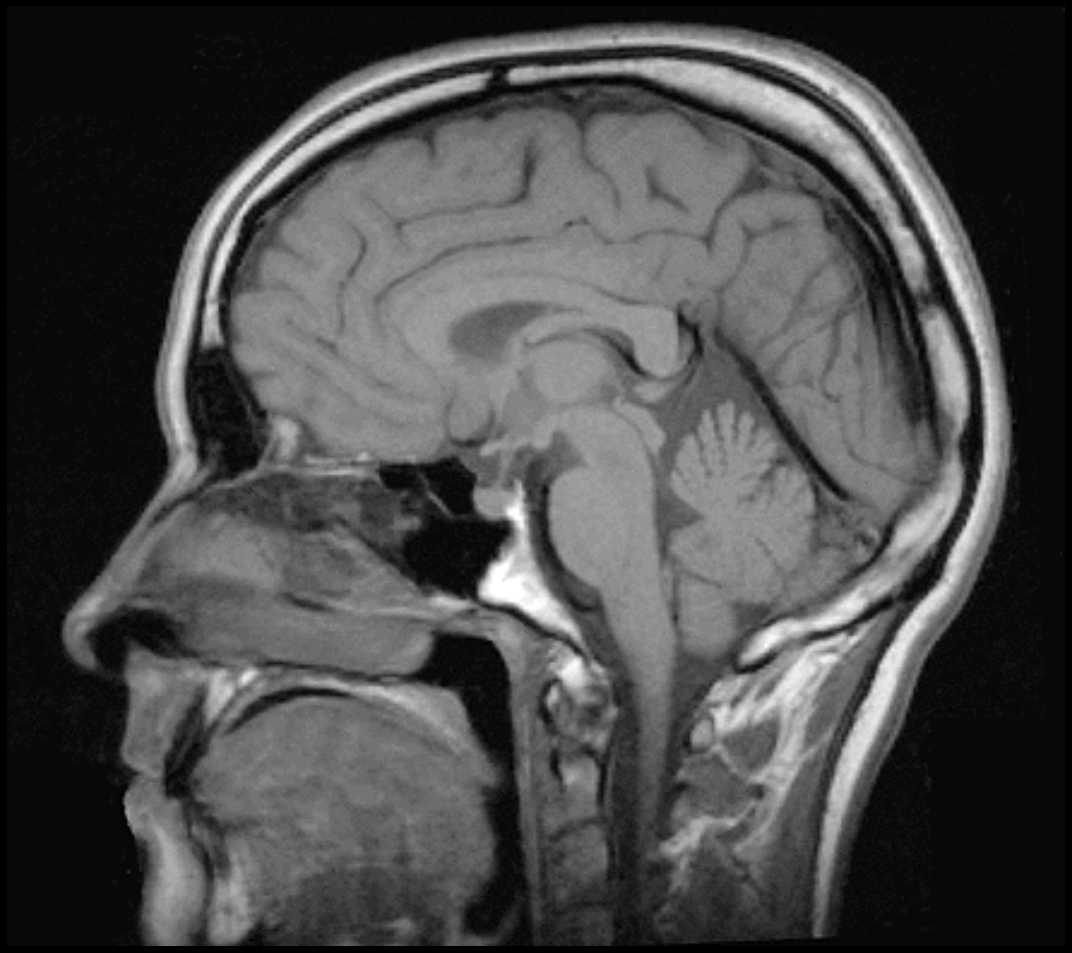
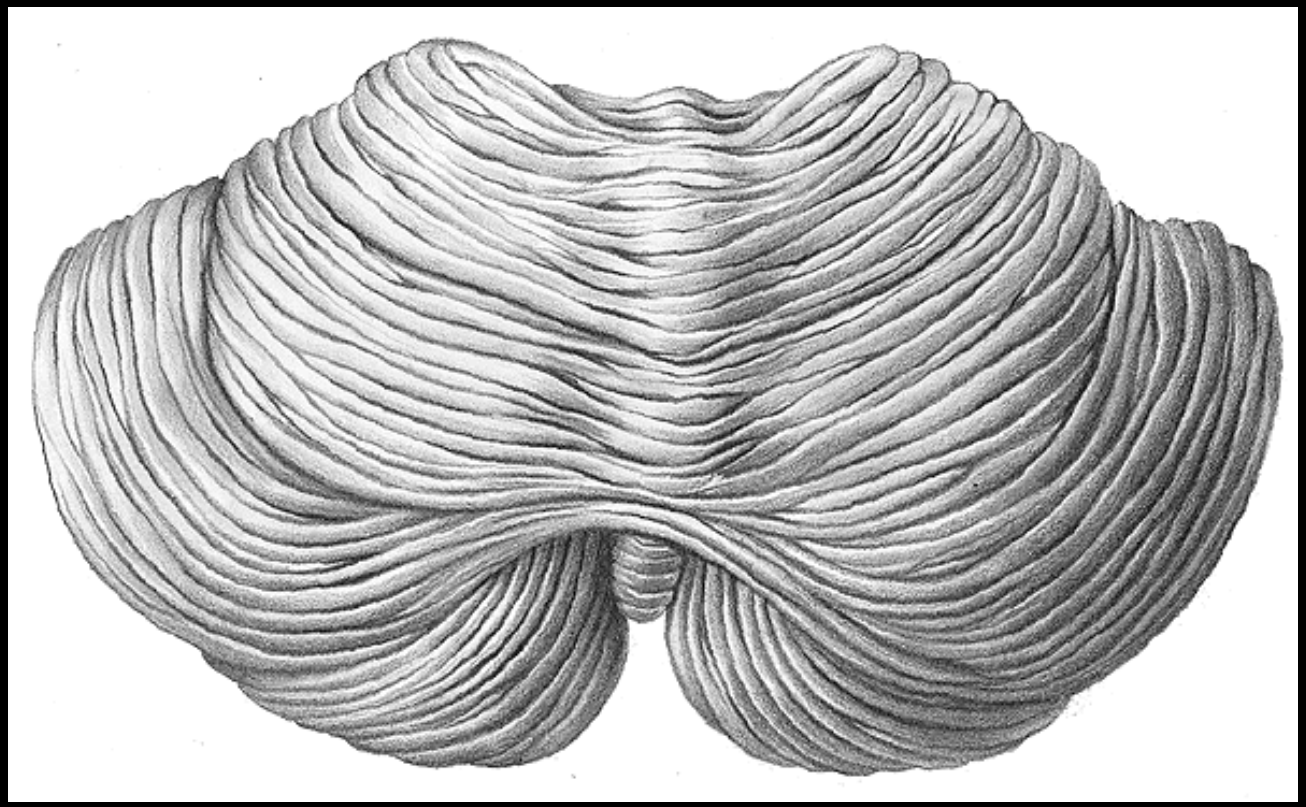
Cerebellum

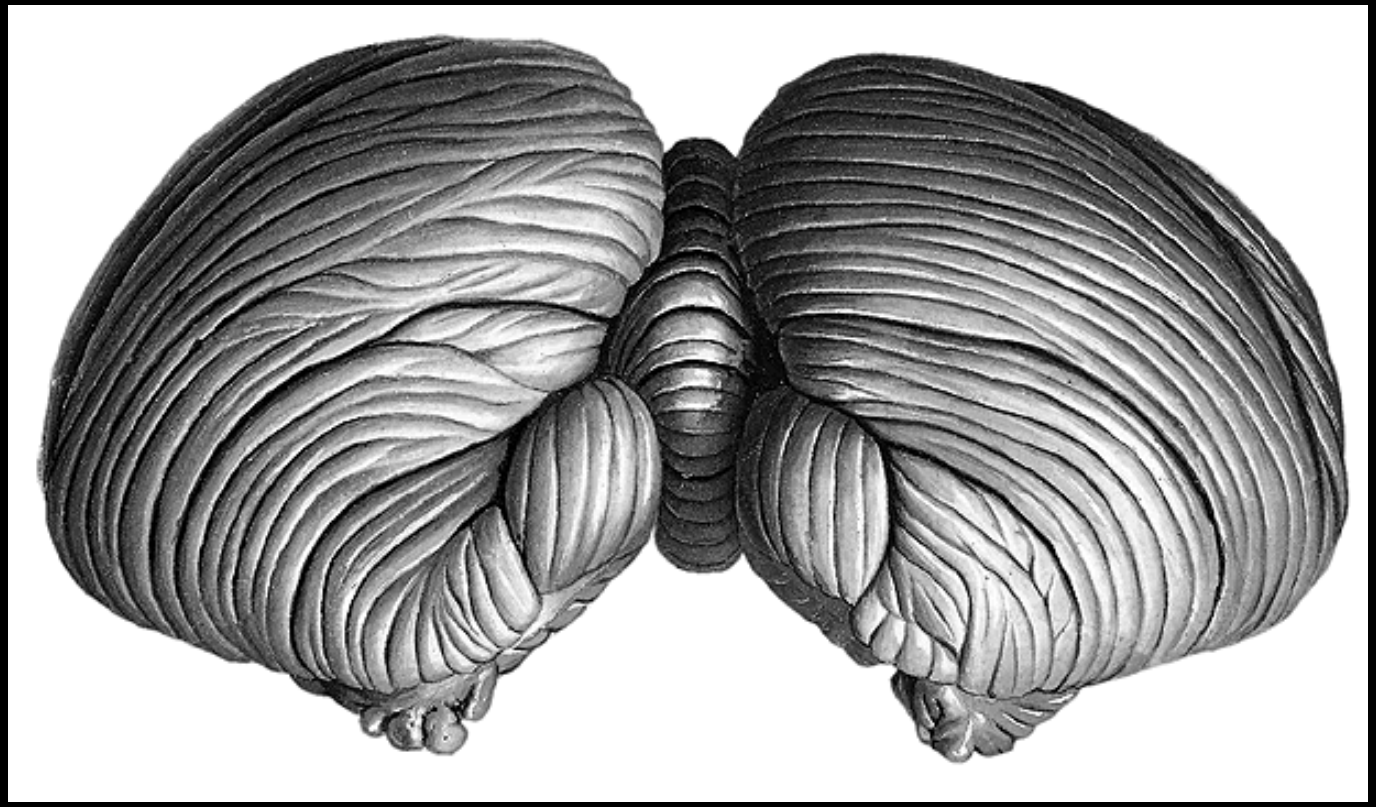


Coordination of movements



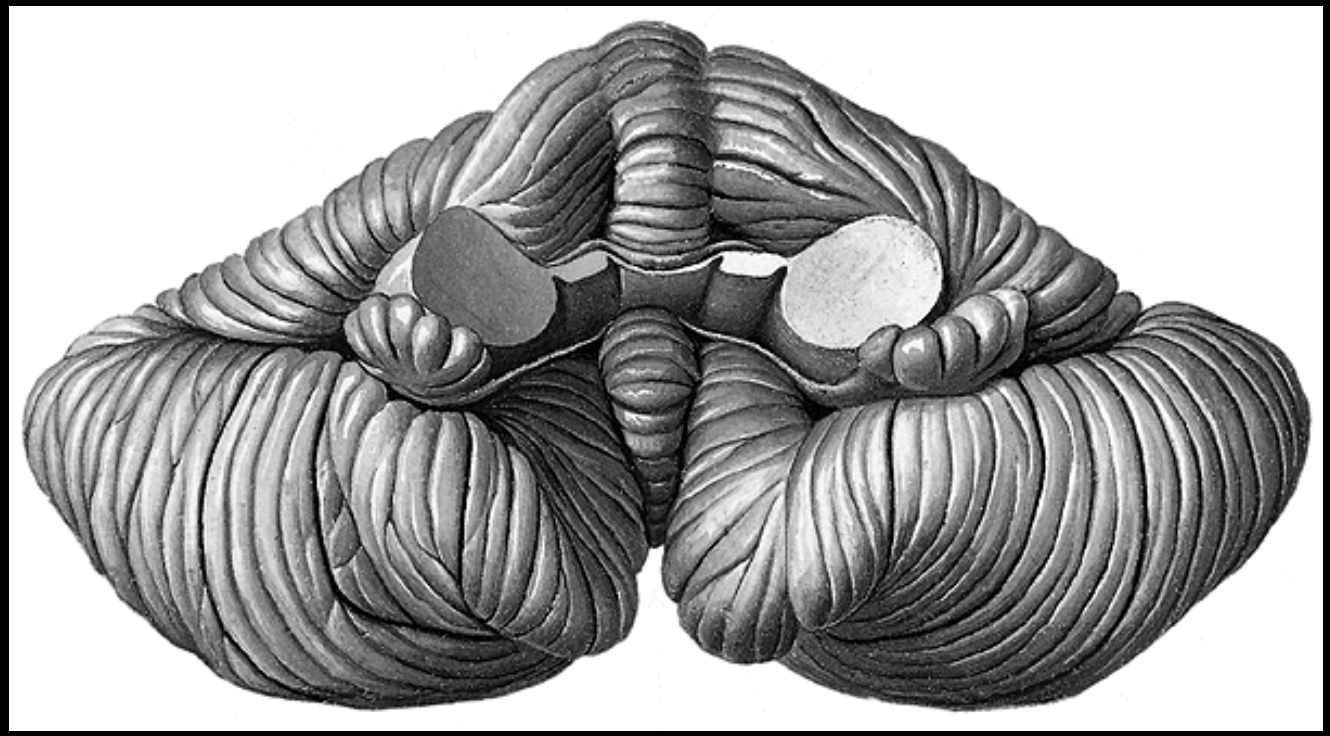
Margo ant., incisura cerebelli ant.

Margo post., incisura cerebelli post.

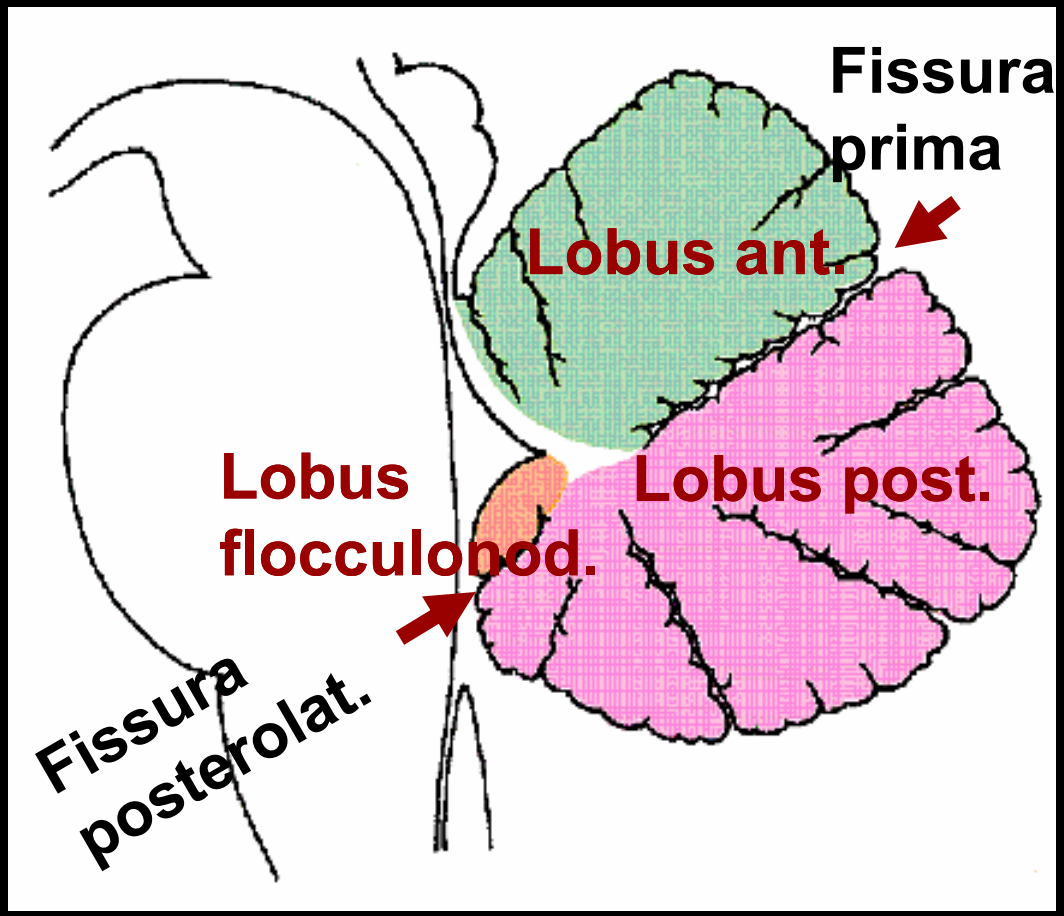


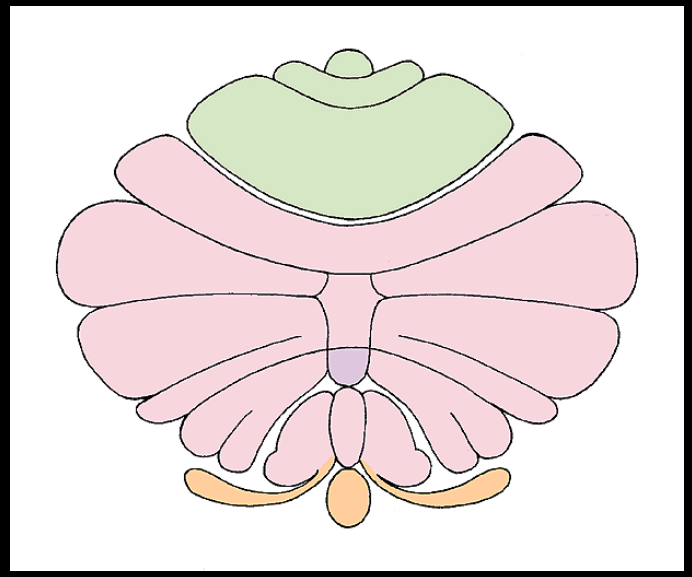
Vermis
Hemispheres

Folia, lobuli, lobi

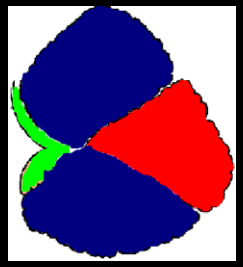


Pars flocculonodularis


Fissura prima
Lobus ant.
Lobus post.
Lobus flocculonod.
Fissura posterolat.



Developmental anatomy



Afferents from vestib. labyrinth
fish, amphibians

Archi-cerebellum

VESTIBULO - CEREBELLUM

Afferents from spinal cord and brainstem
reptiles, birds, mammals

Paleo-cerebellum

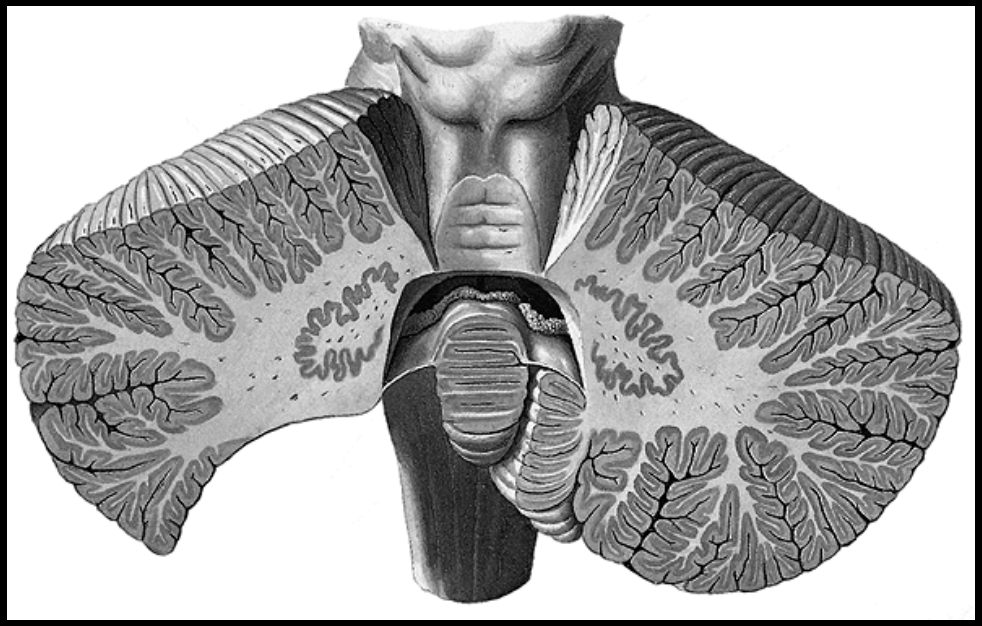
SPINO - CEREBELLUM

Afferents from cortex telencephali

Neo-cerebellum

PONTO - CEREBELLUM

Structure of the cerebellum



Grey matter

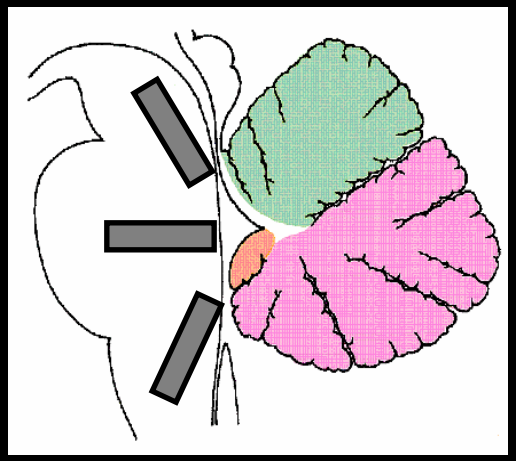
Cortex cerebelli

→ str. moleculare

← str. ganglionare

→ str. granulare

Nuclei cerebellares

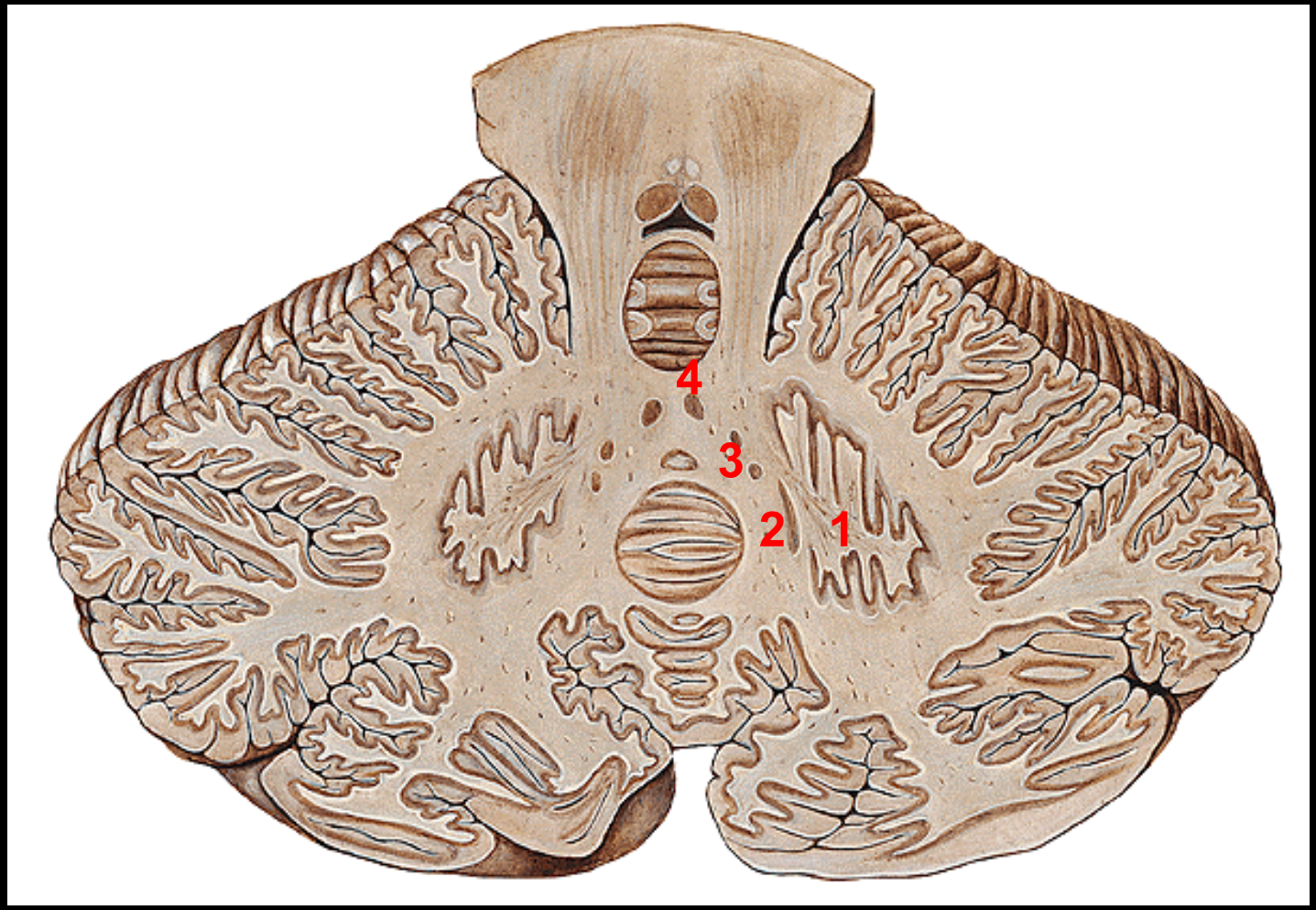


White matter

Subst. medullaris

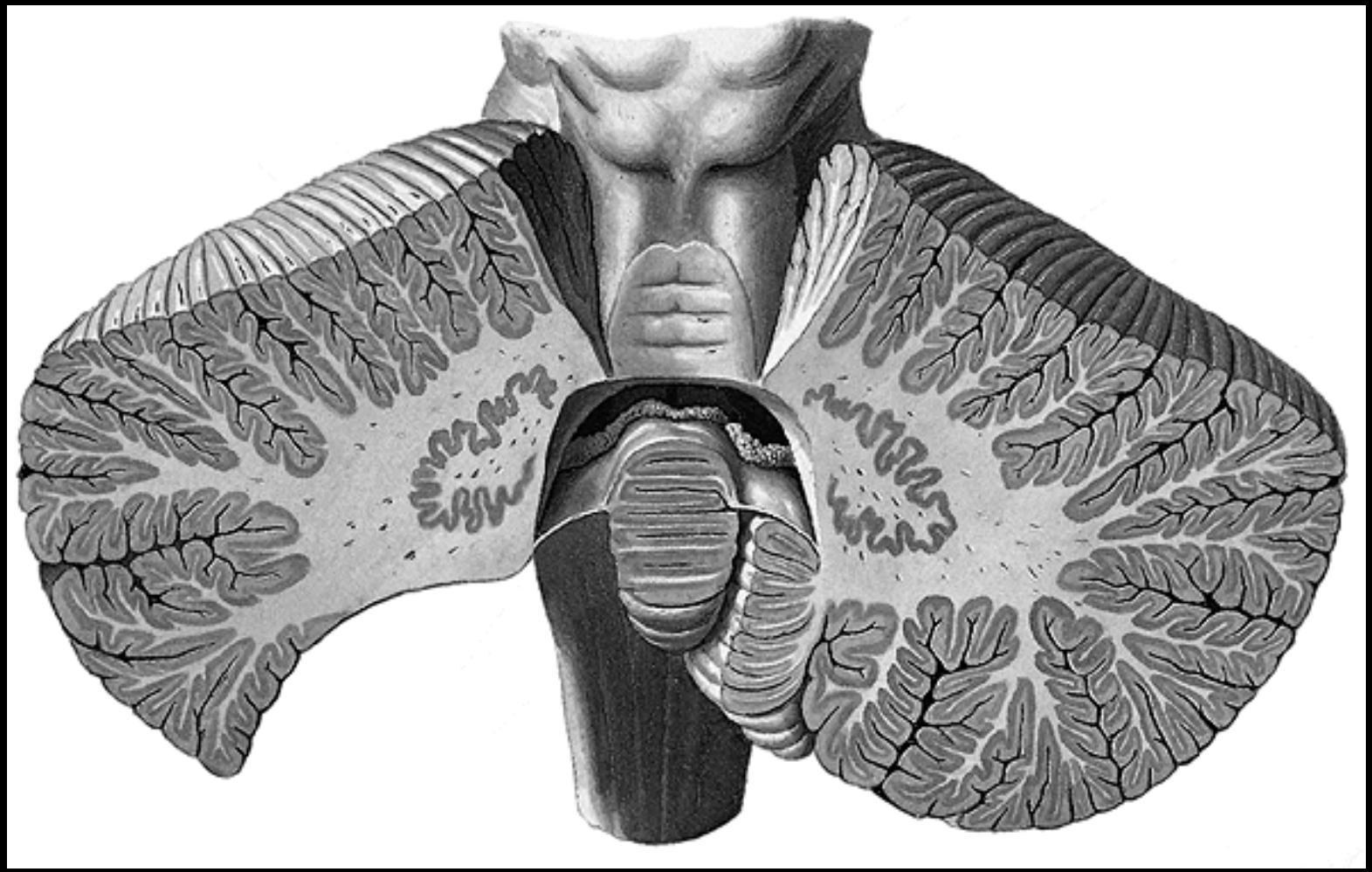
laminae albae (arbor vitae)

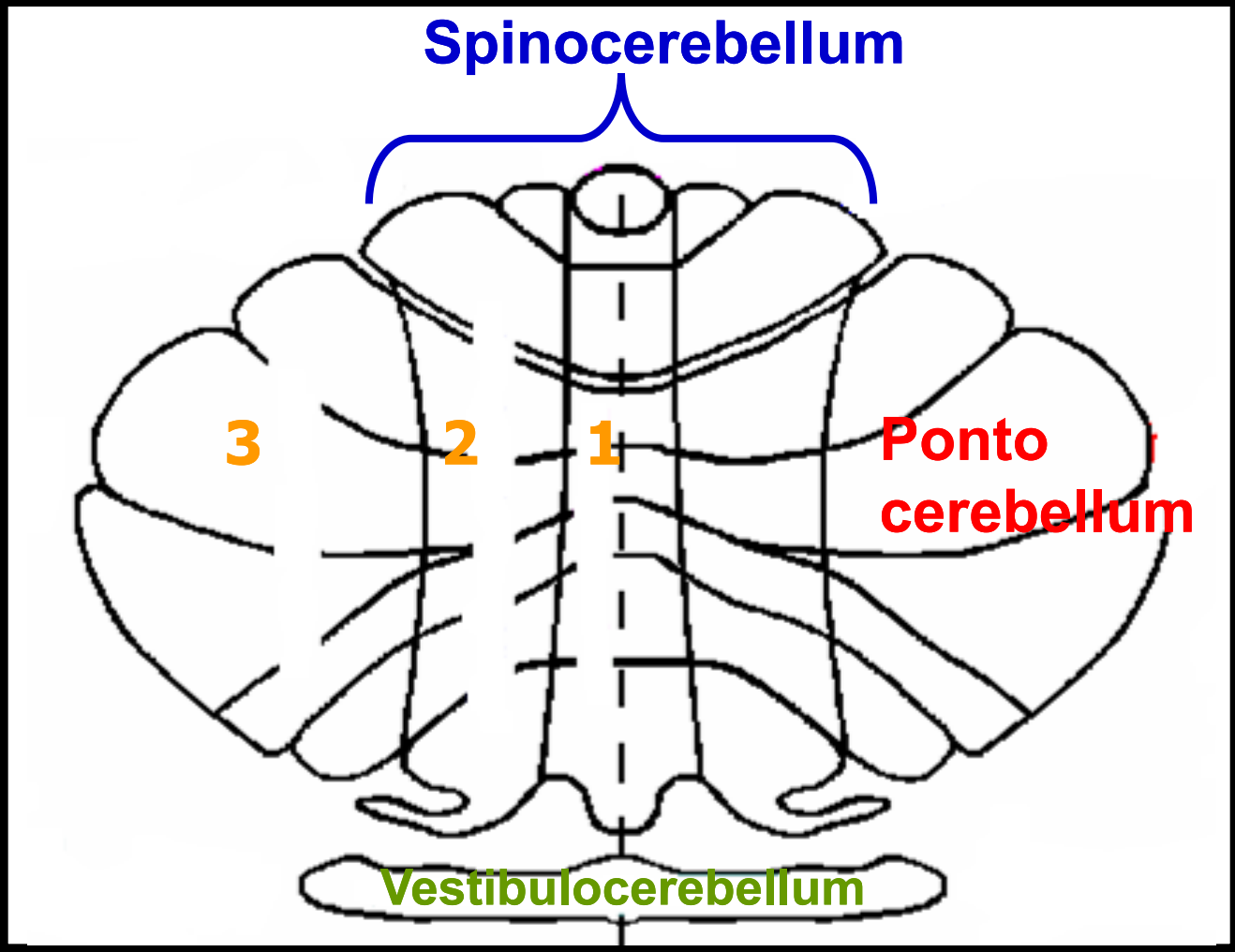
Pedunculi cerebellares



1 ncl. dentatus
2 ncl. emboliformis
3 ncll. globosi
4 ncl. fastigii

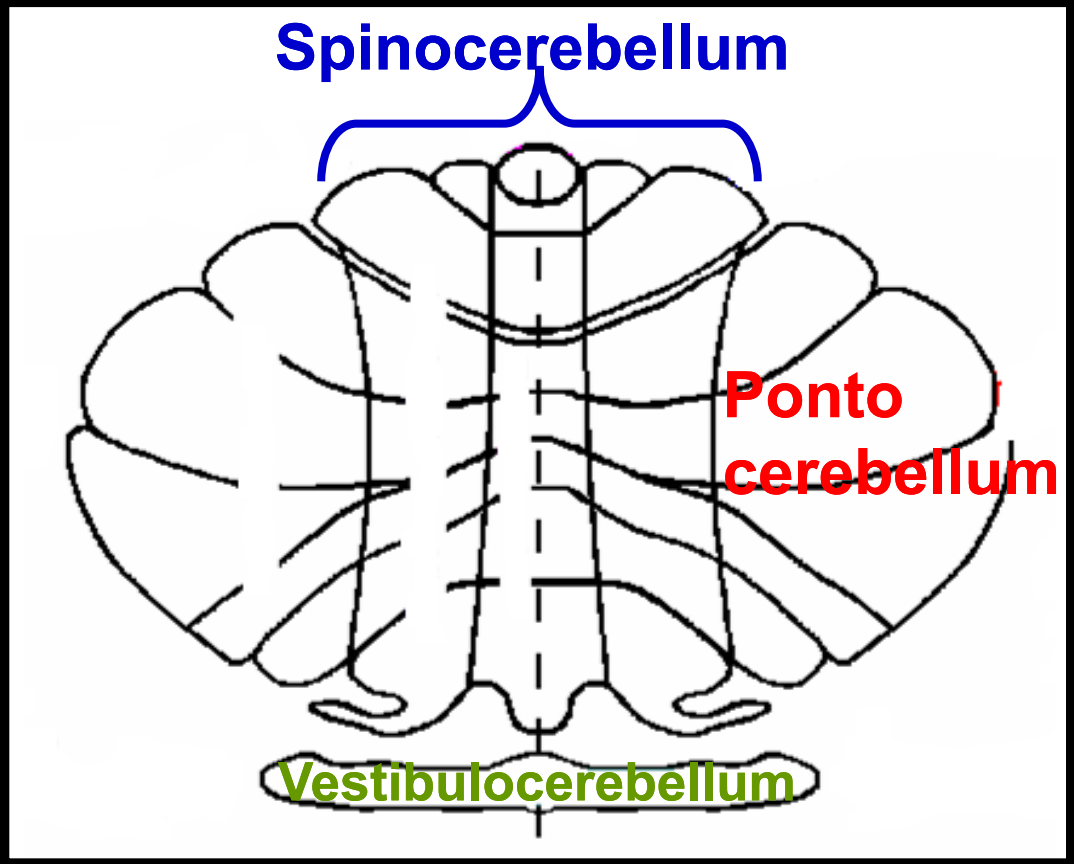
Nuclei cerebelli



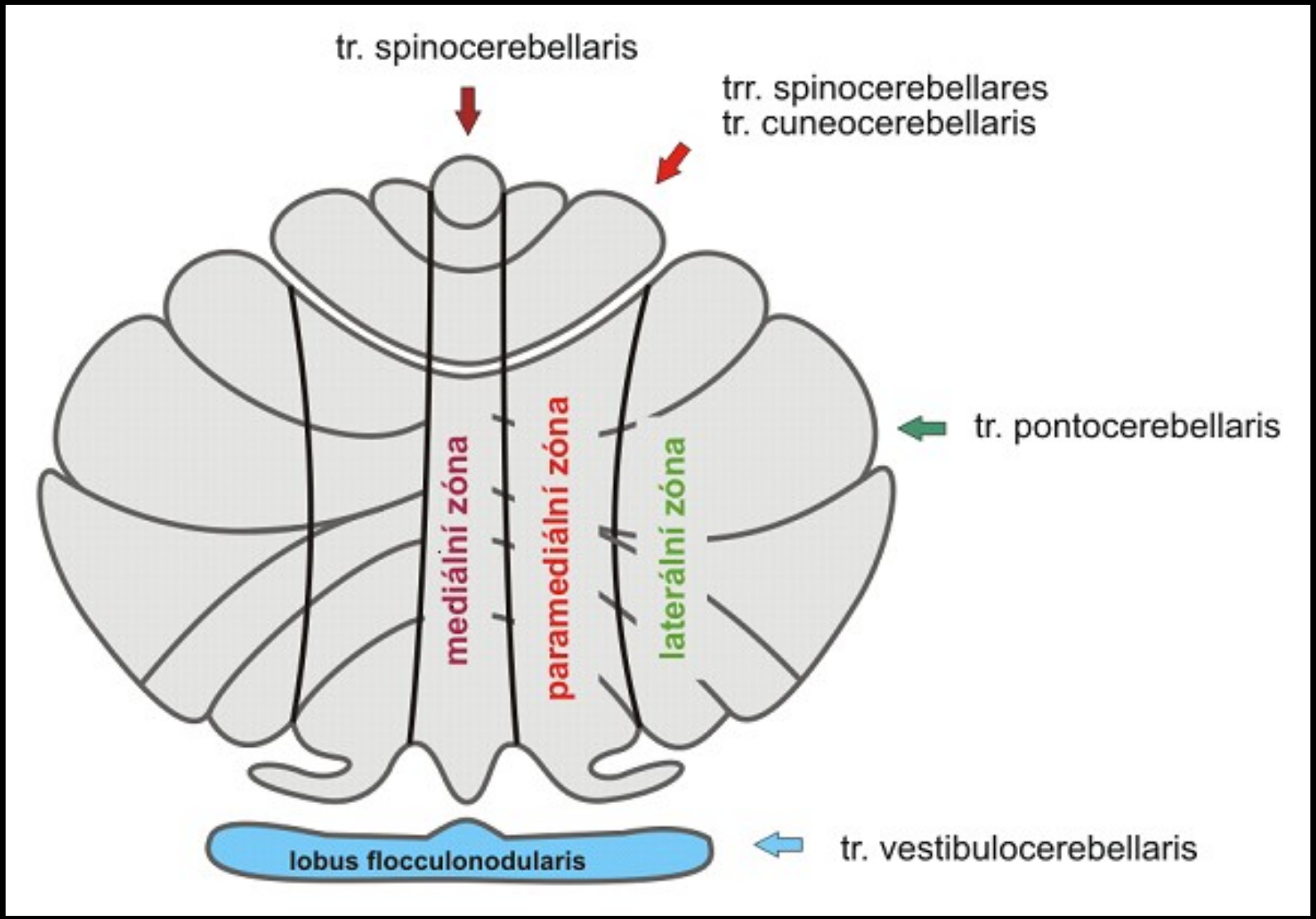


1 median zone
2 paramedian zone
3 lateral zone

L. flocculonodularis



Vestibulocereb. ncll. vestibulares
Spinocereb. ncll. fastigii, emboliformes, globosi
Neocereb. ncl. dentatus


tr. spinocerebellaris
trr. spinocerebellares
tr. cuneocerebellaris
mediální zóna
paramediální zóna
laterální zóna
tr. pontocerebellaris
lobus flocculonodularis
tr. vestibulocerebellaris

Pedunculi cerebel. inf.

→ tr. sp-ce post., cuneo-ce, bulbo-ce, ve-ce, re-ce, olivo-ce

← from lobus flocculonodul. to ncll. vestibulares (tr. ce-ve), to RF of the brainstem (tr. ce-re)

Pedunculi cerebel. medii

→ tr. ponto-ce

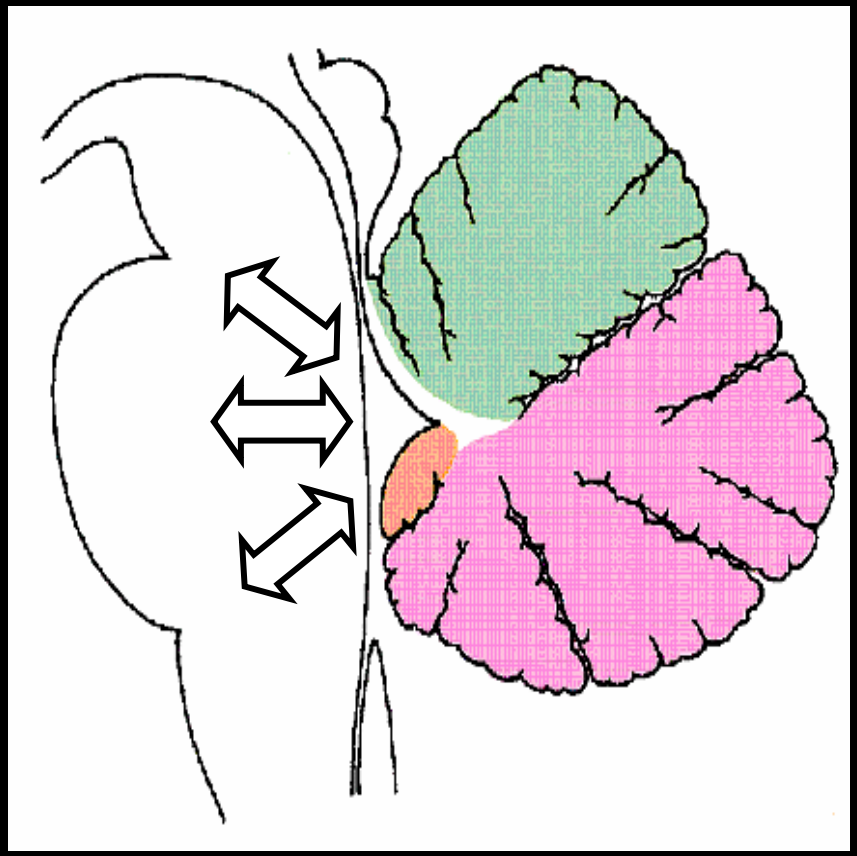
Pedunculi cerebel. sup.

→ tr. sp-ce ant., ru-ce a afferents from ncl. mesenceph. CN V

← from ncll. emboliformes, globosi and dentatus

Afferents : efferents = 40:1

Pathways of the cerebellum



Afferents to the cortex cerebelli

from vestib. labyrinth
from spinal cord and brainstem
from cortex of the brain

Efferents from the nuclei
to brainstem, thalamus

Function of the cerebellum

archicerebellum > posture and eye movements

paleocerebellum > progressive movements (walking, swimming etc.)

neocerebellum > manipulative movements and speech

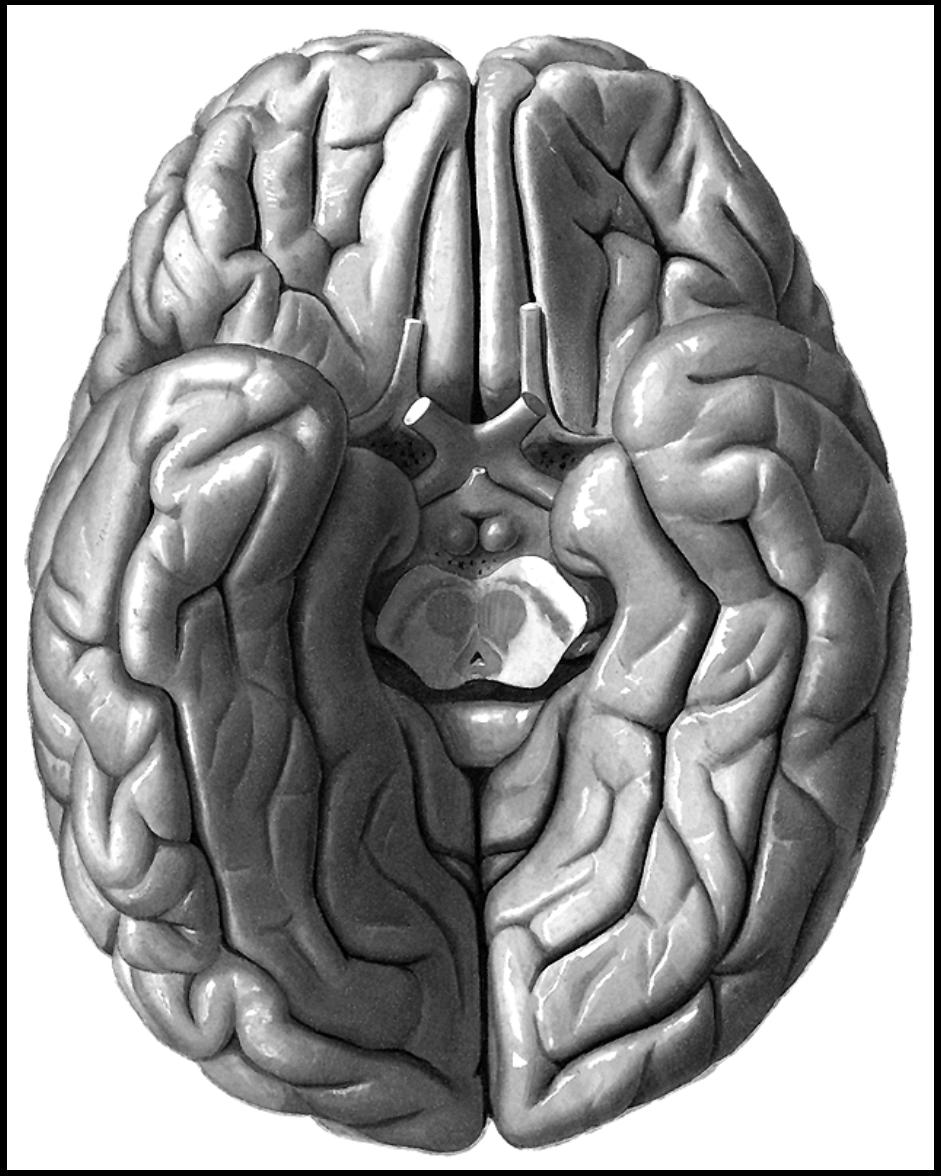
CEREBELLAR DISORDERS

Ataxia inability to stand upright without support

Dysmetria „overshooting“ - the hand may travel past the target

Dyssynergia incoordination

Adiadochokinesia inability to perform rapid alternating movements



DIENCEPHALON

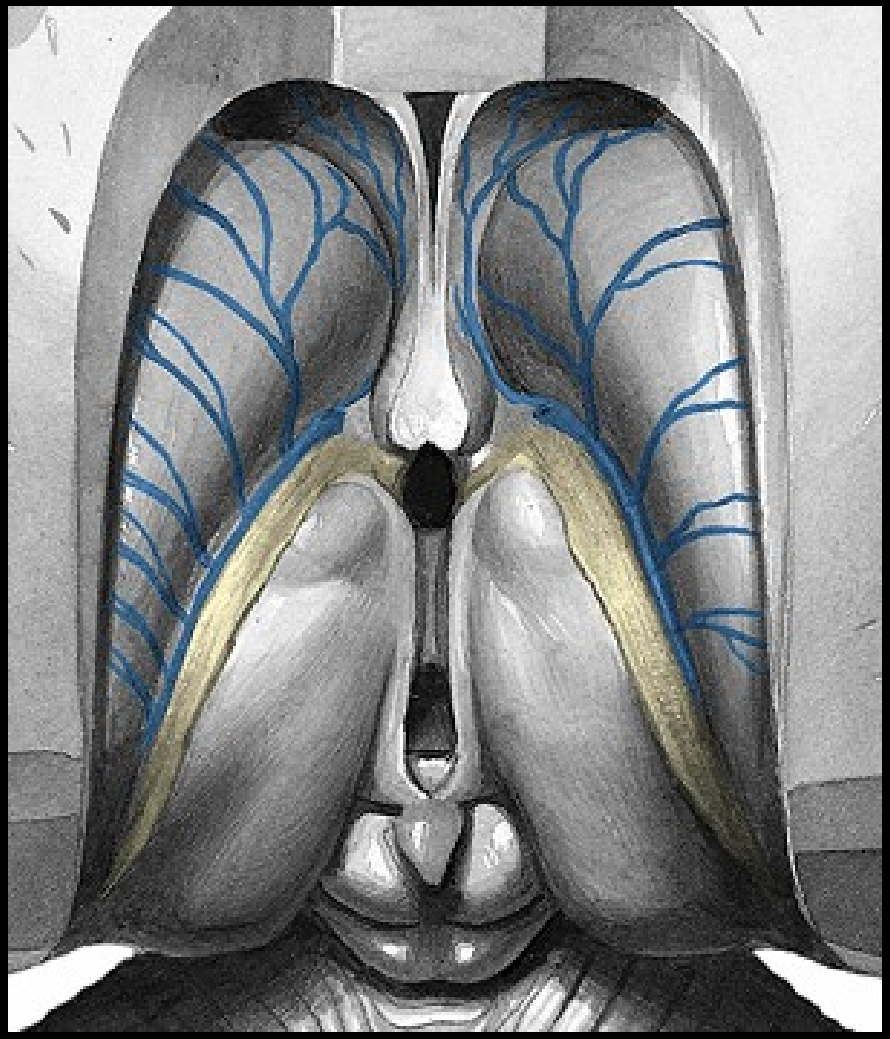
thalamus

(metathalamus)

epithalamus

subthalamus

hypothalamus



Thalamus

tuberculum ant.

pulvinar

stria medullaris
(tela choroidea ventr. III.)

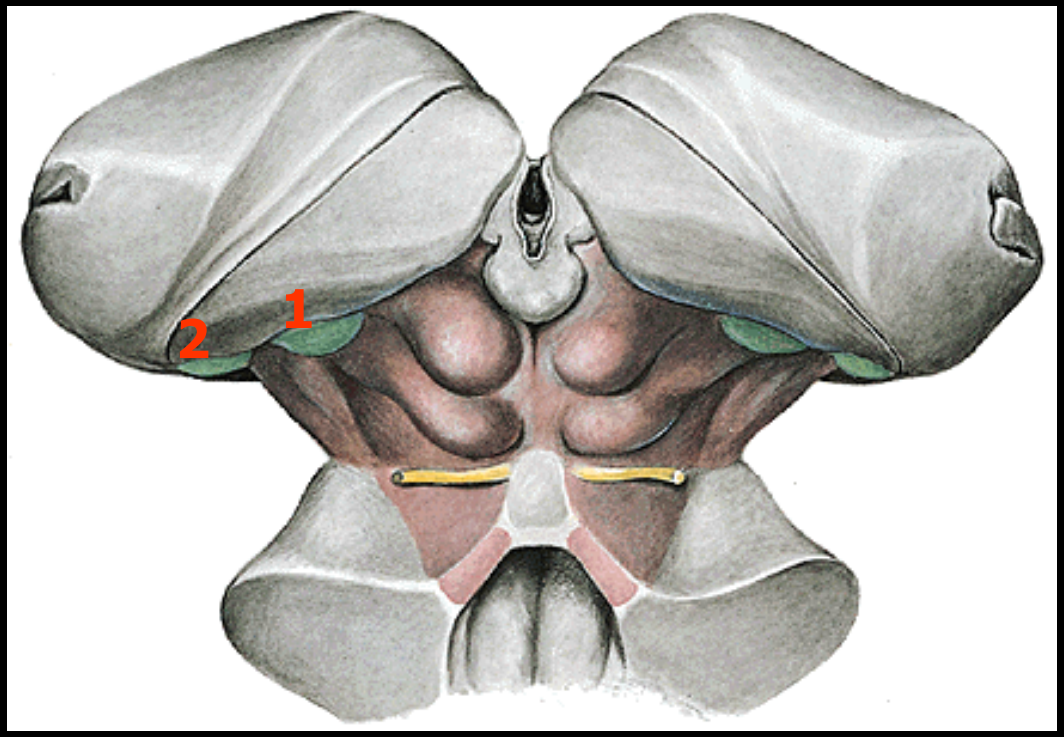
fissura transversa cerebri

taenia choroidea
(tela choroidea ventr. lat.)

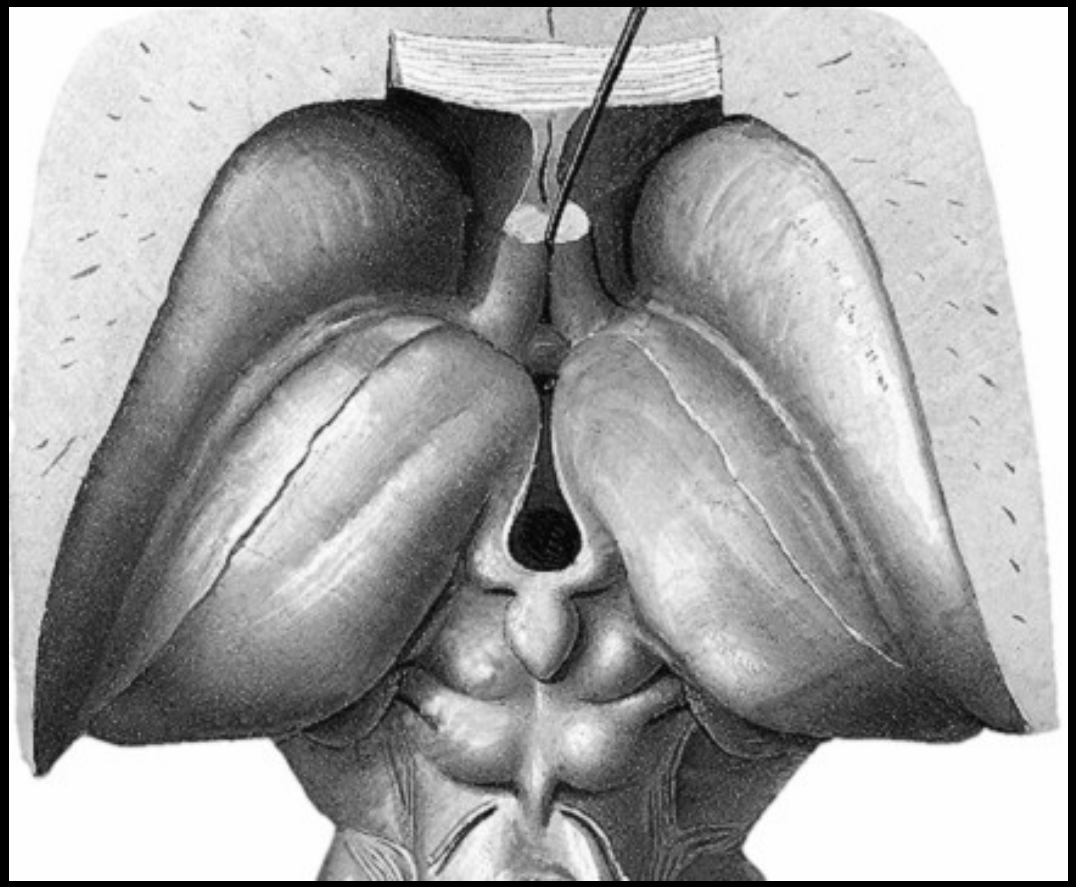
lamina affixa thalami

stria terminalis

Metathalamus



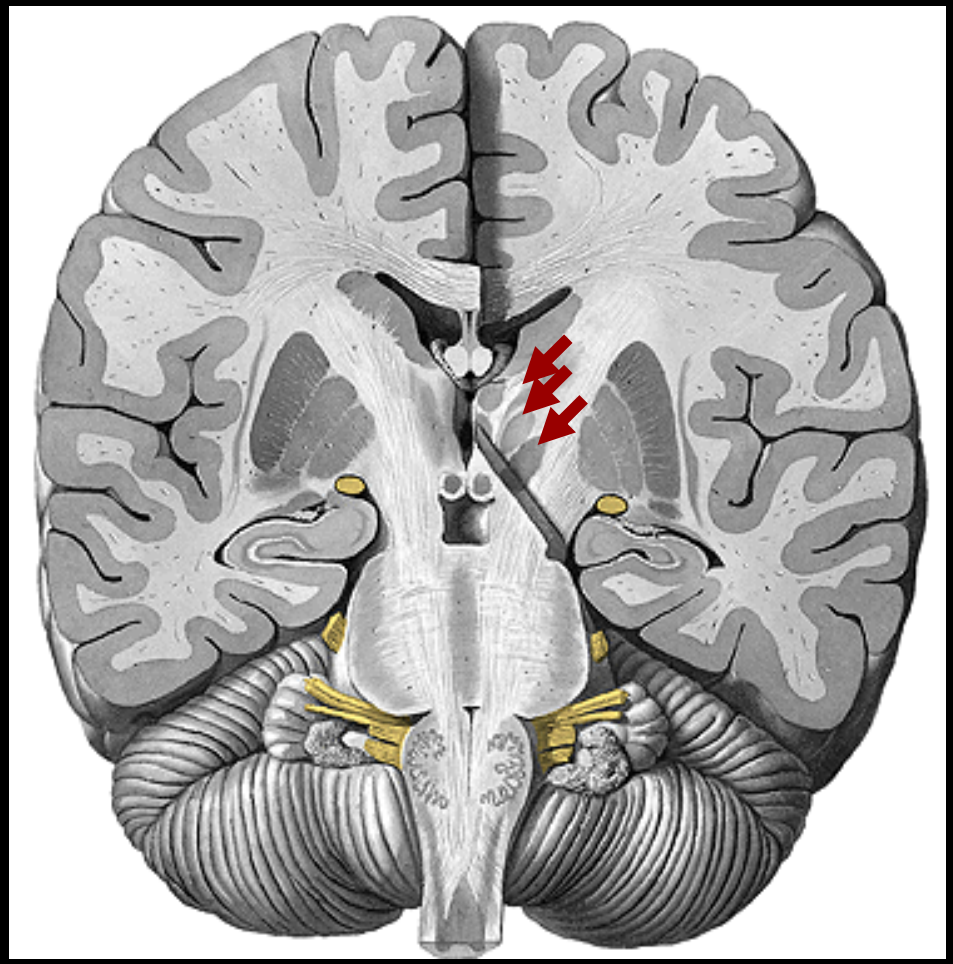
1 corp. geniculatum med.
brachium colliculi inf. – colliculus inf. 2
corp. geniculatum lat.
brachium colliculi sup. – colliculus sup.



Epithalamus

stria medullaris thalami
trigona habenularum
commissura habenularum et post.
corpus pineale (epiphysis cerebri)

Subthalamus



Involved in motor circuits

Grey matter

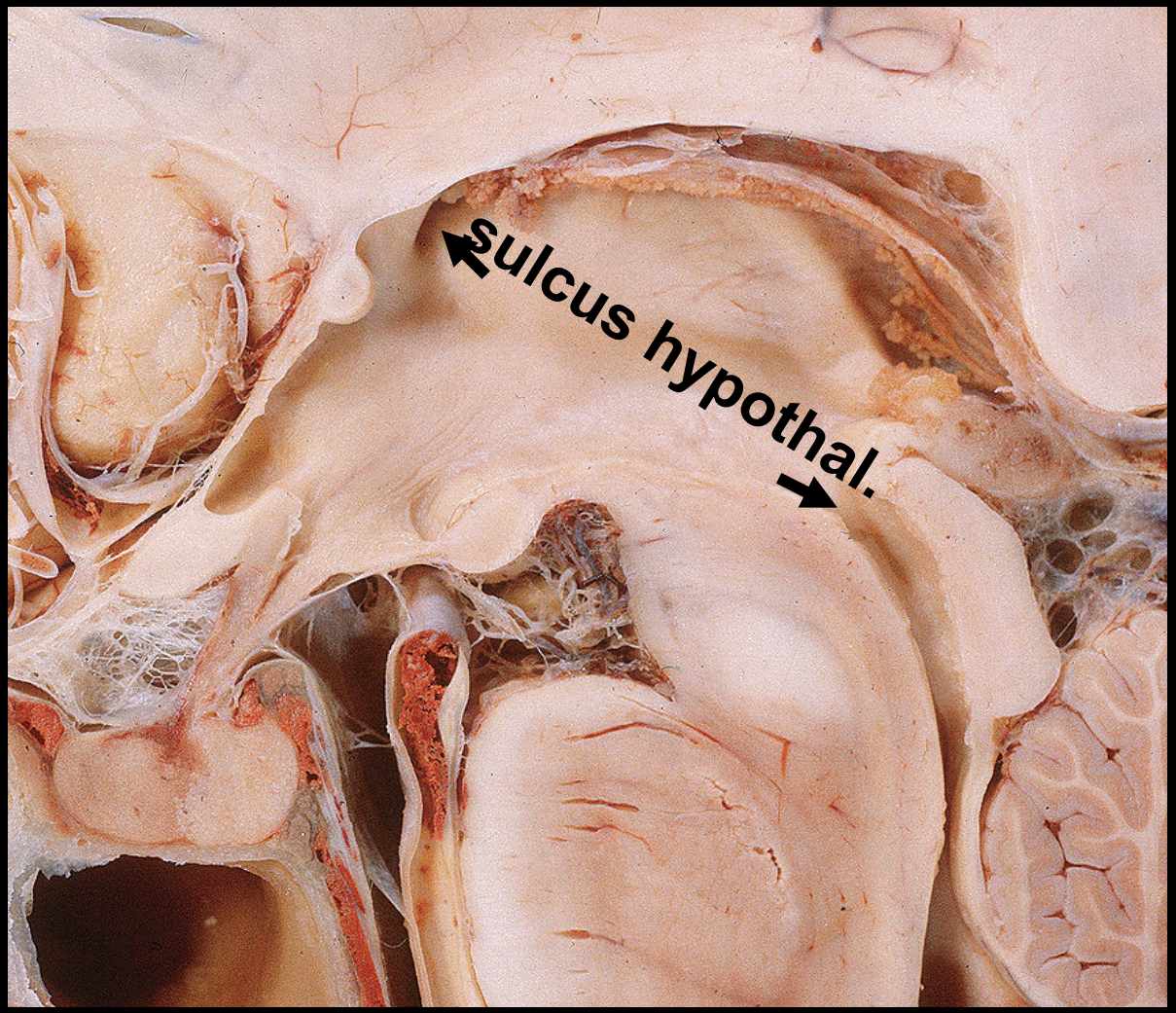
← zona incerta

← ncl. subthalamicus

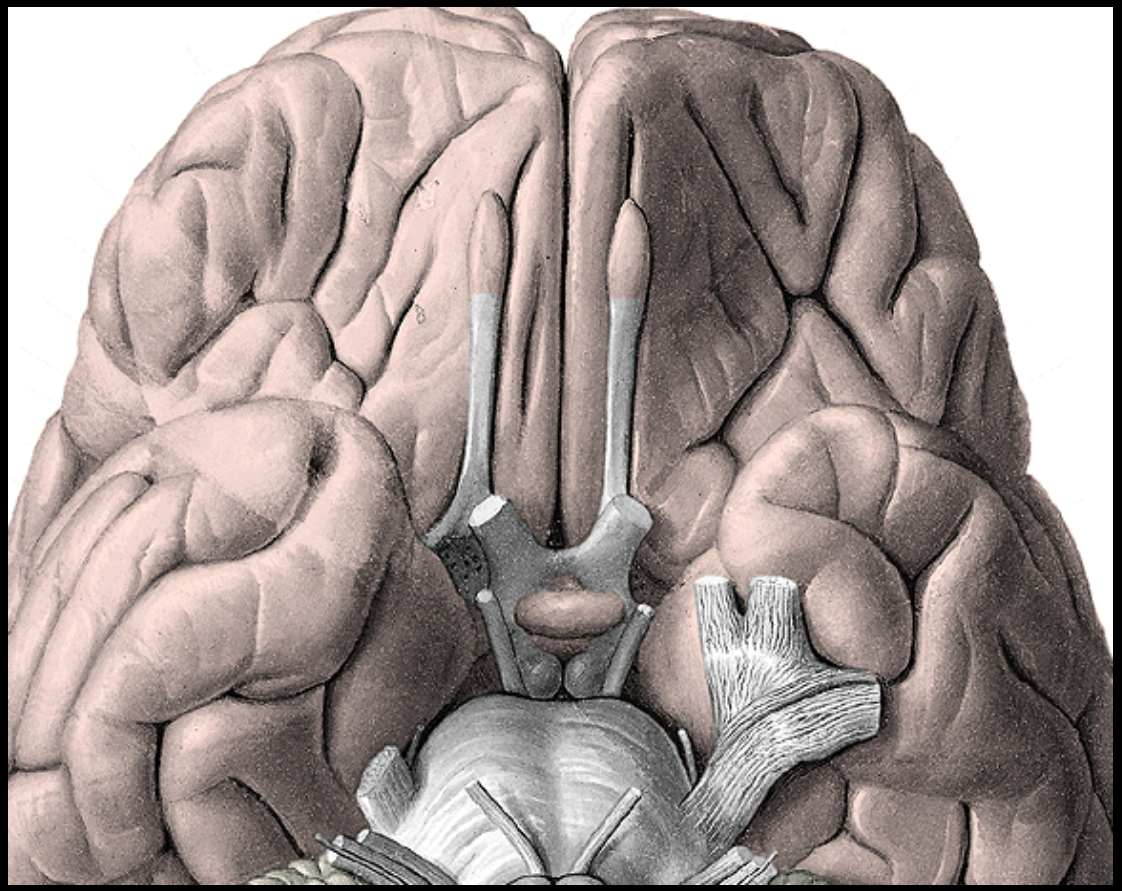
← part of subst. nigra
part of globus pallidus

White matter

Fasc. thalamicus
Fasc. lenticularis
Ansa lenticularis
Fasc. subthalamicus


Sulcus hypothal.

Hypothalamus

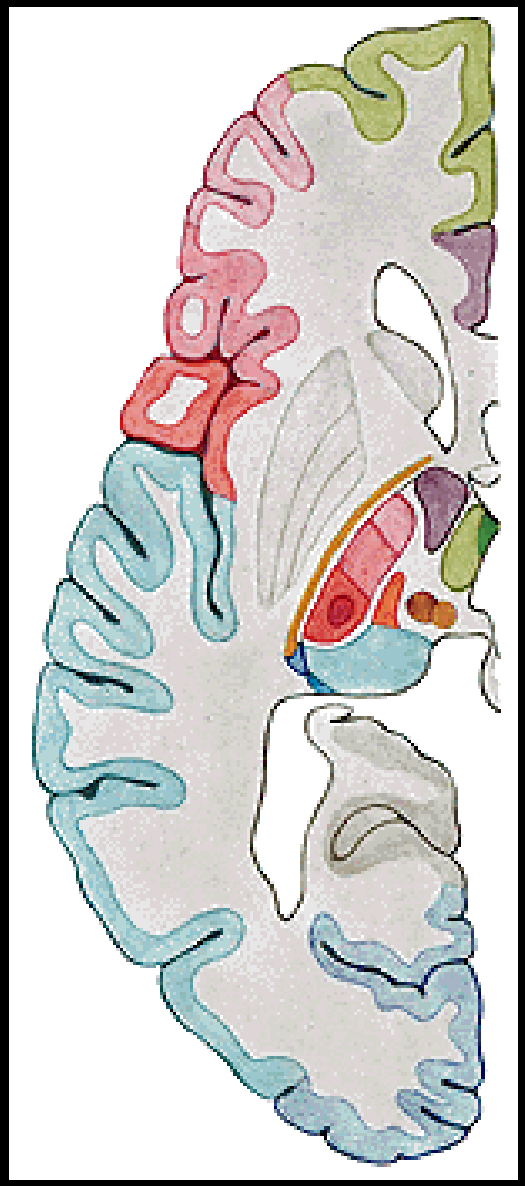


Corp. mamillaria

Infundibulum

Tuber cinereum

Hypophysis cerebri



THALAMUS

- ✓ relay station of ascending pathways
- ✓ involved in motor circuits
- ✓ reciprocal connections to the association areas of the cerebral cortex – functions related to memory, cognition, judgement, mood

Anterior group

A ncll. ant.

Lateral group

dorsal row

LD ncl. lat. dors.

LP ncl. lat. post.

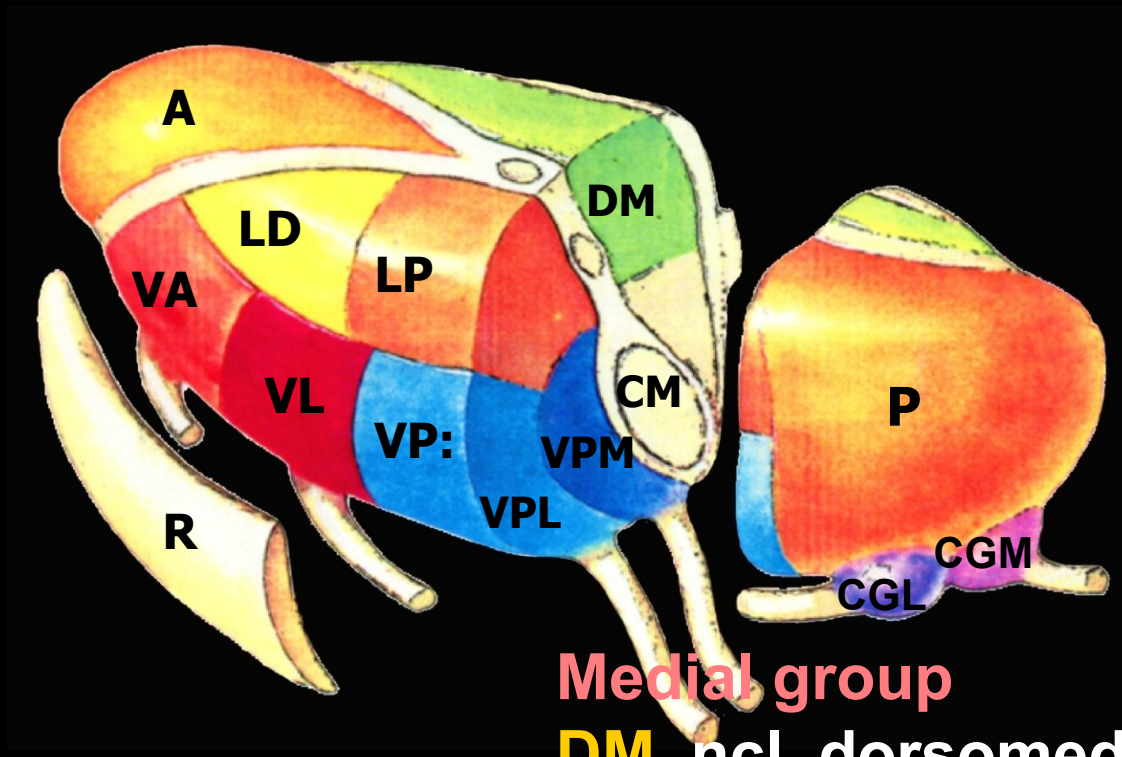
ventral row

VA ncl. ventr. ant.

VL ncl. ventr. lat.

VP ncl. ventr. post.:

- **VPL** ncl. ventr. post-lat
- **VPM** ncl. ventr. post-med
- **CGL** ncl. corporis gen. lat.
- **CGM** ncl. corporis gen. med.



Medial group

DM ncl. dorsomed.

Posterior group

P ncll. pulvinari,post.

Intralaminar group

CM ncl. centromed.

R ncll. reticulares

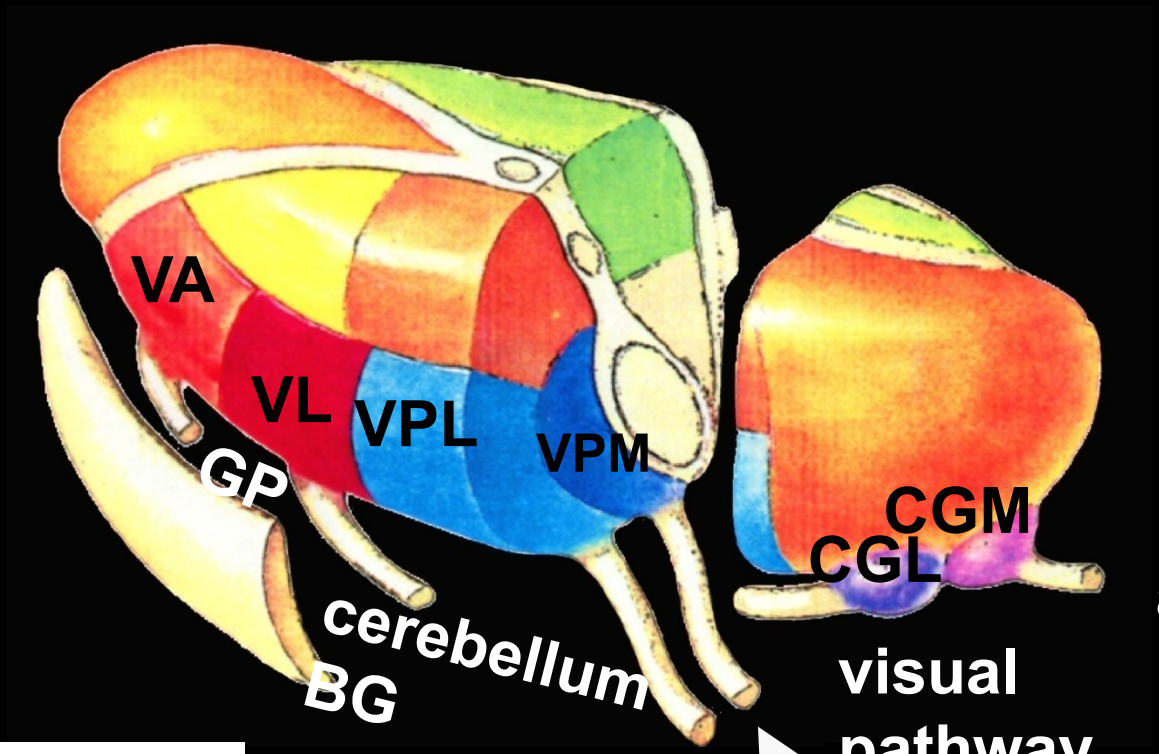
Functional groups of nuclei

specific nuclei
somatosenzory
senzory
motor

non-specific nuclei

association nuclei

Specific nuclei

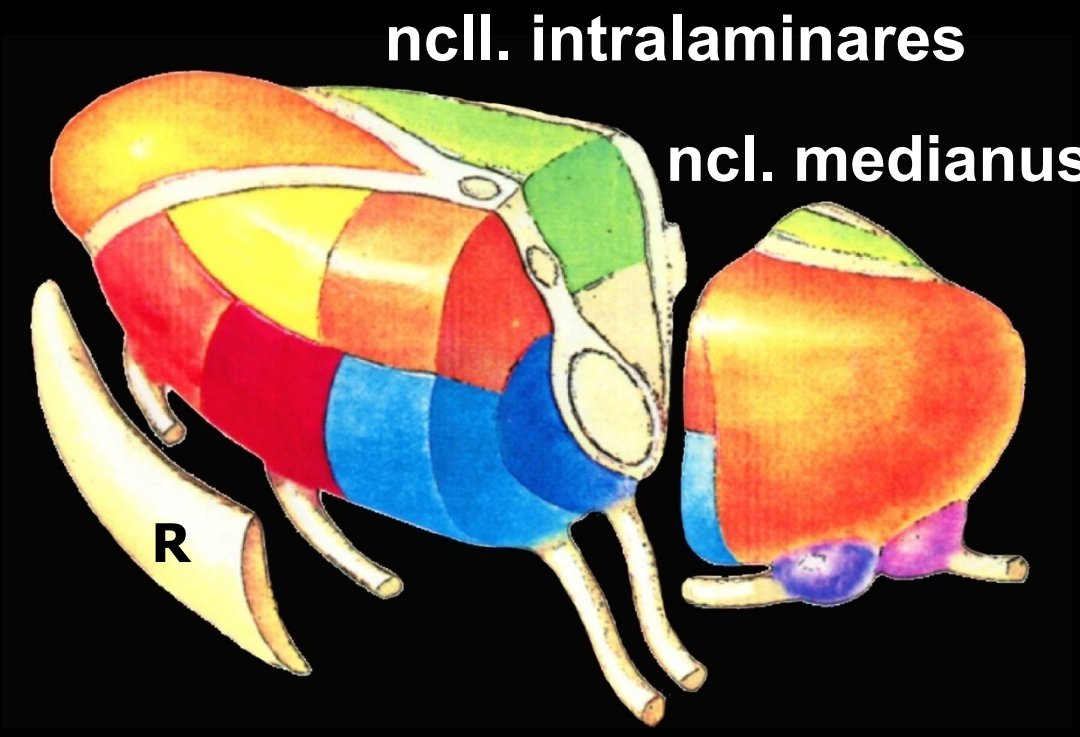


SS: VPL, VPM

S: CGM, CGL

M: VA, VL

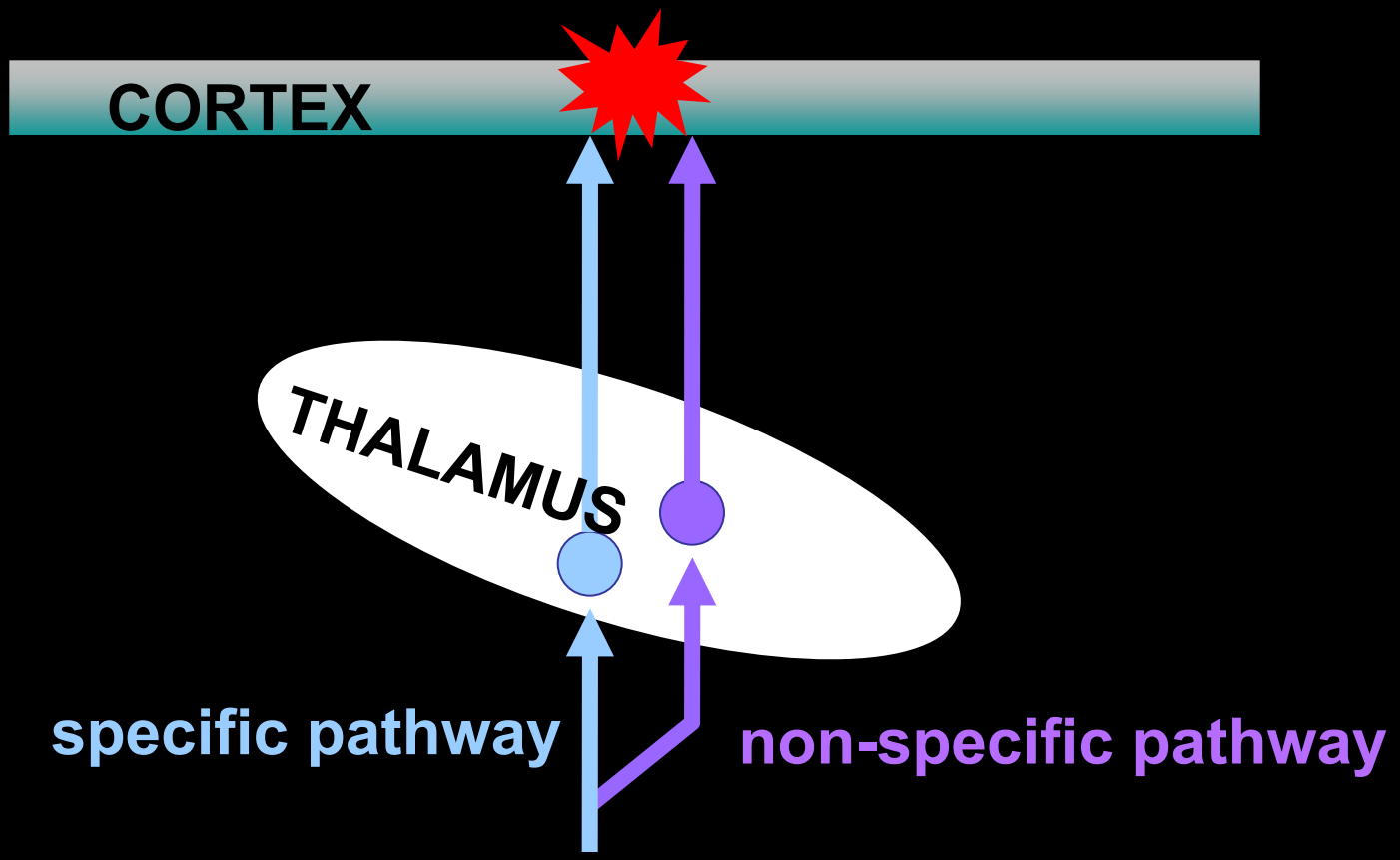
Non-specific nuclei



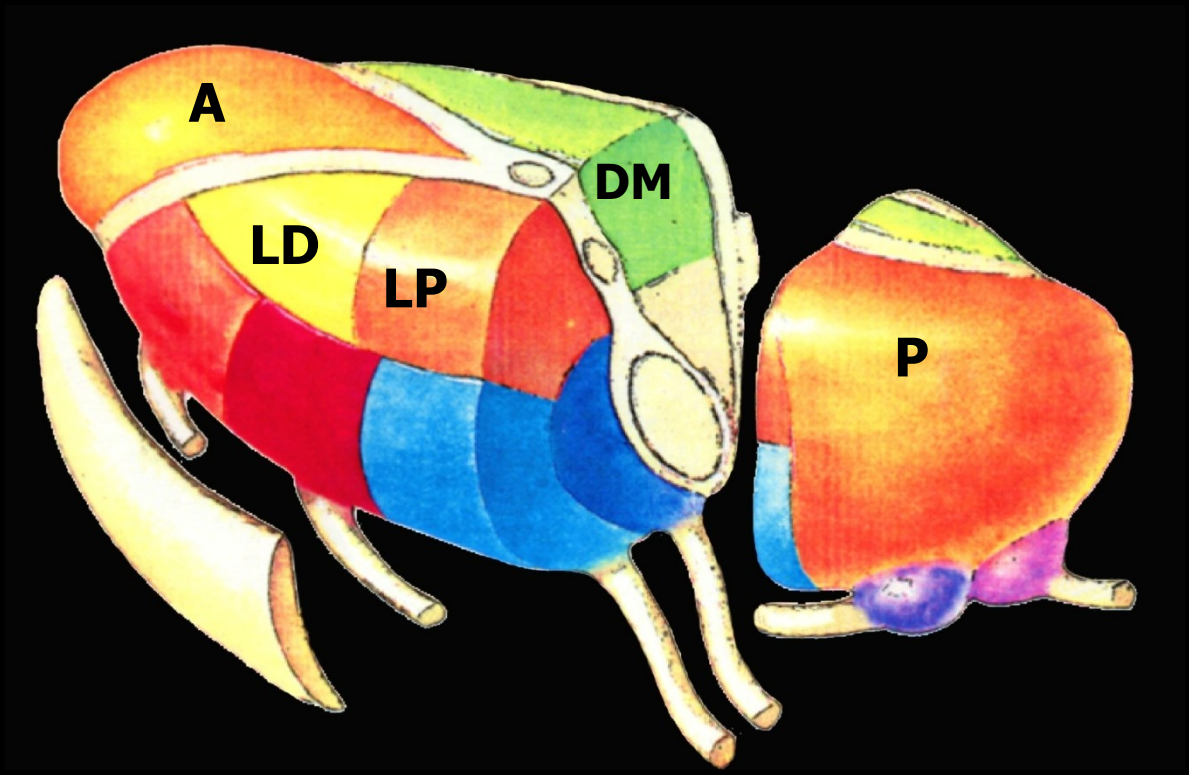
→ from FR of the brainstem and other thalamic nuclei

← to BG, thalamus, cortex (ARAS)

Projection to the cortex through specific and non-specific thalamic nuclei



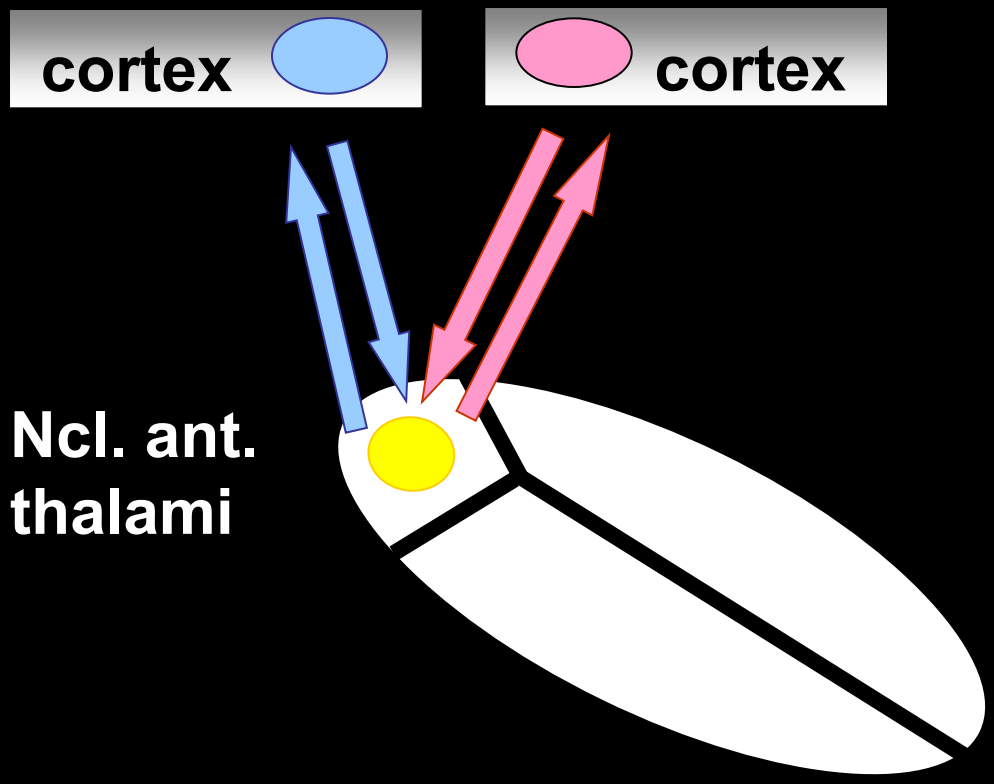
Association nuclei



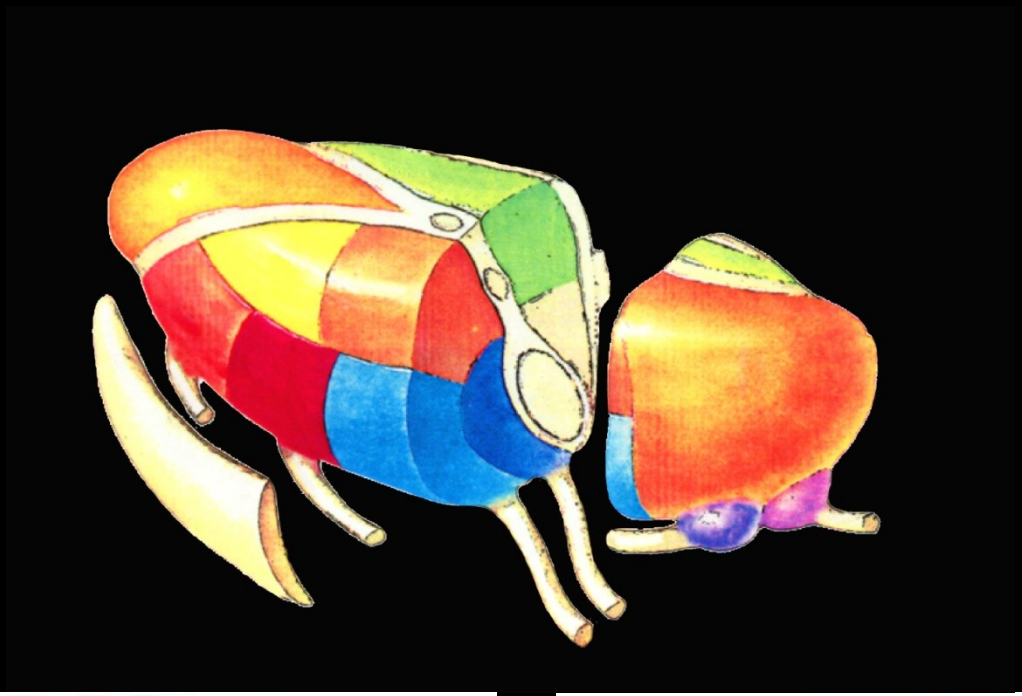
integration of GSA a SA inputs ⇒ to cortex

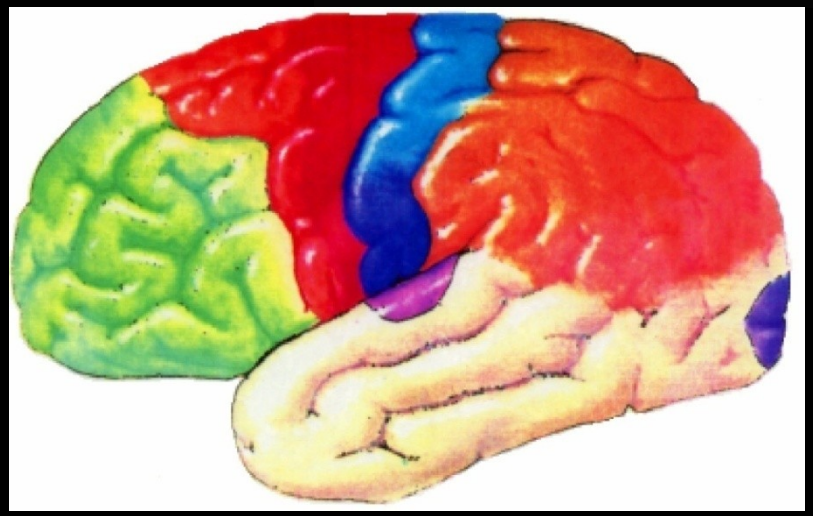
reciprocal connections with the association cortex

Function of association nuclei

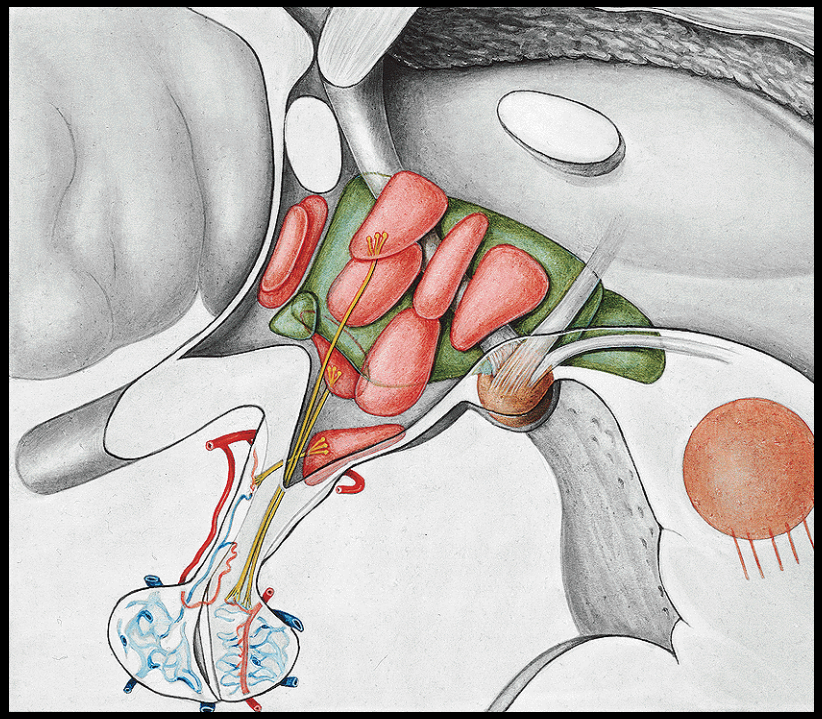


Interconnection of association areas of the cortex





Hypothalamus



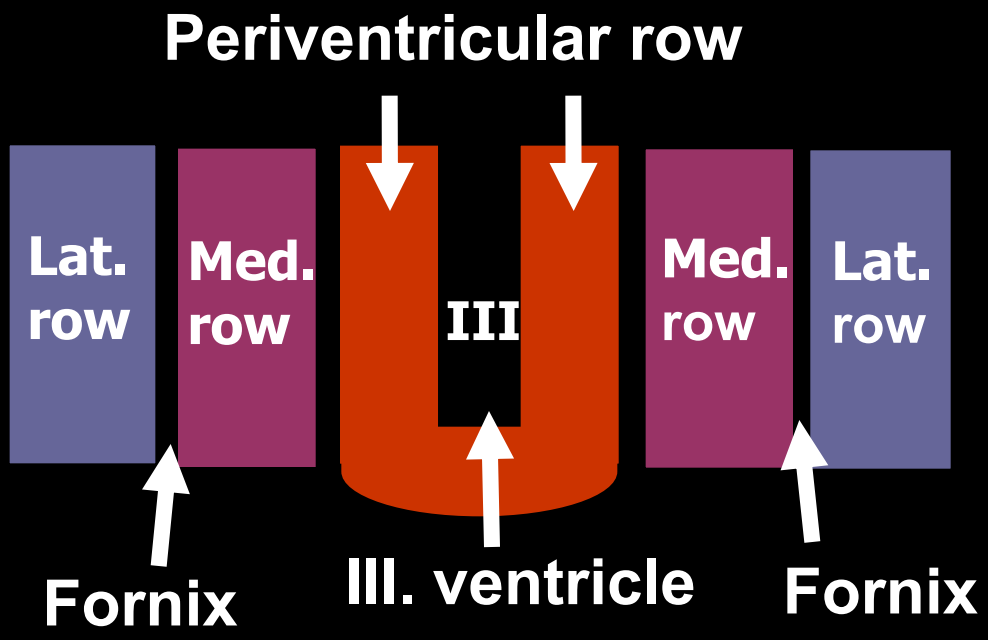
Hypothalamus

control of:

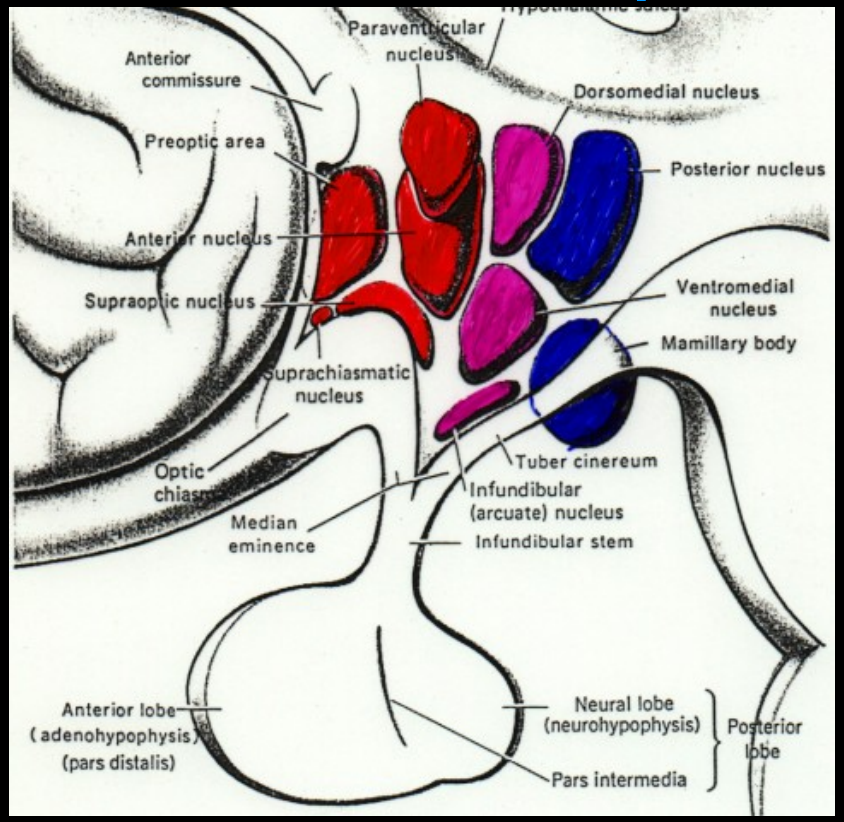
- ANS
- endocrine system

Function of the hypothalamus is related to:
control of vital functions that maintain homeostasis
control of emotions

Hypothalamic nuclei
at the frontal section



ant. middle post.



Hypothalamic nuclei

- sagittal section

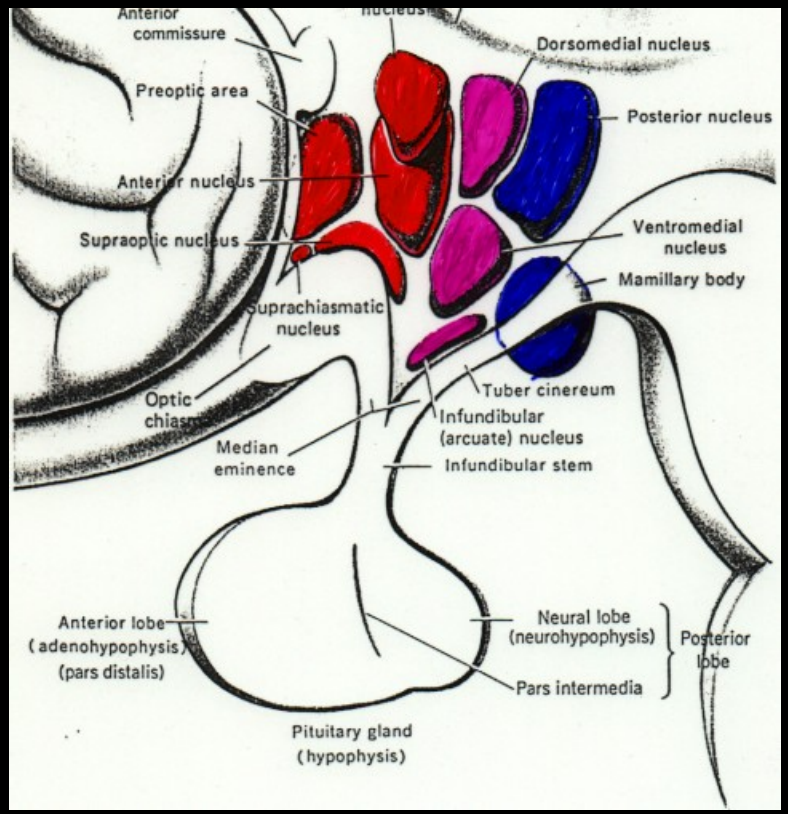
Anterior nuclei

Periventricul row:

ncl. suprachiasmat.

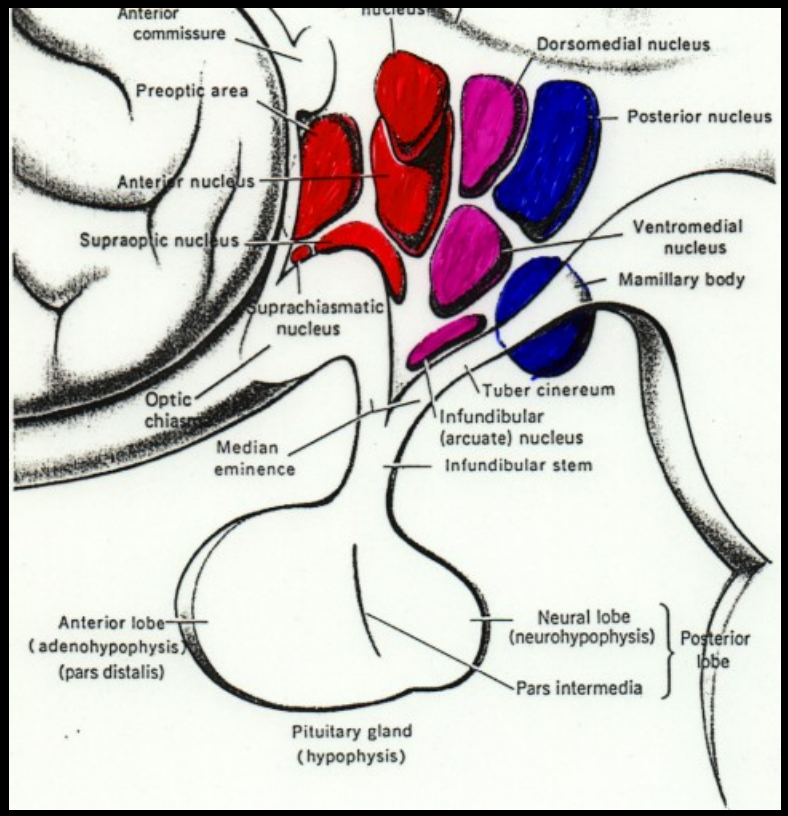
Medial row:

ncl. preopticus, ncl. supraopticus, ncl. ant., ncl. paraventr.



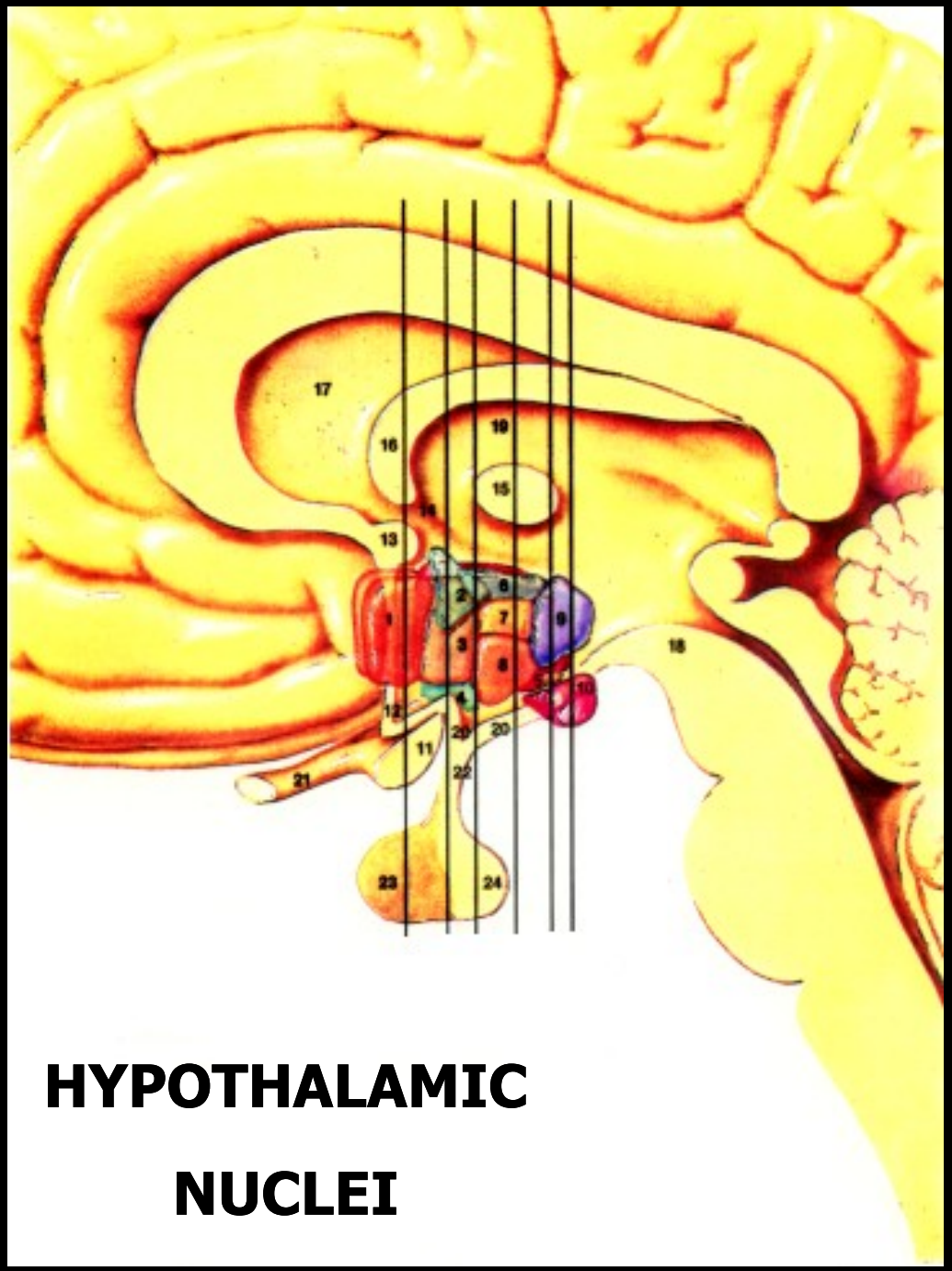
Middle nuclei

Periventricular row: ncl. arcuatus
Medial row: ncl. ventromed. et ncl. dorsomed.



Posterior nuclei

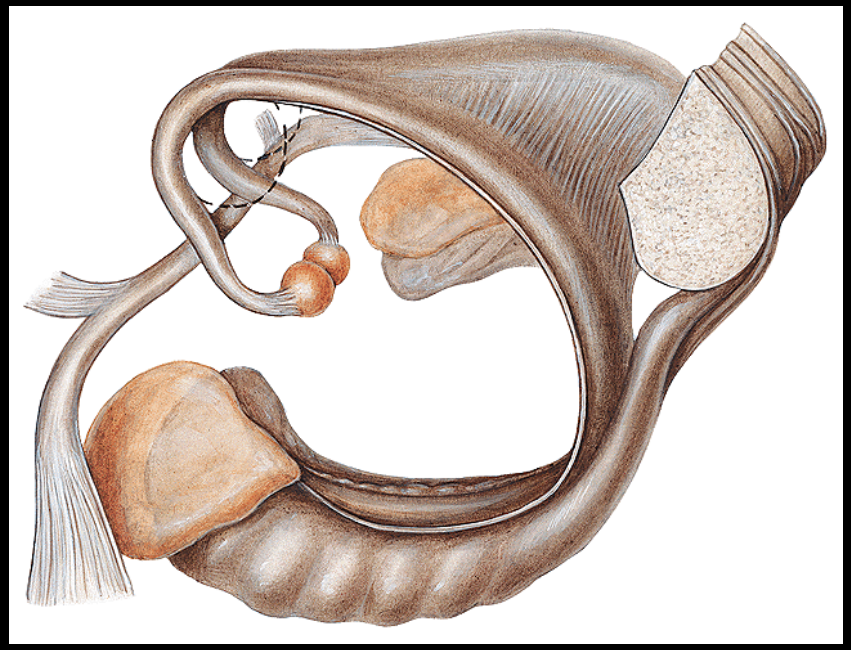
Periventricular + med. rows: ncl. post. et ncl. mamillaris



HYPOTHALAMIC NUCLEI

1. ncl. preopticus
2. ncl. paraventricularis
3. ant. hypoth. area
4. ncl. supraopticus
5. lat. hypoth. area
6. dorsal hypoth.
7. ncl. dorsomedialis
8. ncl. ventromed.
9. post. hypoth. area
10. corpus mammilaris
11. chiasma opticum
12. lamina terminalis
13. commissura ant.
14. sulcus hypothal.
15. adhesio interthal.
16. fornix
17. septum pellucidum
18. fossa interped.
19. thalamus
20. tuber cinereum
21. n. opticus
22. infundibulum
23. lobus ant.
24. lobus post.

White matter of the diencephalon

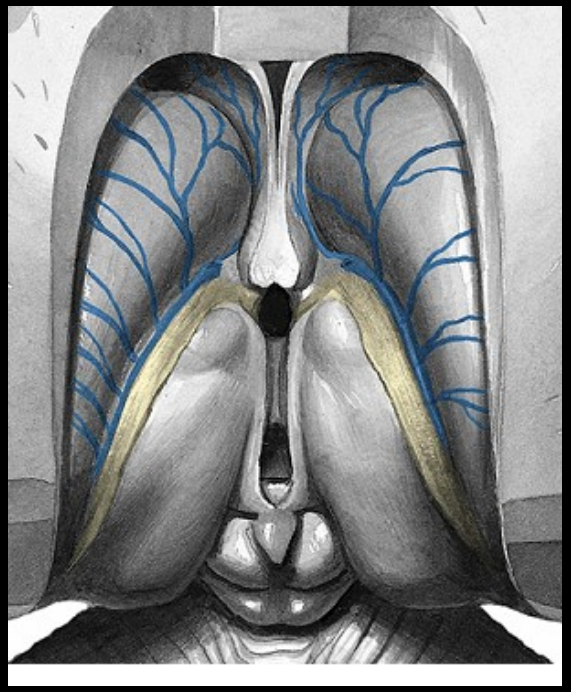


Fornix

Stria medullaris

Stria terminalis

FLD



Hypophysis cerebri

Lobus ant.
adenohypophysis

Pars intermedia

Lobus post.
neurohypophysis
(eminentia mediana
infundibular stalk
lobus post.)

Adenohypophysis

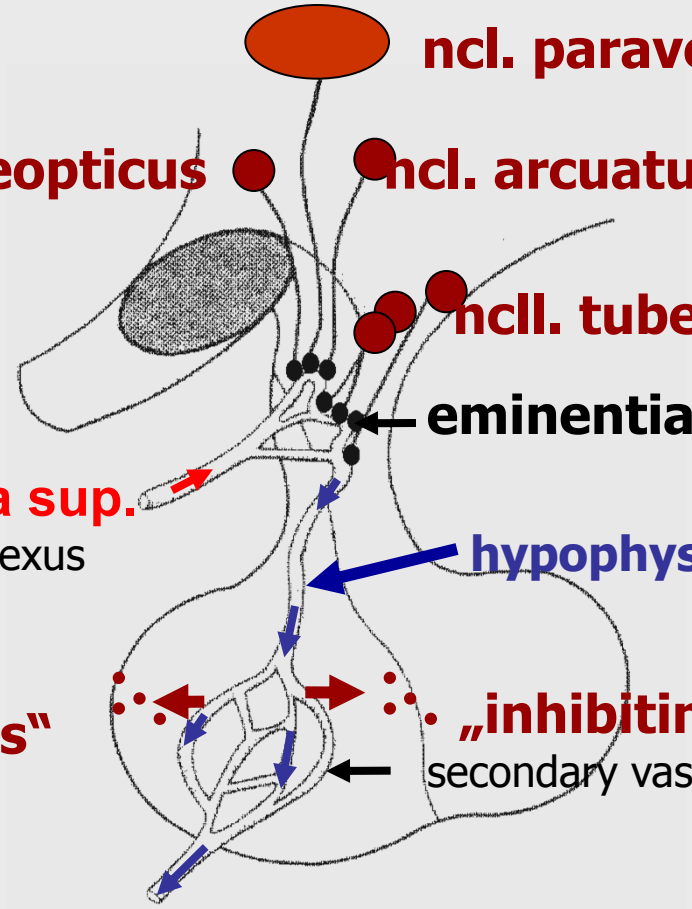
Secretion of hormones:
Thyreotropin
Gonadotropic
Growth
Adrenocorticotropic

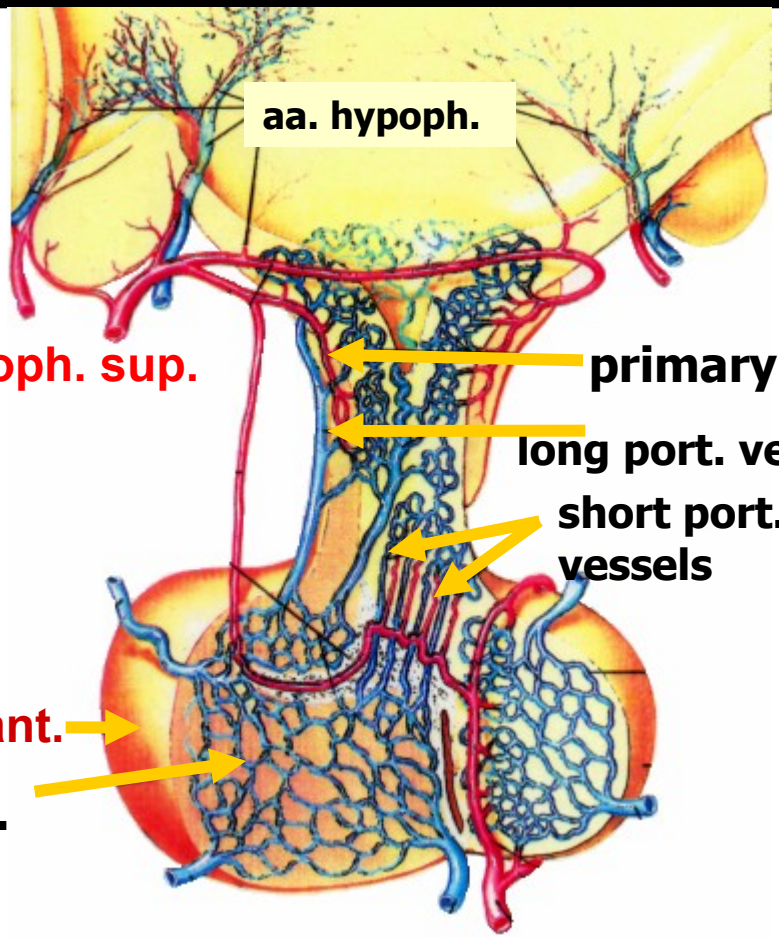
cells of adenohypophysis are stimulated or inhibited by „releasing“ and „inhibiting“ factors (hypophysiotrophins) producing in some hypothalamic nuclei (neurosecretion)

✓ parvocellular neurons reach the median eminence

(tuberoinfundibular tract)

✓ from the infundibulum are transported to the adenohypophysis by the portal vessels


ncl. paraventricularis
ncl. preopticus
ncl. arcuatus
ncll. tuberales
eminentia med.
a. hypophysea sup.
primary vascular plexus
hypophyseal portal vessel
„releasing hormones"
„inhibiting hormones"
secondary vascular plexus
sinus
cavernosus



drainage into the sinus cavernosus

Neurohypophysis

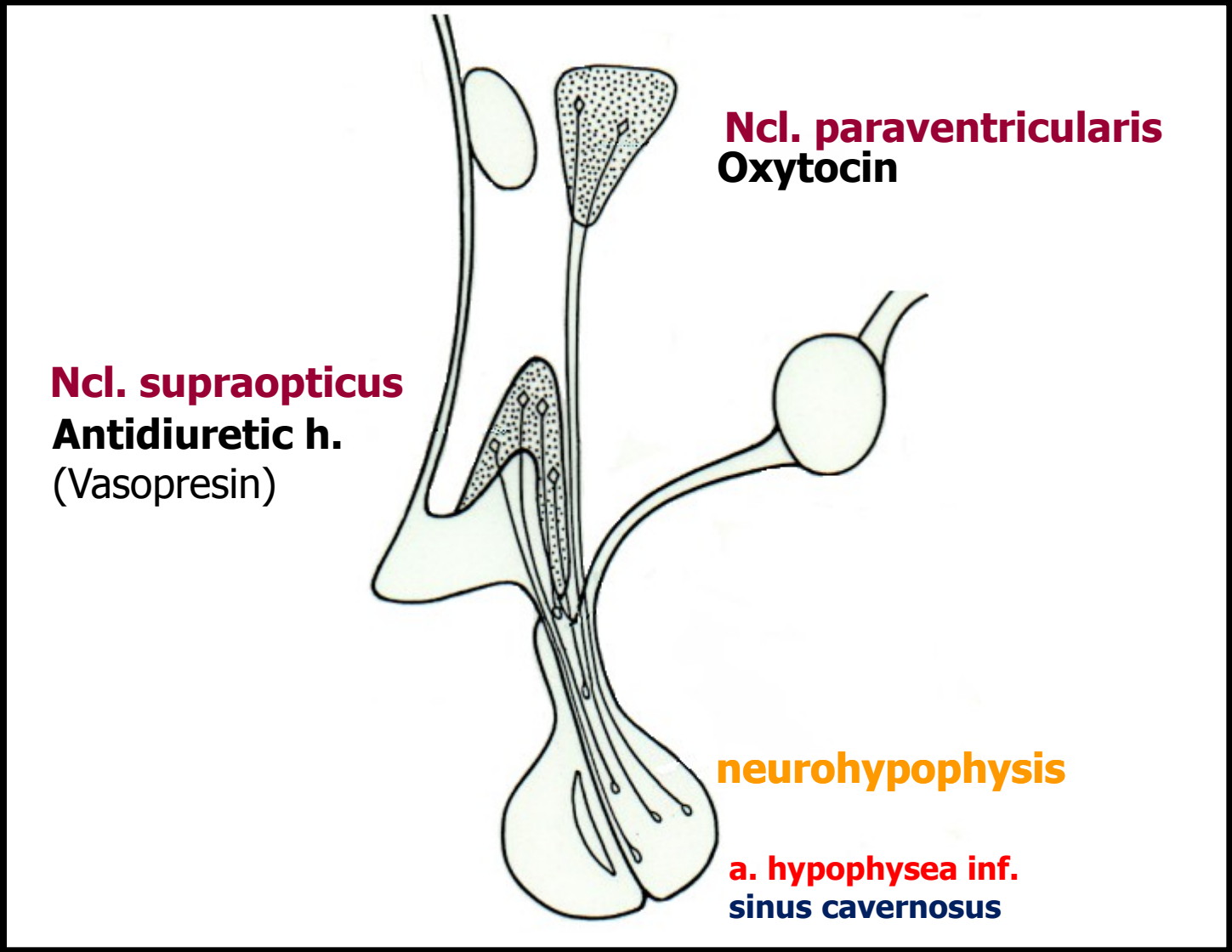
receives axons of magnocellular neuroendocrine cells of the supraoptic and paraventricular hypoth. nuclei

developmentally – part of diencephalon

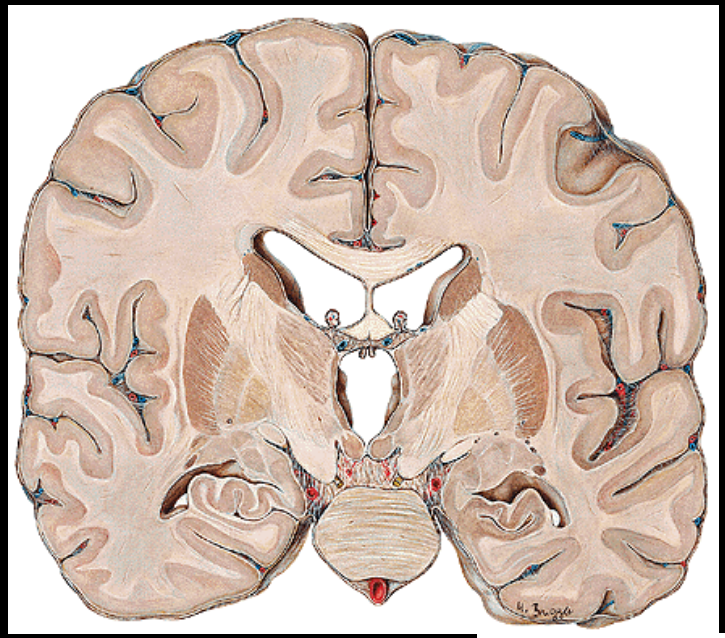
oxytocin and ADH

neuroendocrine cells reach the posterior lobe of the hypophysis through tr. hypothalamo-hypophysialis

Tr. hypoth.-hypophysialis



Telencephalon

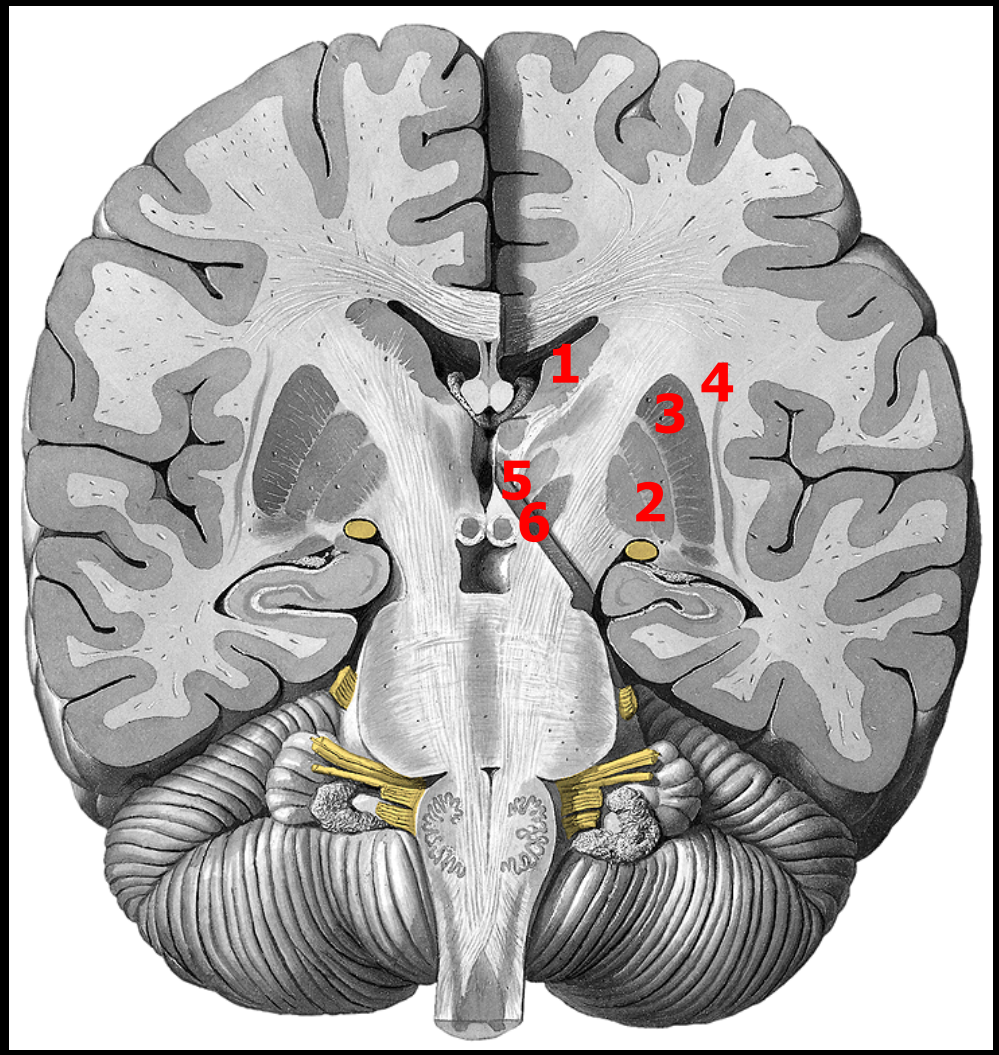


Structure of telencephalon

Gray matter
Basal ganglia
Cortex

White matter - pathways
Projection
Commissural
Association

Basal ganglia



1 ncl. caudatus
2 globus pallidus
3 putamen
4 claustrum
corp. amygdaloideum

Functionally

5 ncl. subthalamicus
6 substantia nigra

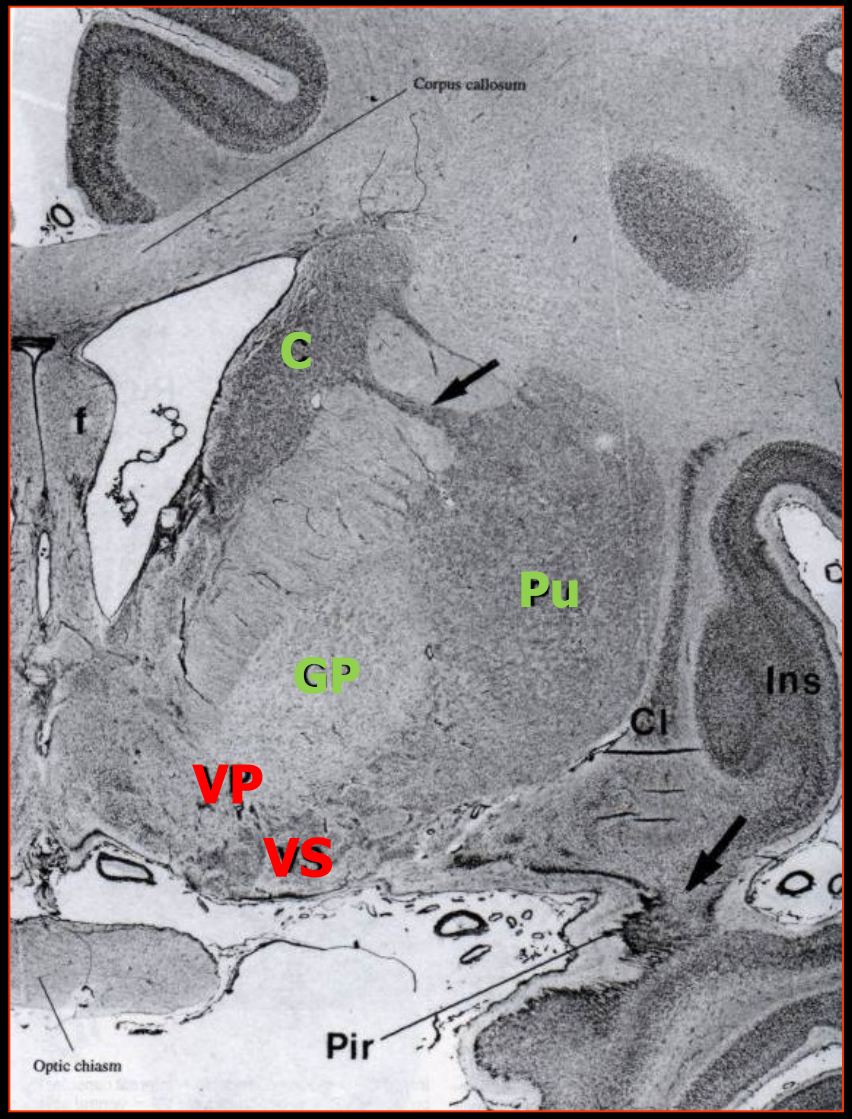
globus pallidus +
putamen = **ncl. lentif.**
ncl. caudatus + putamen
= **corpus striatum**

Development of BG

Palleostriatum (pallidum) = globus pallidus
lat. + med. segment – dorsal pallidum
ventral pallidum

Neostriatum (striatum)
ncl. caudatus, putamen – dorsal striatum
ncl. accumbens – ventral striatum

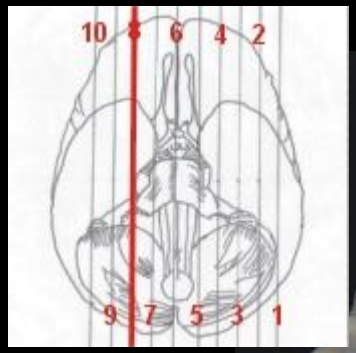
Archistriatum
corpus amygdaloideum



Ncl caudatus + putamen
= dorsal striatum

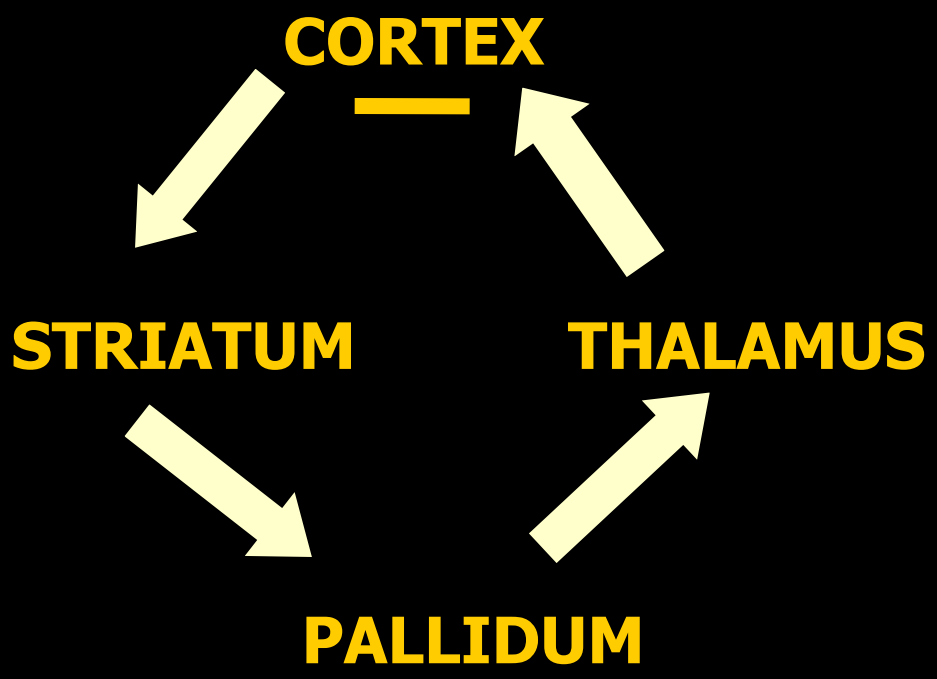
Globus pallidus
= dorsal pallidum

VS = ventr. striatum (ncl. accumbens septi)
VP = ventral pallidum (ncl. basalis Meynerti)



Corpus amygdaloideum

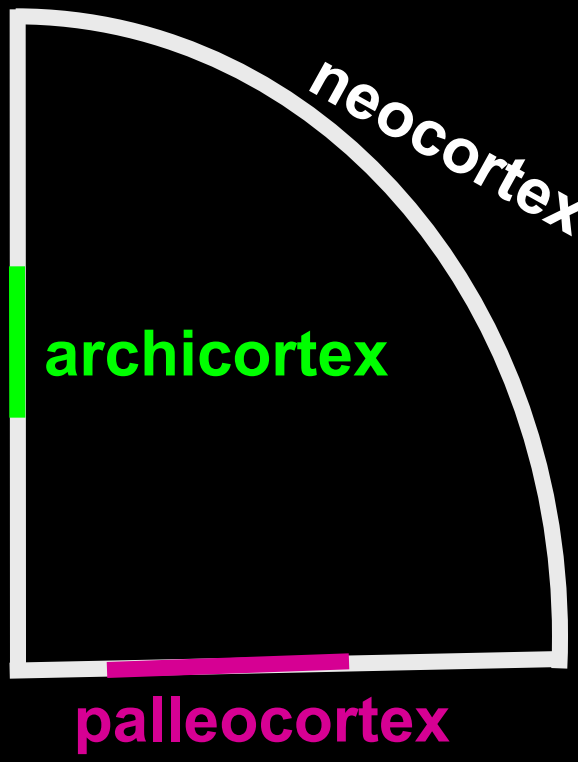
Functional connections of BG



Function of BG

inhibition of cortical and subcortical motor functions

Cerebral cortex



ALLOCORTEX

3-4 layers

a) palleocortex (rhinencephalon)

b) archicortex

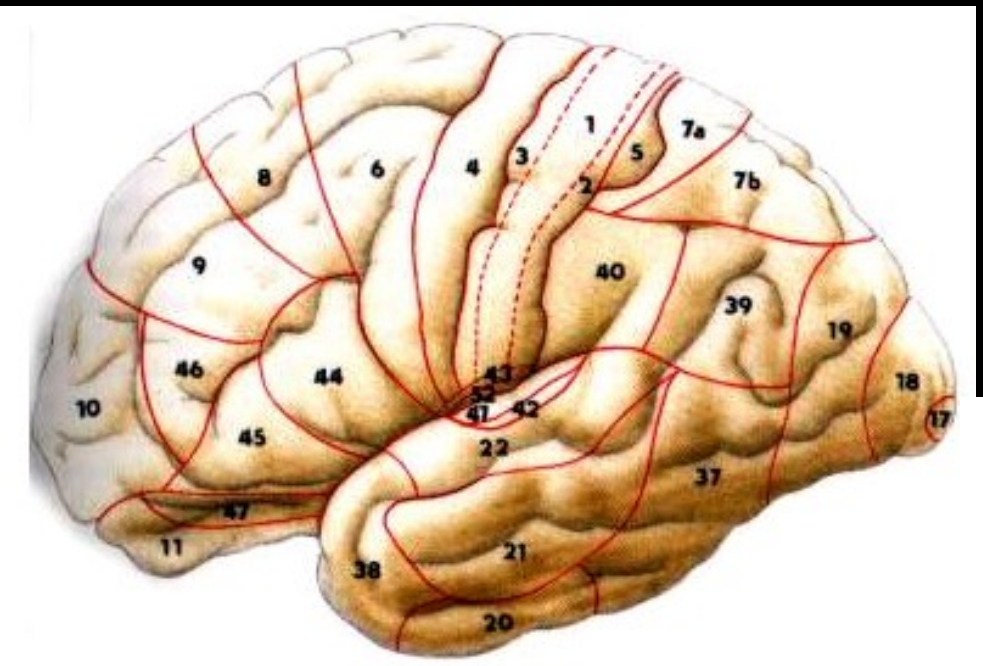
NEOCORTEX

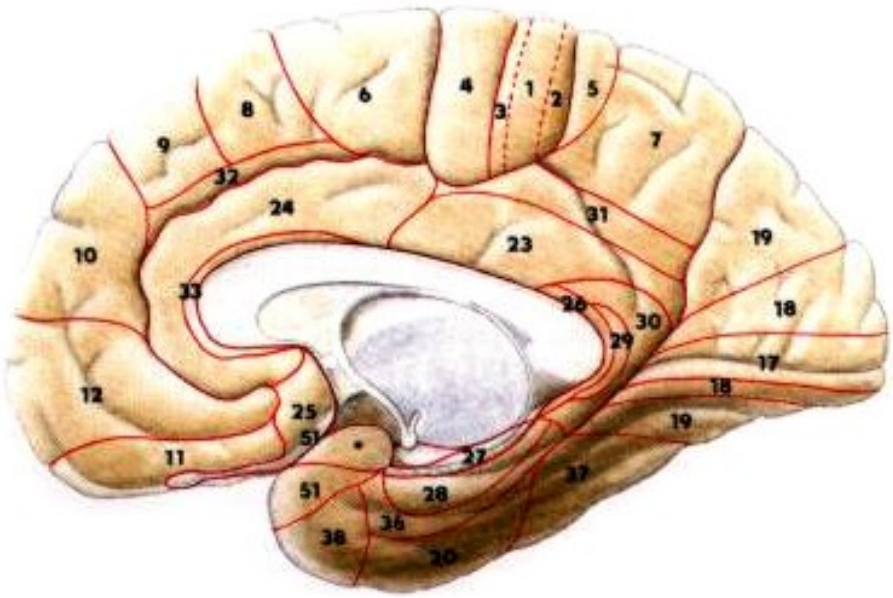
6 layers

Brodman's map (cytoarchitectonic map of cortex)

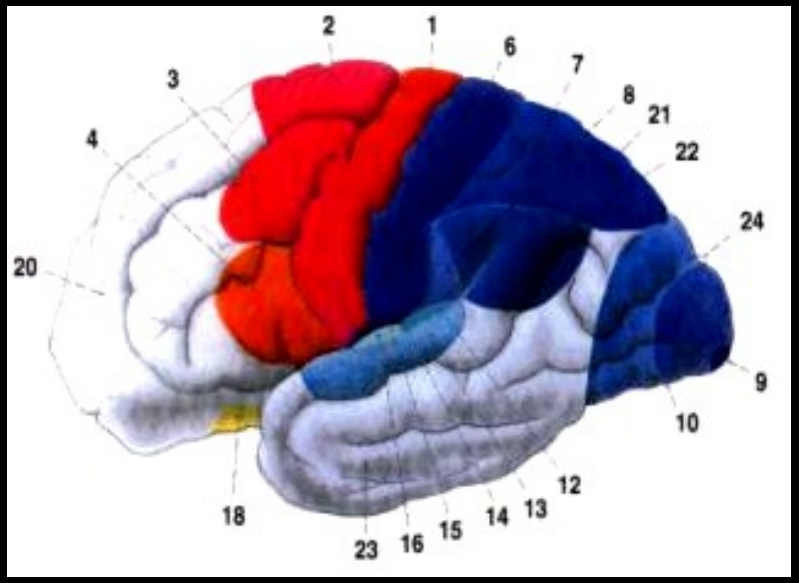
11 regiones

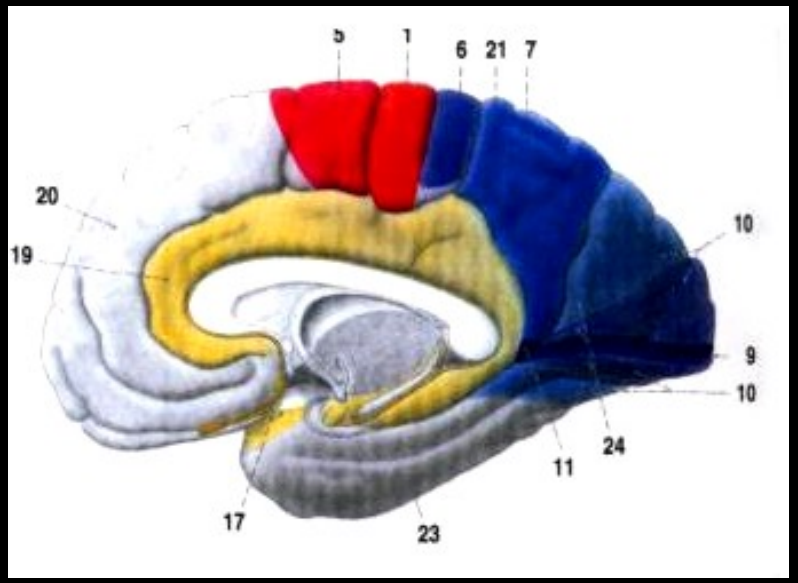
52 areae





Functional regions of cortex

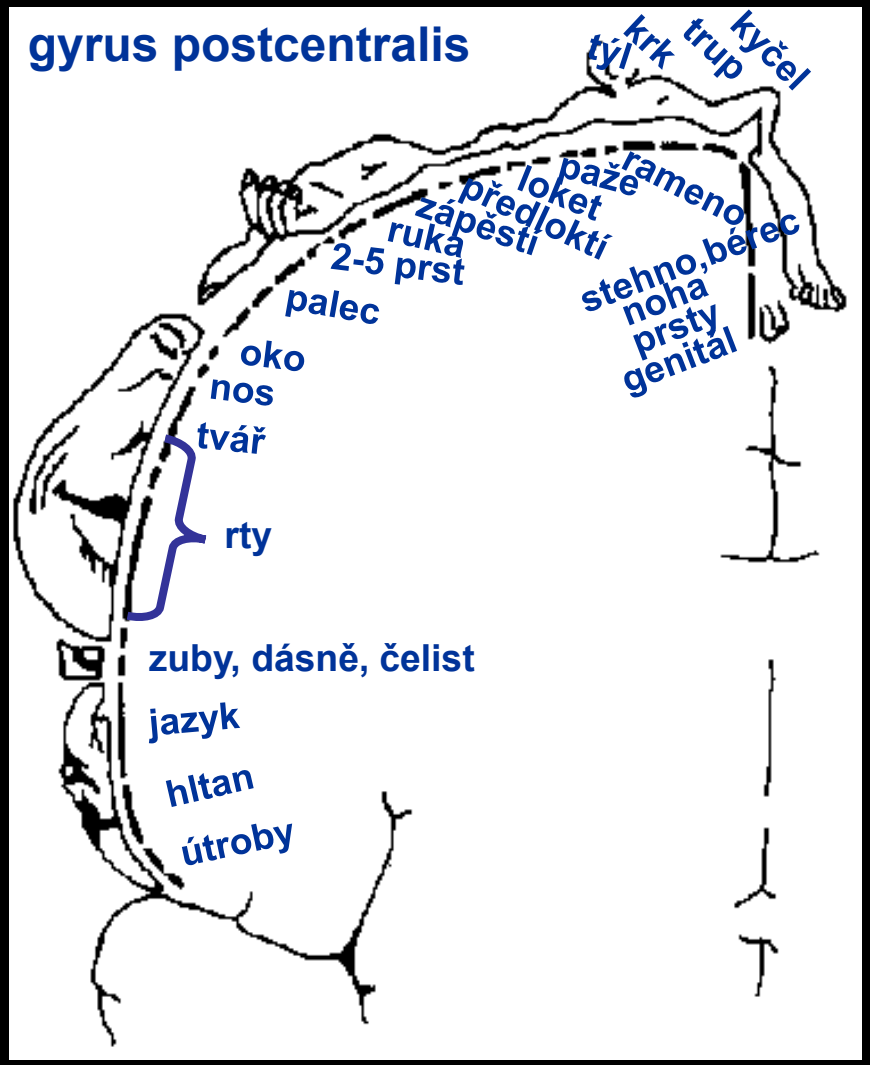




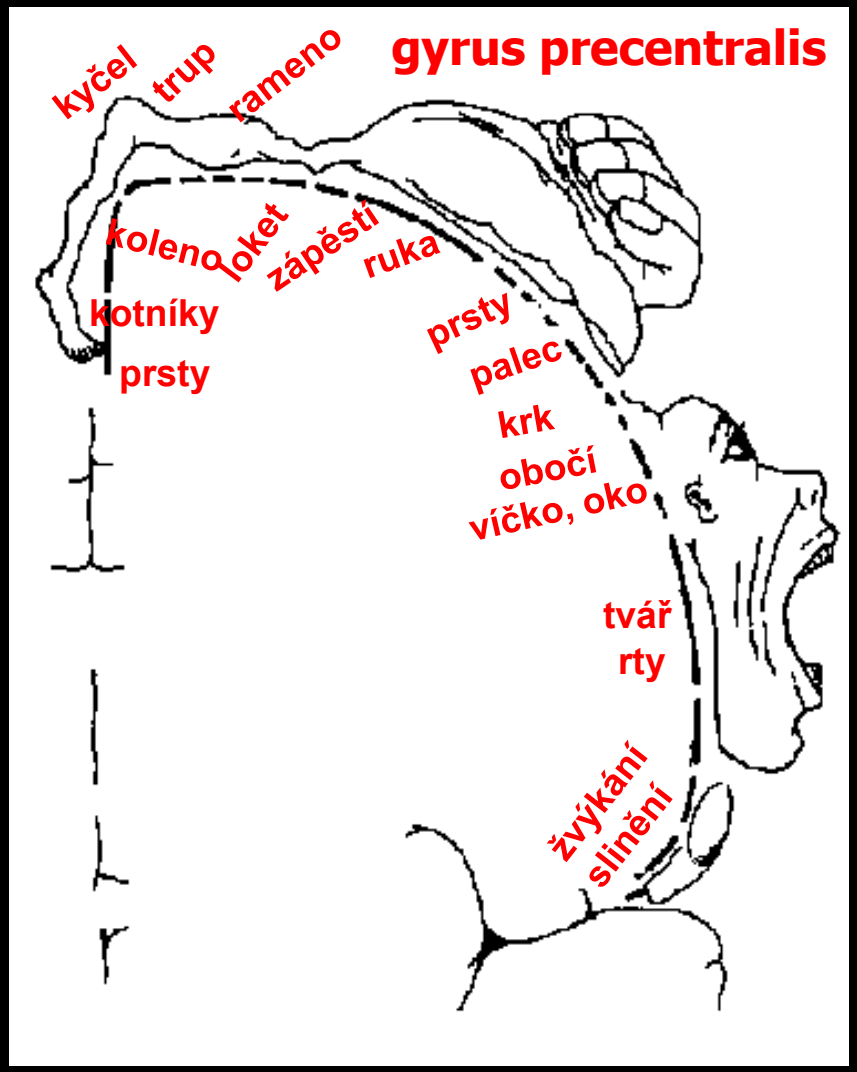
Primary motor c. (a 4), **primary somatic sensory c.** (a 3,1,2), **primary visual c.** (a 17), **primary auditory c.** (a 41,42)

Secondary and association areas

Representation of contralateral body parts

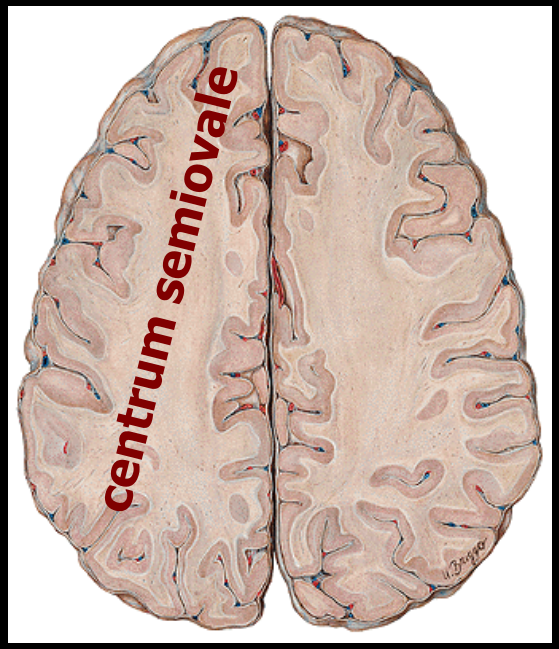


„sensory homunculus“



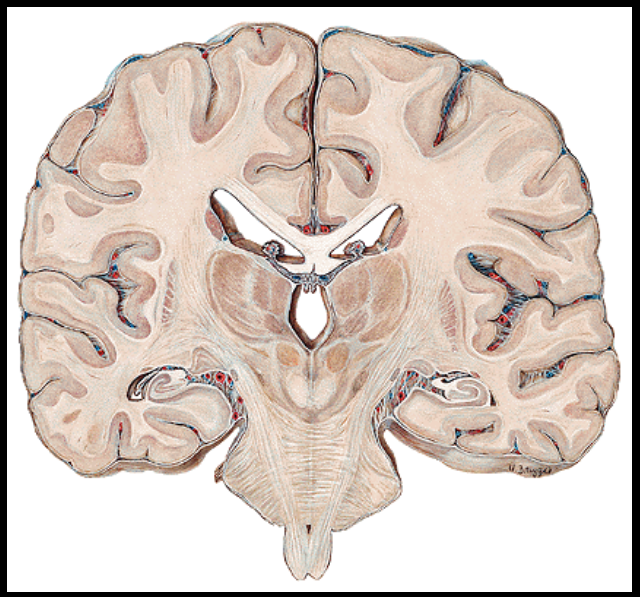
„motor homunculus“

White matter of the telencephalon - corpus medullare

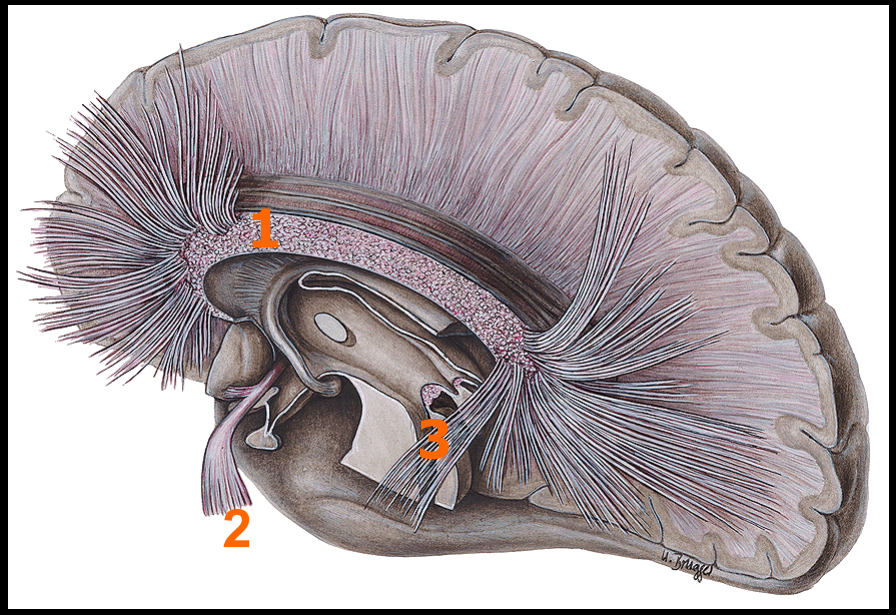


Fibers

commissural
projection
association



Commissural fibers

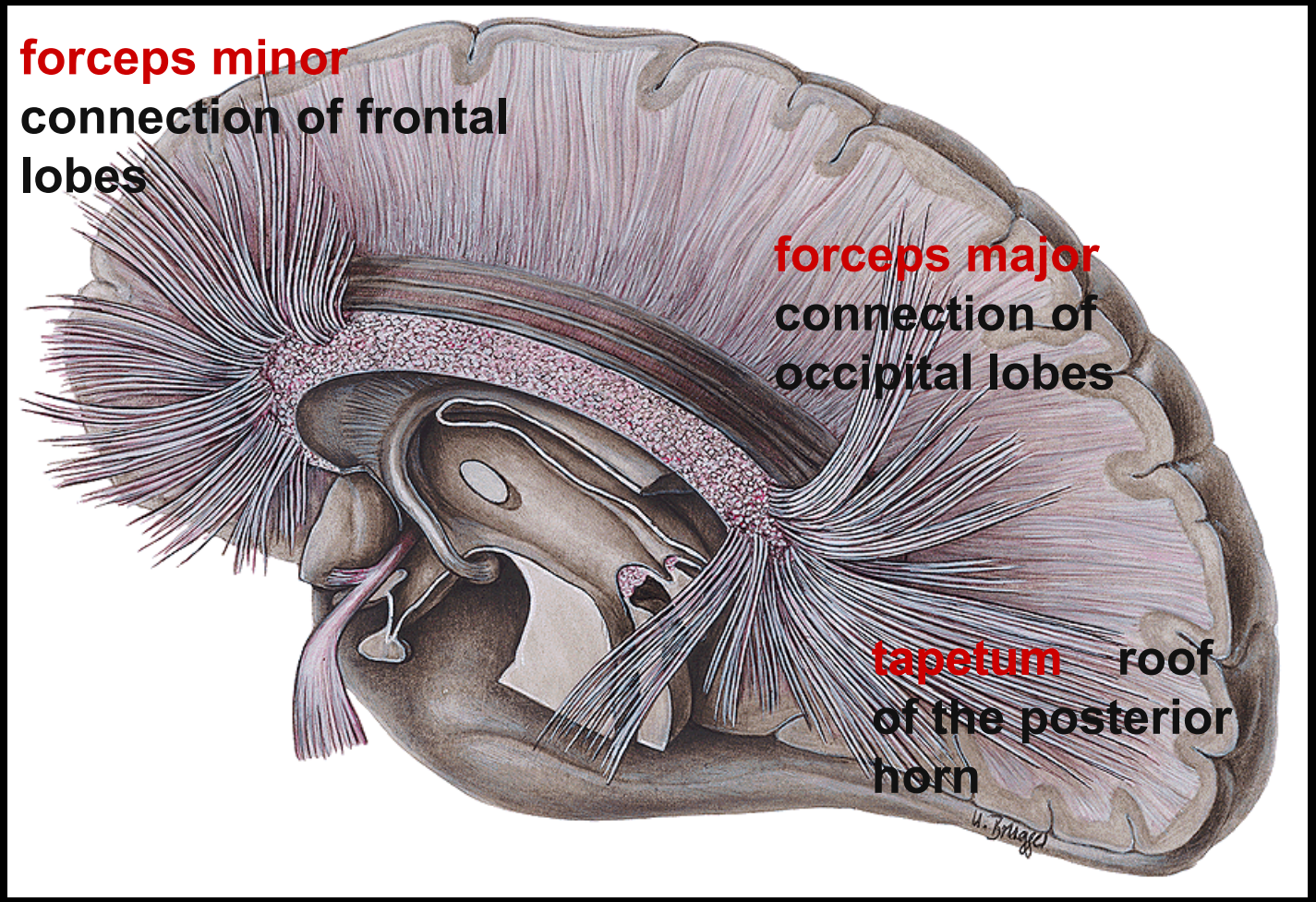


1 corpus callosum
neocortex

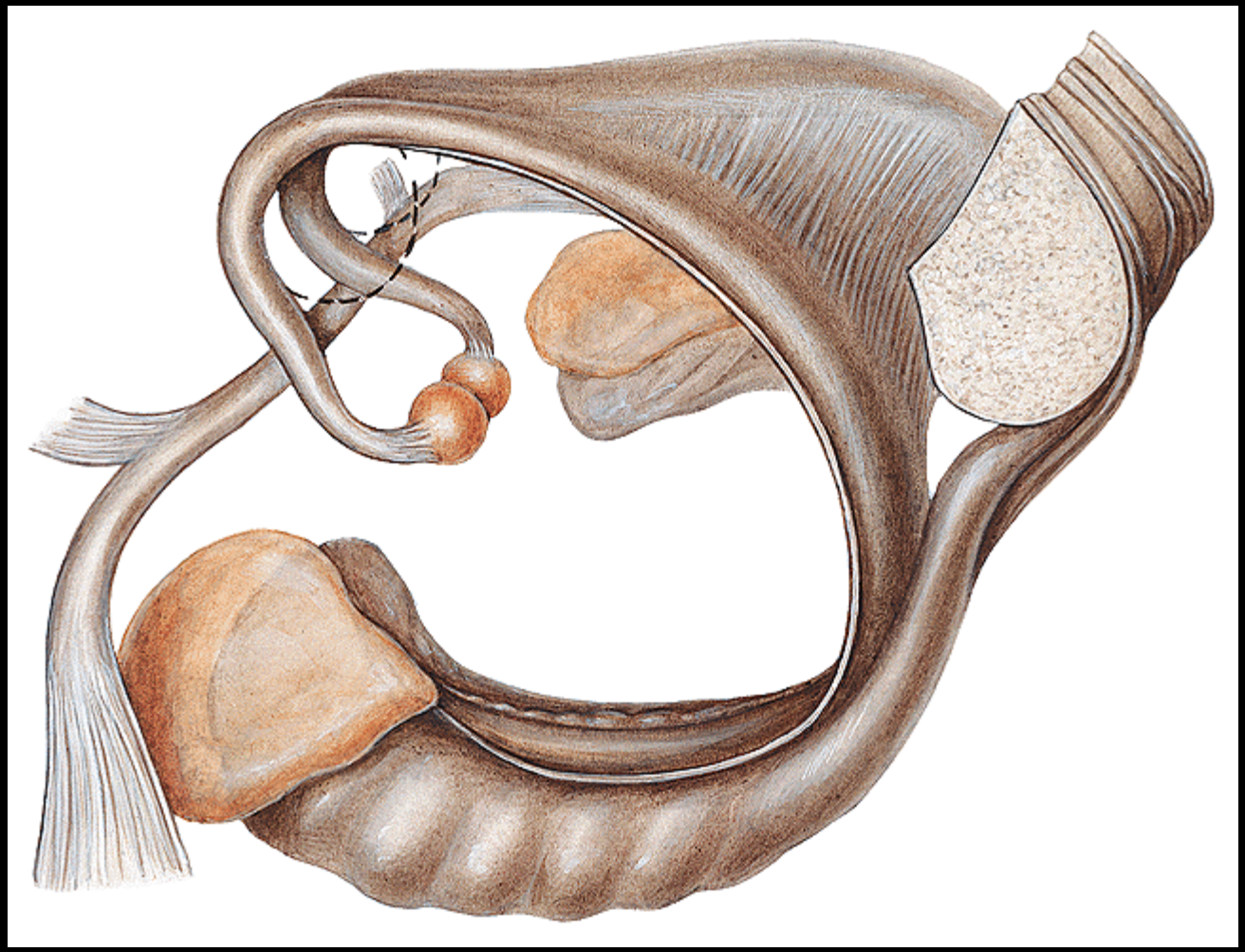
2 commissura ant.
pars ant.- paleocortex
pars post. - neocortex

3 commissura fornicis
archicortex

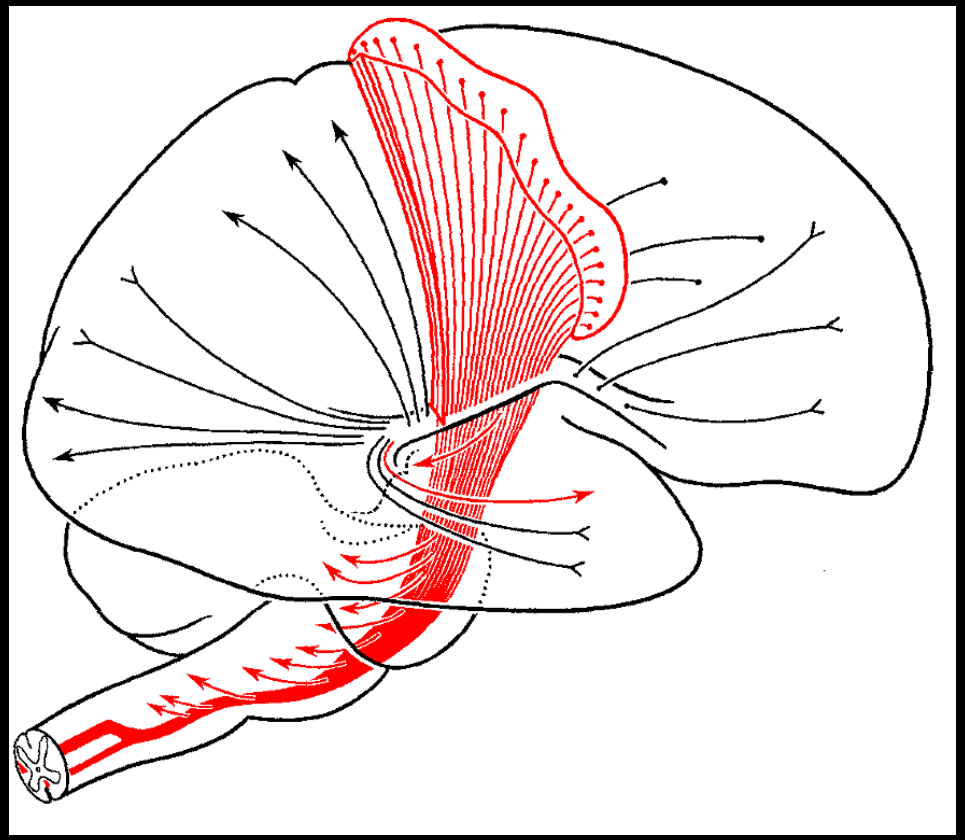
Corpus callosum - 300 million fibers



Commissura fornicis et anterior



Projection fibers



short

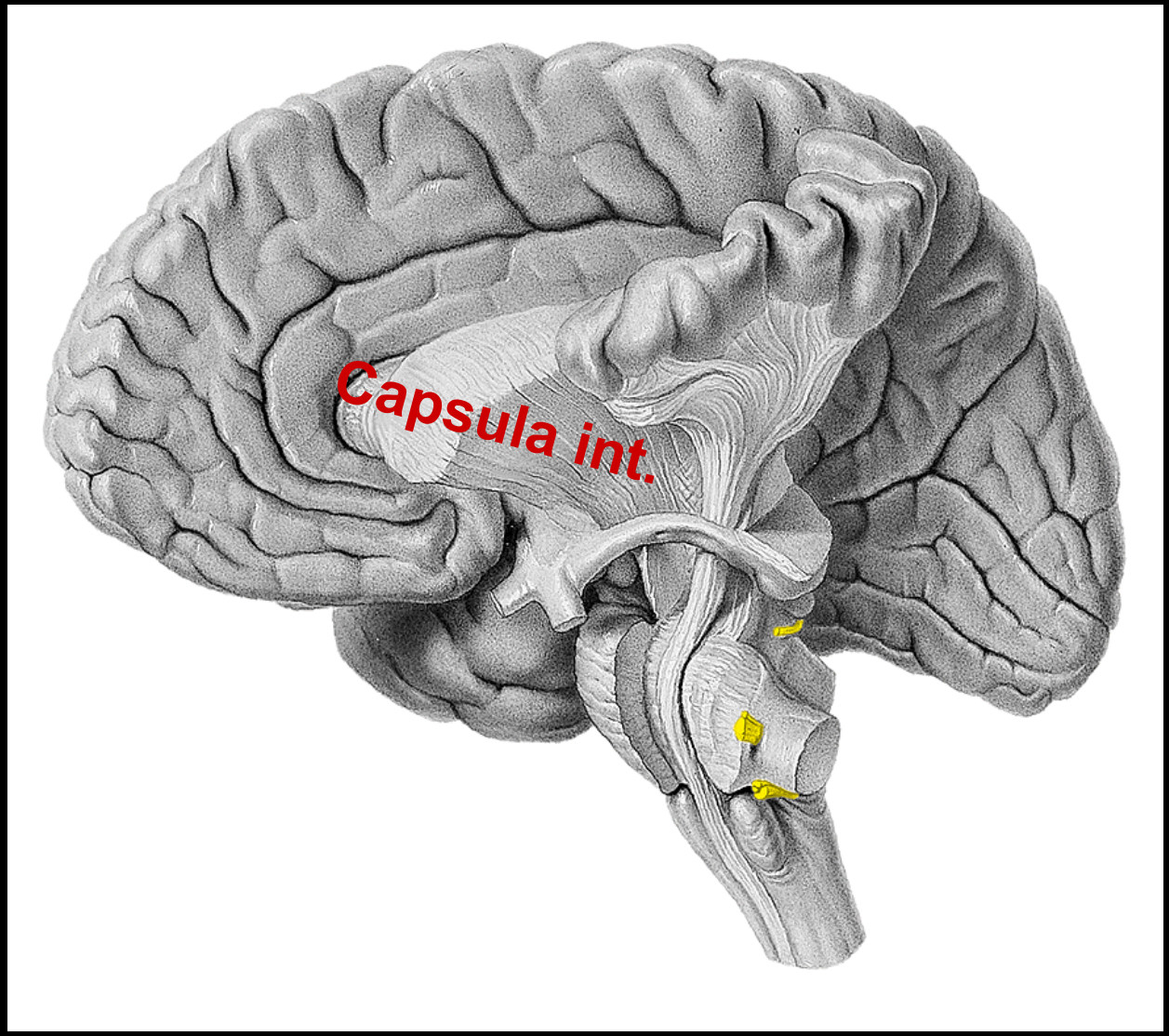
connections between cortex and BG

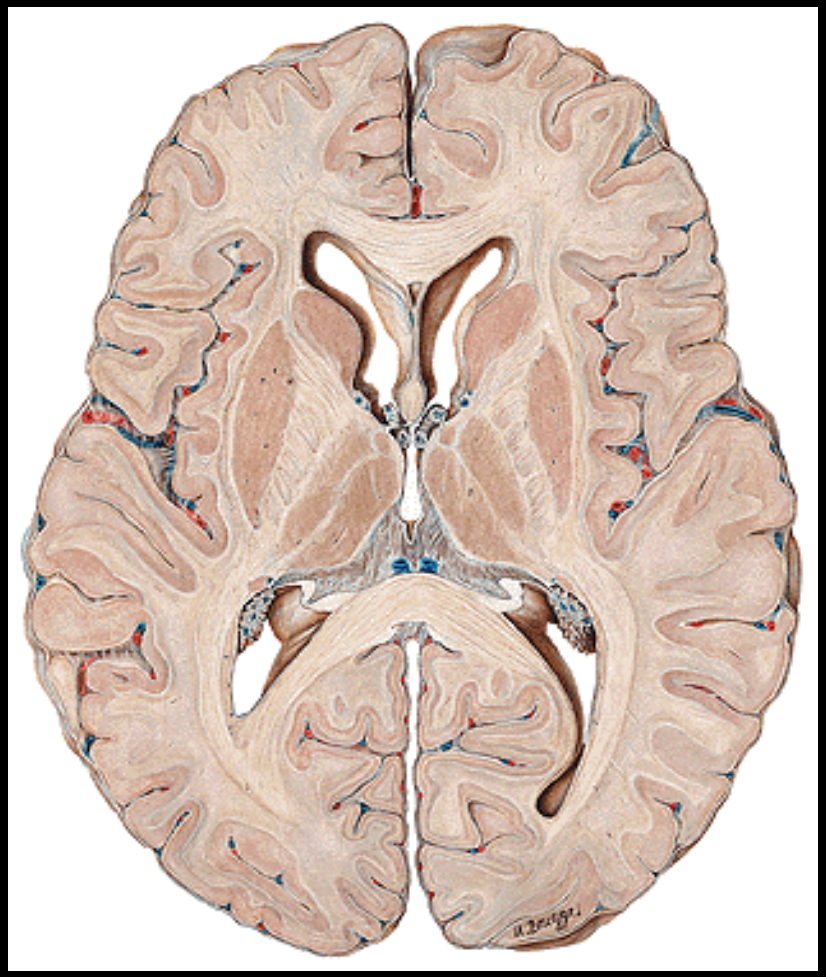
reciprocal connections between cortex and thalamus

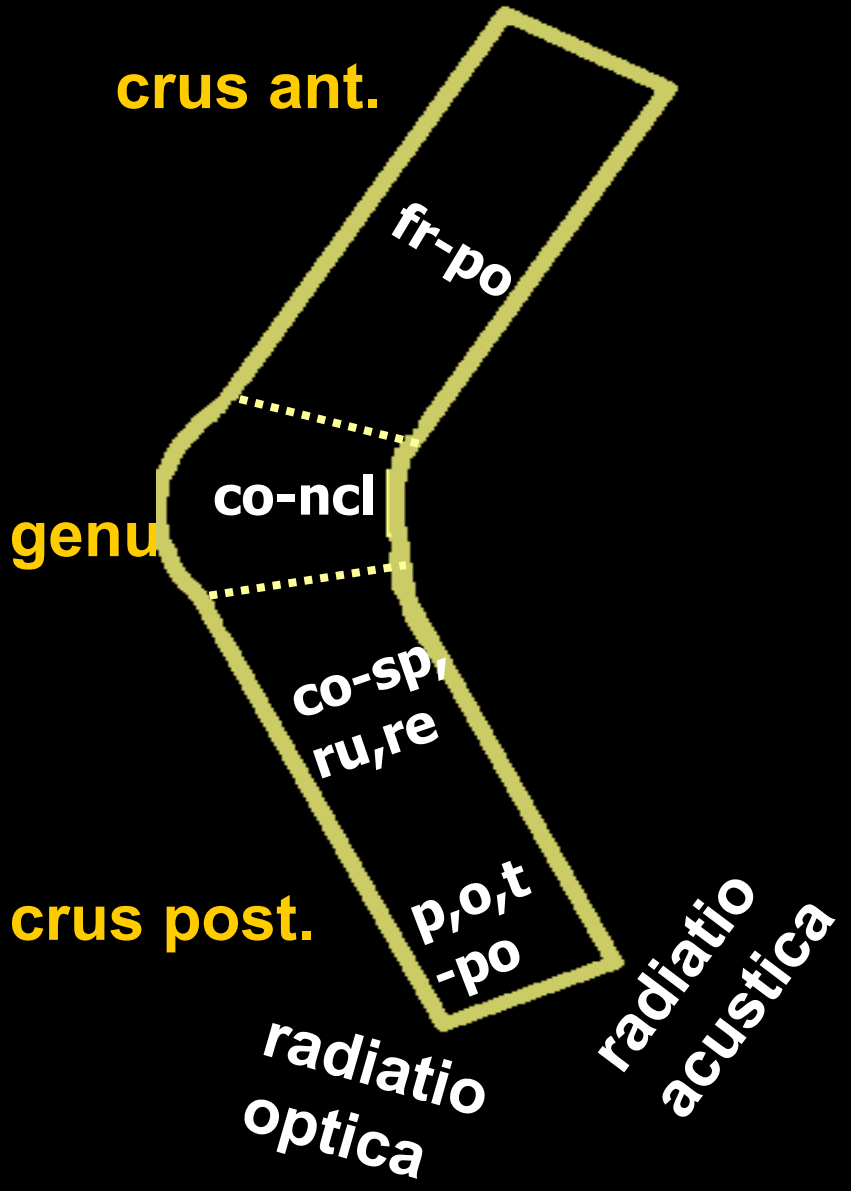
long

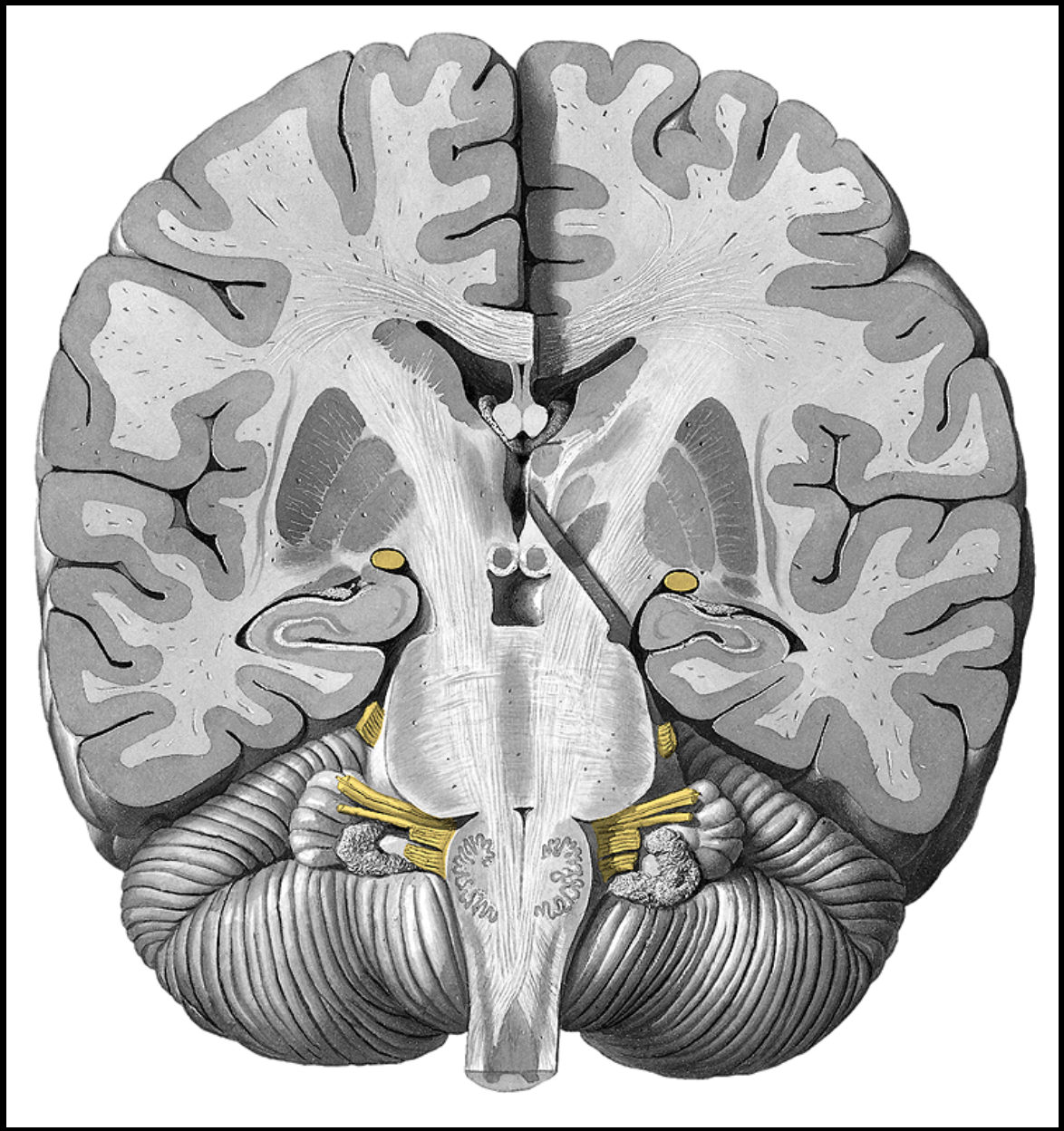
tr. co-sp
tr. co-ncl
tr. co-ret
tr. co-tec
tr. co-ru
tr. co-bulb
tr. co-po

} capsula interna

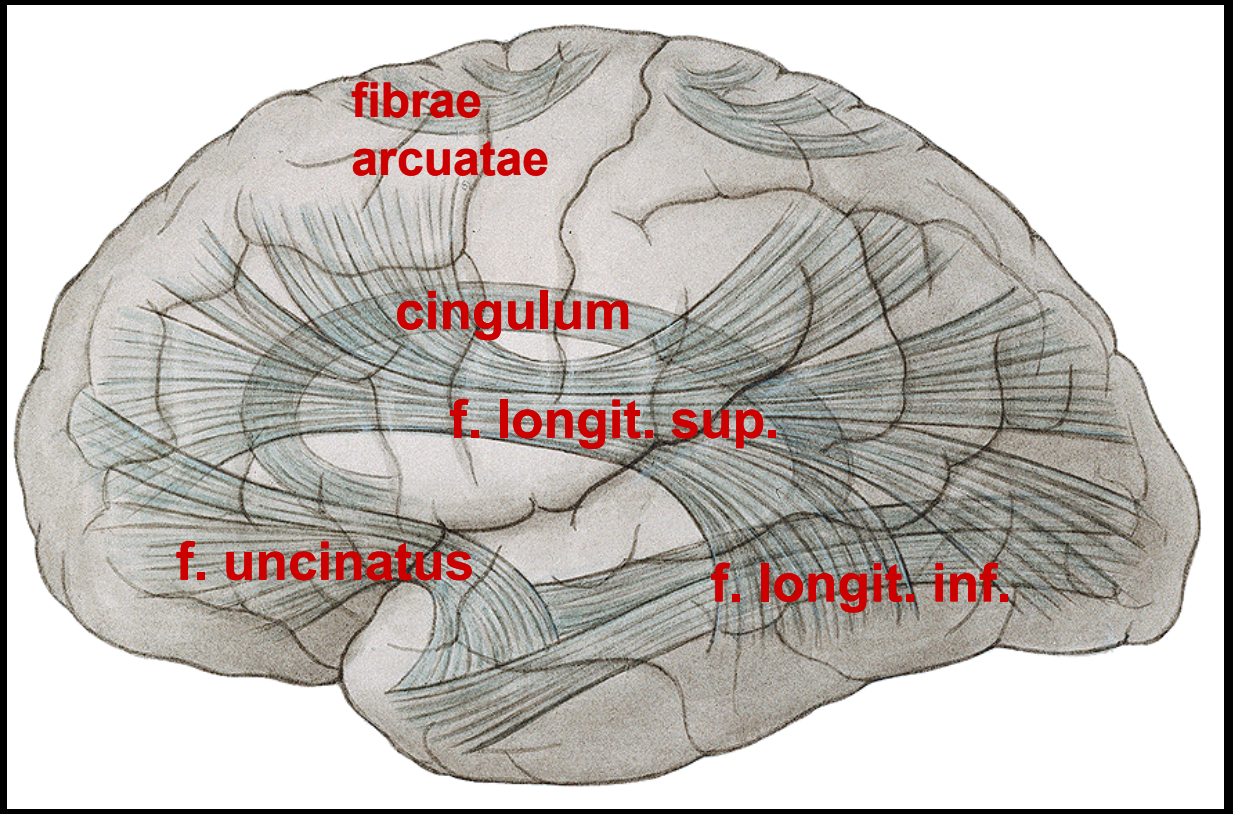

Capsula int.




crus ant.
fr-po
genu
co-ncl
co-sp,
ru,re
crus post.
p,o,t
-po
radiatio
optica
radiatio
acustica



Association fibers: **short** (fibrae arcuatae), **long**



Illustrations were copied from:

Atlas der Anatomie des Menschen/ Sobotta. Putz,R., und Pabst,R. 20. Auflage. München: Urban & Schwarzenberg, 1993

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