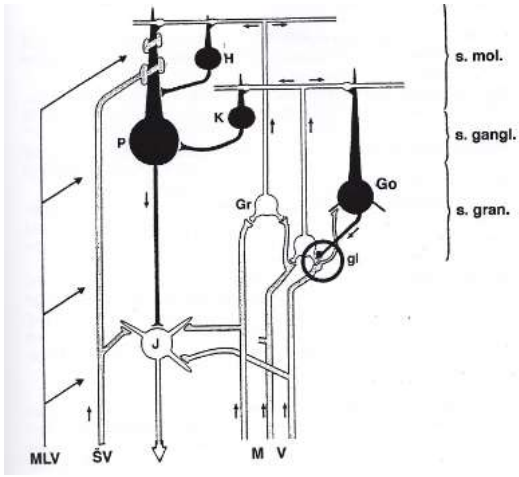
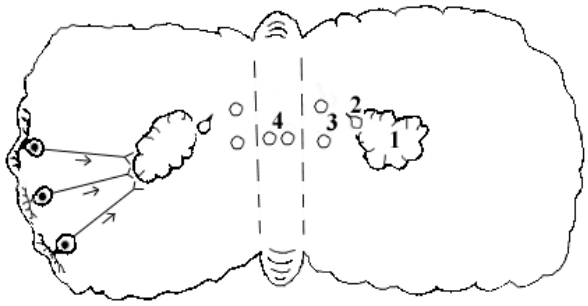


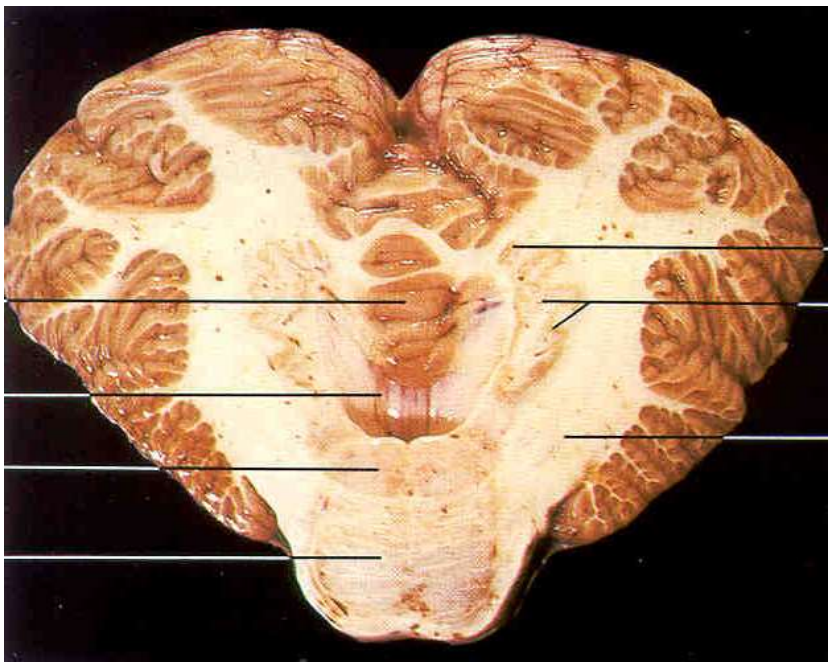
SCHEMA OF CEREBELLAR NUCLEI



1 - dentate nucleus
(ncl. lateralis cerebelli)
2 - emboliform nucleus
(ncl. interpositus anterior)
3 - globose nucleus
(ncl. interpositus posterior)
4 - fastigial nucleus
(ncl. medialis cerebelli)

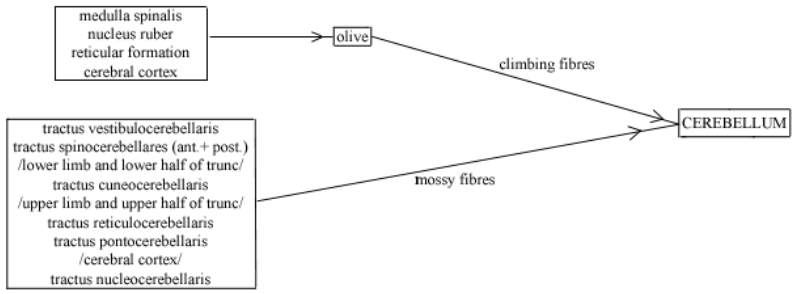
Cerebellum

Section in Plane of Superior Cerebellar Peduncle

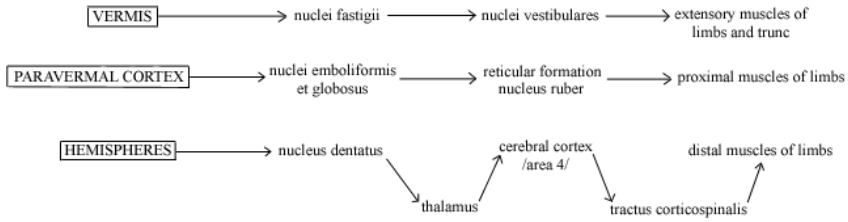


total index of afferent and effernet impulse = 40 : 1

CEREBELLAR AFFERENTATION

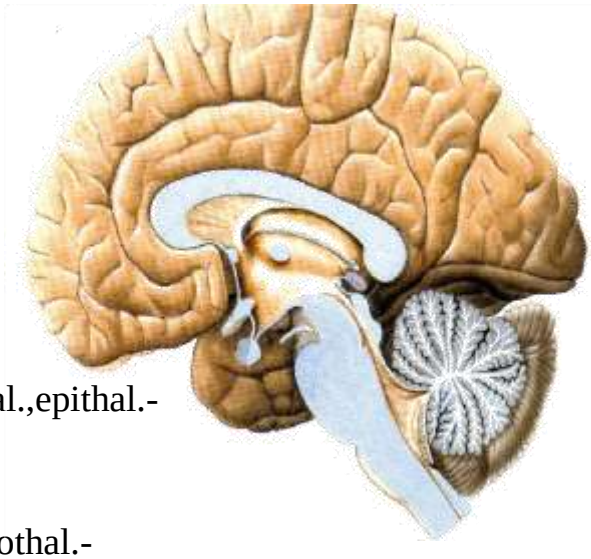


CEREBELLAR EFFERENTATION

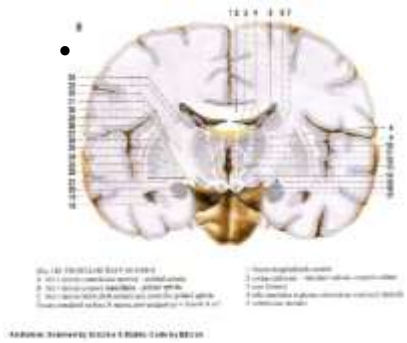


DIENCEPHALON

- Epithalamus
- Thalamus
- Metathalamus
- Subthalamus
- Hypothalamus

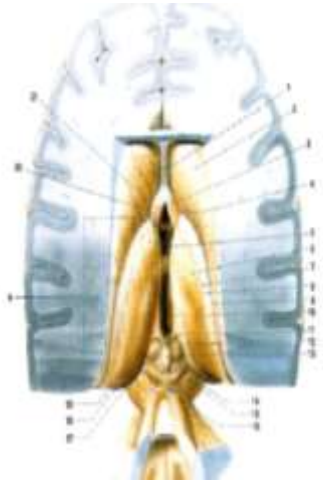


- Dorsalníč.-thalamus,methatal.,epithal.-senzitivita
- Ventrálně-subthalamus,hypothal.-motorika(viscero)



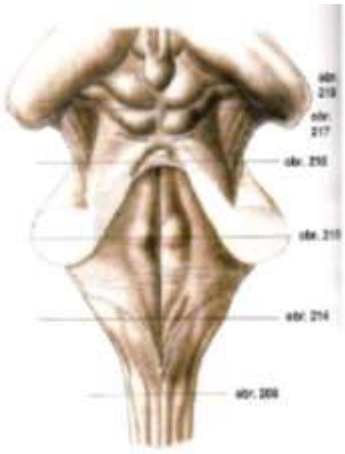
EPITHALAMUS

- Strpo III.komory- tela chorioidea
- taenia thal.-stria medullaris th.(dráhy)
- Epithal.- trigonum habenulare
- Habenula-spojení+křížení-commissura habenularum
- Corpus pineale-epifysa
- Nc.habenulares-med.+lat.-do nc.interpeduncularis,RF
- Commissura posterior-zad.nc.thalamu+coll.sup.+nc.pretekt.+ fasc.longitud.med. (okohyb.nc.)



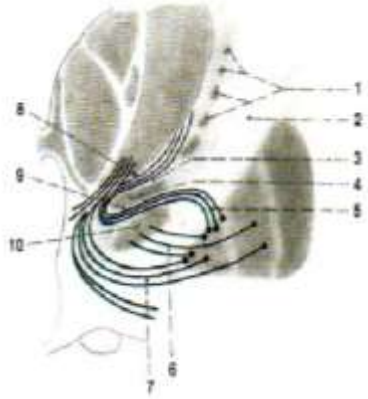
METATHALAMUS

- **Corpus geniculatum laterale-** z coll.sup.- přes brachium coll.sup.
- **Nc.corporis genic.later.-** radiatio optica
- **Corpus geniculatum mediale-**z coll.inf.-přes brachium coll.inf
- **Nc.corporis gen.med.-** radiatio acustica



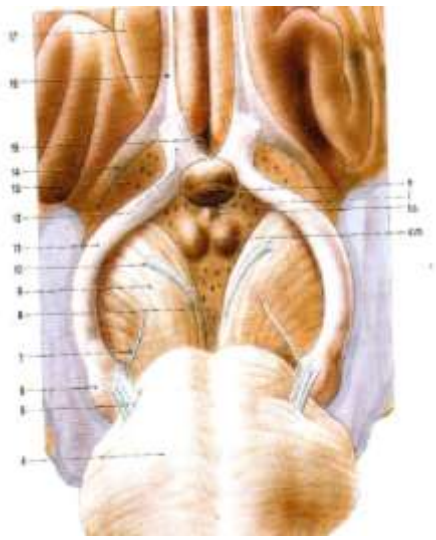
SUBTHALAMUS

- Kaudálně,ventrálně od thalamu
- Zevně od hypothalamu
- **Nc.subthalamicus**-spoje s nc.pallidus-motor.
- **Zona incerta**-nad nc.subth.-motor.
- **Fascic.thalamicus**-Forelovo pole H1-z gl.pal.+mozečku
- **Fascic.lenticularis**-Forelovo pole H2- z gl.pal. do thal.
- **Ansa lenticularis**-z gl.pal.,k fasc.lent.a thal. do HYPOTH:!
- **Fasc.subthalamicus**-spoj gl.pal.s nc.subth. (vzadu skrz caspsula int)

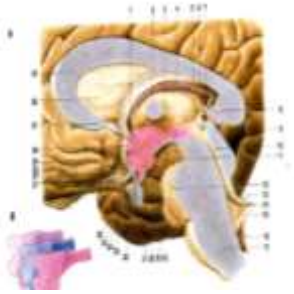


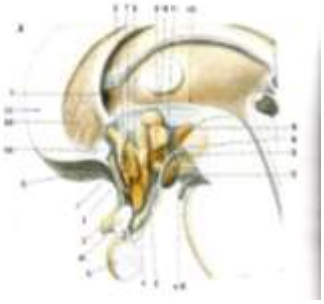
HYPOTHALAMUS

- Visceromotor. Zóna
- Corpora mamillaria
- Tuber cinereum
- Infundibulum –hypofysa (reces.infundibuli)
- Lamina terminalis-vpředu
- Later.hranice-capsula interna,subthalamus

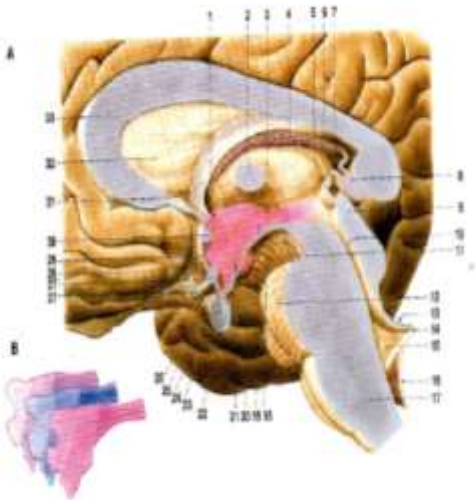


- Nuclei-areae
- neuroendokrinní fce, autonnom.regul. (čich.dr.,limb.sy.)
- **Podélné zóny-**
- -periventikulární
- -mediální
- -laterální
- **Příčné dělení-**
- -přední hypoth.-area preoptica +hypothalamica anterior
- -střední hypoth.-nc.tuberales +area hypothalamica dorsalis
- -zadní hypoth.-area hypothalamica posterior +nc.corporis mamillaris



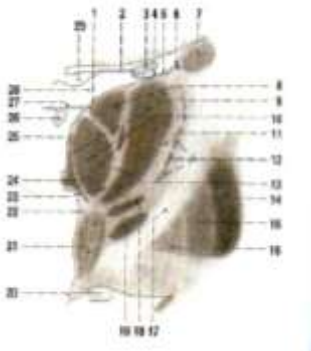


- BÍLÁ HMOTA
- **Fornix**
- **Fasc.mamill.princeps-** fasc.mamillothalamicus (nc.anteriores thal.)
- Fasc.mamillotegment.-RF
- **Stria terminalis**-z corpus amigd. do hypoth.
- **Stria medularis thalami**-z hypoth. do habenuly
- **Fasc.prosencephalicus**- z mozk.kůry,z RF
- **Pedunculus mamill**.-do RF kmene a zpět
- **Fasc.longitud.posterior-** mediál.zóna hypoth. do autonom.jader hl. nervů

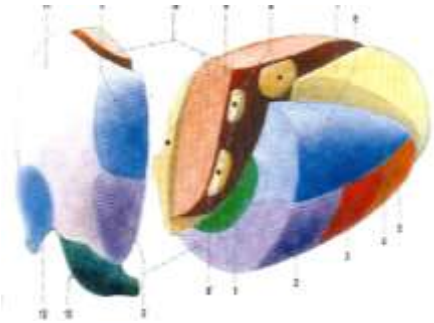


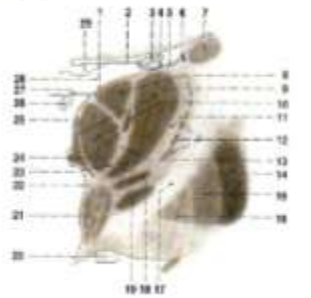
THALAMUS

- Tuber anterius-pulvinar
- Adhesio interthalamica
- Fissura telodiencephalica-
- dorsál.volná č. thal.nad III.kom.
- Taenia choroidea-lamina affixa-
- -stria terminalis- v.talamostriata sup.
- Basálně-subthal.,hypoth.
- Okcipitálně-metathal.

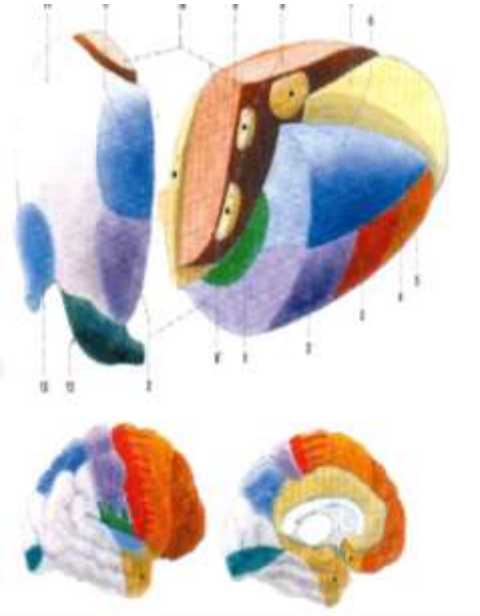


- Lamina medullaris later.
- Lamina medularis med.
- JÁDRA:
- Nc.anteriores
- Nc.mediani
- Nc.mediales
- Nc.ventrales-ventrolaterales
- Nc.reticulares
- Nc.intralaminares
- Nc.posteriores
- „brána vědomí“-senzitivita
- ,-motor jádra –z mozečku, gl.palidus,RF subst. nigrae

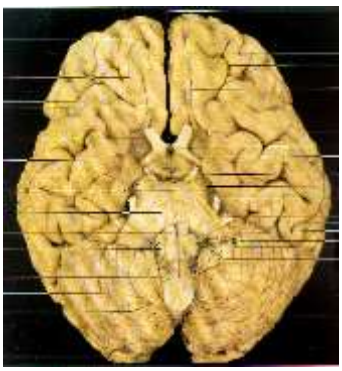


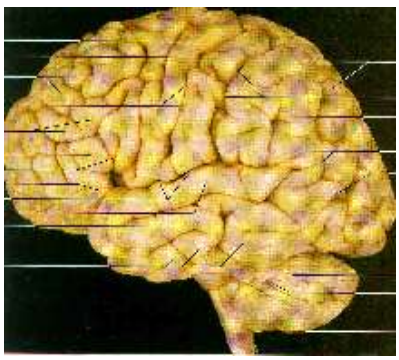


- Spoj s hypoth.-pedunculus thalamicus inf.
- Radiationes thalami-skrz capsula interna
- Radiatio th. ant.
- Radiatio th. centralis
- Radiatio th posterior-radiatio optica+radiatio acustica



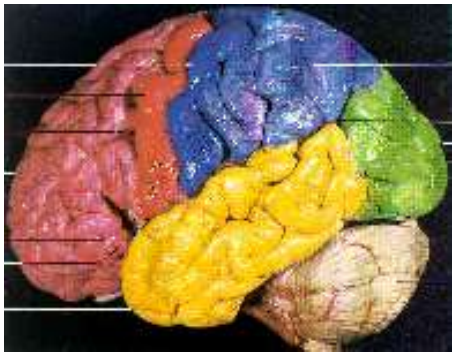
CNS - TELENCEPHALON

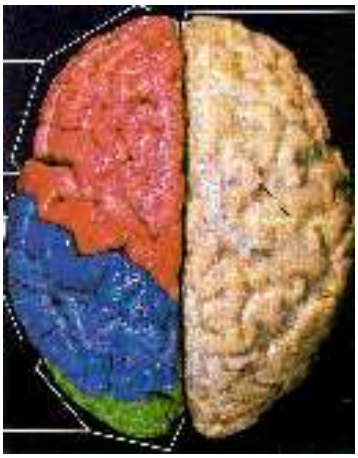


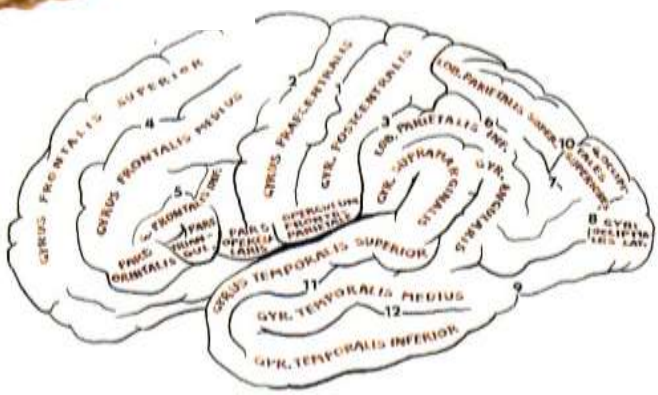


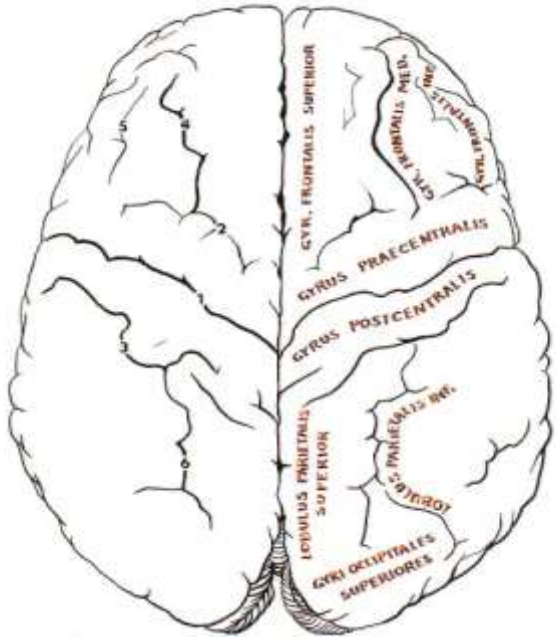
Cerebrum - Lobes

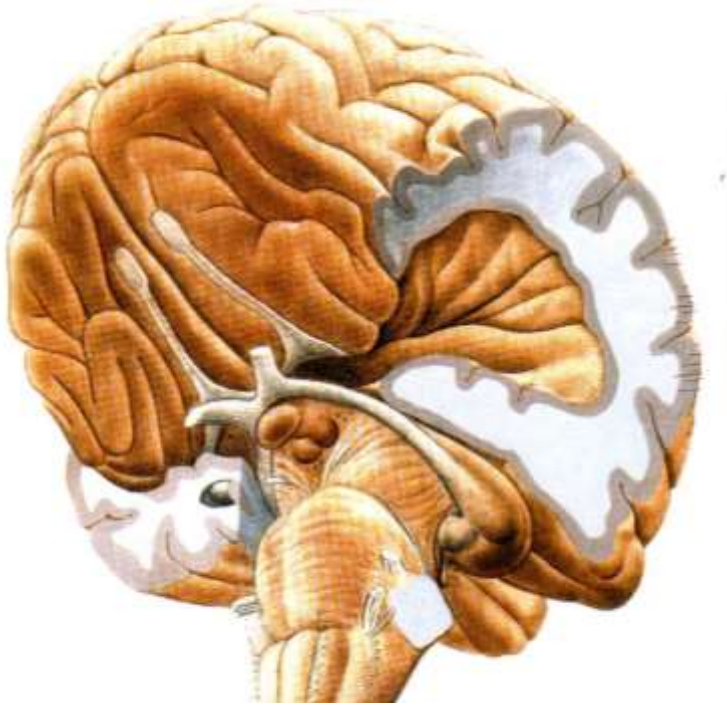
Lateral View

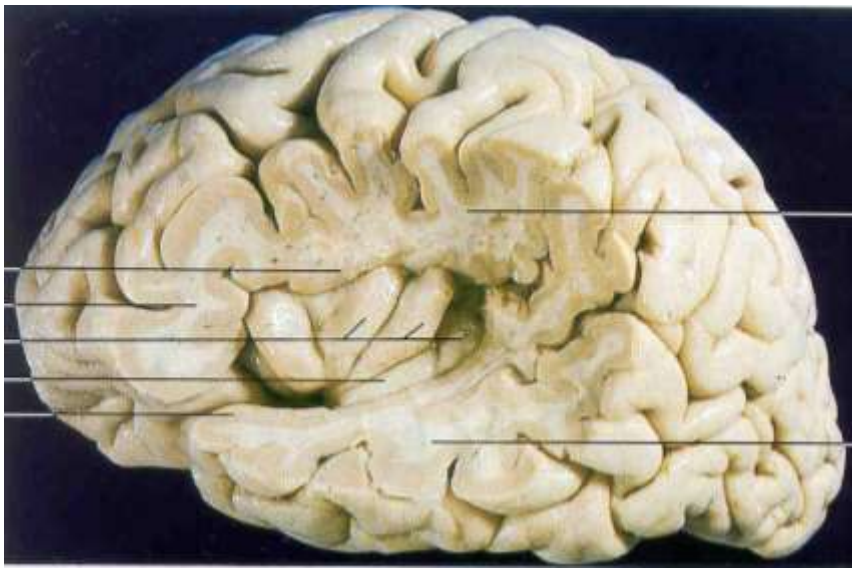


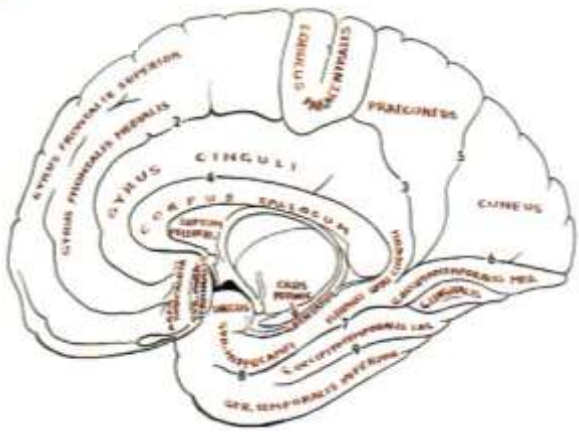


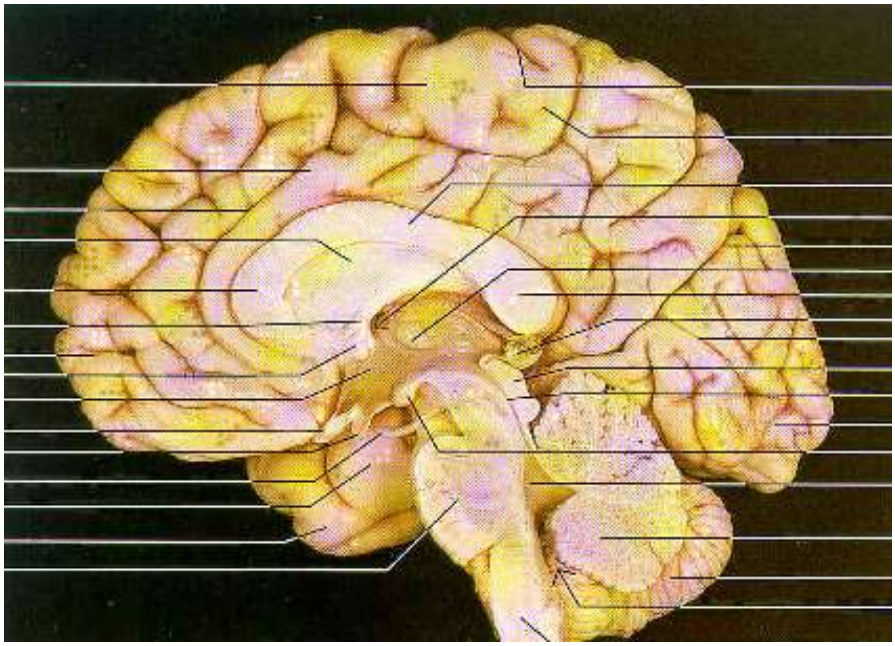


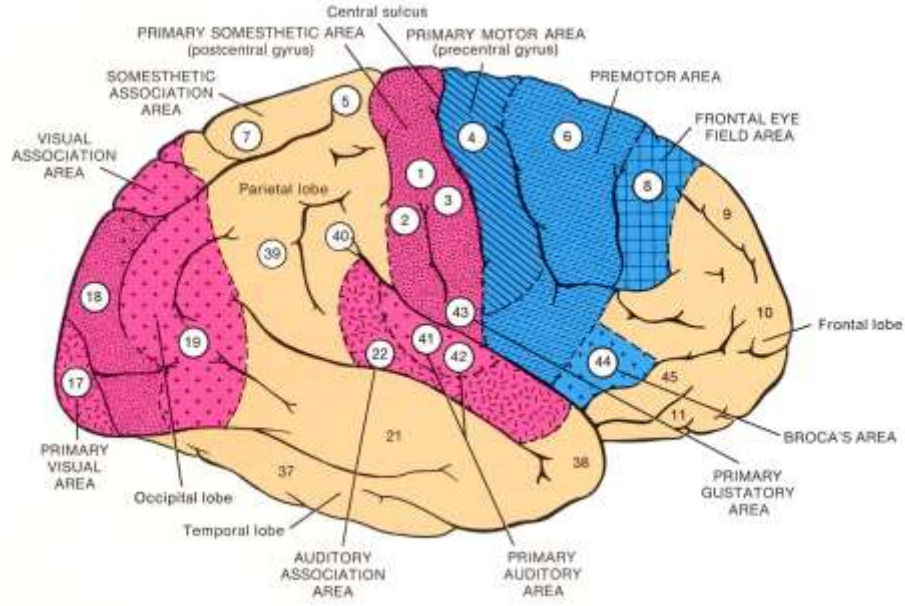

GYR. FRONTALIS SUPERIOR
SULCUS PRAECENTRALIS
GYR. FRONTALIS MED.
GYRUS PRAECENTRALIS
SULCUS CENTRALIS
GYRUS POSTCENTRALIS
LOBULUS PARIETALIS SUPERIOR
SULCUS INTERPARIETALIS
GYRI OCCIPITALES SUPERIORES






GYRUS
CINGULI
CORPUS
SULCUS
PRAECUNEUS
CUNEUS




Central sulcus
PRIMARY SOMESTHETIC AREA (postcentral gyrus)
PRIMARY MOTOR AREA (precentral gyrus)
SOMESTHETIC ASSOCIATION AREA
PREMOTOR AREA
FRONTAL EYE FIELD AREA
VISUAL ASSOCIATION AREA
Parietal lobe
Frontal lobe
BROCA'S AREA
PRIMARY GUSTATORY AREA
PRIMARY VISUAL AREA
Occipital lobe
Temporal lobe
AUDITORY ASSOCIATION AREA
PRIMARY AUDITORY AREA
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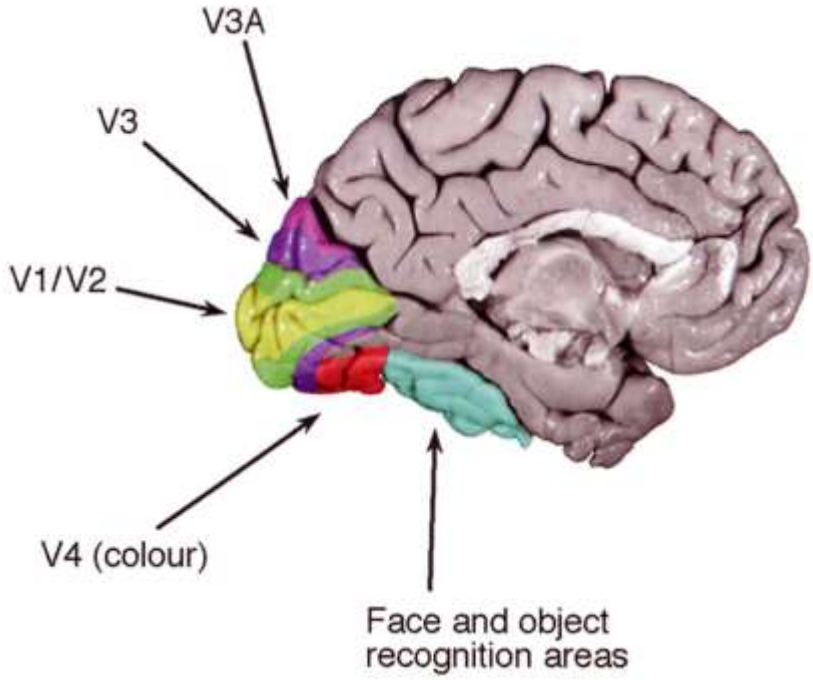
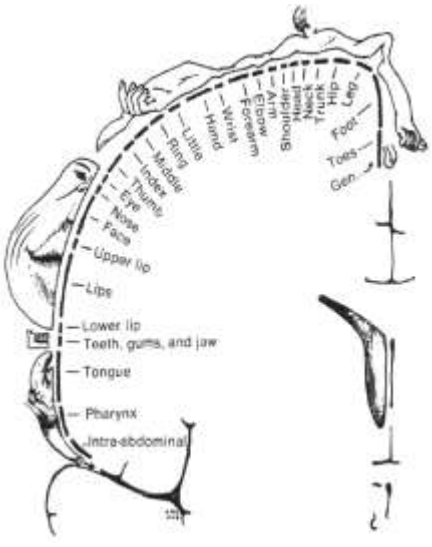


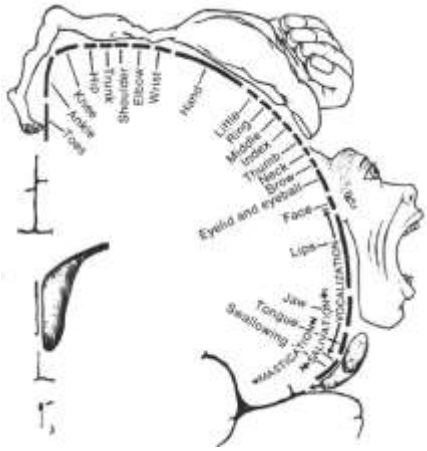
Sensory Homunculus



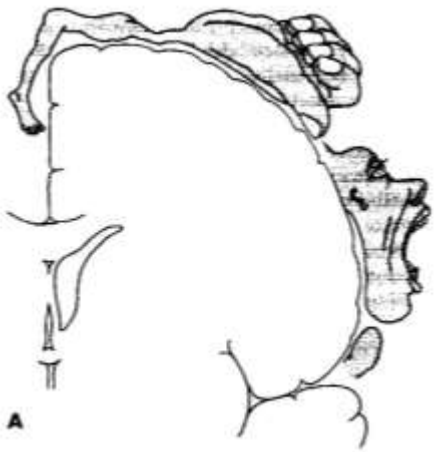
Motor Areas

- **primary motor area (M I) - area 4**
- **premotor Area (PM) – area 6**
- **supplementary motor area (SMA) – area 6**
- **frontal eye field** – area 8

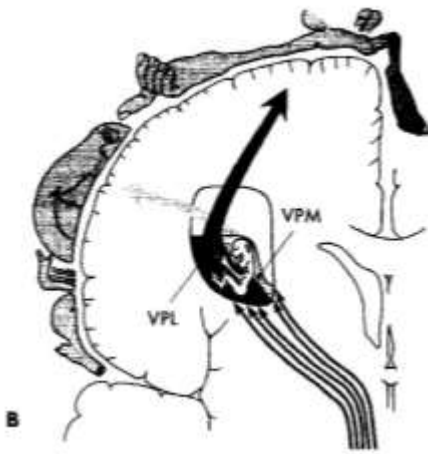
Motor Homunculus

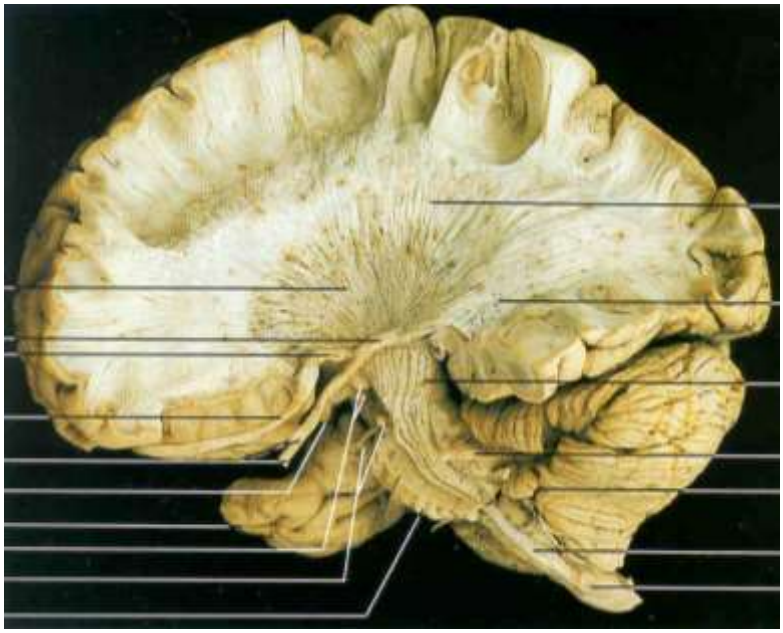


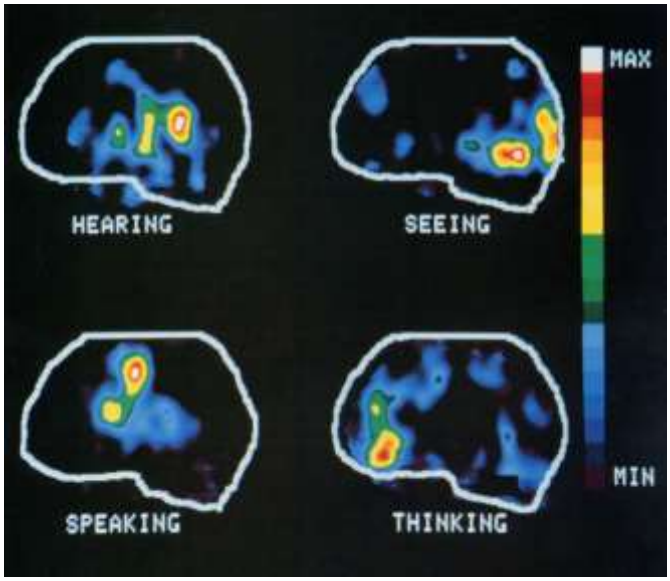
MOTORIC



SENSORY

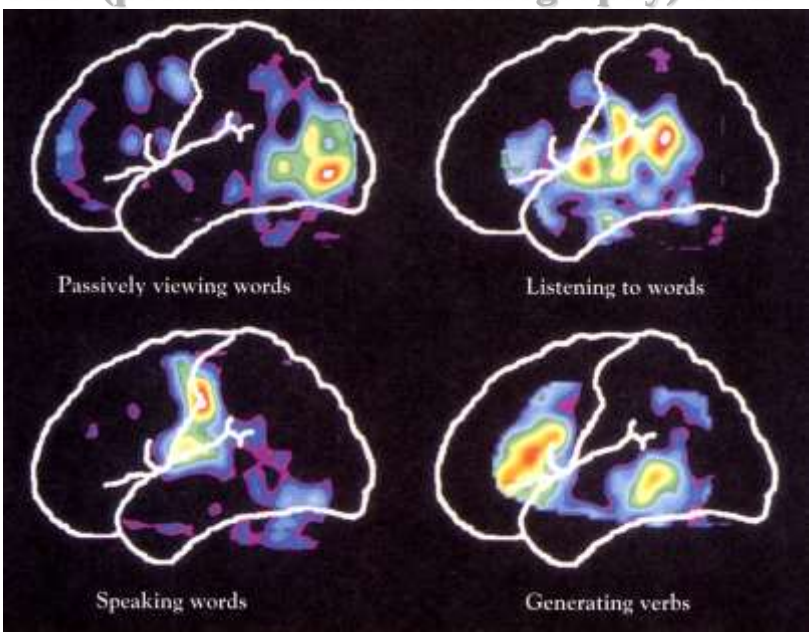




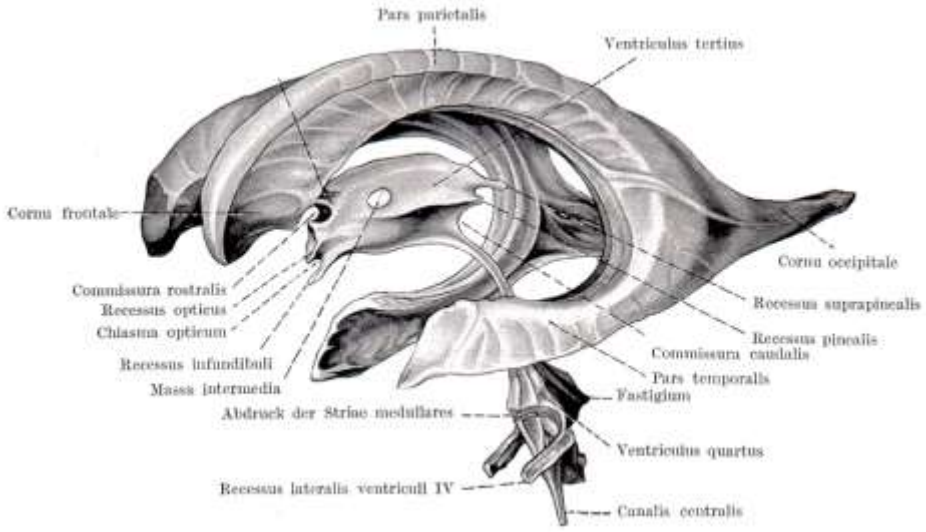


PET (positron emission tomography) scan

PET (positron emission tomography) scan



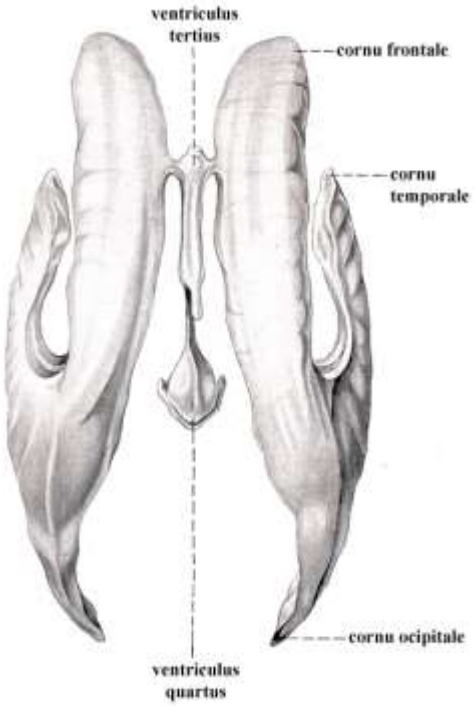
CEREBROSPINAL FLUID

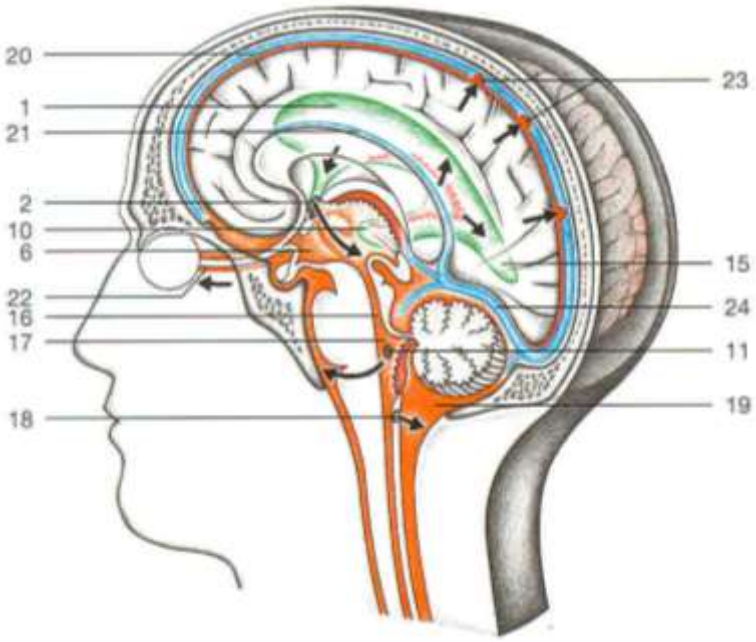


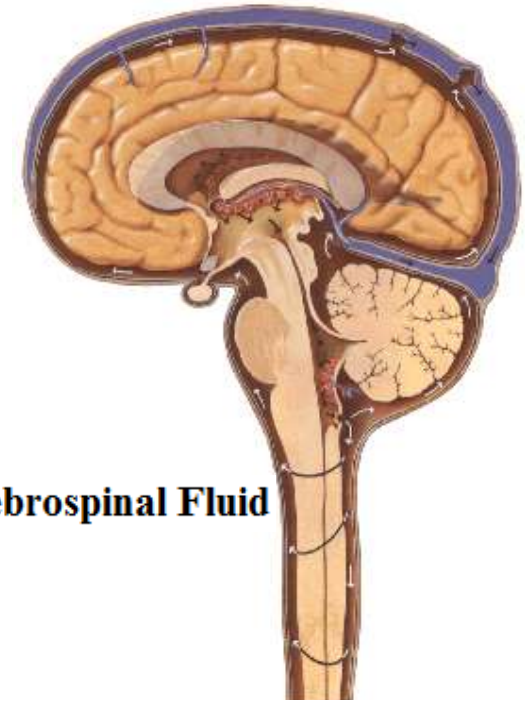
Ventriculus lateralis (paired)

- cornu frontale/anterius
- pars centralis (atrium)
- cornu occipitale/posterius (bulbus) – calcar avis, eminentia collateralis
- cornu temporale/inferius - hippocampus

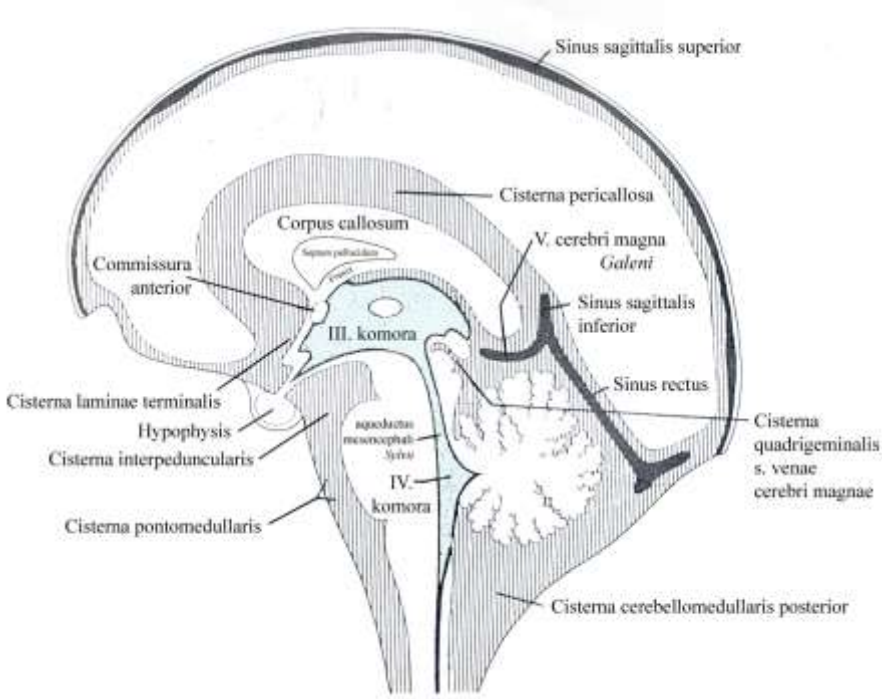
- stria terminalis
- lamina affixa
- taenia choroidea





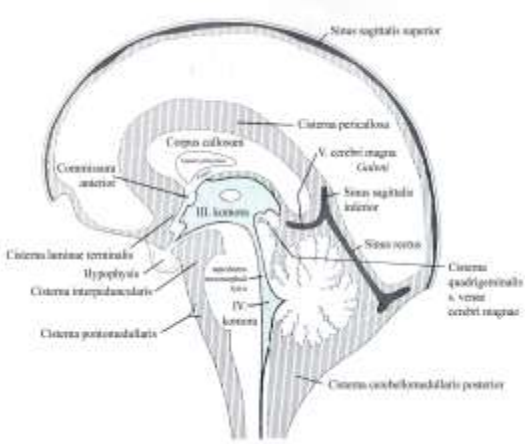


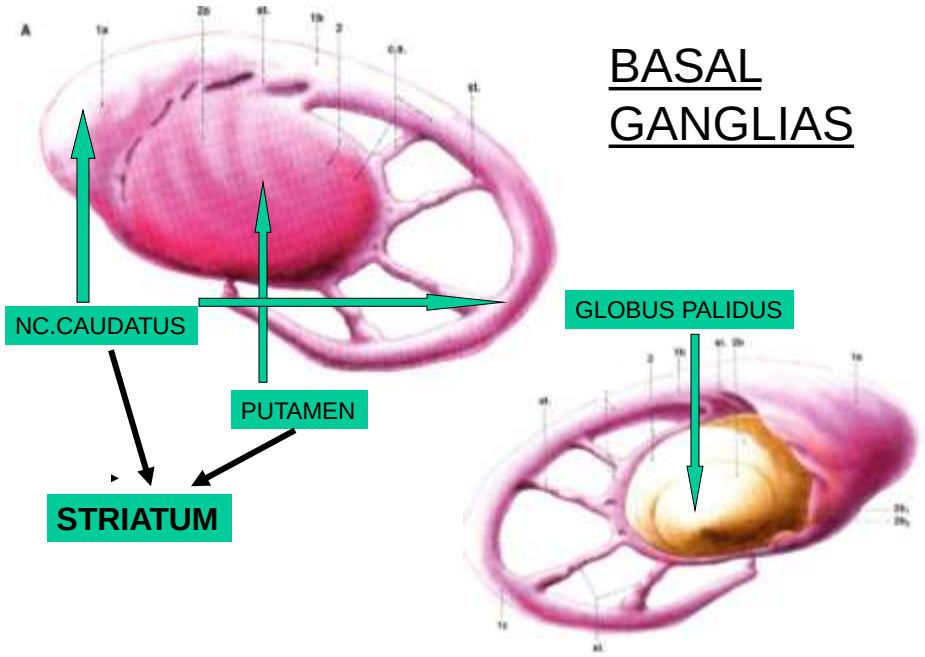
Circulation of Cerebrospinal Fluid

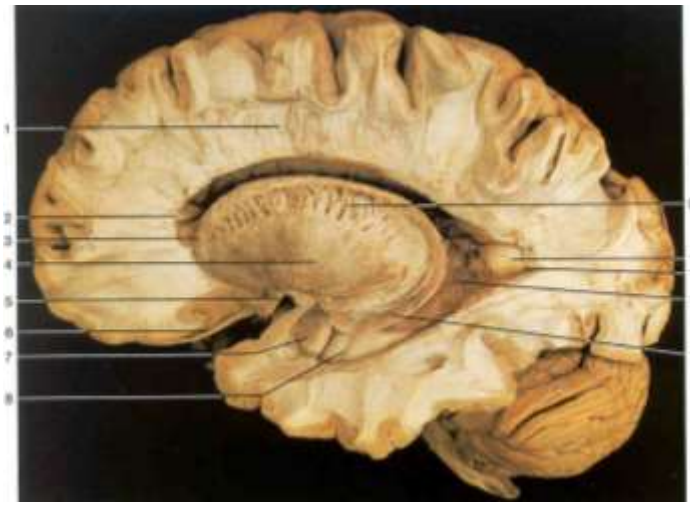


Cisternae subarachnoideales

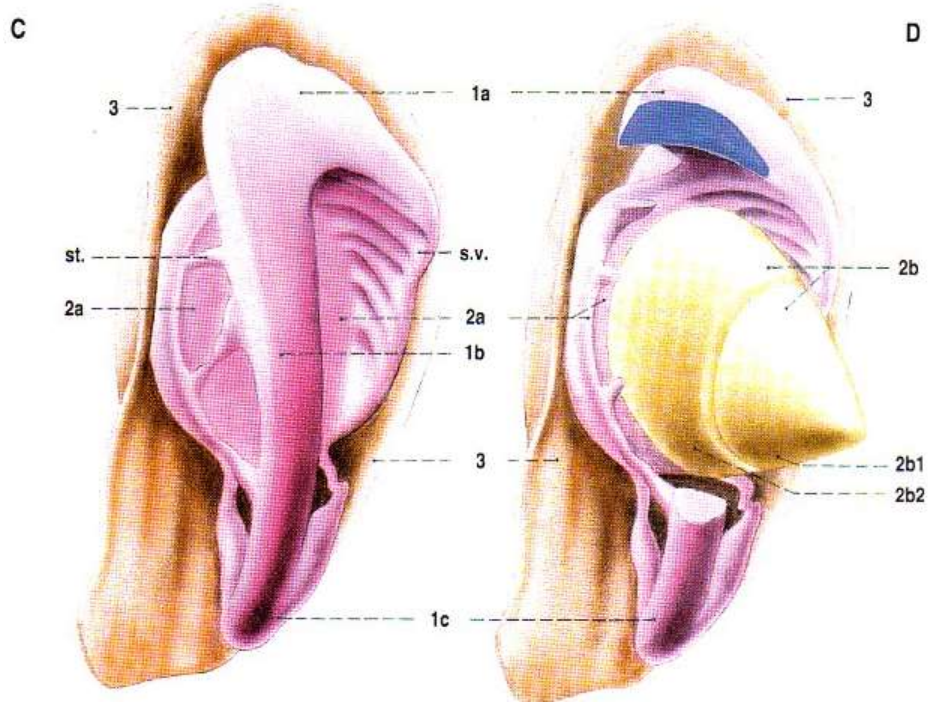
c. cerebellomedullaris post. (= c. magna)
c. cerebellomedullaris lat.
c. fossae lateralis cerebri
c. chiasmatis
c. interpeduncularis
c. ambiens
c. pericallosa
c. pontocerebellaris
c. laminae terminalis
c. quadrigeminalis (= c. venae cerebri magnae)
c. lumbalis

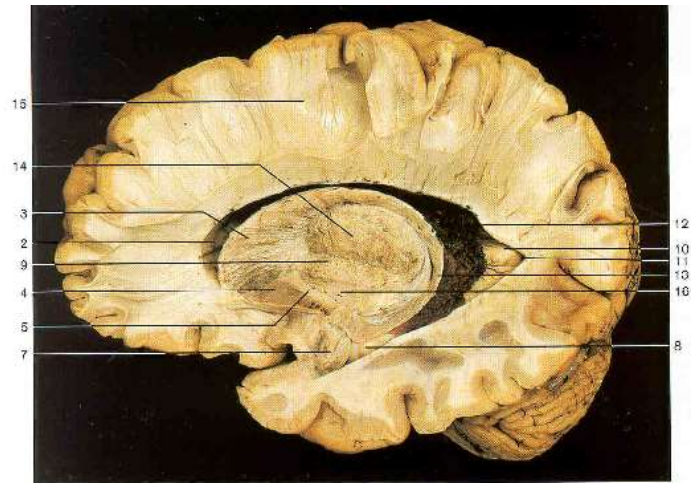






1 corona radiata
2 cornu ant. ventriculi lat.
3 caput **nuclei caudati**
4 **putamen** (incl. lentiformis)
5 commissura ant.
6 tractus olfactorius
7 **corpus amygdaloideum**
8 digitationes hippocampi
9 **capsula int.**
10 calcar avis
11 cornu post. ventriculi lat.
12 plexus choroideus
13 cauda nuclei caudati
14 **thalamus**
15 fibrae arcuatae cerebri
16 globus pallidus (zvyšok)

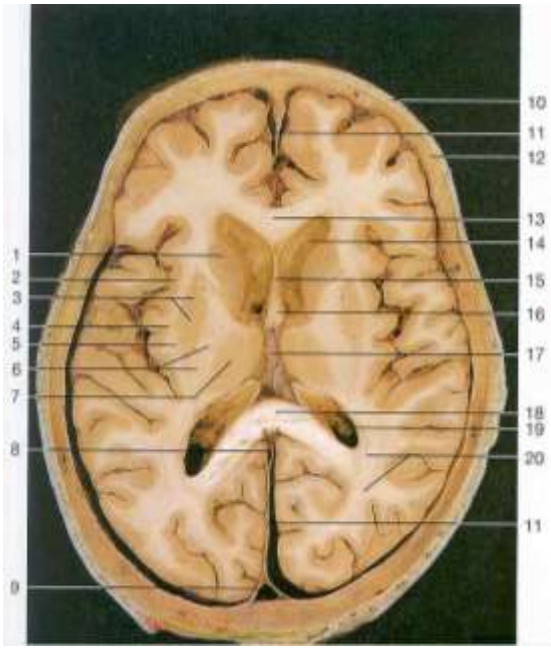




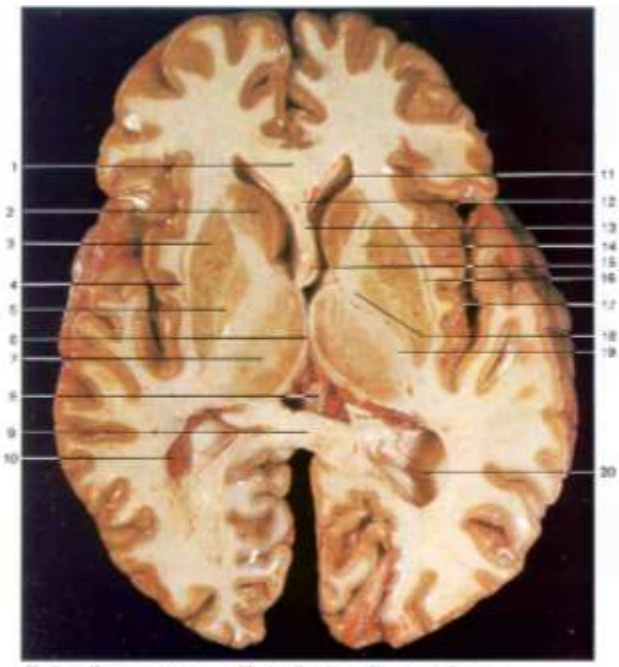
1 corona radiata
2 cornu ant. ventriculi lat.
3 caput **nuclei caudati**
4 **putamen** (incl. lentiformis)
5 commissura ant.
6 tractus olfactorius
7 **corpus amygdaloideum**
8 digitationes hippocampi
9 **capsula int.**
10 calcar avis
11 cornu post. ventriculi lat.
12 plexus choroideus
13 cauda nuclei caudati
14 **thalamus**
15 fibrae arcuatae cerebri
16 globus pallidus (zvyšok)

Basal Nuclei [Ganglia]

Horizontal Sections through Cerebrum

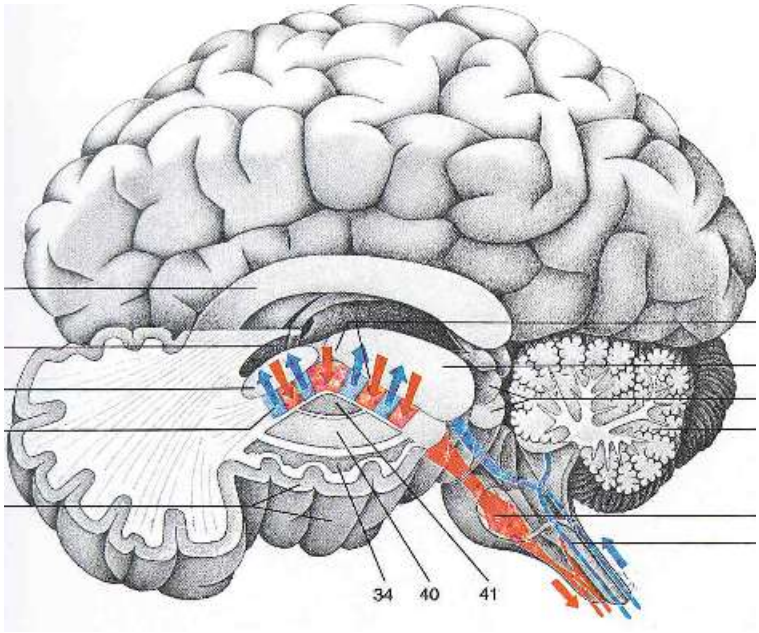


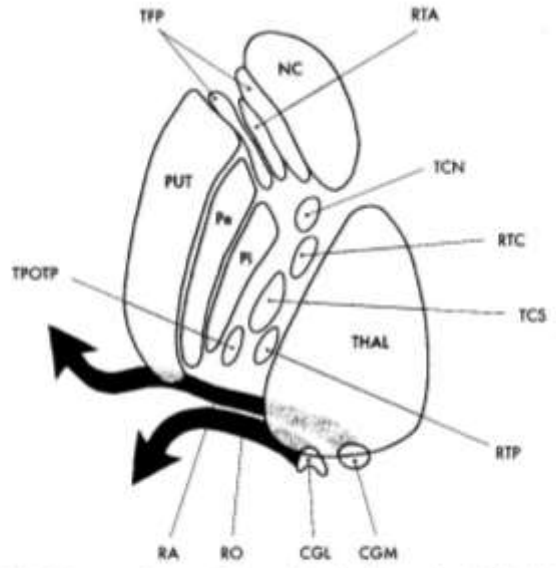
1 **ncl. caudatus** (caput)
2 insula
3 ncl. caudatus (corpus)
4 claustrum
5 capsula ext.
6 capsula int.
7 **thalamus**
8 sinus rectus
9 sinus sagittalis sup.
10 kožа hlavy
11 falx cerebri
12 calvaria (diploe)
13 genu corporis callosi
14 cornu ant. ventriculi lat.
15 **septum pellucidum**
16 columna fornicis
17 plexus choroideus ventriculi tertii
18 splenium corporis callosi
19 vchod do cornu inf. ventriculi lat.
20 radiatio optica
21 **ventriculus tertius**



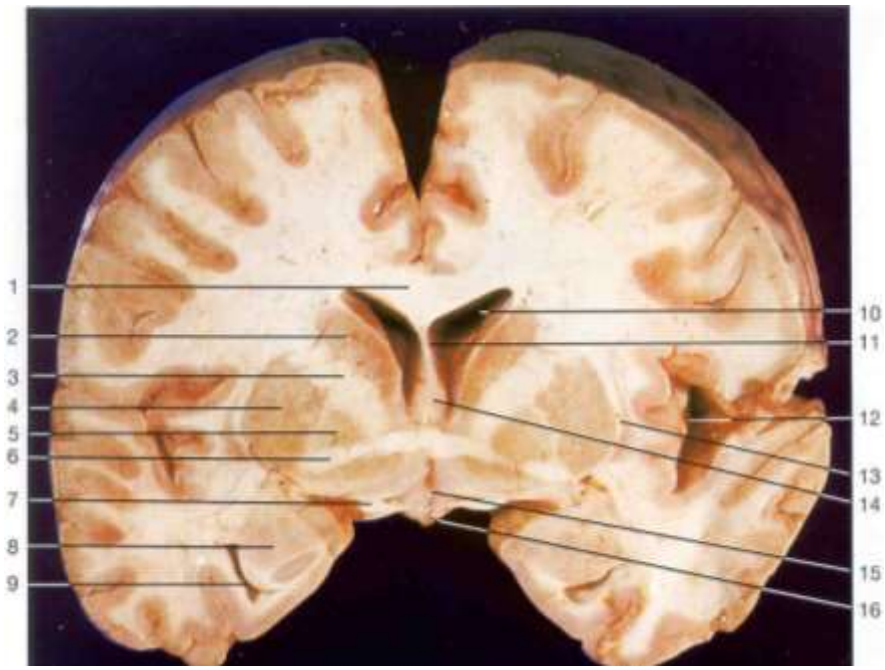
Horizontálny rez mozgom na výške bazálnych ganglií a capsula interna

INTERNAL CAPSULE





TFP = tr. frontopontinus, RTA = radiatio thalami anterior. Genu: TCN = tr. corticonuclearis. RTC = radiatio thalami centralis, TCS = tr. corticospinalis (pyramidová dráha), TPOTP = tr. parieto-occipitotemporopontinus, RTP = radiatio thalami posterior, RO = radiatio optica, RA = radiatio acustica. NC = nc. caudatus, PUT = putamen, Pe = pallidum externum, Pi = pallidum internum, CGL = corpus geniculatum laterale, CGM = corpus geniculatum mediale, THAL = thalamus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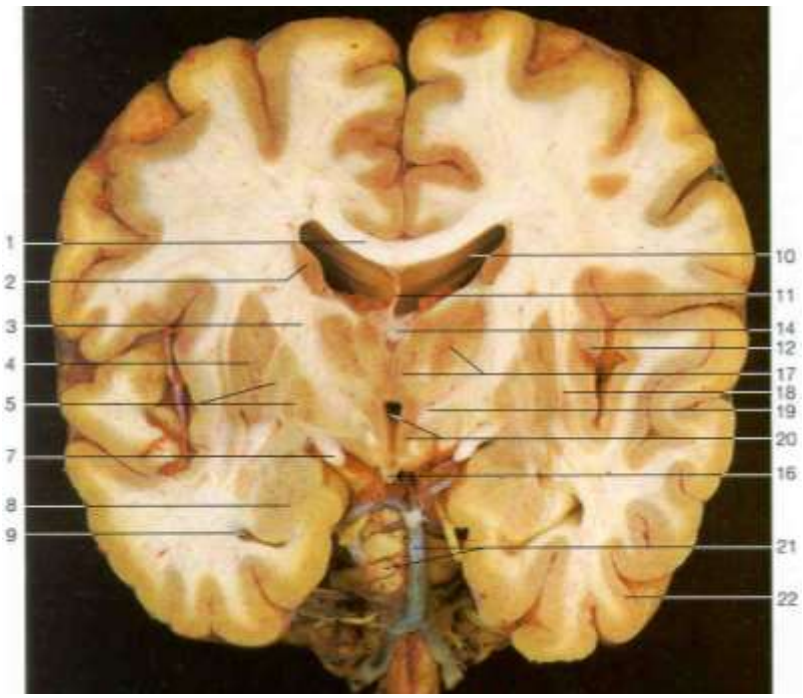
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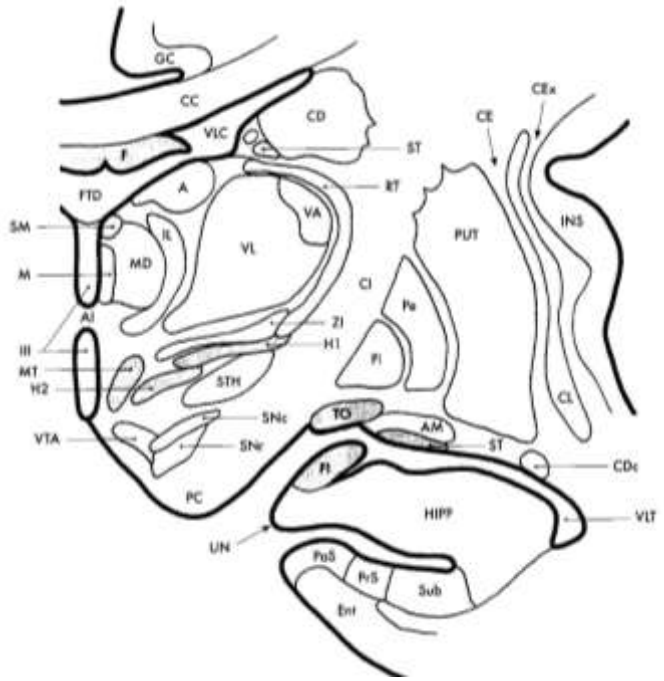
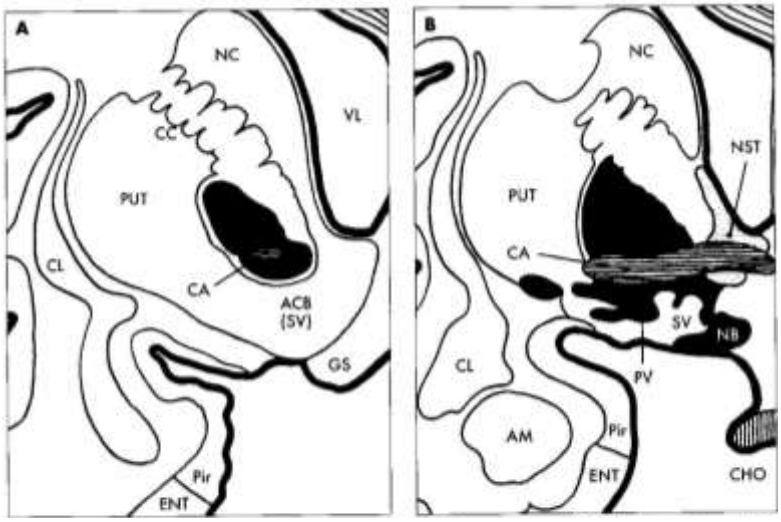
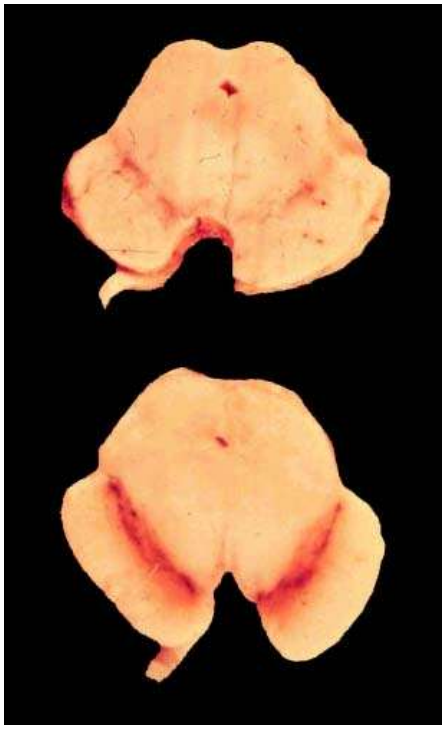




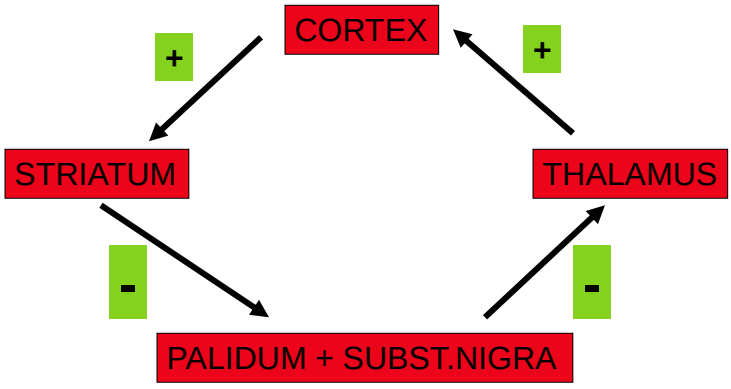
ACB = nc. accumbens (striatum ventrale, SV), AM = rostrální pól amygdaly, CA = commissura anterior, CL = claustrum, ENT = entorhinální korová oblast (area 28), GPe = pallidum externum, GS = gyrus subcallosus, CHO = chiasma opticum, NB = nc. basalis (Meynerti), NC = nc. caudatus, NST = nc. striae terminalis a výběžky amygdaly (extended amygdala), Pir = piriformní korová oblast (paleocortex, area 51), PUT = putamen, PV = pallidum ventrale, SV = striatum ventrale, VL = ventriculus lateralis. Růžově – pallidum externum a pallidum ventrale, tmavě šedě – nc. basalis (Meynerti).

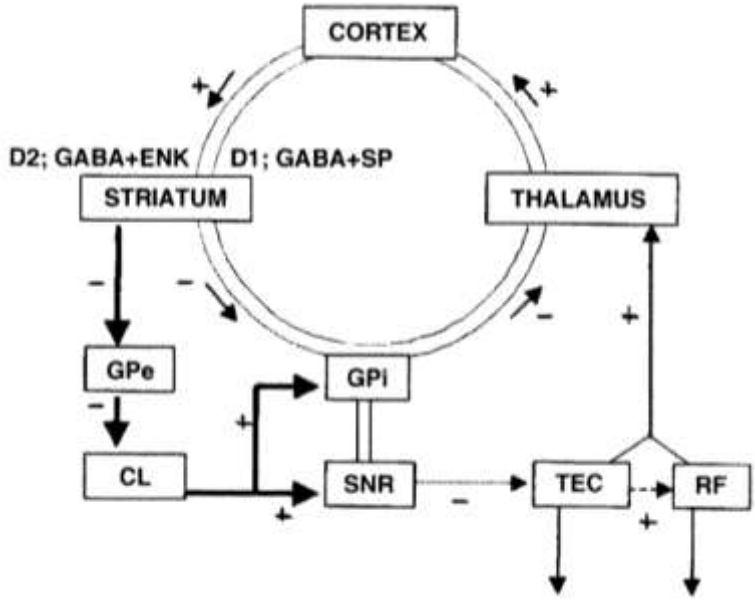
PARKINSON´S DISEASE

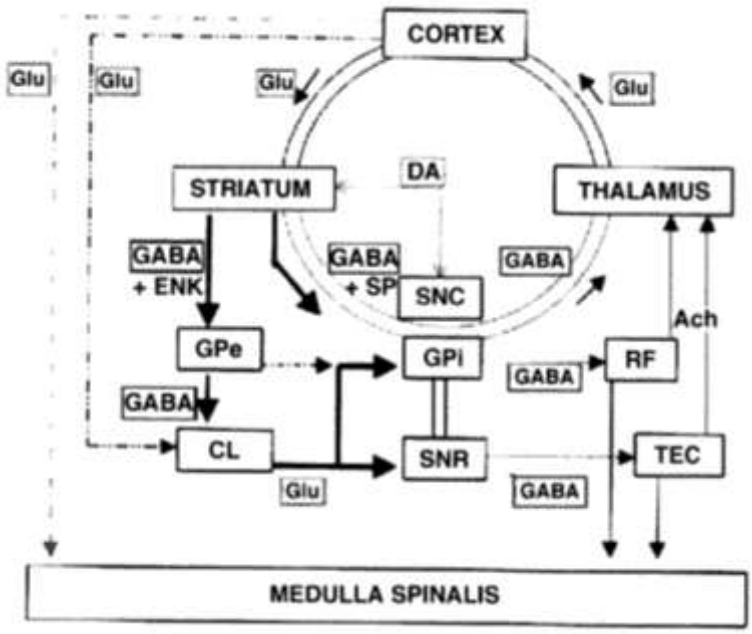
NORMAL

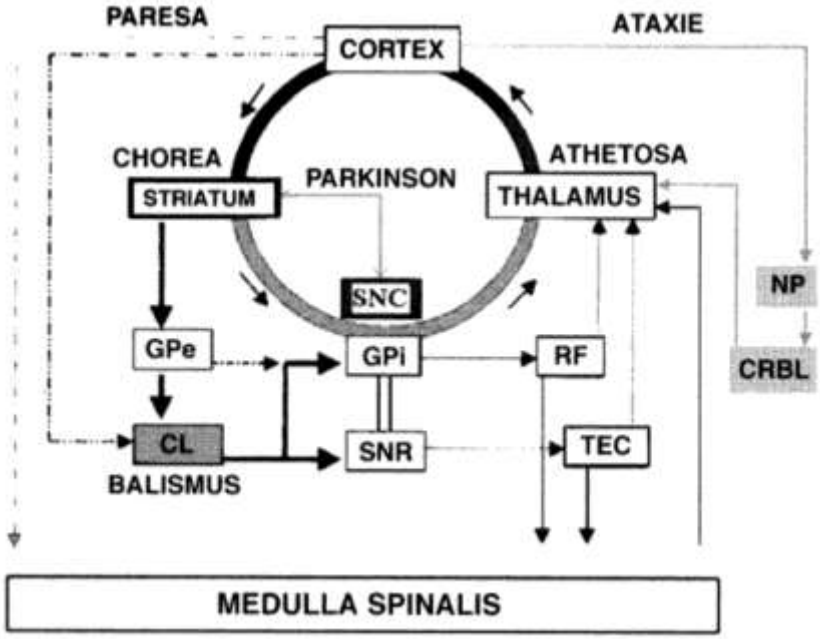


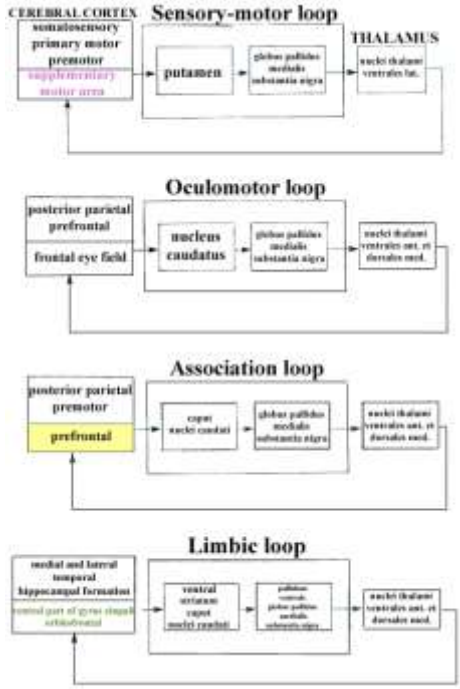
CIRCLE OF BASAL GANGLIAS



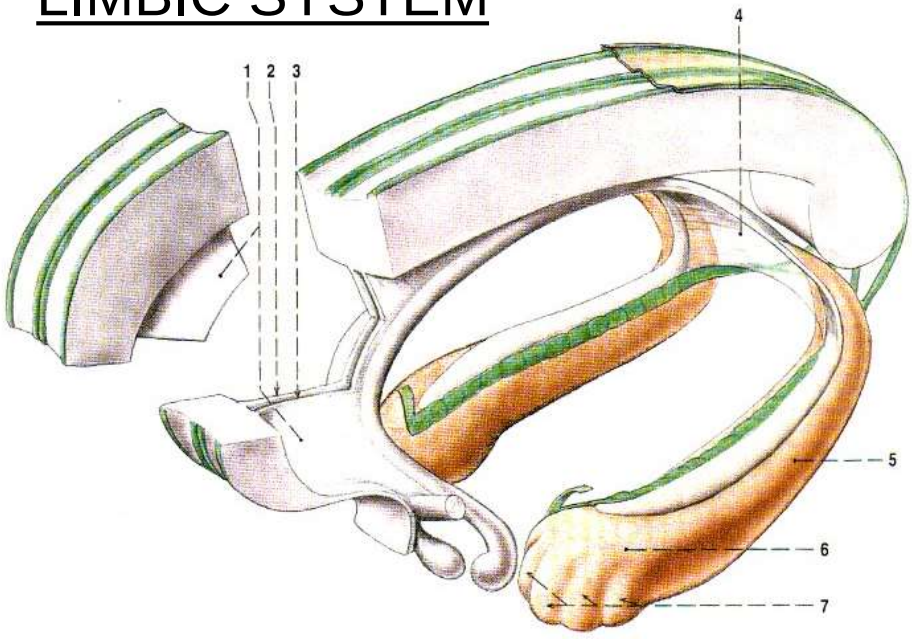

CORTEX
D2; GABA+ENK
D1; GABA+SP
STRIATUM
THALAMUS
GPe
GPi
CL
SNR
TEC
RF

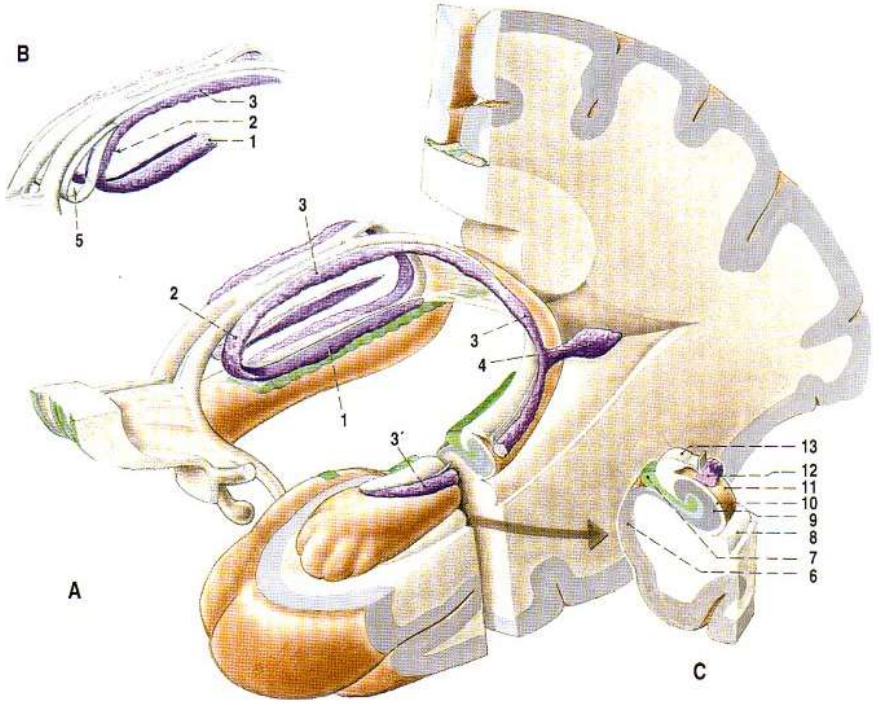

CORTEX
Glu
Glu
Glu
Glu
STRIATUM
DA
THALAMUS
GABA
+ ENK
GABA
+ SP
SNC
GABA
Ach
GPe
GPi
RF
GABA
GABA
CL
SNR
TEC
Glu
GABA
MEDULLA SPINALIS

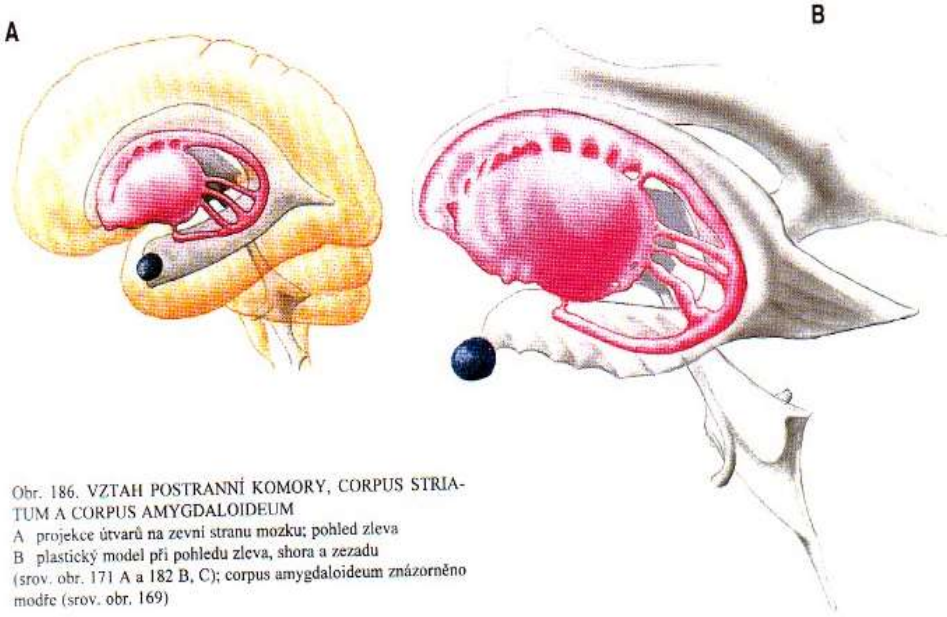

PARESA
ATAXIE
CORTEX
CHOREA
PARKINSON
ATHETOSA
STRIATUM
THALAMUS
SNC
NP
GPe
GPi
RF
CRBL
CL
SNR
TEC
BALISMUS
MEDULLA SPINALIS


CEREBRAL CORTEX
Sensory-motor loop
somatosensory
primary motor
premotor
supplementary
motor area
putamen
THALAMUS
Oculomotor loop
posterior parietal
prefrontal
frontal eye field
nucleus
caudatus
Association loop
posterior parietal
premotor
prefrontal
Limbic loop
medial and lateral
temporal
hippocampal formation

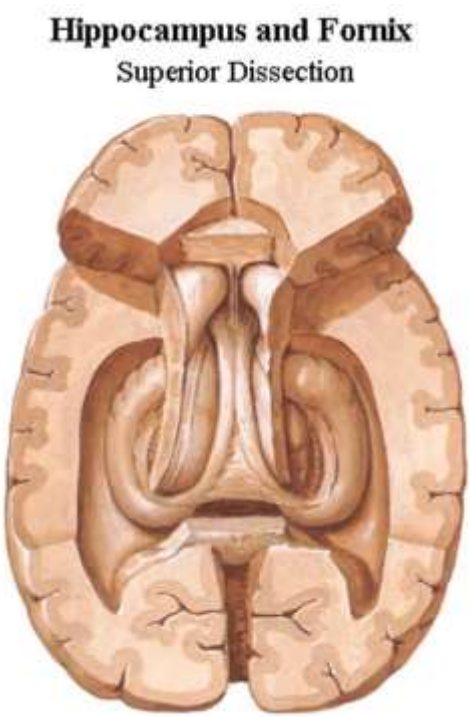
LIMBIC SYSTEM

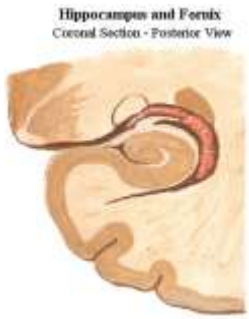


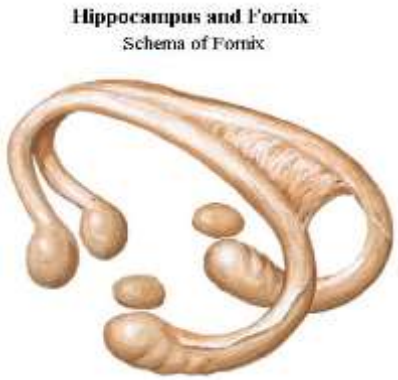


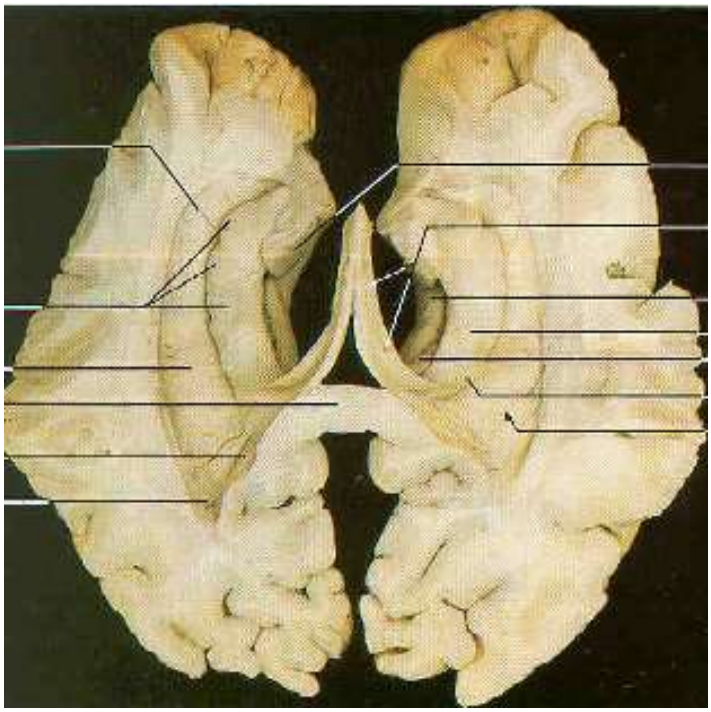


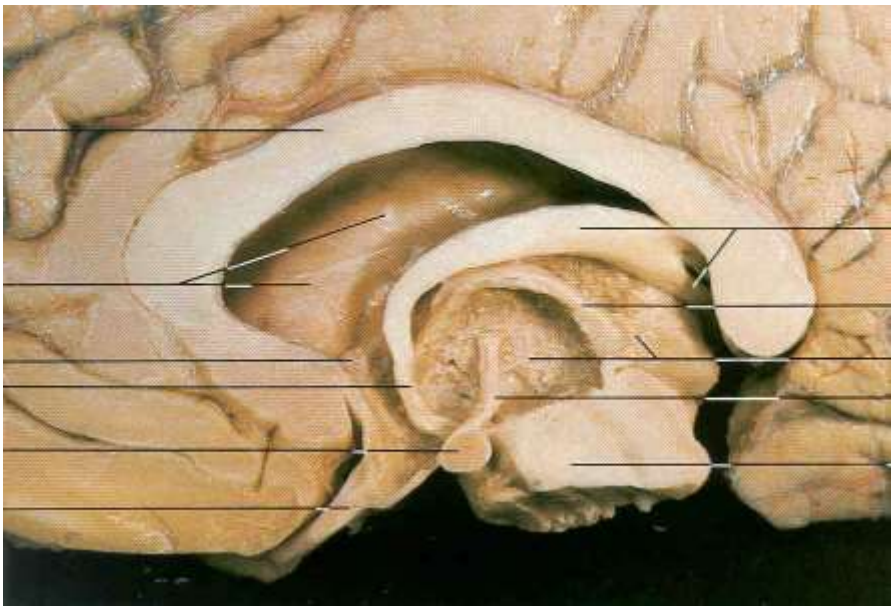
Obr. 186. VZTAH POSTRANNÍ KOMORY, CORPUS STRIATUM A CORPUS AMYGDALOIDEUM
A projekce útvarů na zevní stranu mozku; pohled zleva
B plastický model při pohledu zleva, shora a zezadu
(srov. obr. 171 A a 182 B, C); corpus amygdaloideum znázorněno modře (srov. obr. 169)

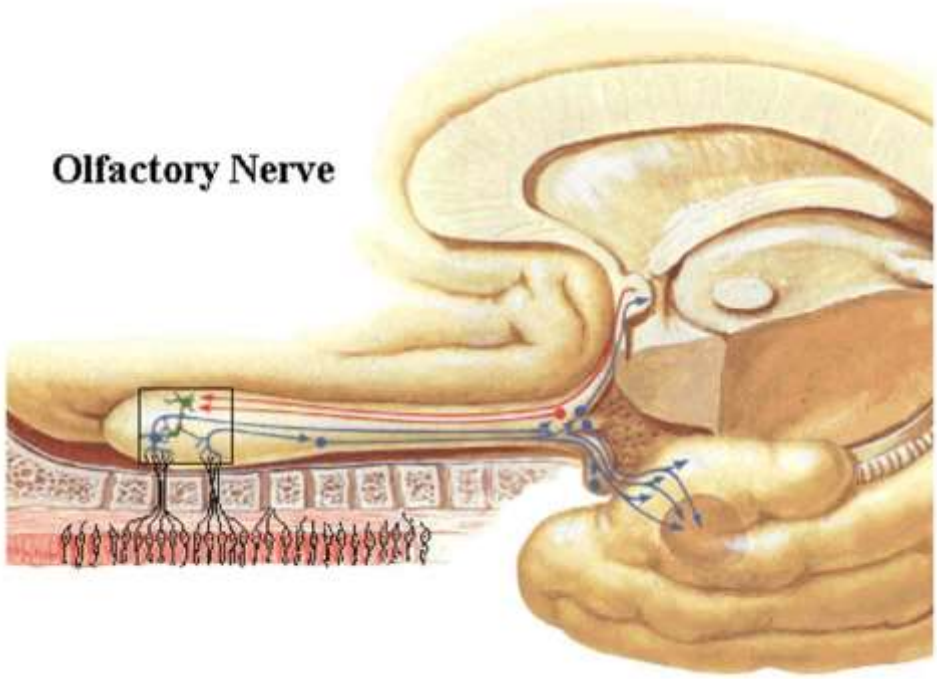






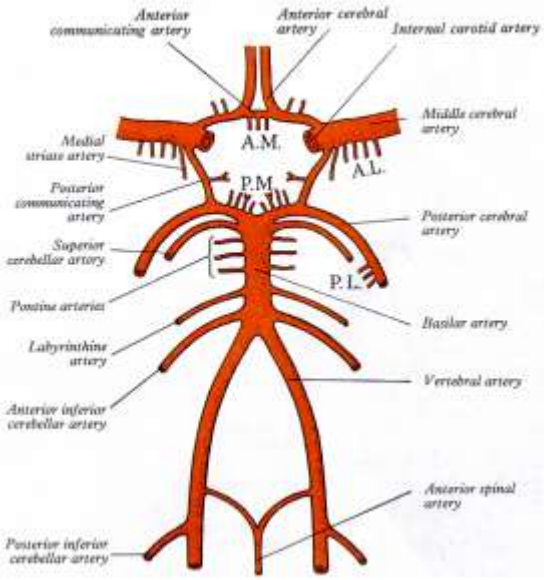






CÉVNÍ SYSÉM CNS

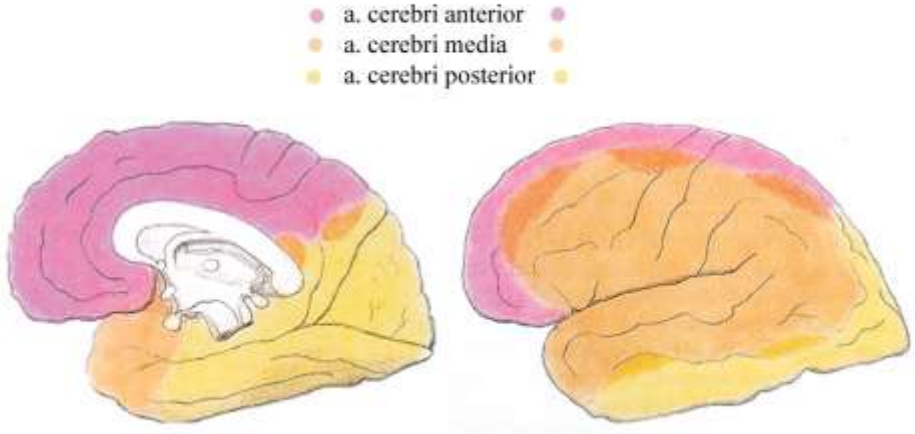
CIRCULUS ARTERIOSUS CEREBRI *WILLISI*

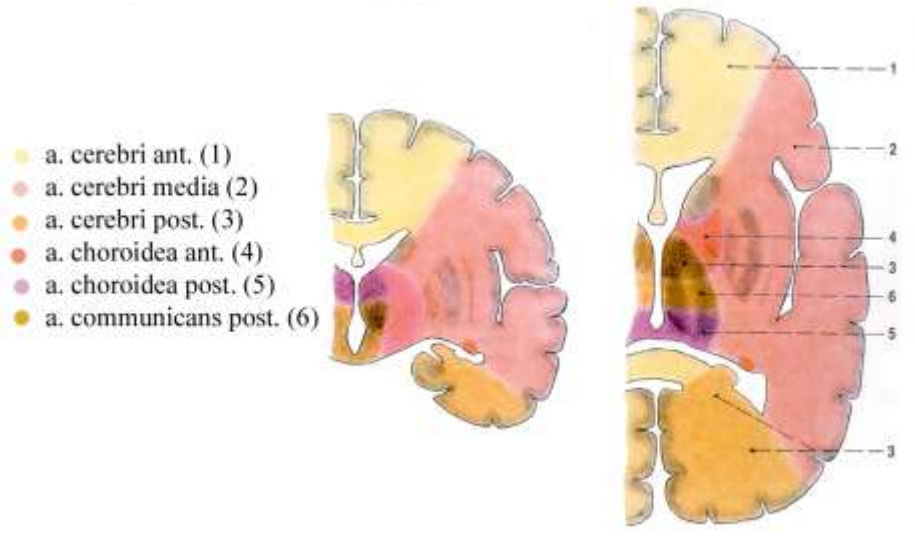


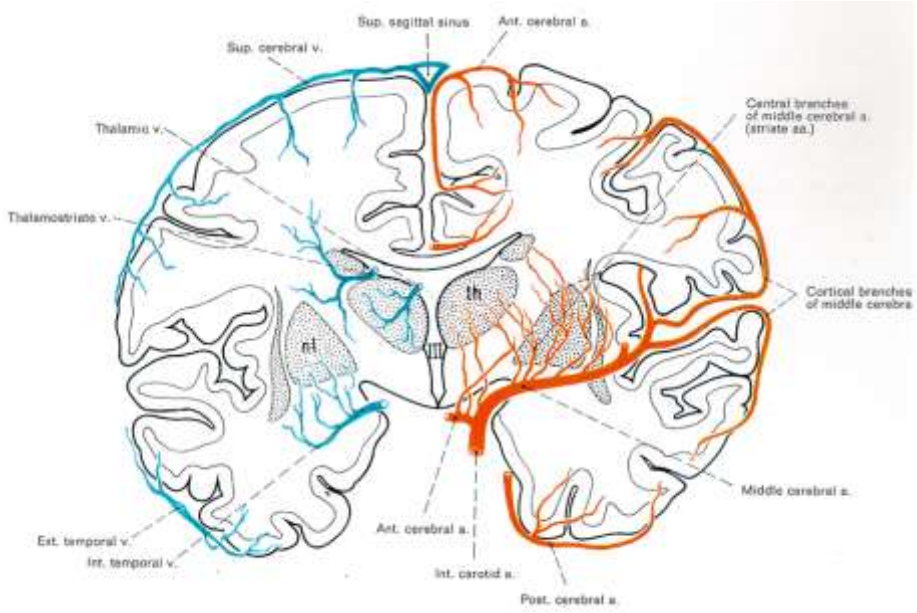
circulus arteriosus *Willisi*

- a. cerebri anterior, media, posterior
- a. communicans ant. (1) et post. (2)
- a. choroidea ant., rr. posteriores (from a. cerebri post.)
- aa. centrales → *deep structures*
  - anteromediales
  - anterolaterales (a. hemorrhagica *Charcoti* for putamen → **CMP**) !!!
  - posteromediales
  - posterolaterales
- aa. vertebrales
  - a. inferior posterior cerebelli
- a. basilaris
  - a. inferior anterior cerebelli → a. labyrinthi
  - aa. pontis, aa. mesencephalicae
  - a. superior cerebelli

ARTERIES


a. cerebri anterior
a. cerebri media
a. cerebri posterior


a. cerebri ant. (1)
a. cerebri media (2)
a. cerebri post. (3)
a. choroidea ant. (4)
a. choroidea post. (5)
a. communicans post. (6)
1
2
4
3
6
5
3



ARTERIES OF MEDULLA SPINALIS

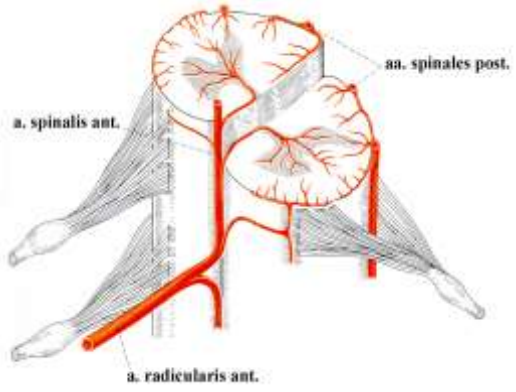
1. LONGITUDINAL ARTERIES:
   - a. spinalis ant.← a.vertebralis
   - aa. spinales post. ← a. inf. post. cerebelli ← a. basilaris
2. TRANSVERSAL ARTE

rr. spinales →

aa. radiculares ant.+post.

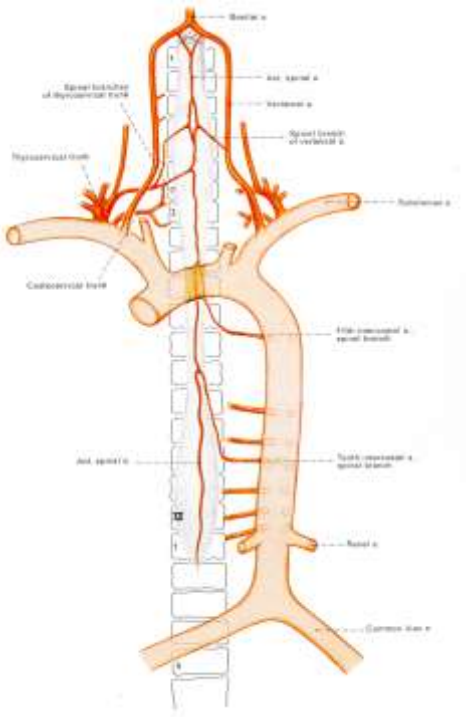
→ aa. sulcomarginales

+ *vasocoronae*



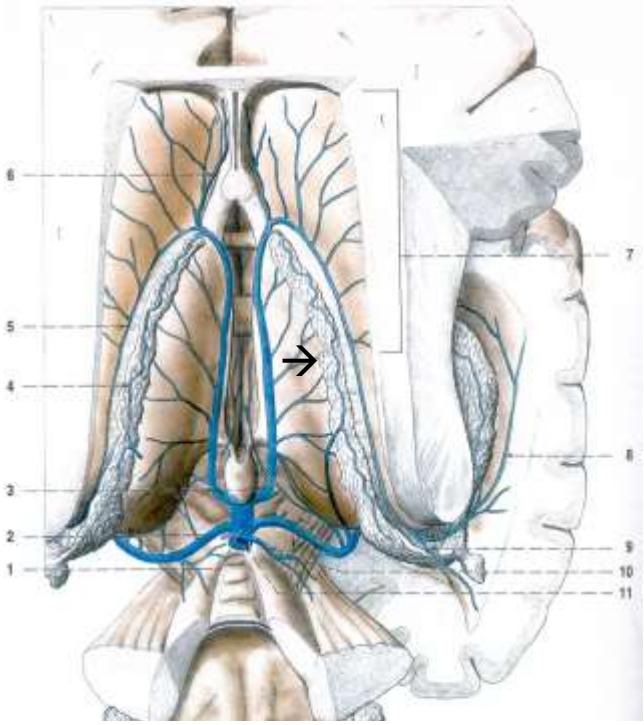
a. vertebralis
a. cervicalis ascendens
a. cerviclais profunda
aa. intercostales posteriores
aa. lumbales
a. iliolumbalis
aa. sacrales laterales

<u>aa. radiculares</u>
5-9
a. radicularis magna
Adamkiewiczi



VEINS OF BRAIN

1. <u>VEINS OF BRAIN STEM (= vv. trunci encephali)</u>
   v. pontomesencephalica
   vv. pontis + vv. medullae oblongatae
   VEINS OF CEREBELLUM → v. cerbri magna, sinus rectus, transversus, sigmoideus, petrosus sup.
2. <u>DEEP VEINS OF BRAIN (= vv. profundae cerebri)</u>
   v. basalis *Rosenthali* (← vv. c. ant., v. c. media prof.) → v. c. magna
   v. c. magna *Galeni* → sinus rectus
   v. c. interna
   - v. thalamostriata sup. + v. choroidea ant (+ v. septi pellucidi ant.)



VEINS OF BRAIN

SUPERFICIAL VEINS (= vv. superficiales cerebri)

vv. superiores → sinus sagittalis sup.

v. media superficialis → sinus cavernosus / sphenoparietalis

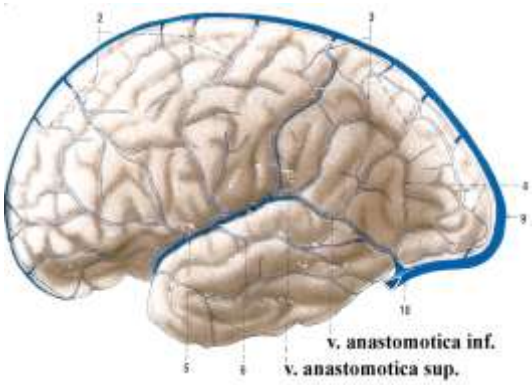
v. anastomotica sup. *Trolardi*

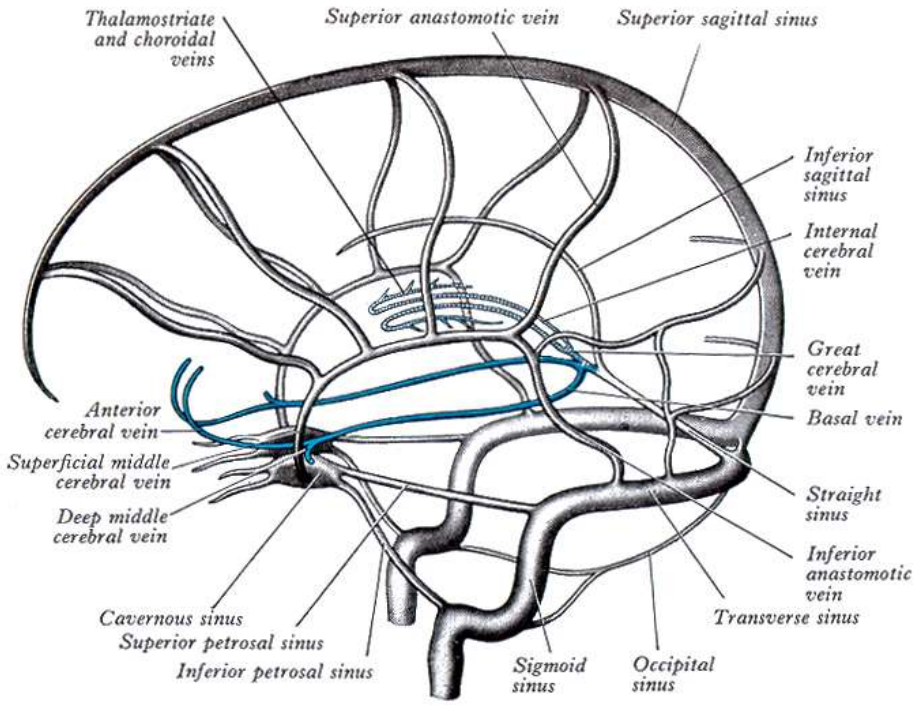
v. anastomotica inf. *Labbéi*

vv. inferiores

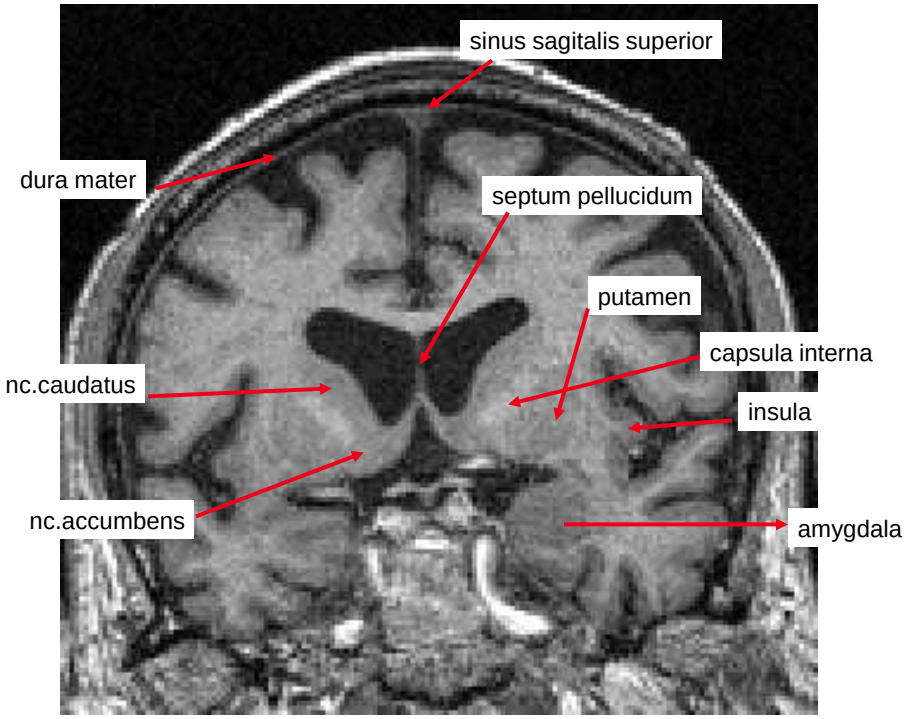
→ sinus petrosi

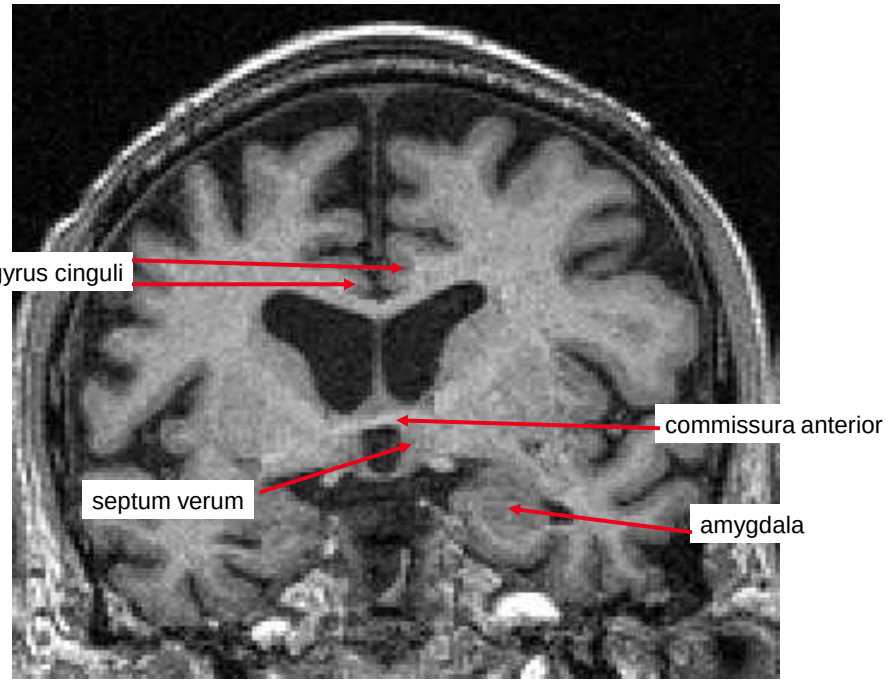
→ sinus transversus

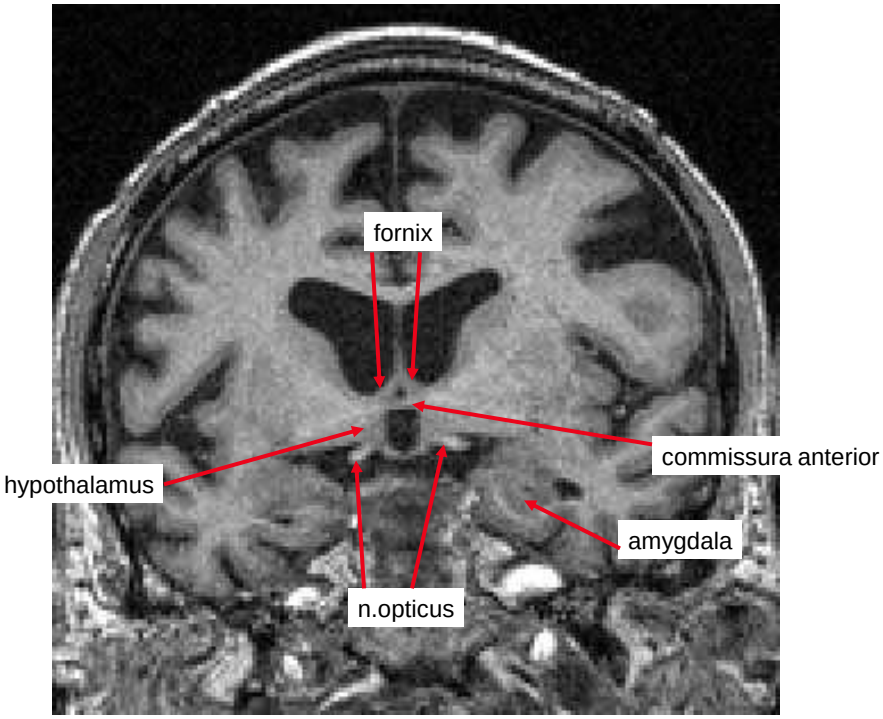


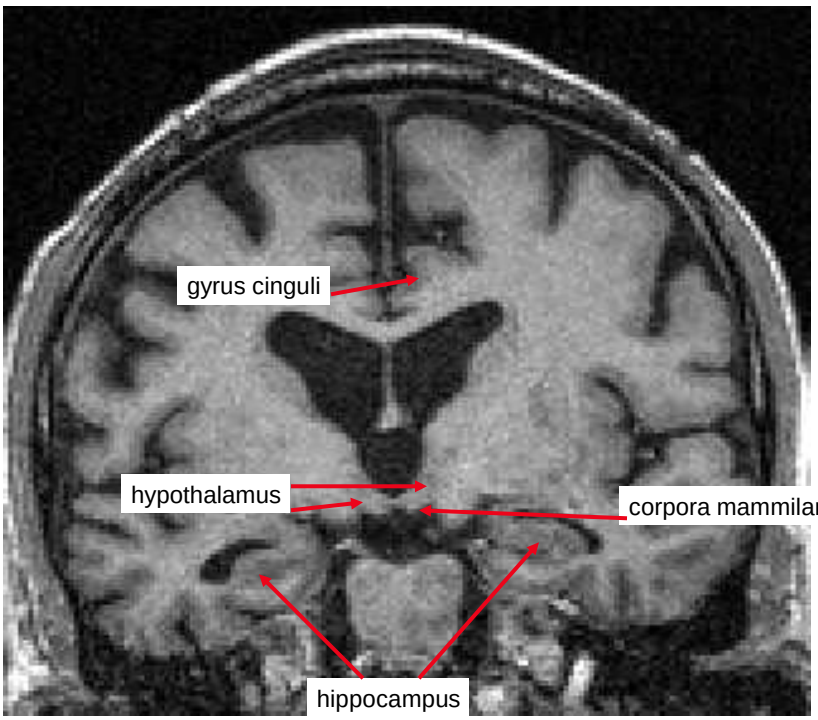


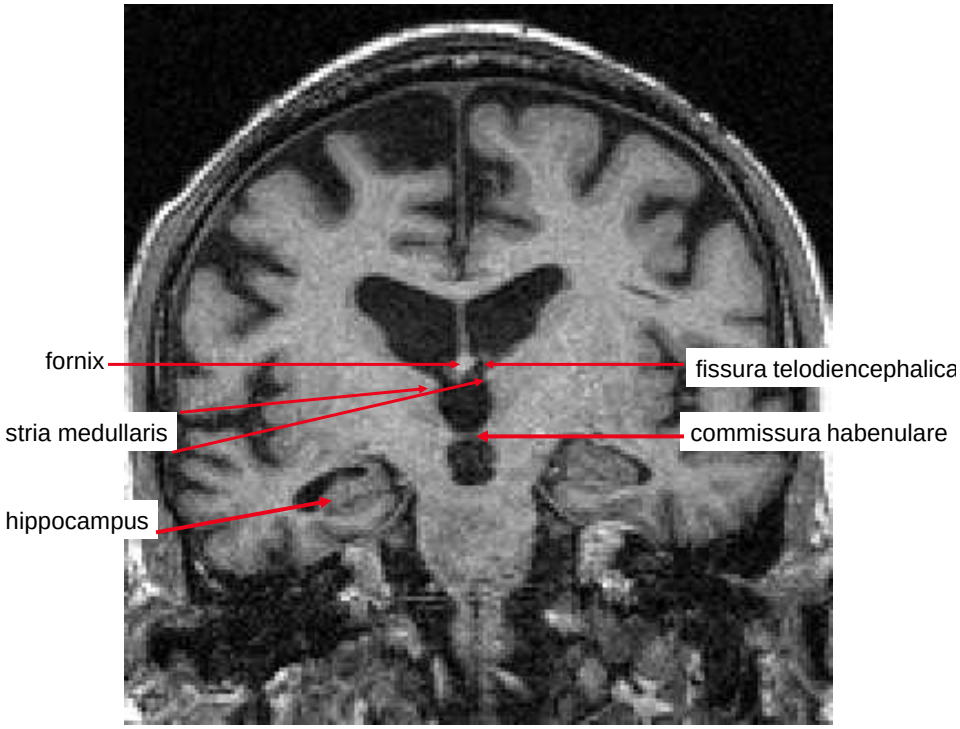
MAGNETICKÁ RESONANCE

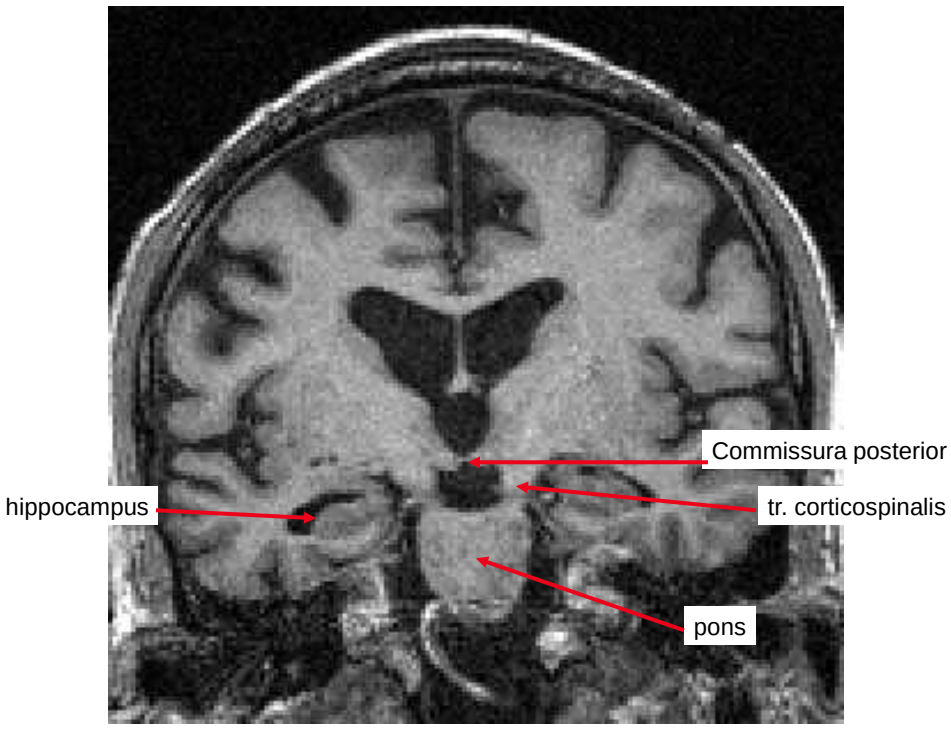

sinus sagitalis superior
dura mater
septum pellucidum
putamen
capsula interna
nc.caudatus
insula
nc.accumbens
amygdala

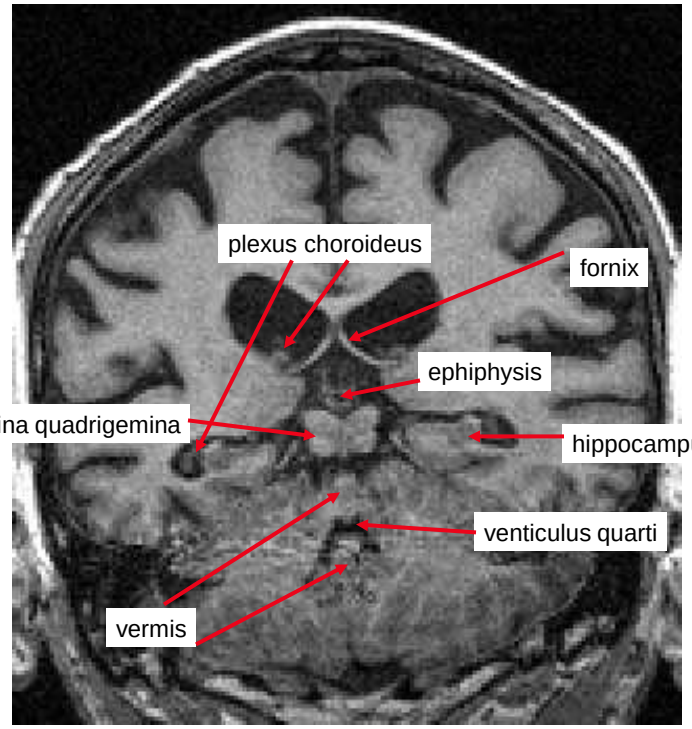

gyrus cinguli
commissura anterior
septum verum
amygdala

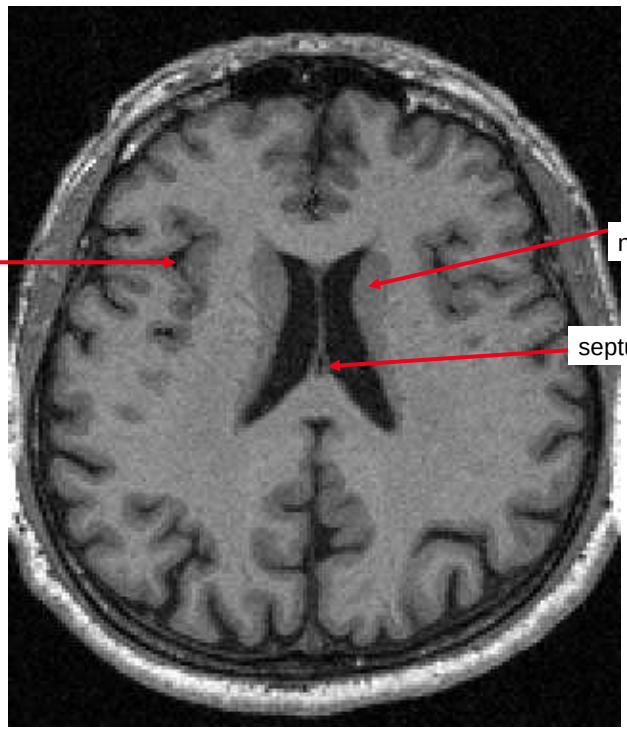

fornix
commissura anterior
hypothalamus
amygdala
n.opticus

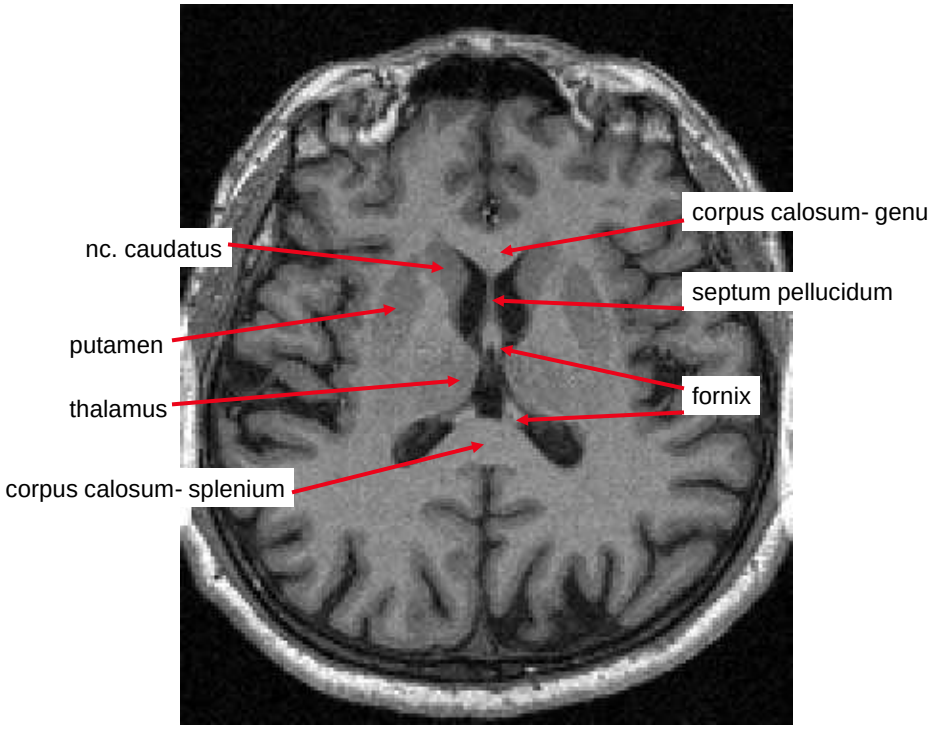

gyrus cinguli
hypothalamus
corpora mammilaria
hippocampus

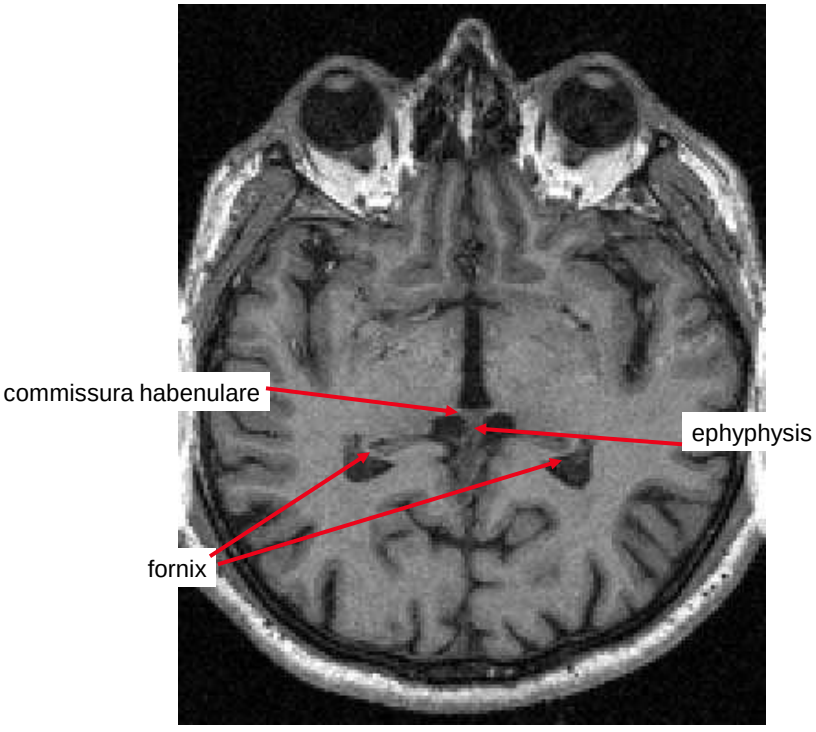

fornix
fissura telodiencephalica
stria medullaris
commissura habenulare
hippocampus

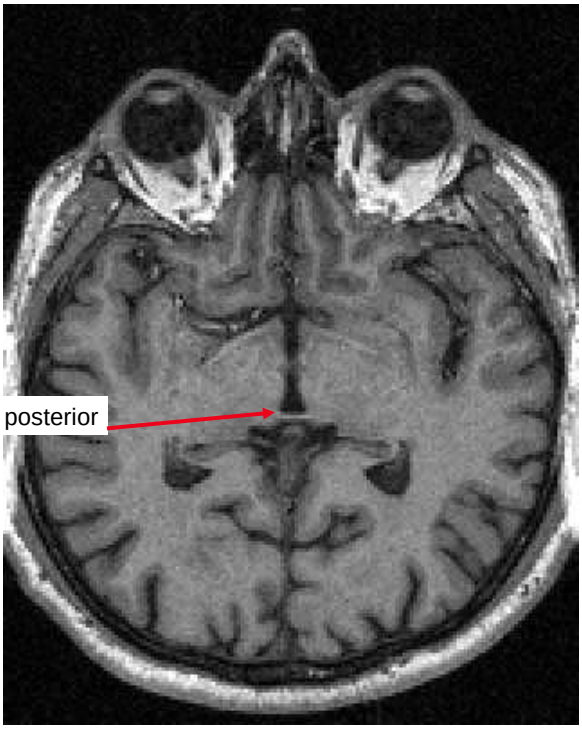

Commissura posterior
hippocampus
tr. corticospinalis
pons

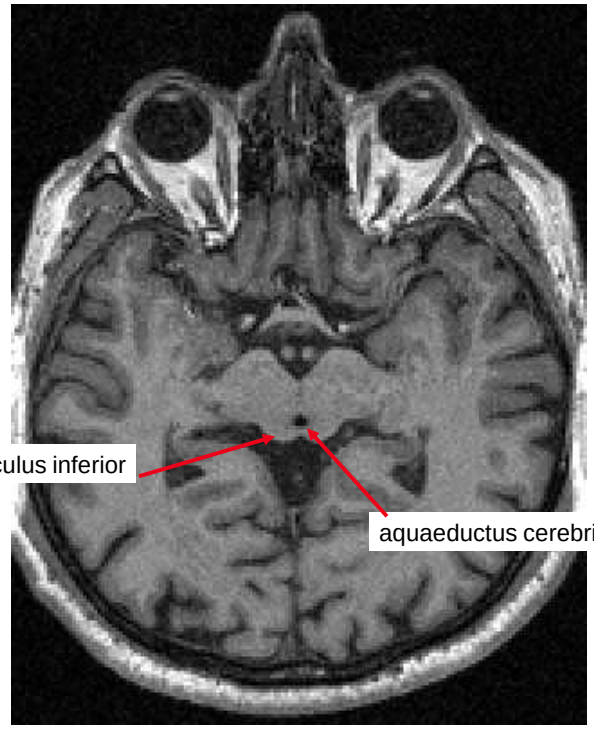

plexus choroideus
fornix
ephiphysis
lamina quadrigemina
hippocampus
venticulus quarti
vermis

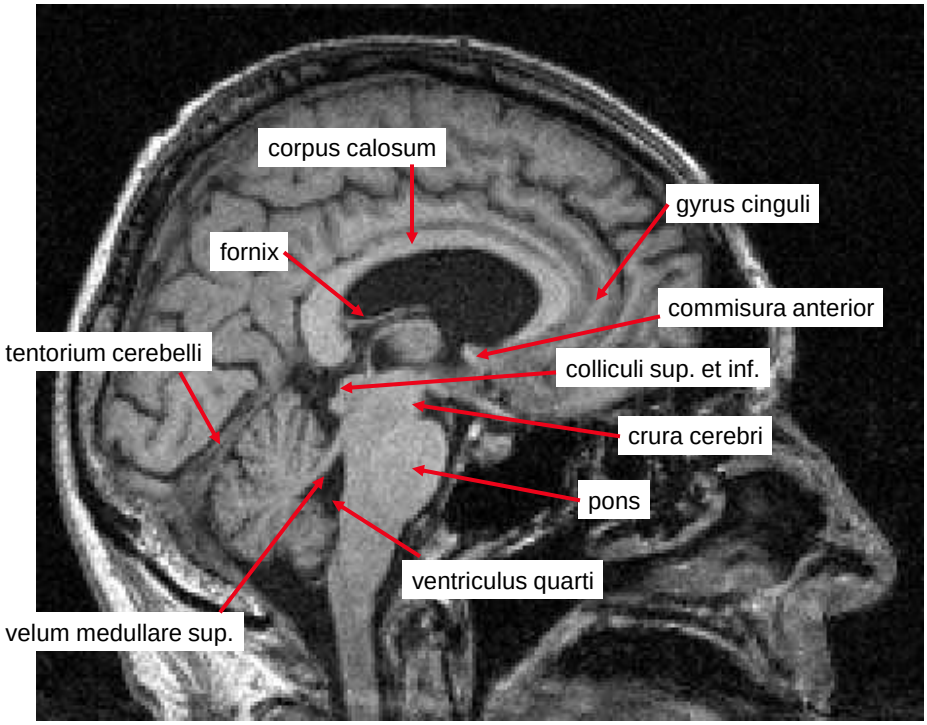

insula
nc.caudatus
septum pellucidum

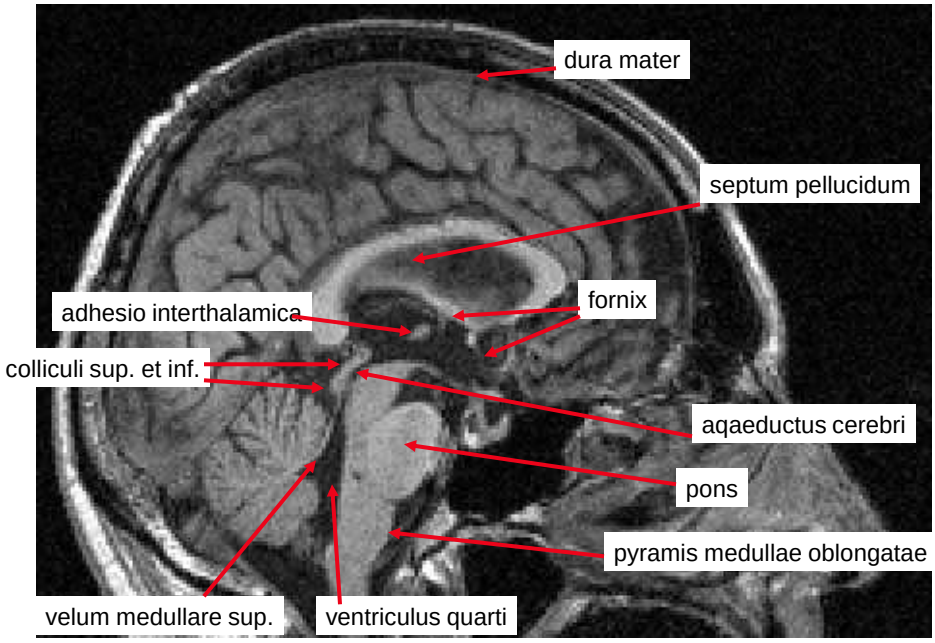

corpus calosum- genu
nc. caudatus
septum pellucidum
putamen
fornix
thalamus
corpus calosum- splenium

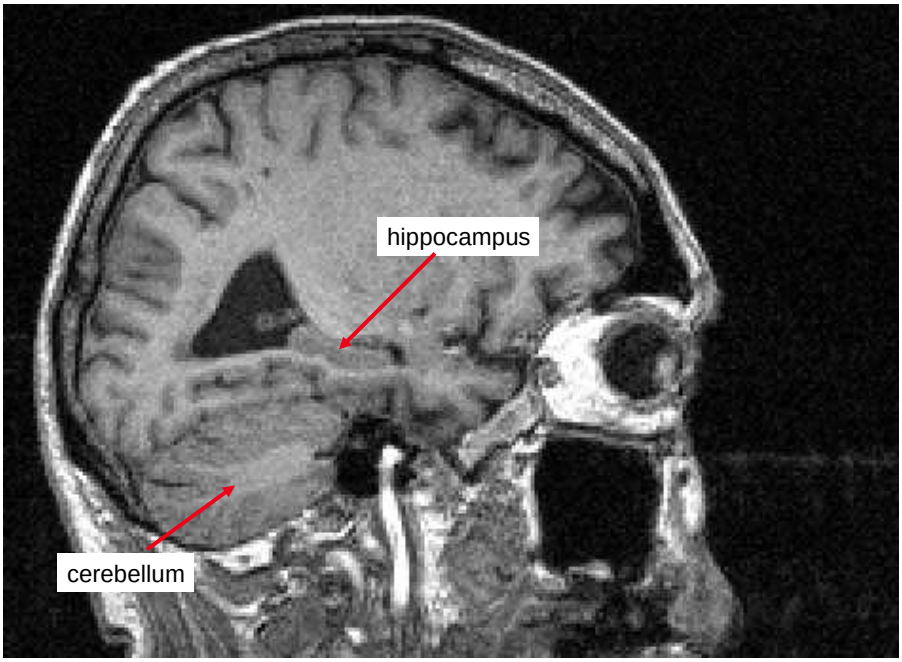

commissura habenulare
ephyphysis
fornix

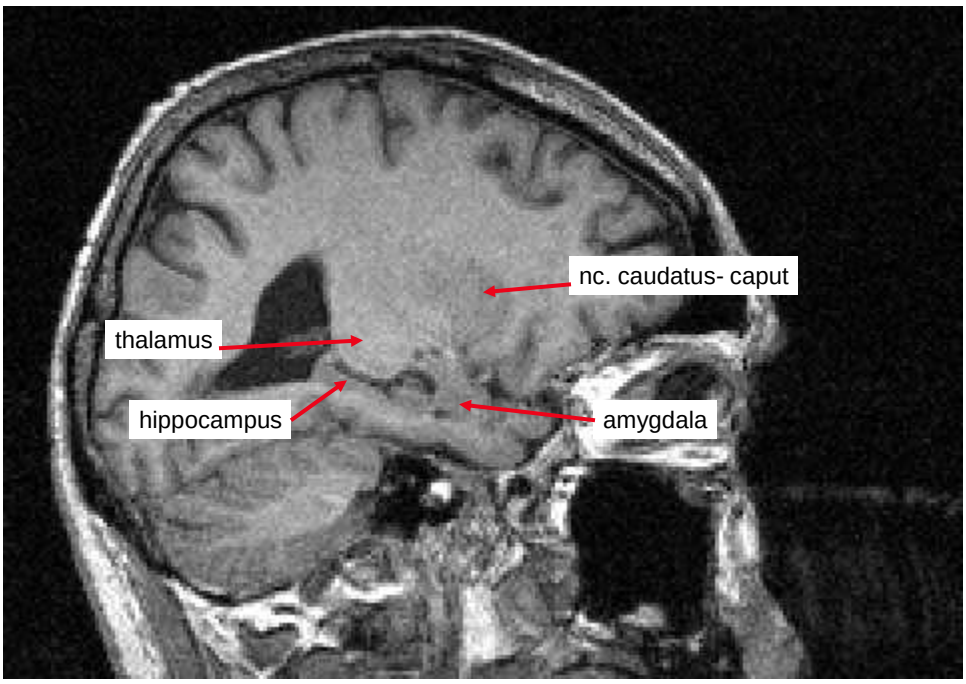

commissura posterior

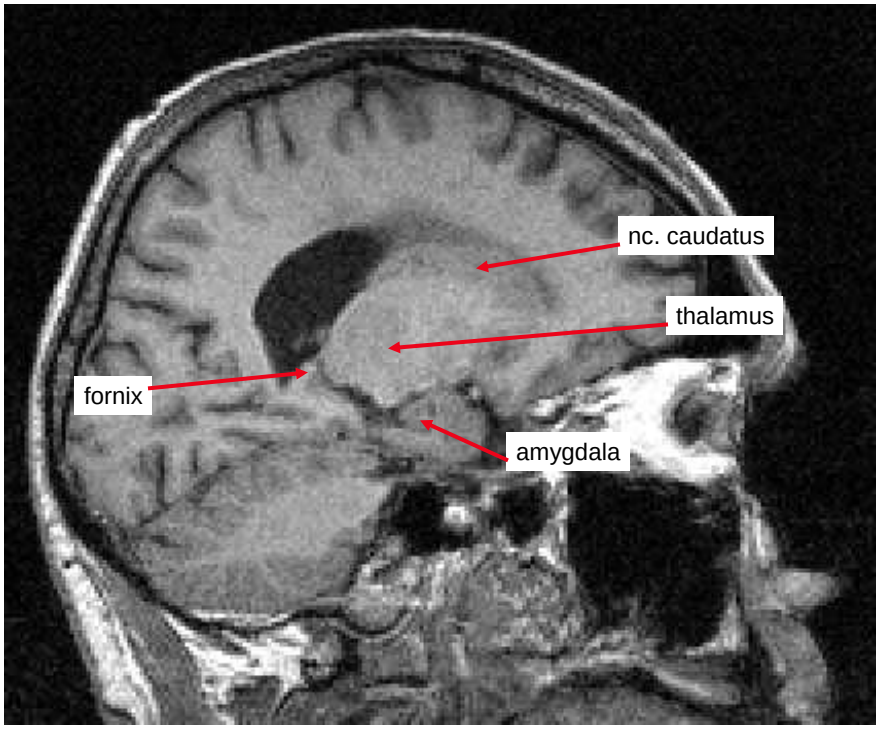

colliculus inferior
aquaeductus cerebri


corpus calosum
gyrus cinguli
fornix
commisura anterior
tentorium cerebelli
colliculi sup. et inf.
crura cerebri
pons
ventriculus quarti
velum medullare sup.


dura mater
septum pellucidum
fornix
adhesio interthalamica
colliculi sup. et inf.
aqaeductus cerebri
pons
pyramis medullae oblongatae
velum medullare sup.
ventriculus quarti

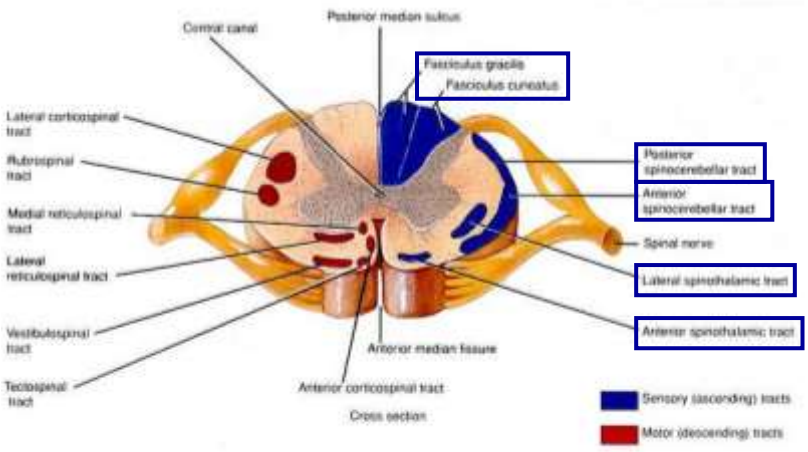

hippocampus
cerebellum


nc. caudatus- caput
thalamus
hippocampus
amygdala

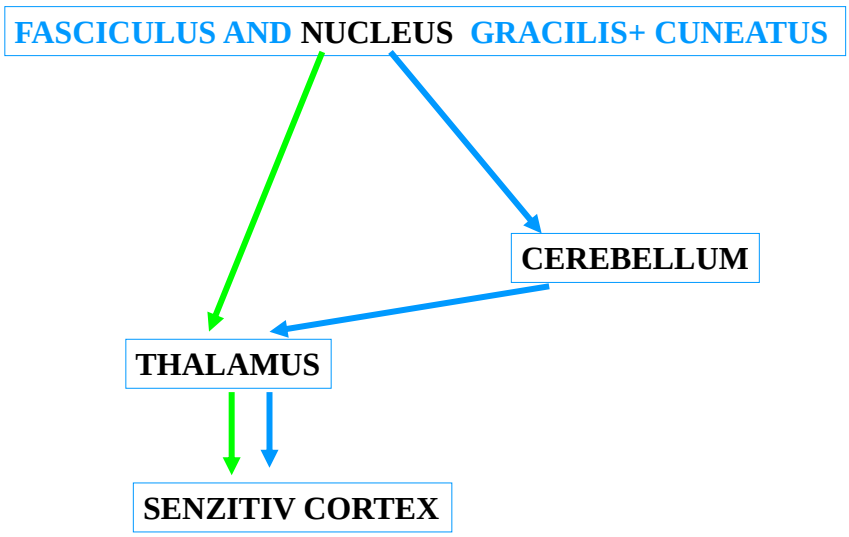


ZÁKLADNÍ DRÁHY CNS

TOUCH, PROPRIOCEPTION, PAIN, HOT, COLD, VIBRATIONS



TOUCH, STATIC PROPRIOCEPTION



DYNAMIC PROPRIOCEPTION

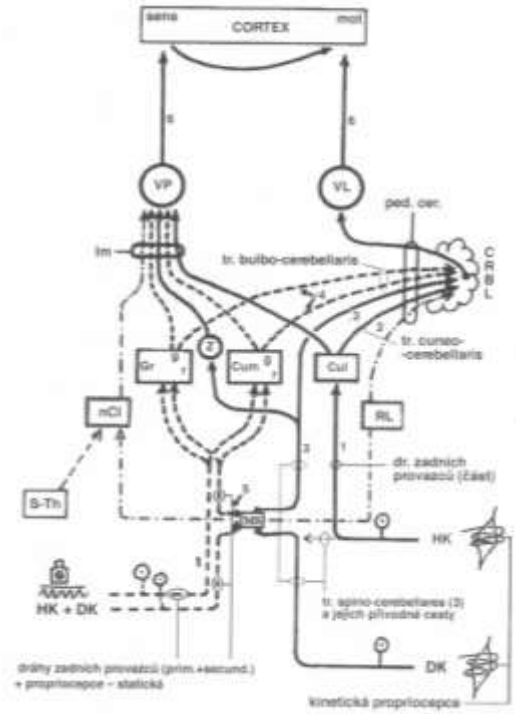
CORNU POSTERIUS OF MEDULLA SPINALIS

FASCICULUS CUNEATUS

SPINOCEREBELLAR TRACT- LL

NUCLEUS CUNEATUS LAT.- UL

CEREBELLUM



PAIN,HOT COLD, VIBRATION

CORNU POSTERIUS OF MEDULLA SPINALIS

SPINOTHALAMIC TRACT

(FAST PAIN)

SPINORETICULAR TRACT

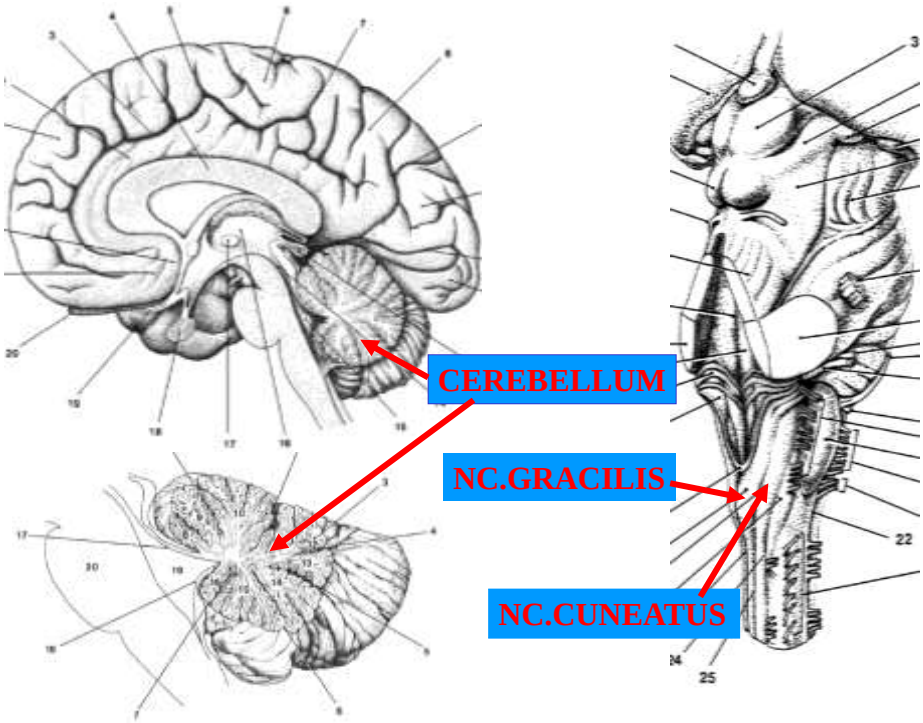
(SLOW PAIN)

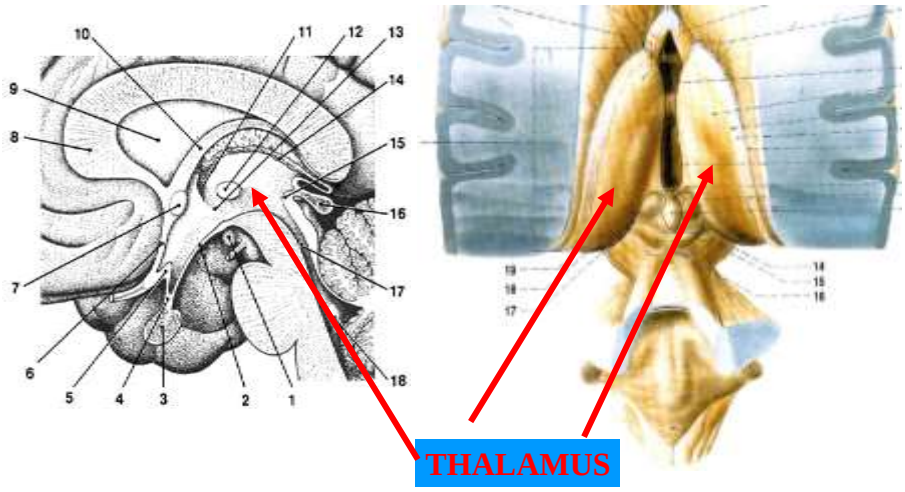
RETICULAR FORMATION

THALAMUS

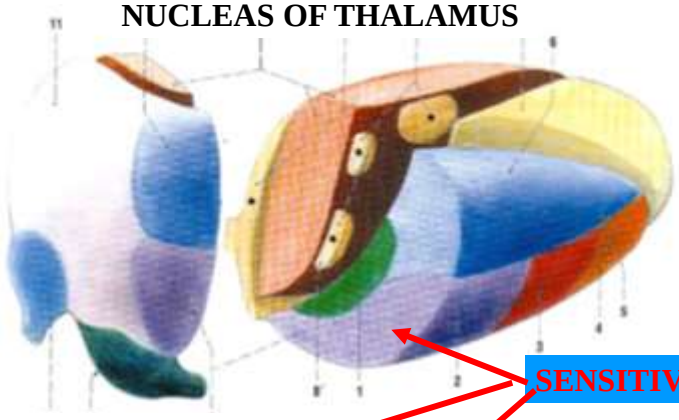
SENZITIV CORTEX

HYPOTHALAMUS



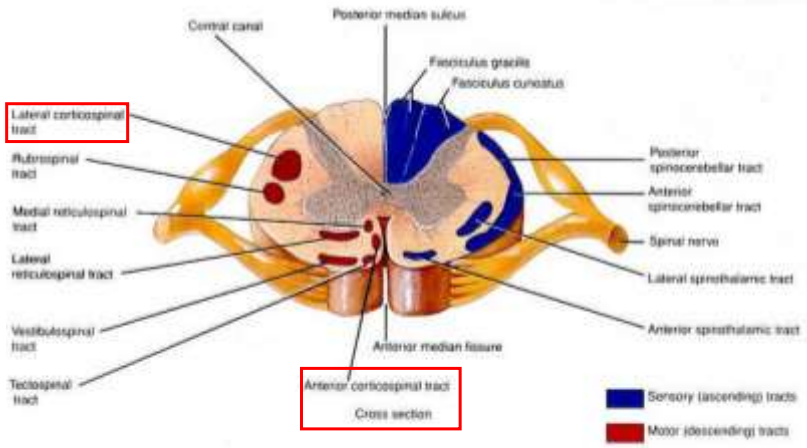


NUCLEAS OF THALAMUS



CORTICAL CENTRES

MOTORIC SYSTEM- PYRAMIDAL



MOTORIC SYSTEM- PYRAMIDAL

MOTORIC CORTEX

↓

CAPSULA INTERNA

↓

CRURA CEREBRI

↓

PONS

↓

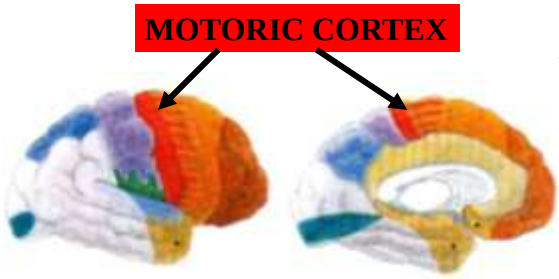
PYRAMIDES OF MEDULLA OBLONGATA

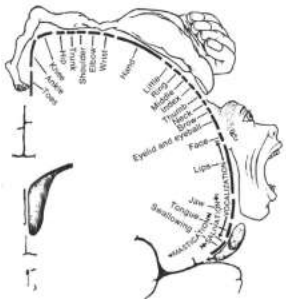
↓

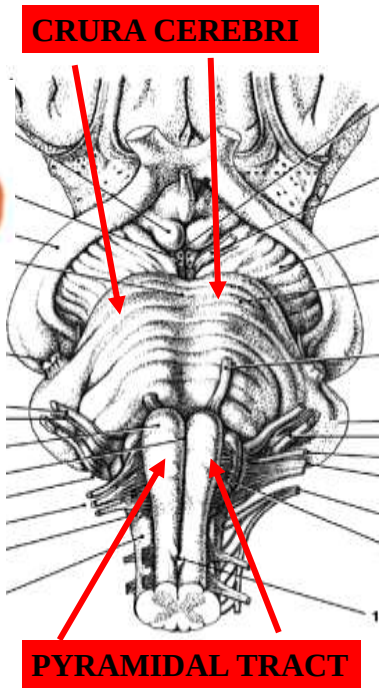
CORTICOSPINAL TRACT – LATER.+ ANTER.

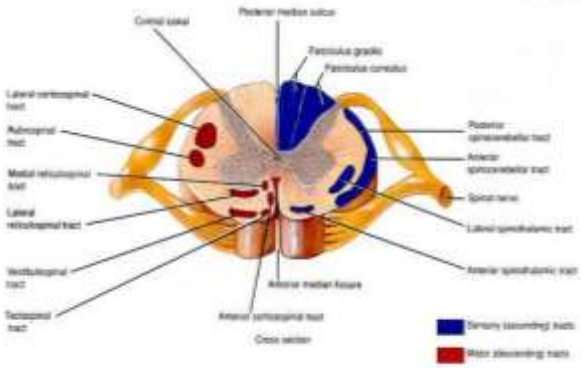
↓

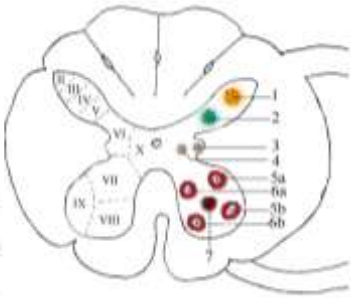
CORNUA ANTERIORES OF MEDULLA SPINALIS

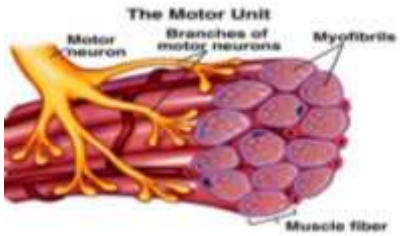

MOTORIC CORTEX



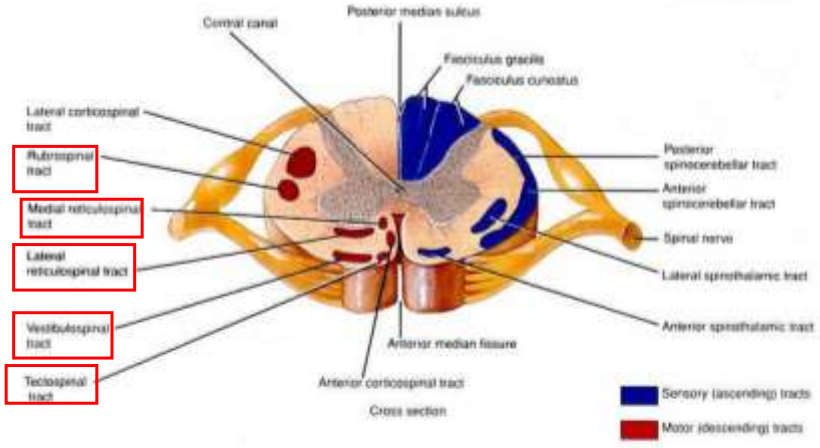

CRURA CEREBRI
PYRAMIDAL TRACT






The Motor Unit
Motor neuron
Branches of motor neurons
Myofibrils
Muscle fiber

MOTORIC SYSTEM- EXTRAPYRAMIDAL



MOTORIC SYSTEM- EXTRAPYRAMIDAL

MESENCEPHALON **PONS**

NC. RUBER **TECTUM** **RF** **NC.VESTIBULARES**

RUBROSPINAL TRACT
TECTOSPINAL TRACT
RETICULOSPINAL TRACT
VESTIBULOSPINAL TRACT

CORNUA ANTERIORES OF MEDULLA SPINALIS

POSTURAL MUSCLES

DĚKUJI ZA POZORNOST