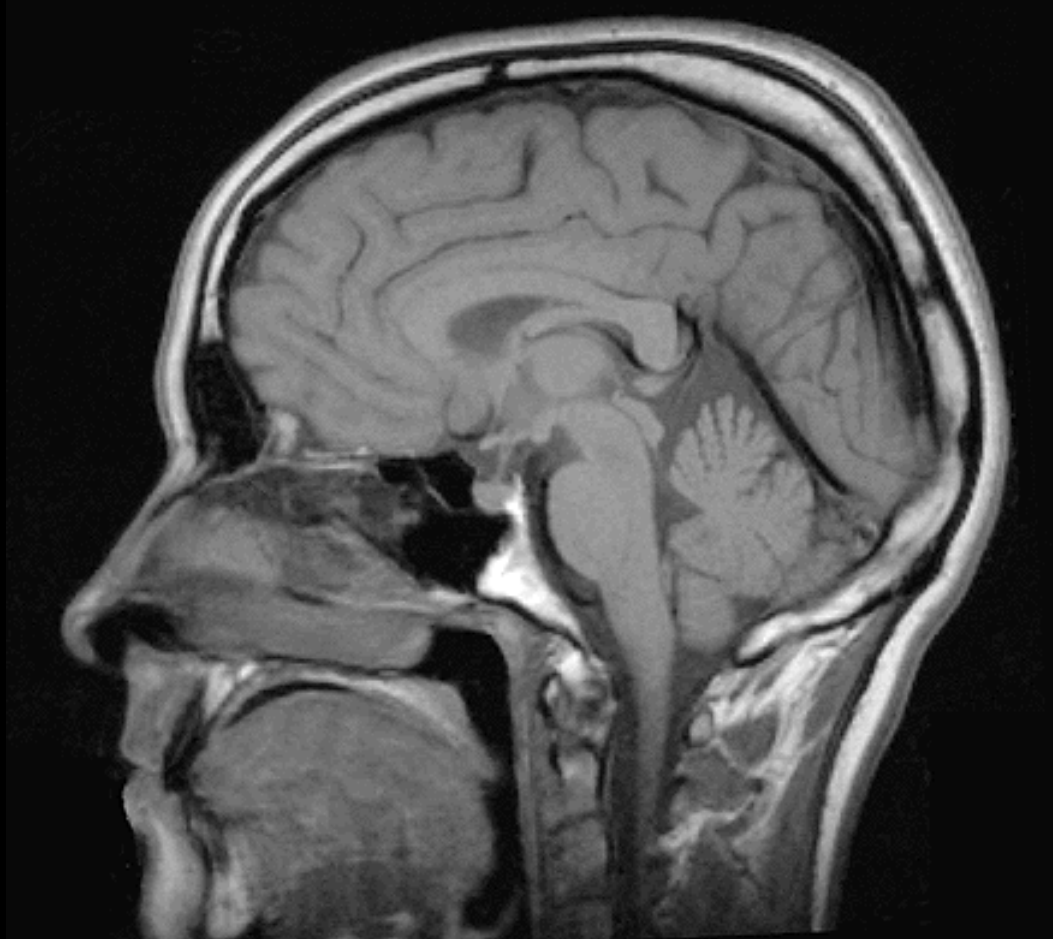
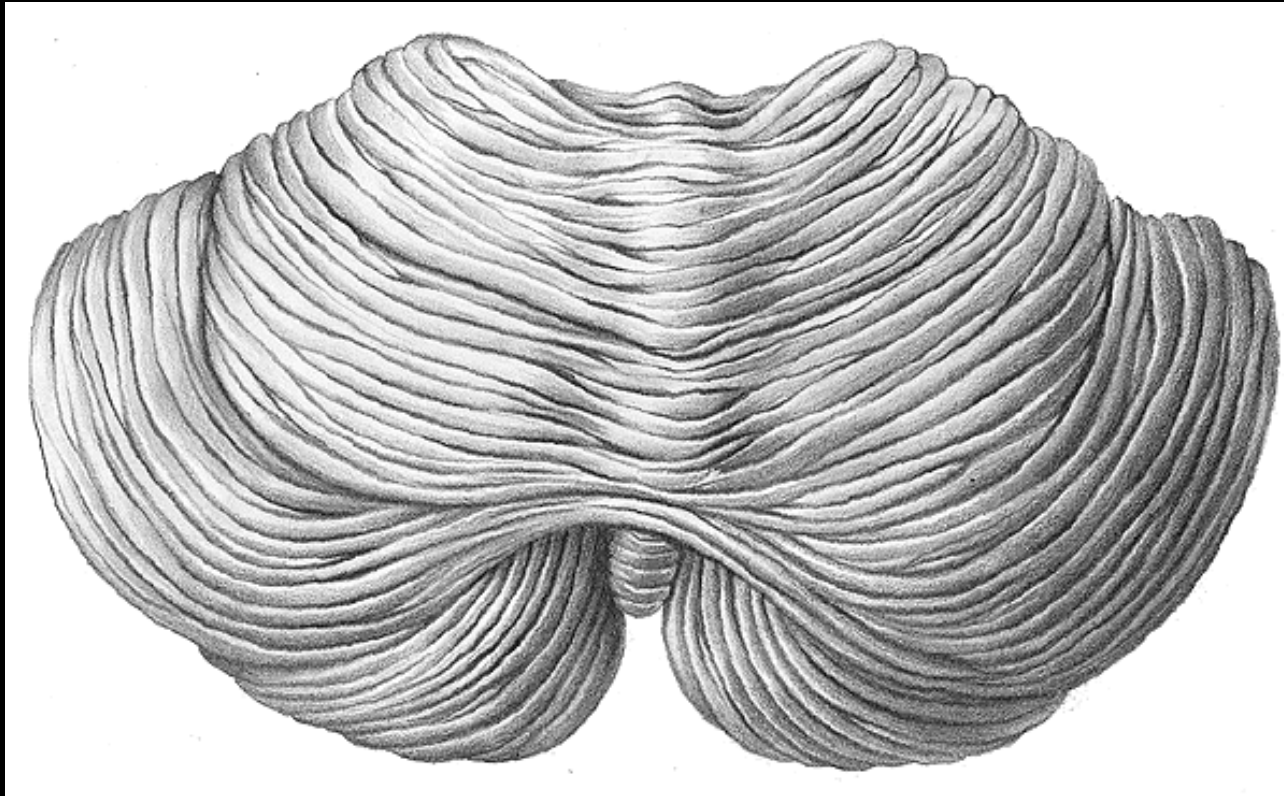


Cerebellum

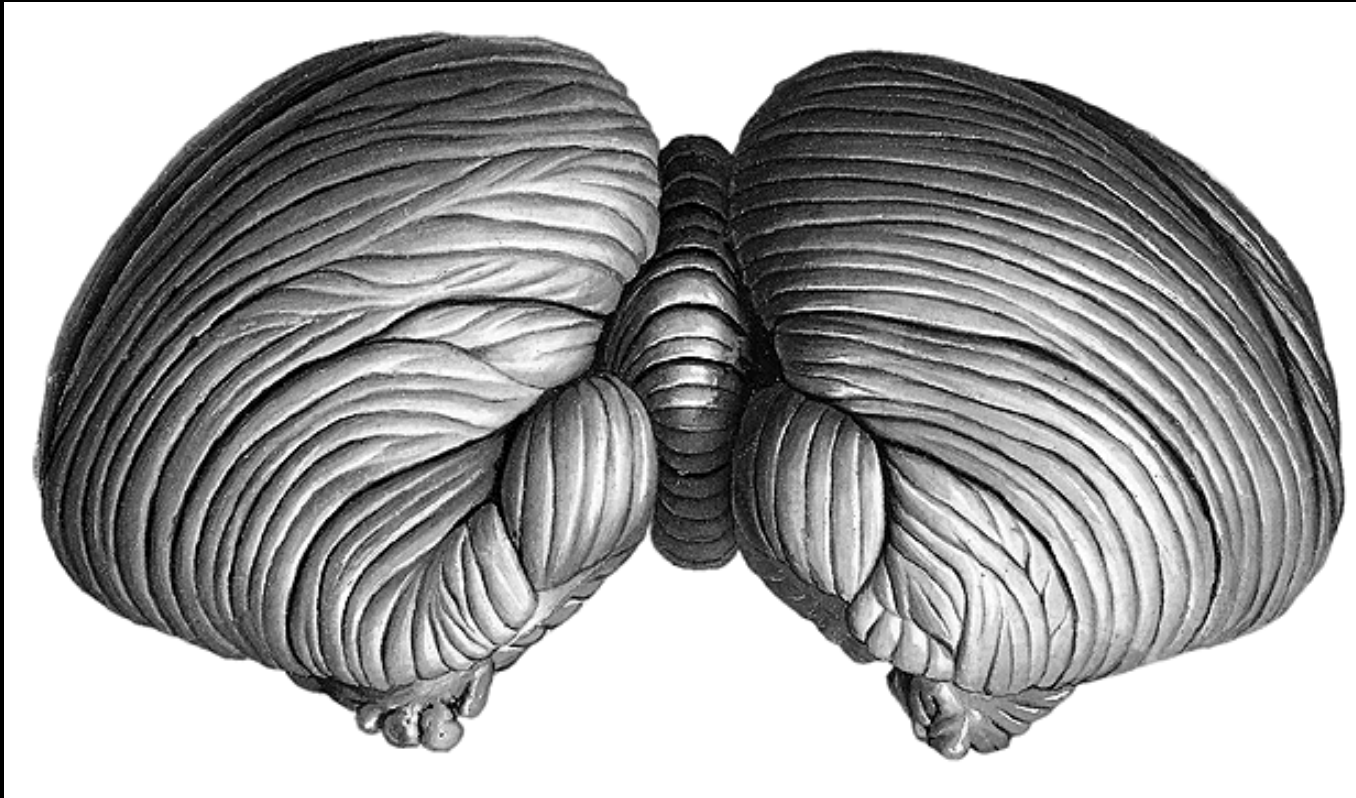


Coordination of movements



Margo ant., incisura cerebelli ant.

Margo post., incisura cerebelli post.

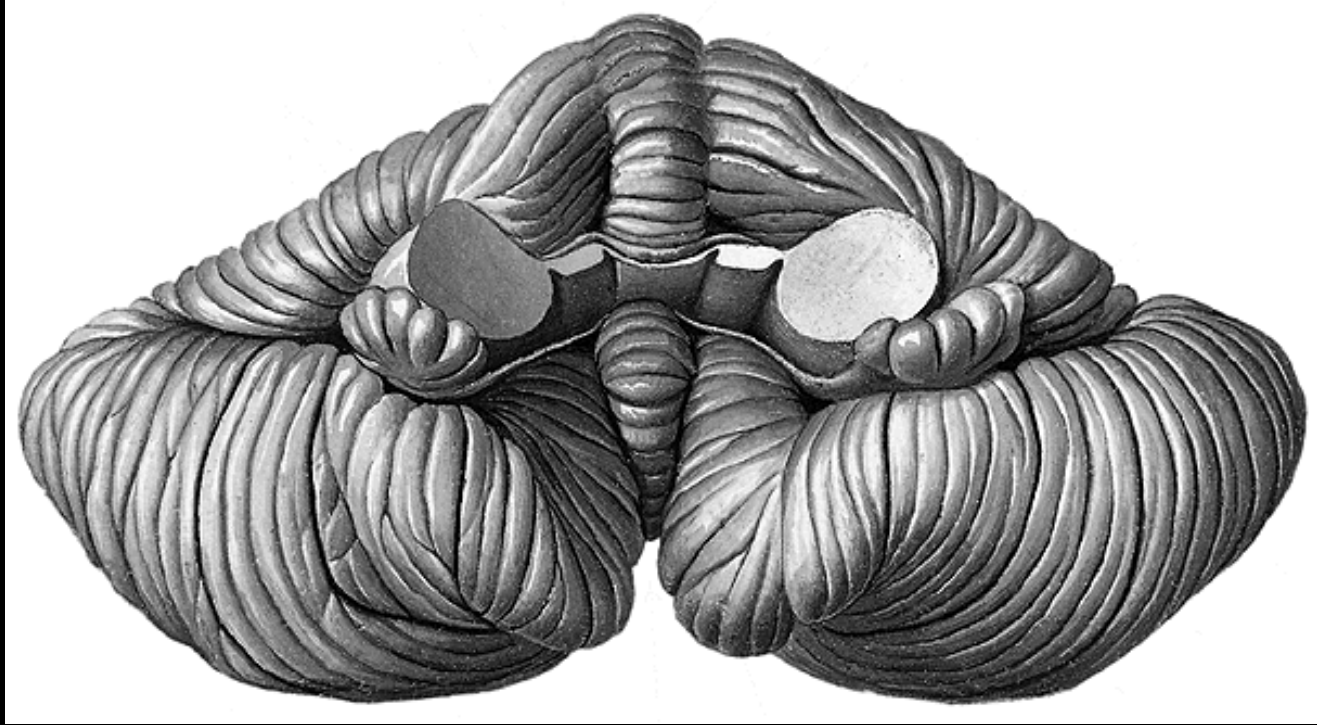


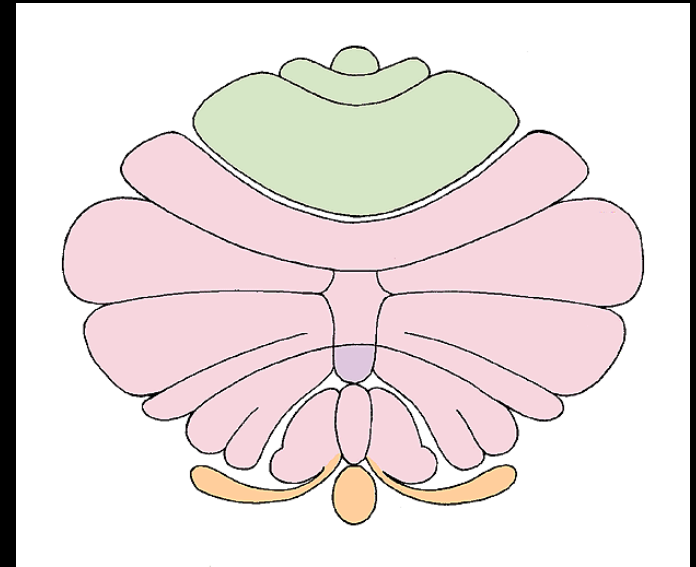
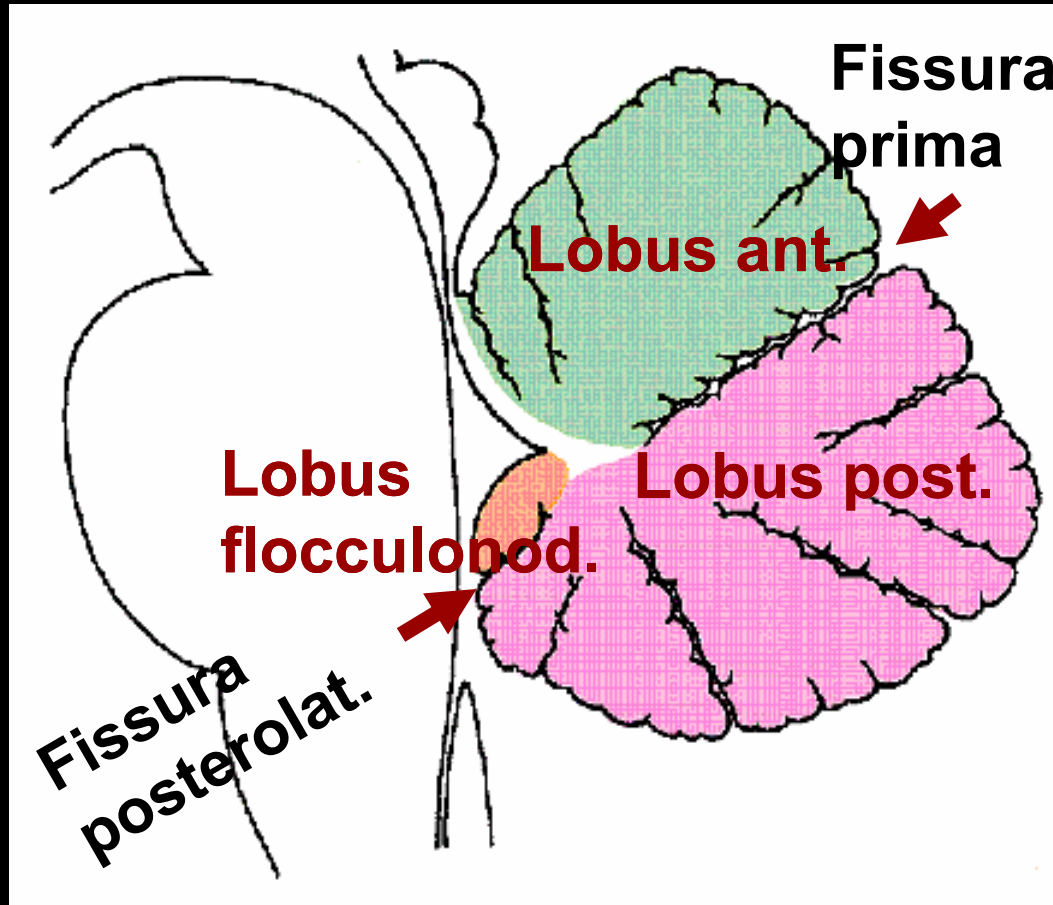
Vermis

Hemispheres

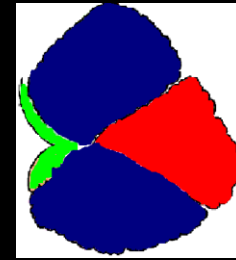
Pars flocculonodularis

Folia, lobuli, lobi





Developmental anatomy



Afferents from vestib. labyrinth
fish, amphibians

Archi cerebellum

VESTIBULO - CEREBELLUM

Afferents from spinal cord and brainstem
reptiles, birds, mammals

Paleo cerebellum

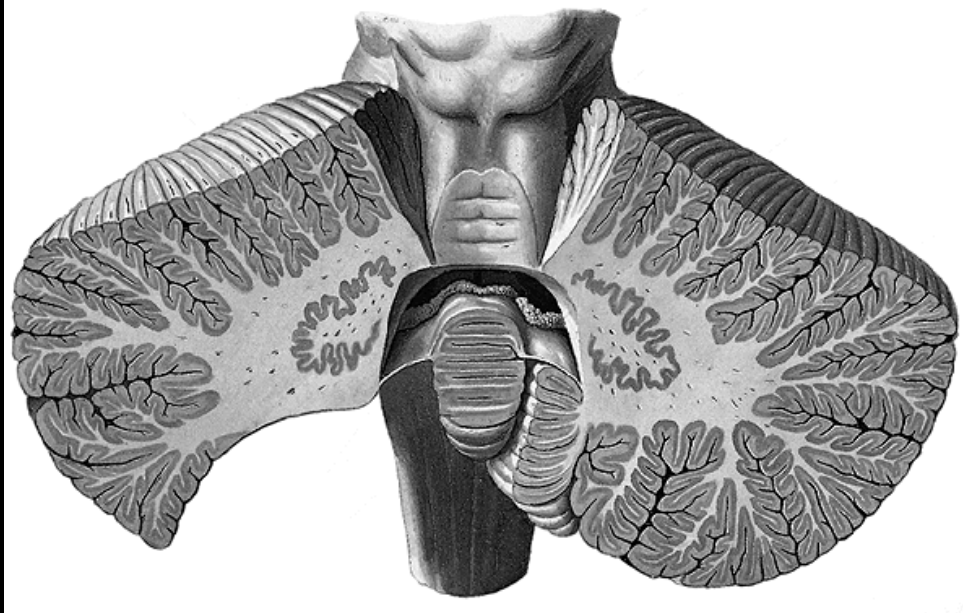
SPINO - CEREBELLUM

Afferents from cortex telencephali

Neo cerebellum

PONTO - CEREBELLUM

Structure of the cerebellum



Grey matter

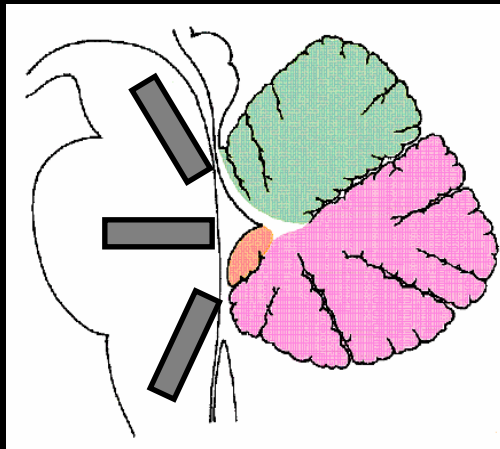
Cortex cerebelli

→ str. moleculare

← str. ganglionare

→ str. granulare

Nuclei cerebellares

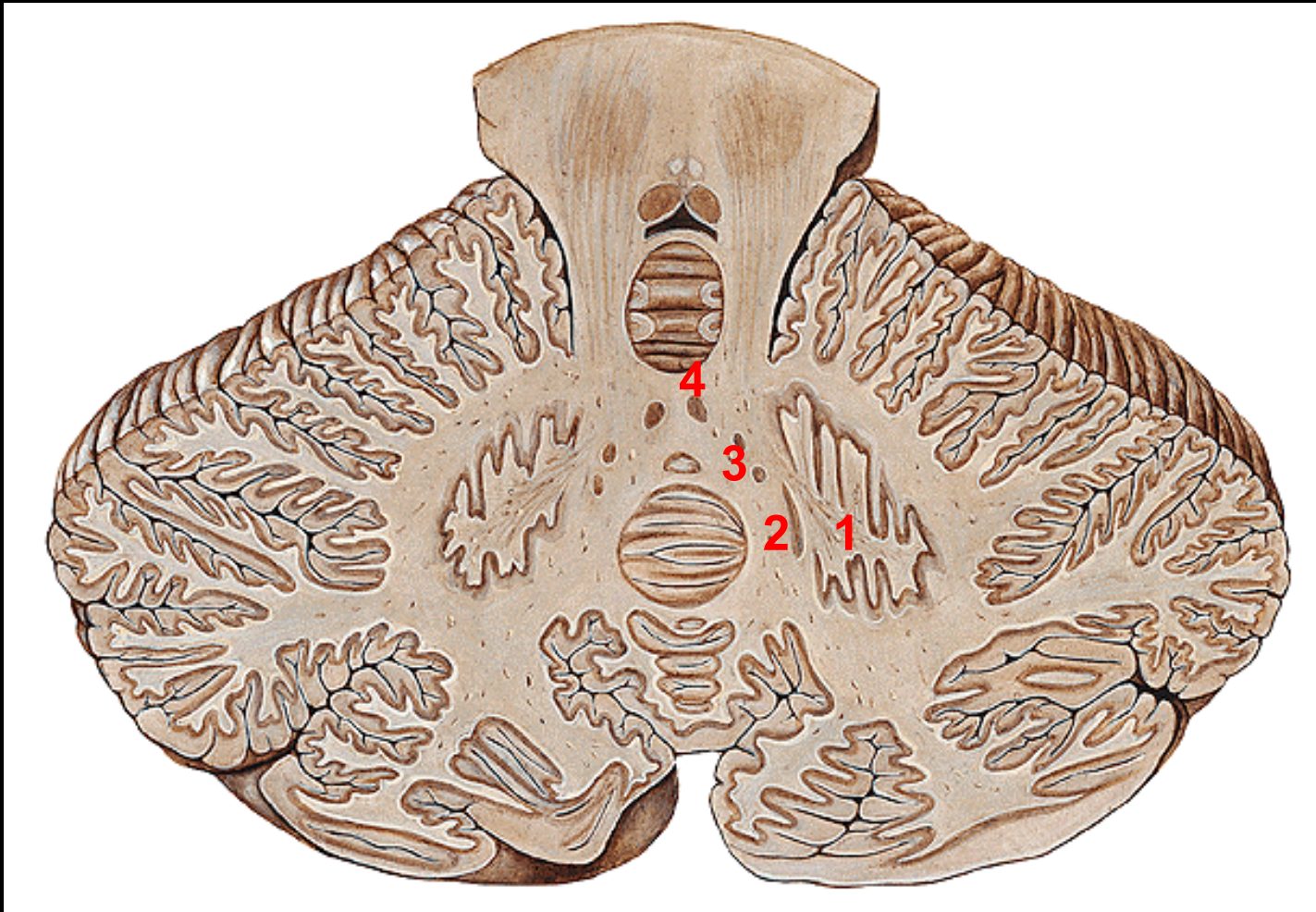


White matter

Subst. medullaris

laminae albae (arbor vitae)

Pedunculi cerebellares



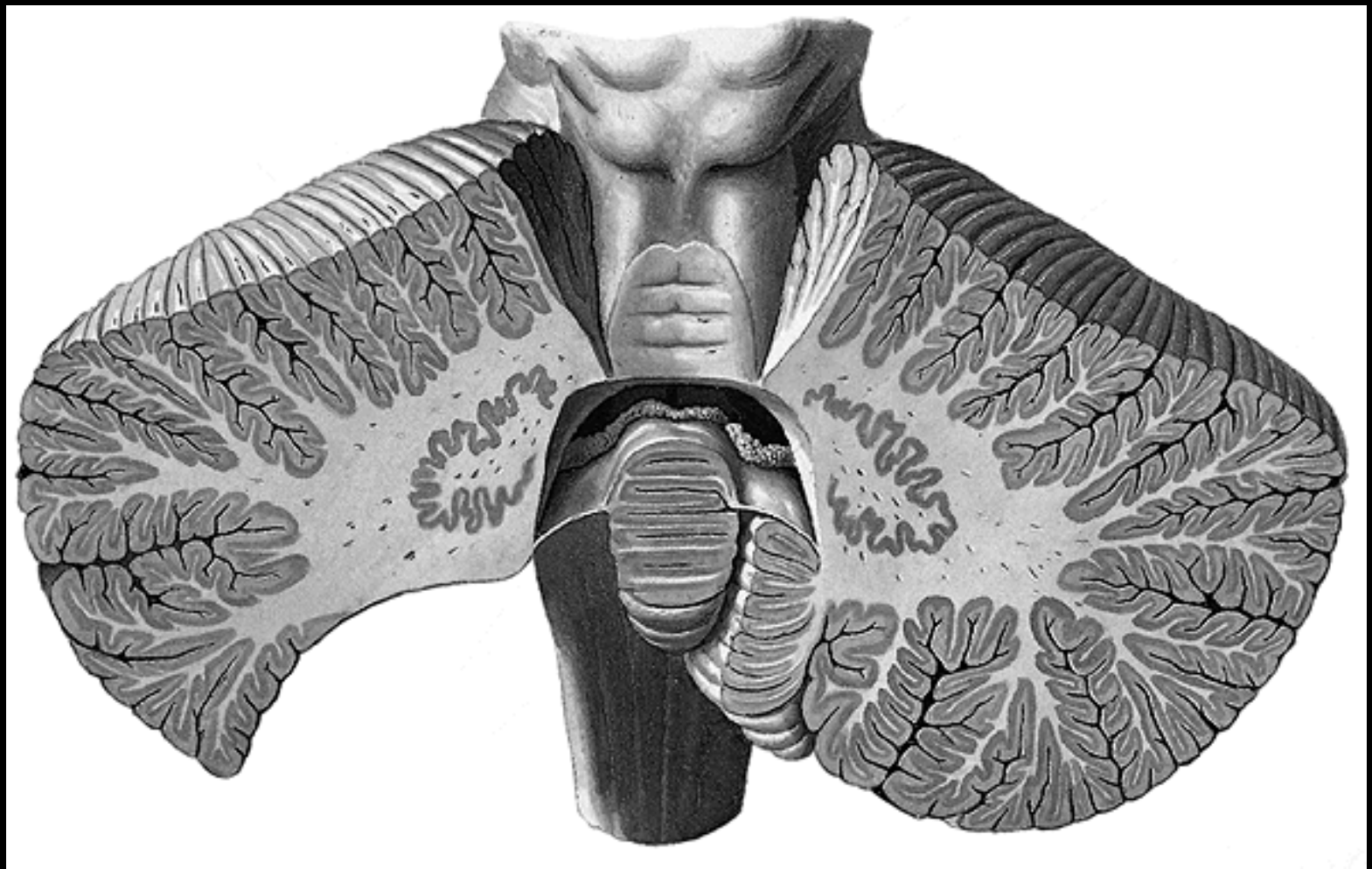
1 ncl. dentatus

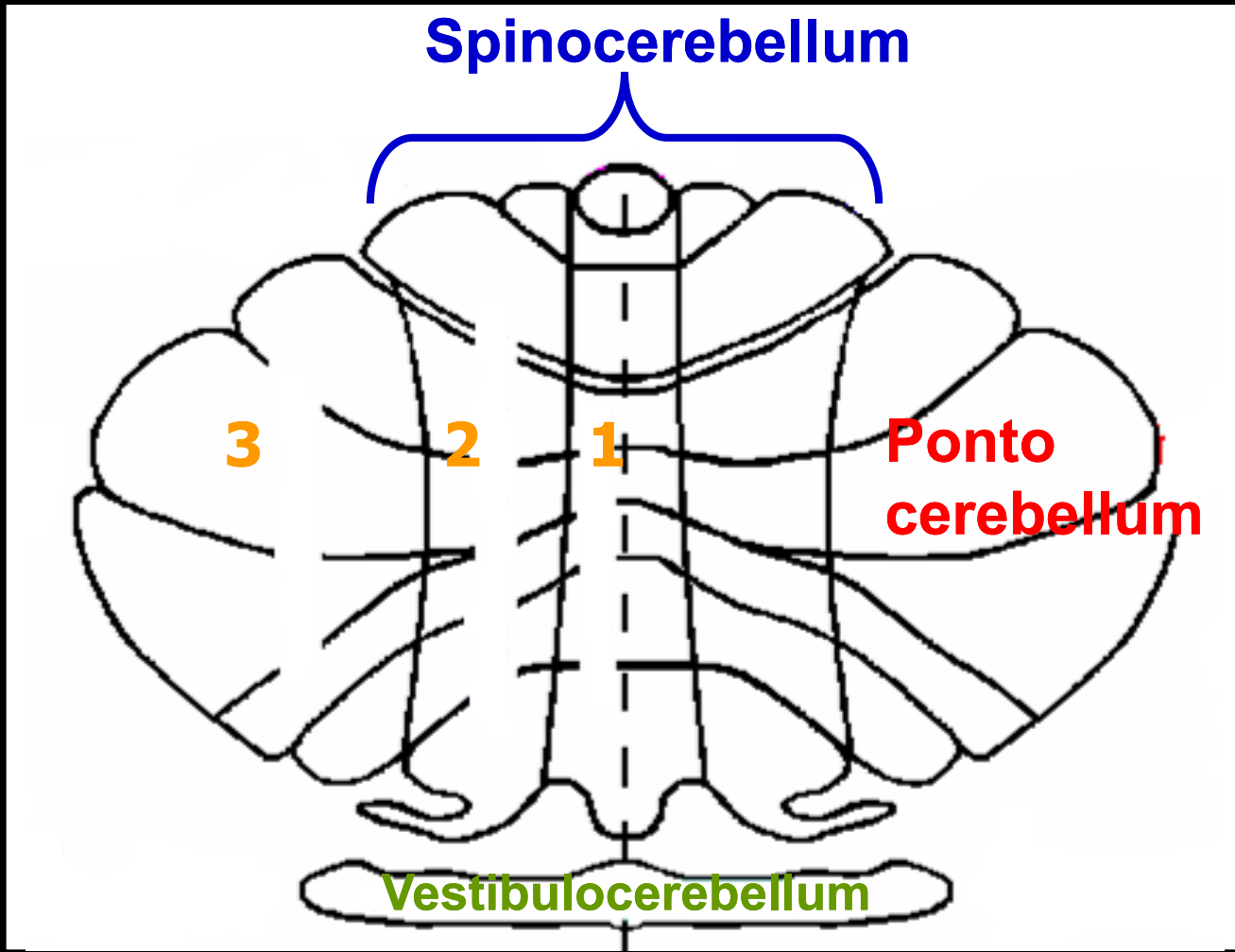
2 ncl. emboliformis

3 ncll. globosi

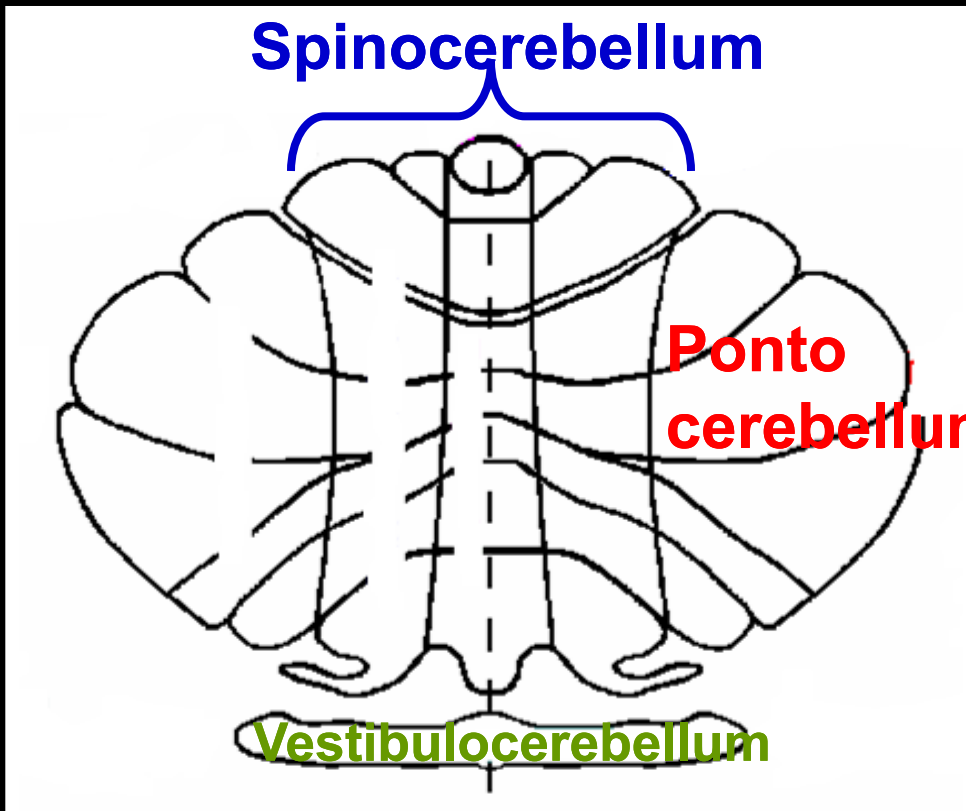
4 ncl. fastigii

Nuclei cerebelli





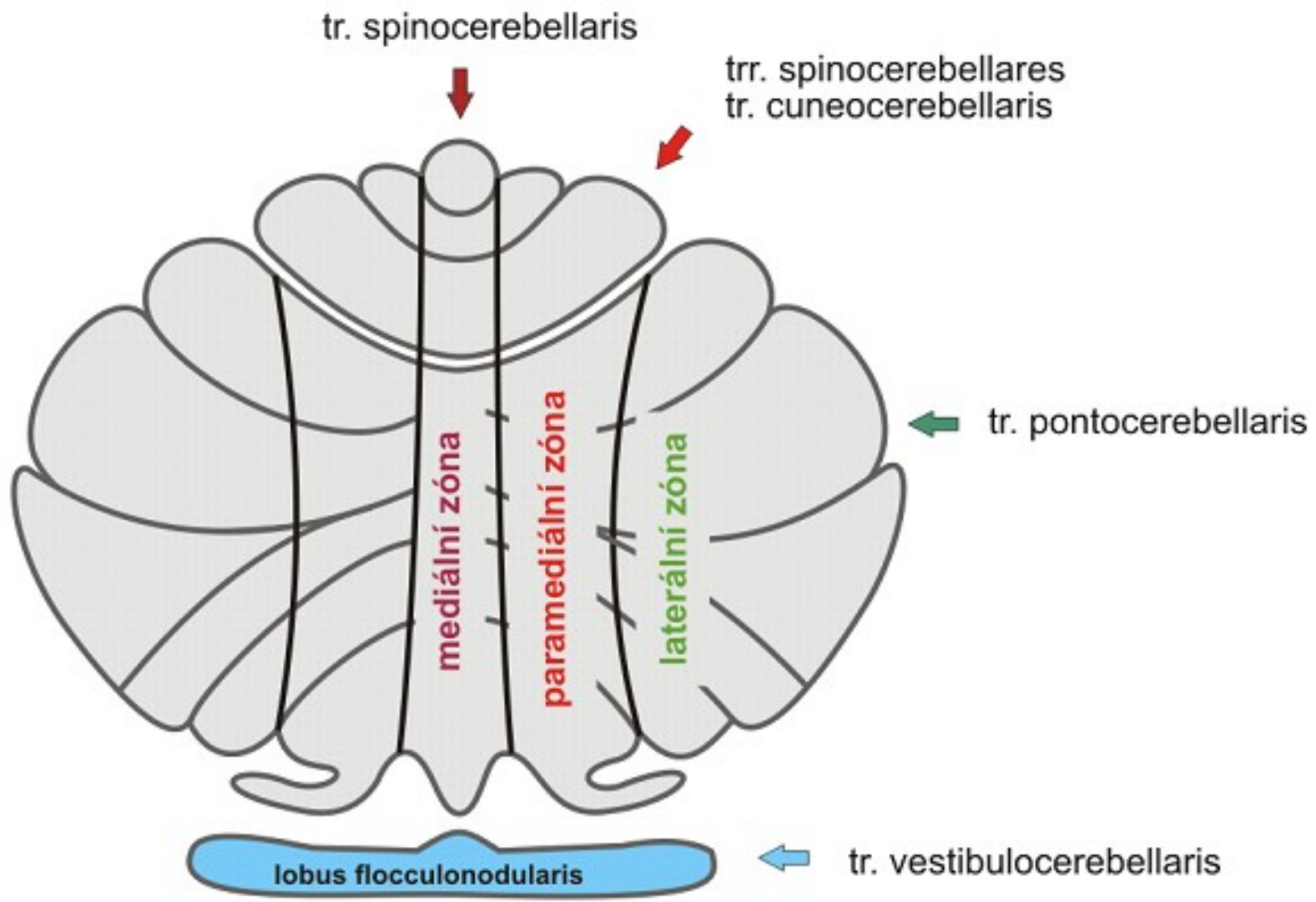
- 1** median zone
- 2** paramedian zone L. flocculonodularis
- 3** lateral zone



Vestibulocereb. ncl. vestibulares

Spinocereb. ncl. fastigii, emboliformes, globosi

Neocereb. ncl. dentatus



tr. spinocerebellaris

tr. spinocerebellares
tr. cuneocerebellaris

tr. pontocerebellaris

lobus flocculonodularis

tr. vestibulocerebellaris

mediální zóna

paramediální zóna

laterální zóna

Pedunculi cerebel. inf.

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

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

Pedunculi cerebel. medii

→ tr. ponto-ce

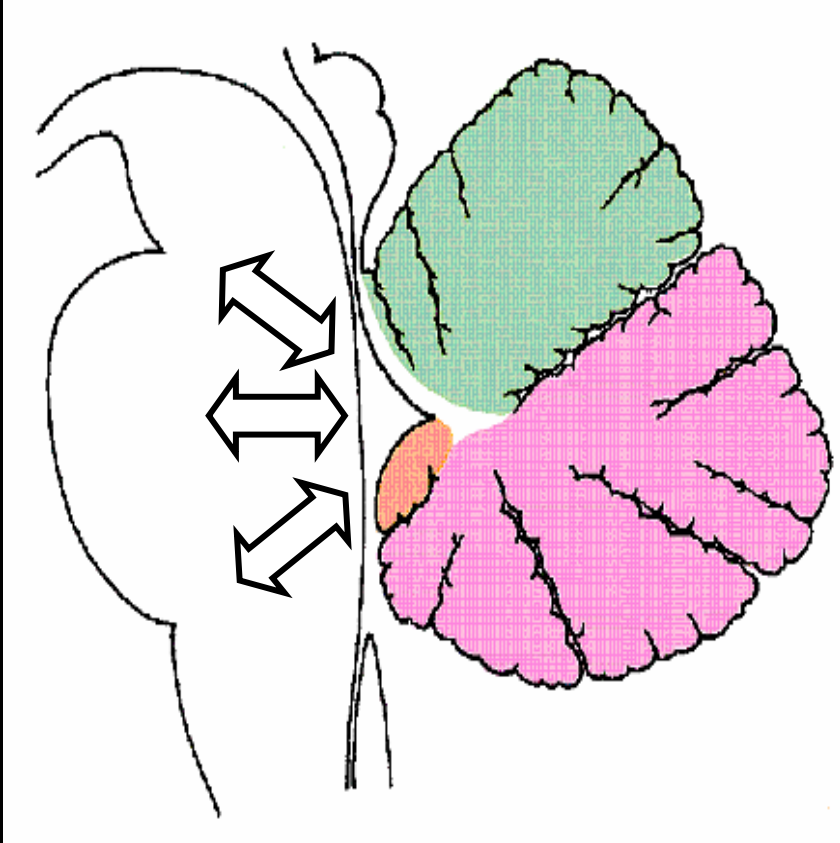
Pedunculi cerebel. sup.

→ 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

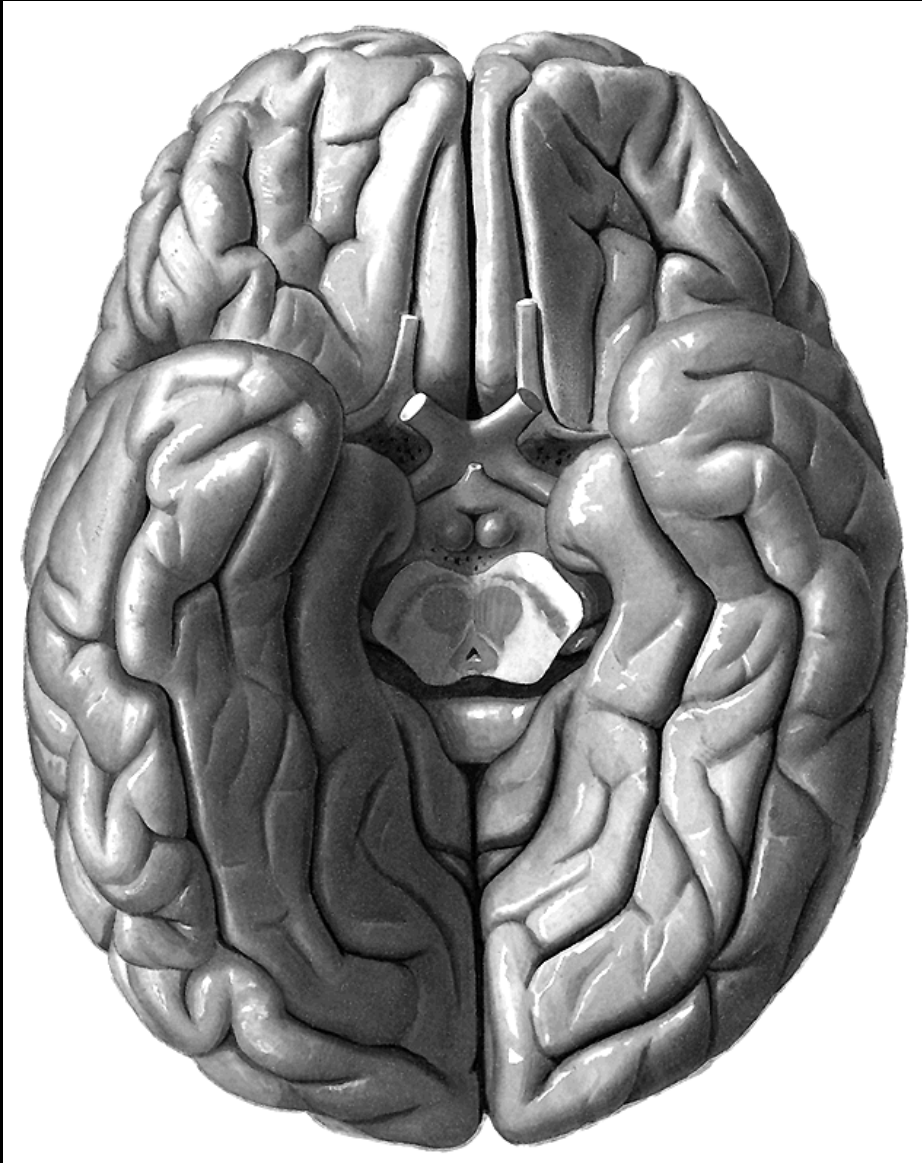


Ataxia inability to stand upright without support

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

Dyssynergia incoordination

Adiadochokinesia inability to perform rapid alternating movements



DIENCEPHALON

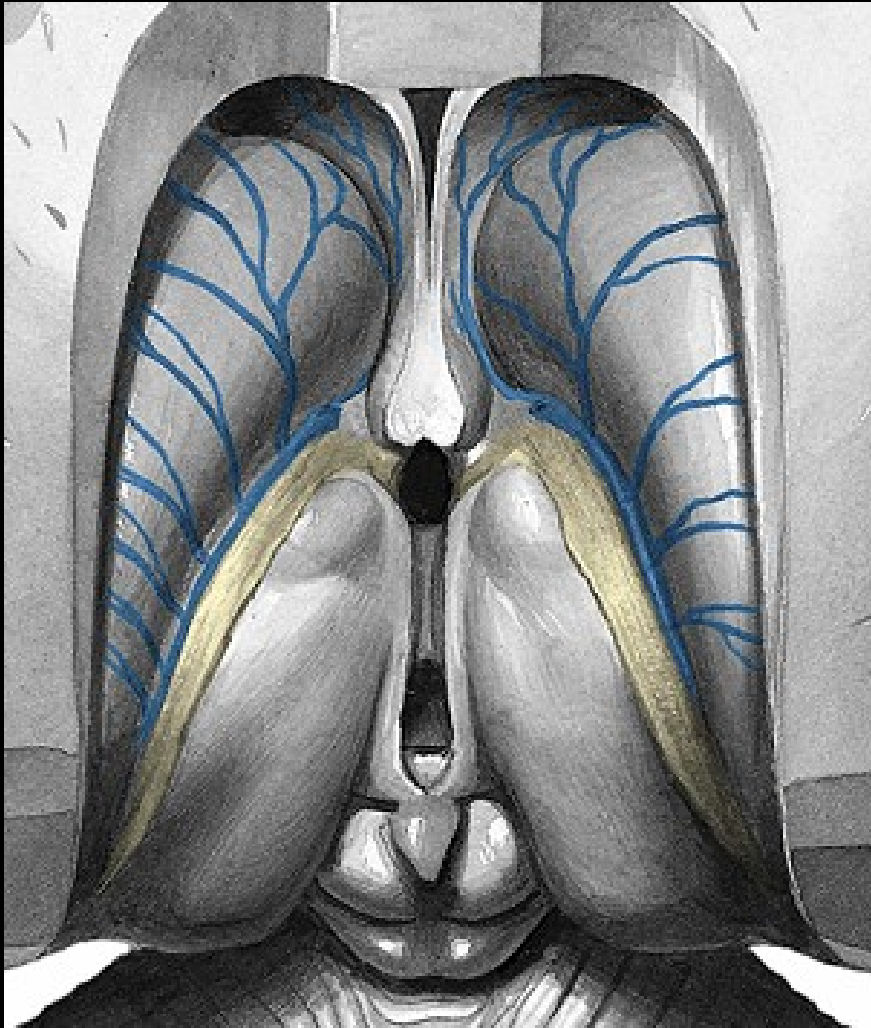
thalamus

epithalamus

subthalamus

hypothalamus

(metathalamus)



Thalamus

tuberculum ant.

pulvinar

stria medullaris

(tela choroidea ventr. III.)

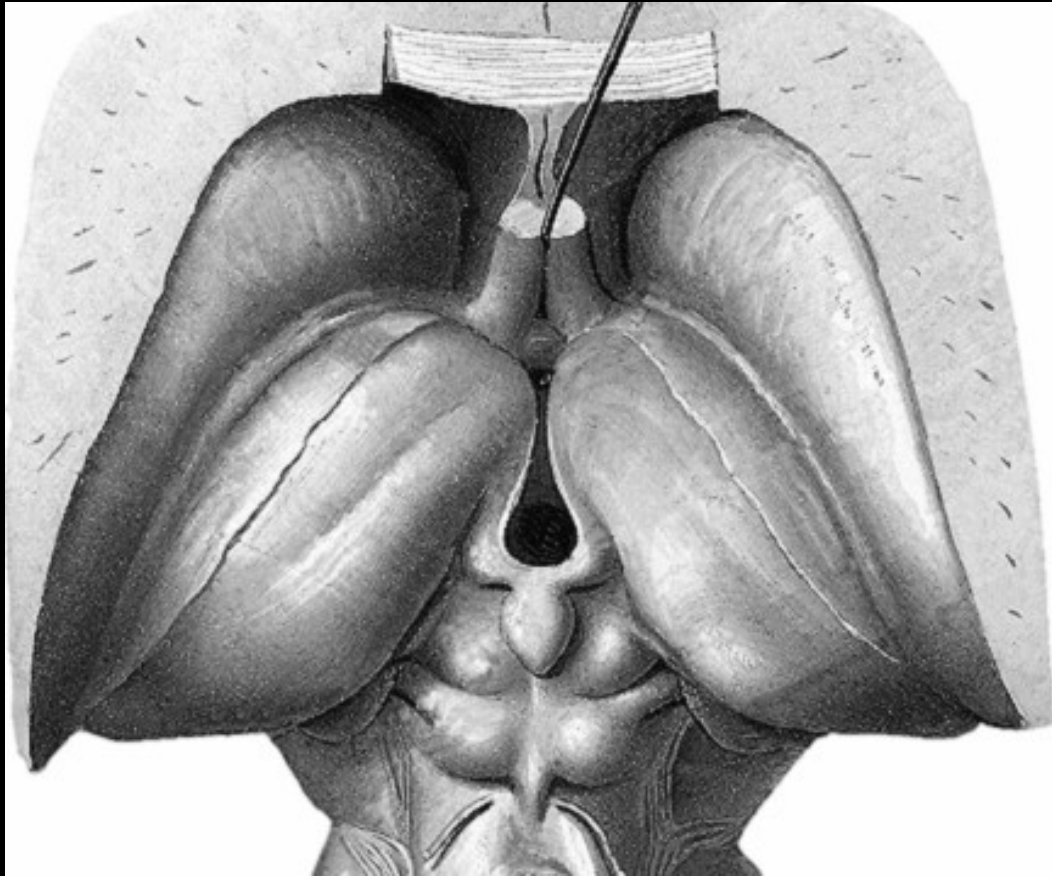
fissura transversa cerebri

taenia choroidea

(tela choroidea ventr. lat.)

lamina affixa thalami

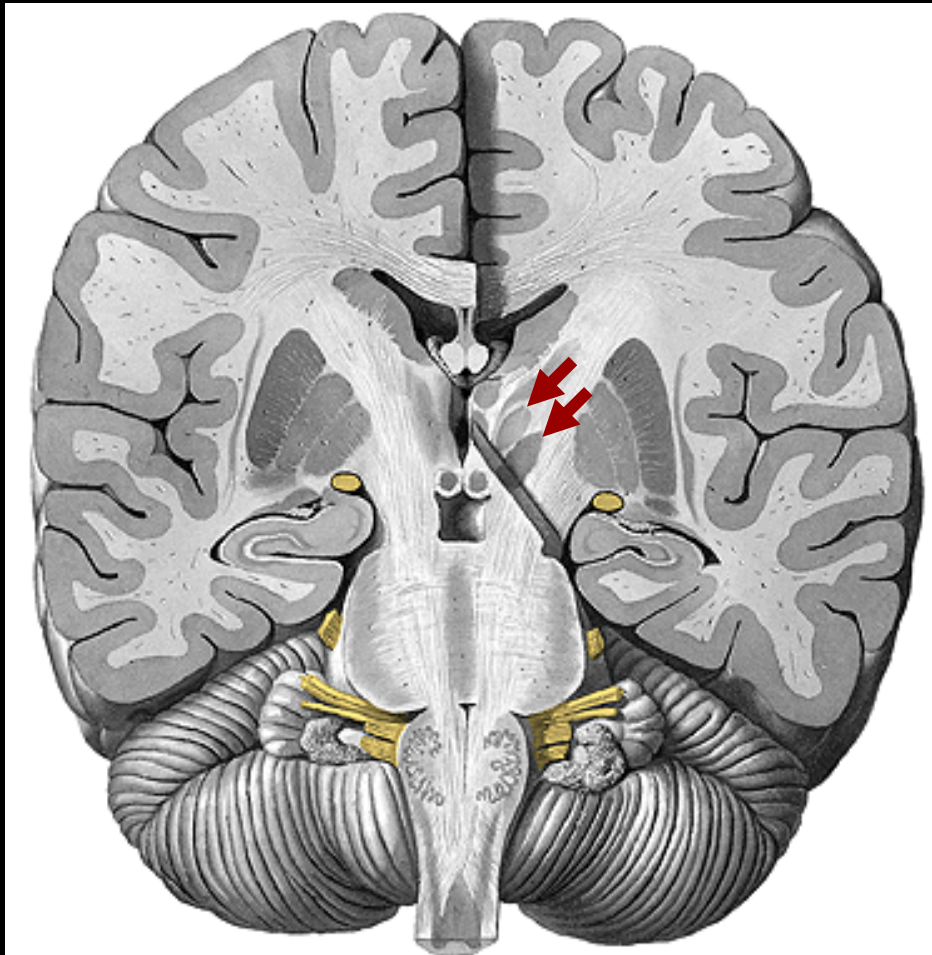
stria terminalis



Epithalamus

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

Subthalamus



Involved in motor circuits

Grey matter

← ncl.

subthalamicus

part of subst. nigra

part of globus pallidus

← **zona incerta**

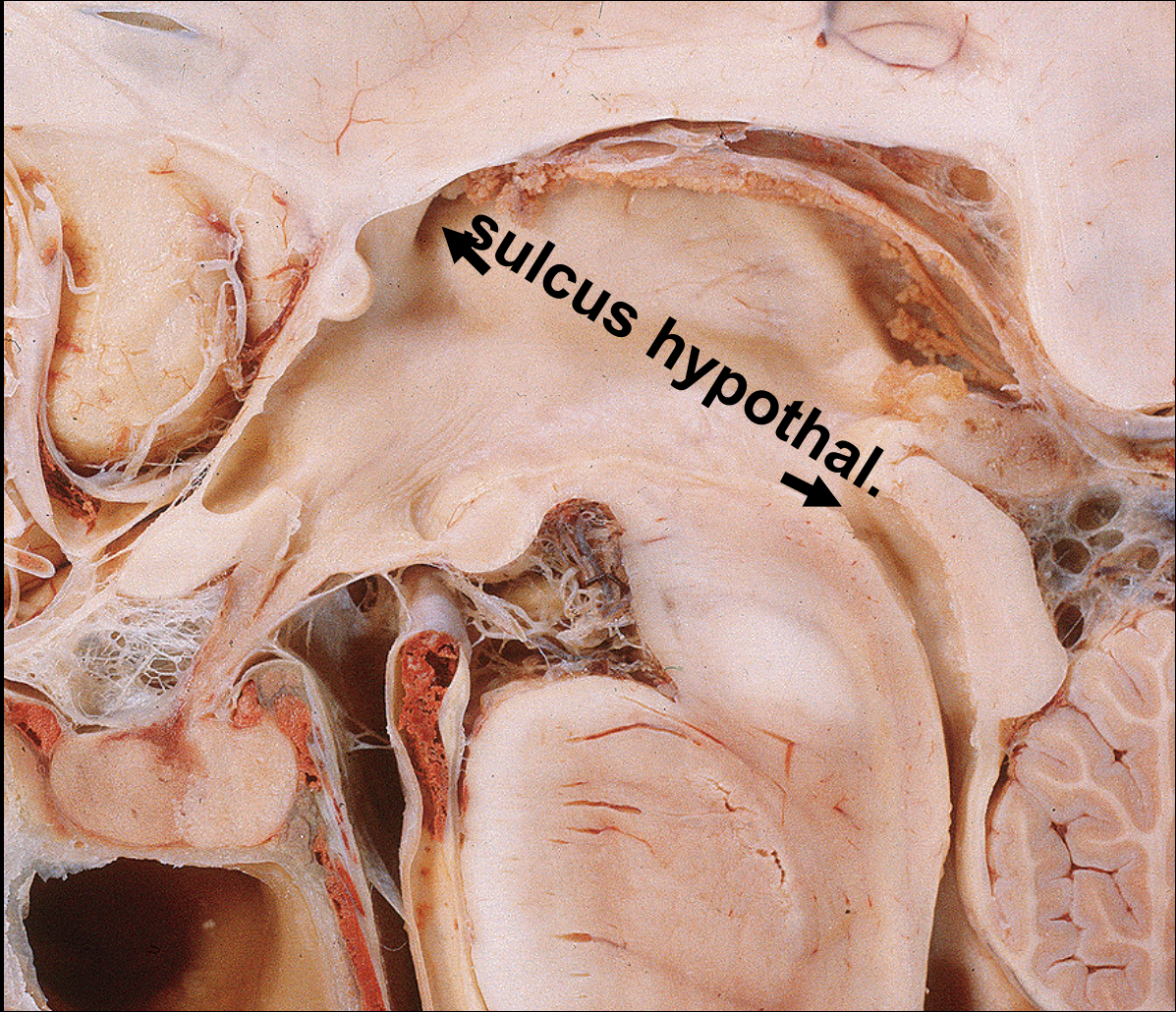
White matter

Fasc. thalamicus

Fasc. lenticularis

Ansa lenticularis

Fasc. subthalamicus



Hypothalamus



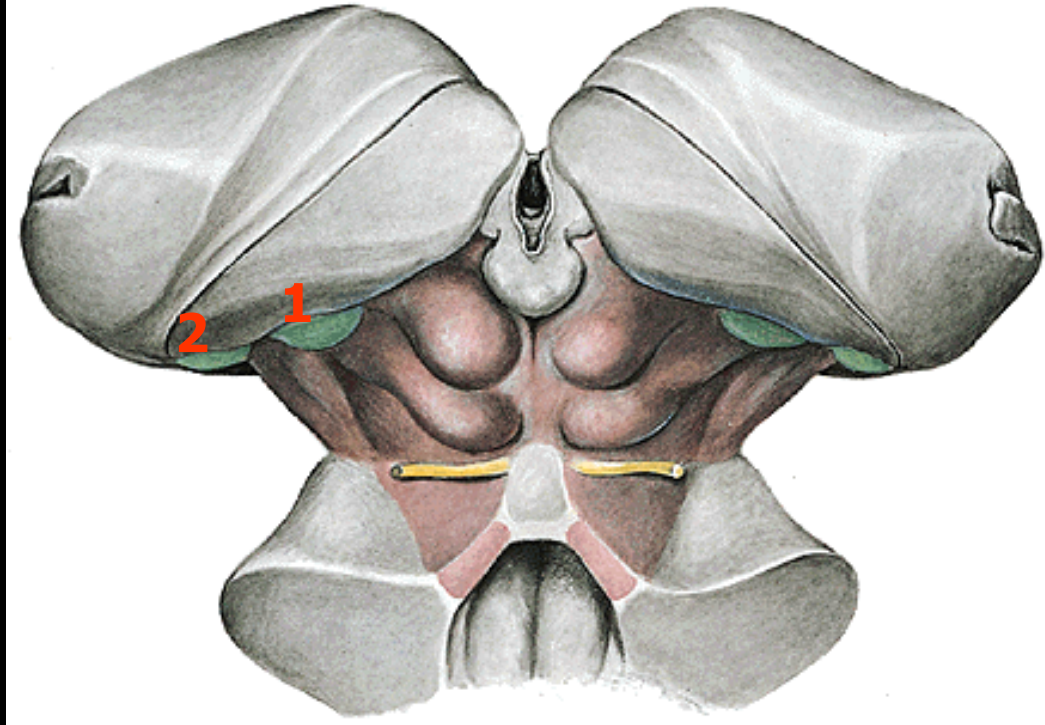
Corp. mamillaria

Infundibulum

Tuber cinereum

Hypophysis cerebri

Metathalamus

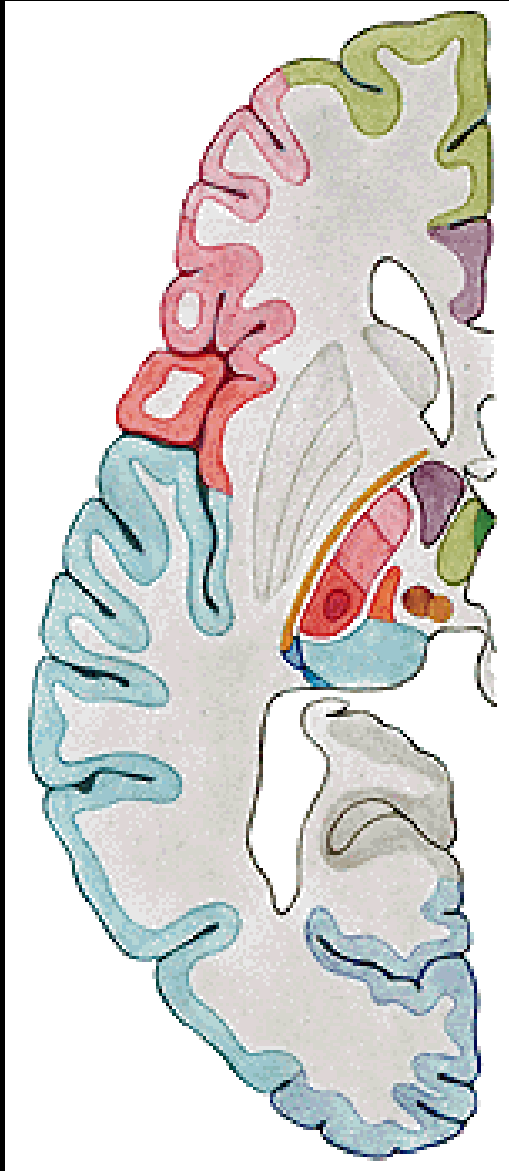


1 corp. geniculatum med.

brachium colliculi inf. – colliculus inf. **2**

corp. geniculatum lat.

brachium colliculi sup. – colliculus sup.



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.

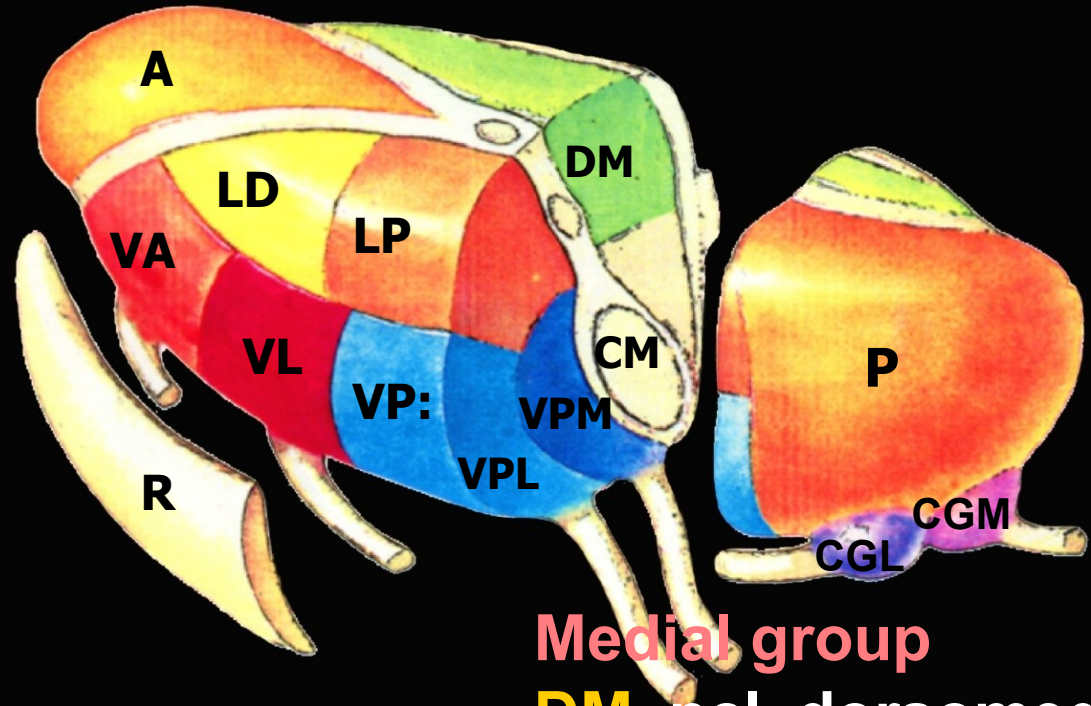
VP ncl. ventr. post.:

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

somatosensory

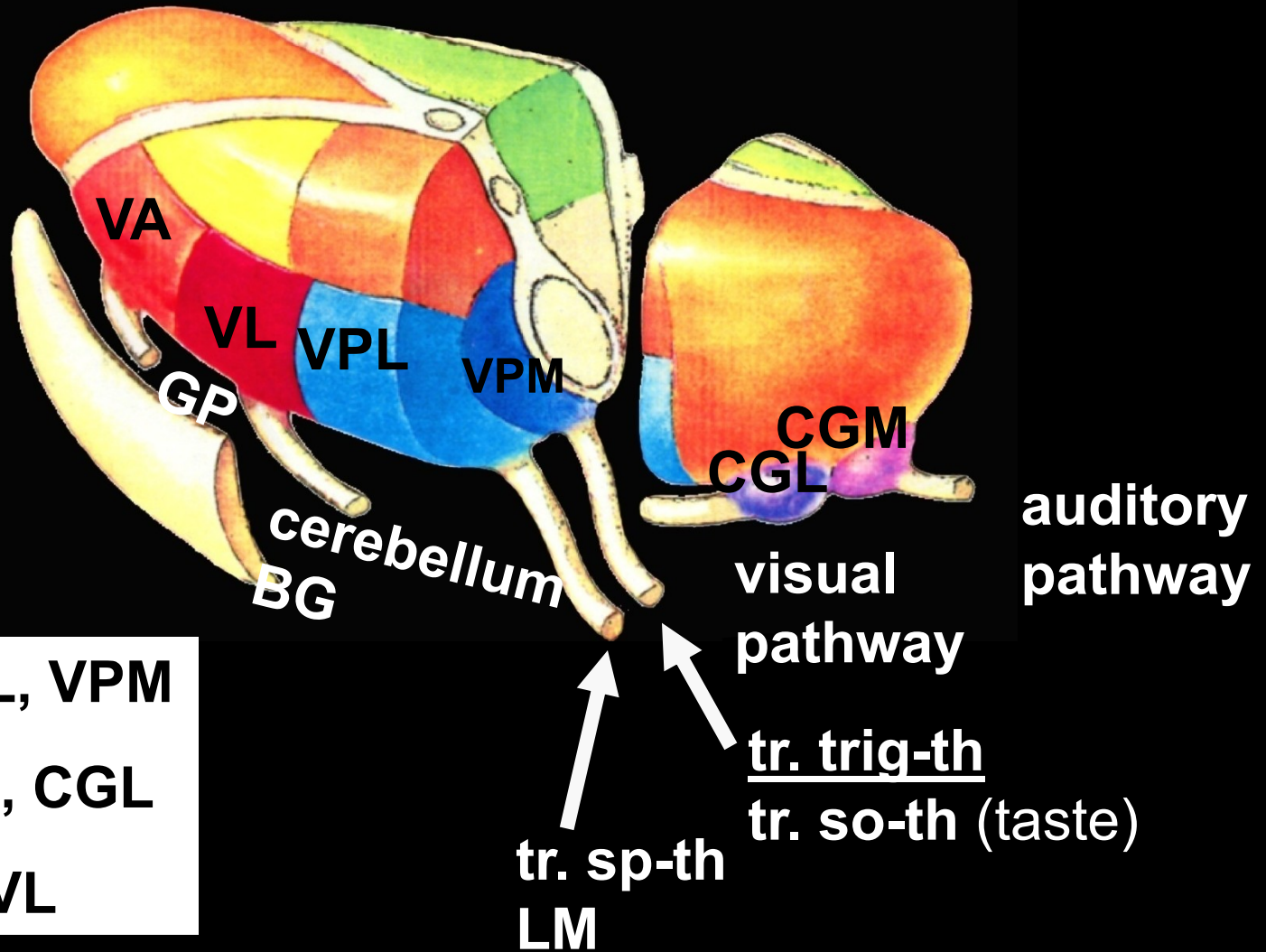
sensory

motor

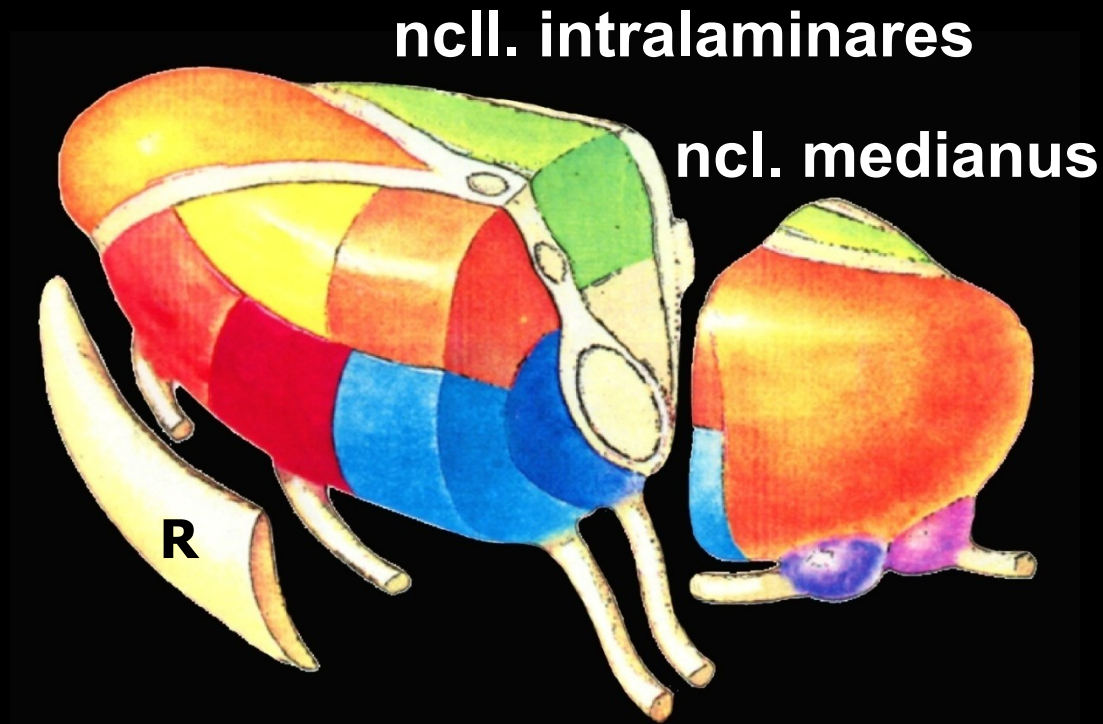
non-specific nuclei

association nuclei

Specific nuclei



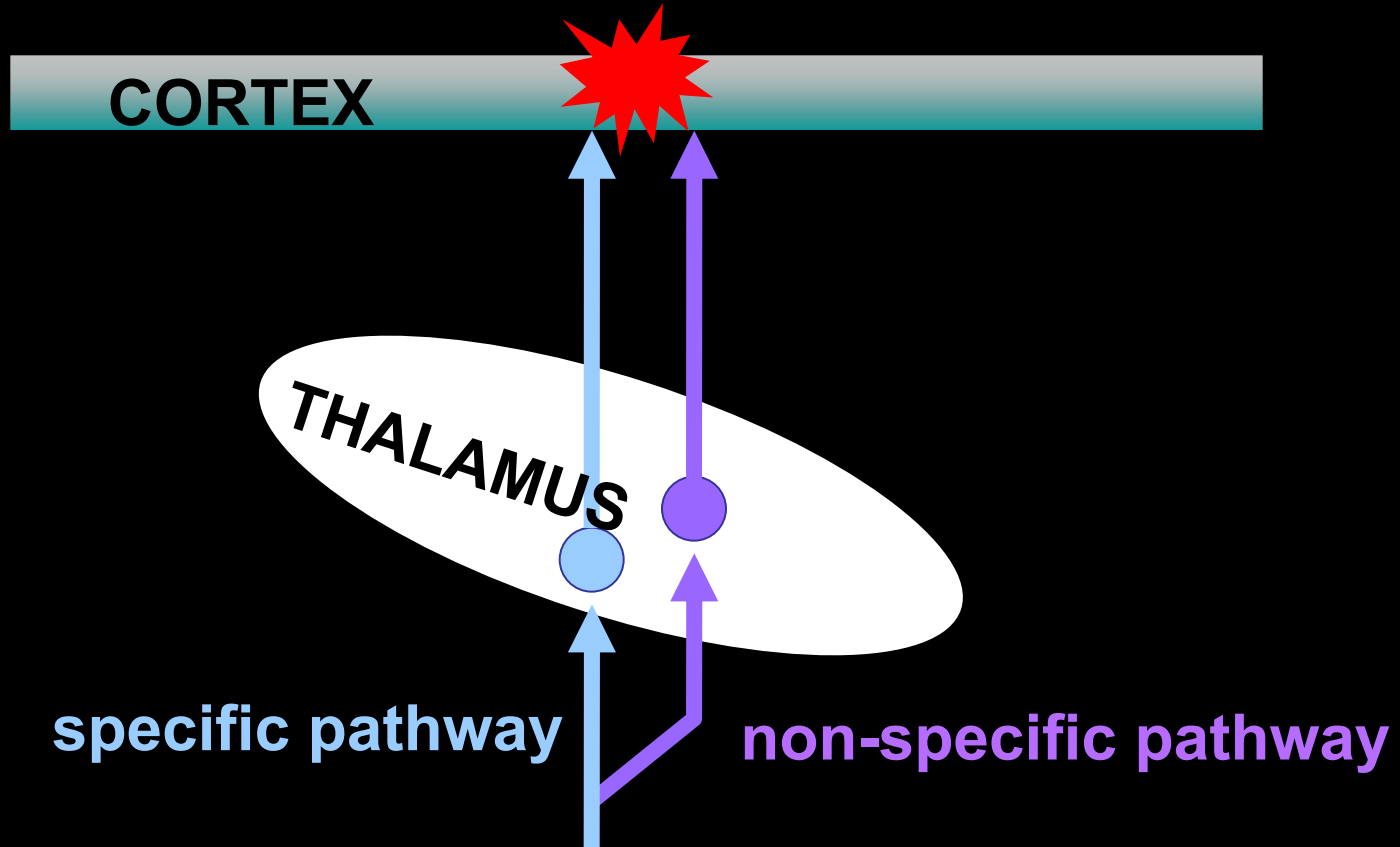
Non-specific nuclei



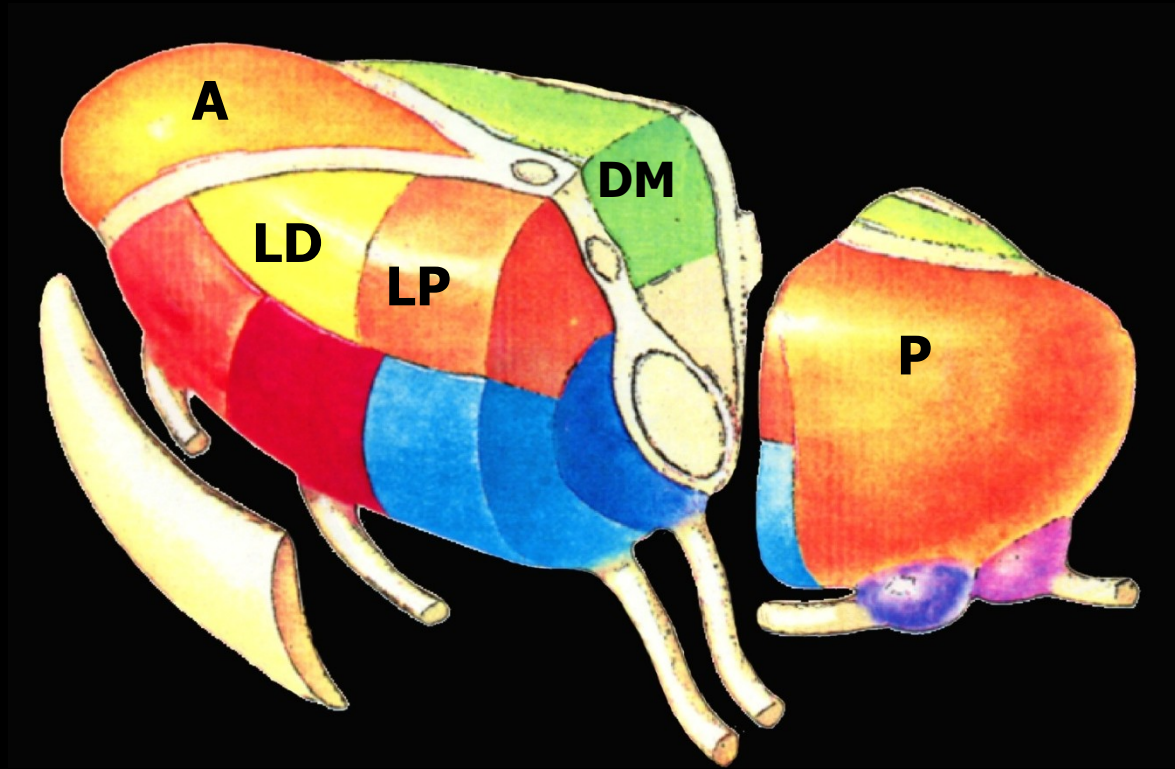
→ from FR of the brainstem and other thalamic nuclei

← to BG, thalamus, cortex (ARAS)

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

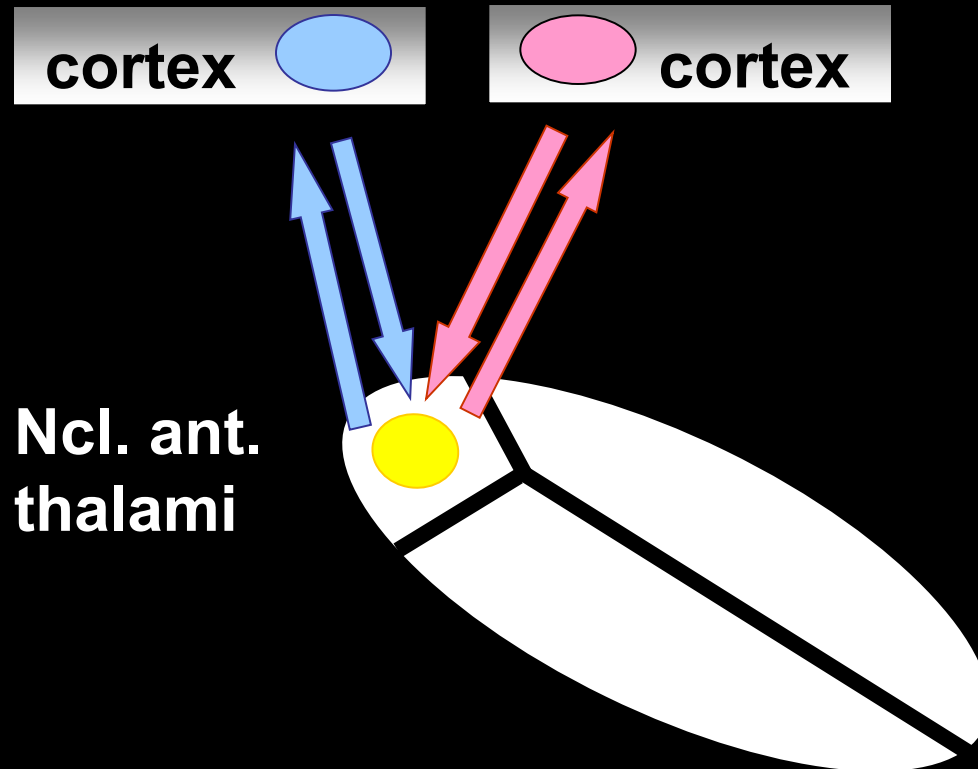


Association nuclei

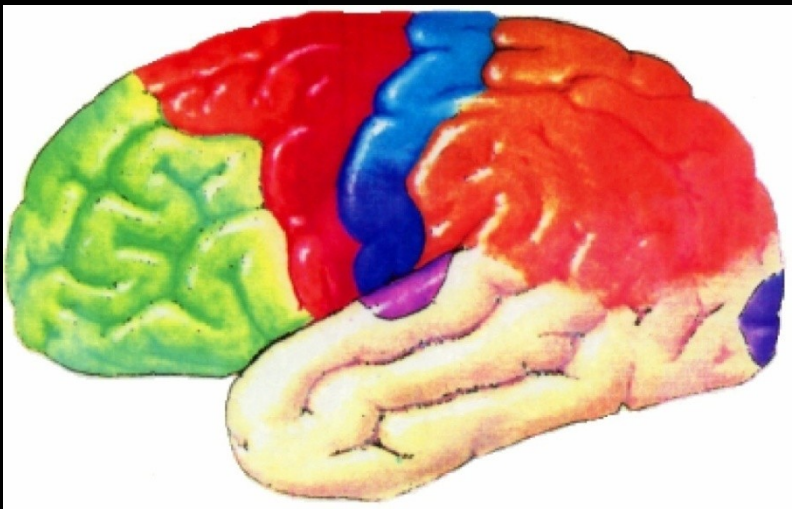


integration of SS a S inputs \Rightarrow to cortex
reciprocal connections with the association
cortex

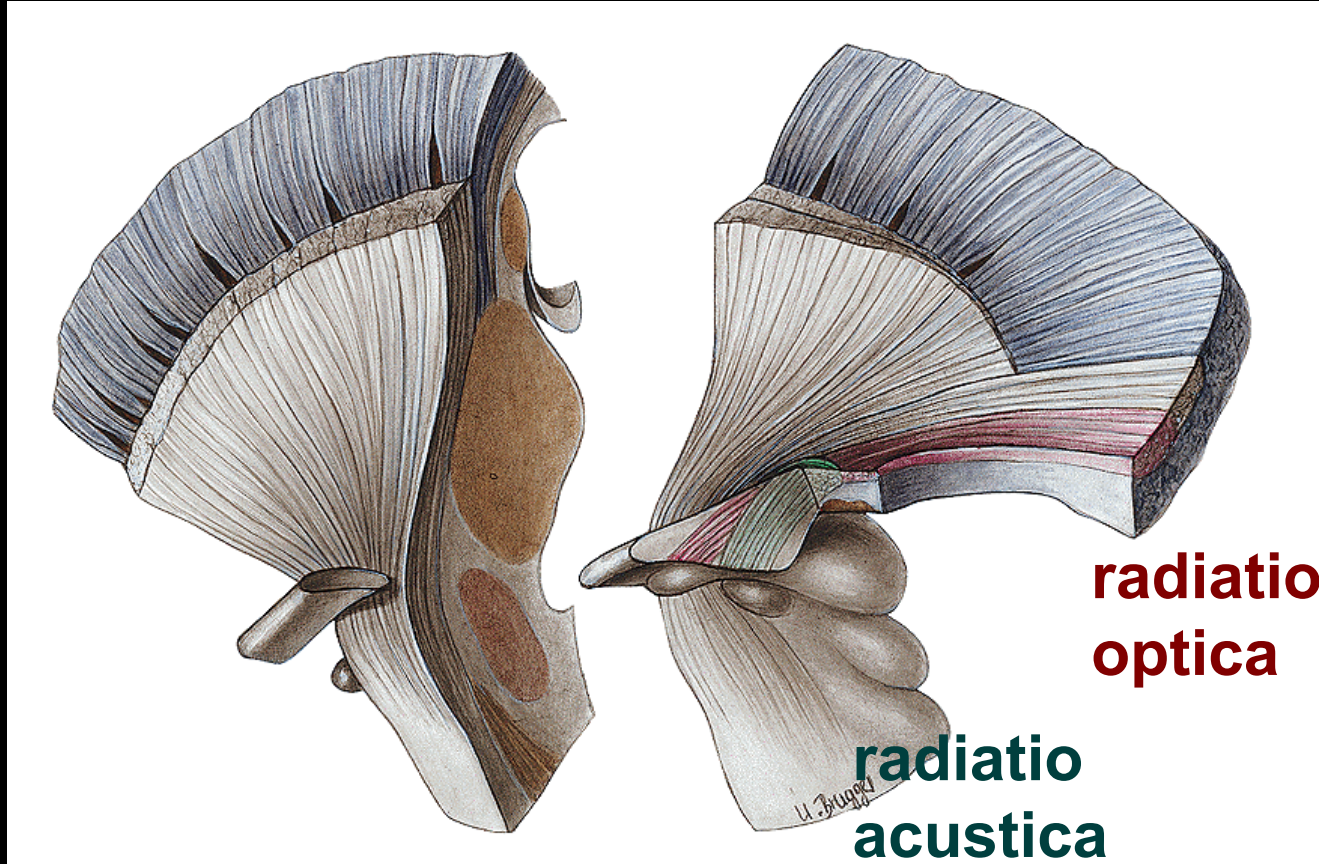
Function of association nuclei



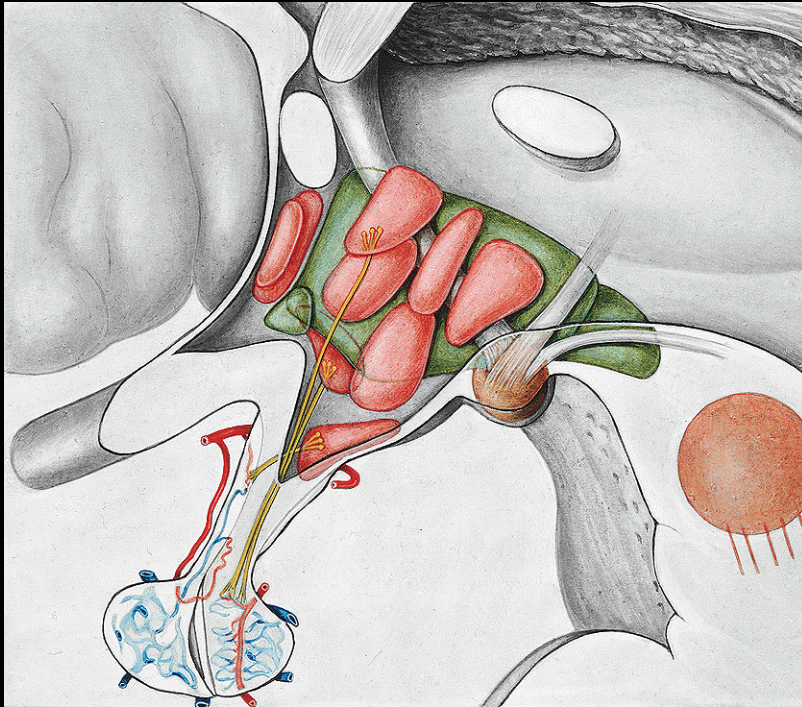
Interconnection of association areas of the cortex



Thalamic connections



Hypothalamus



Hypothalamus

control of:

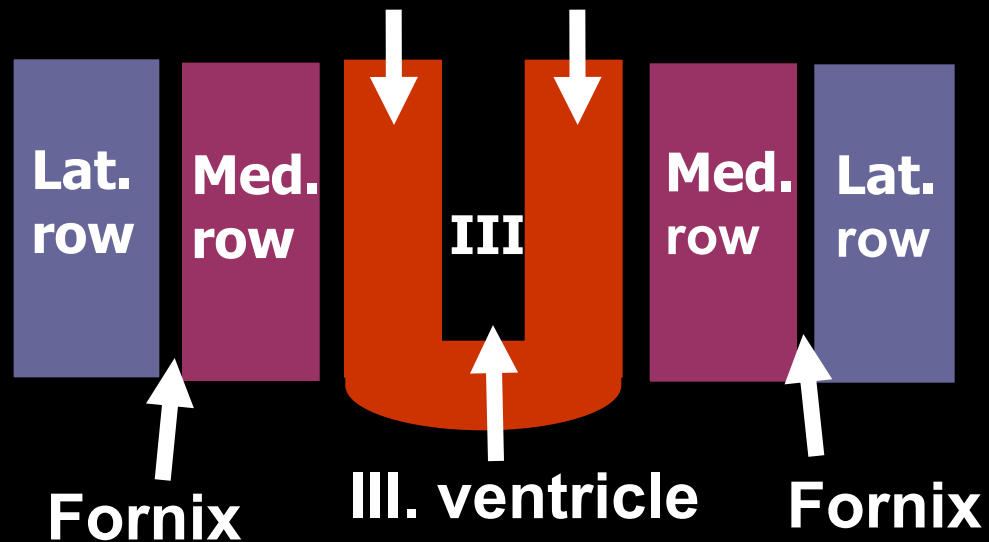
- ANS
- endocrine system

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

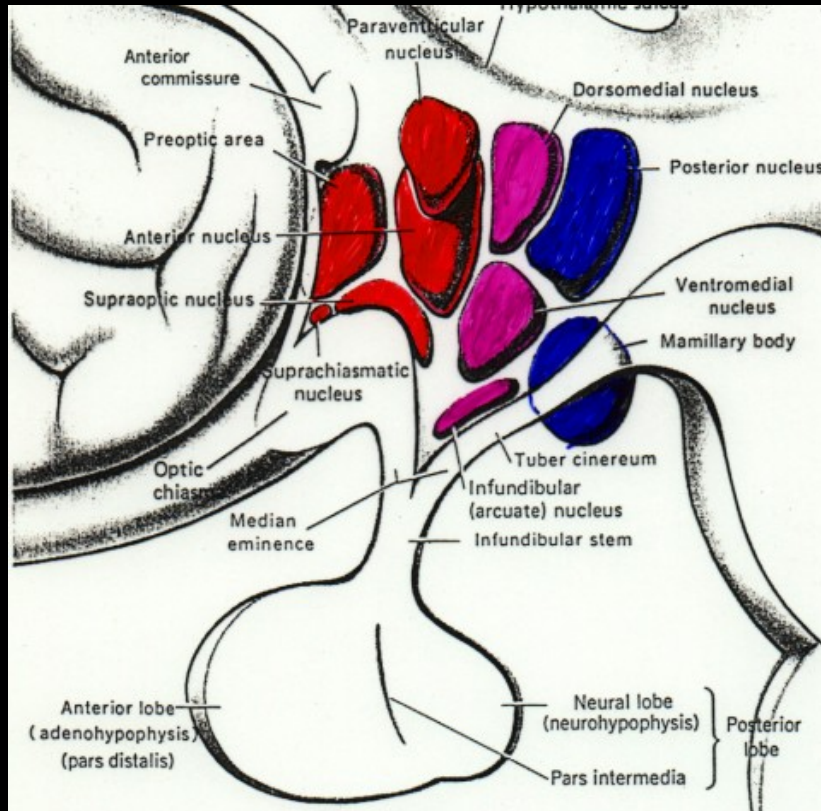


Hypothalamic nuclei from the frontal aspect

Periventricular row



ant. medial post.



Hypothalamic nuclei from sagittal aspect

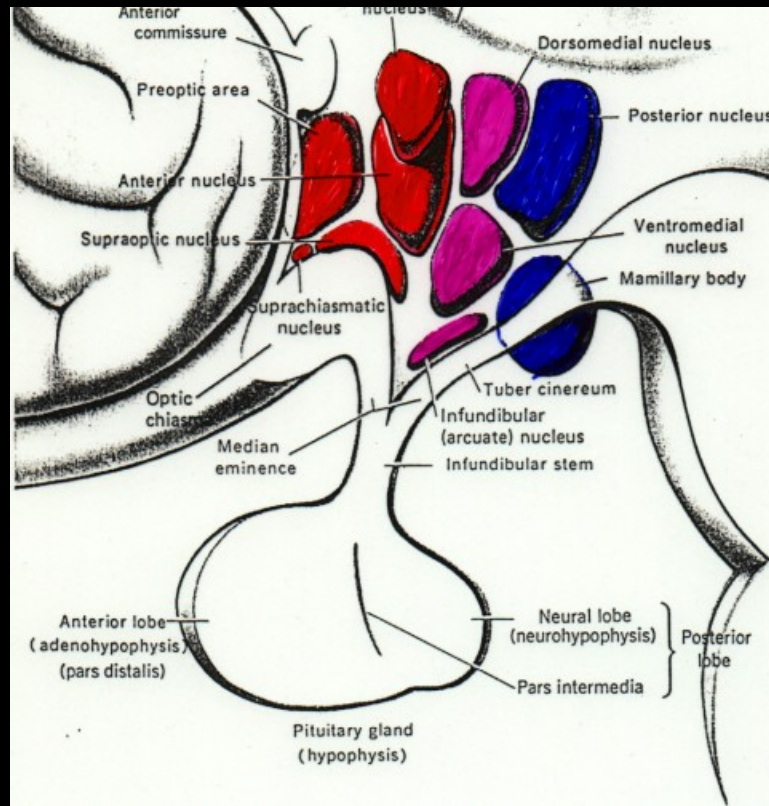
Anterior nuclei

Periventricular row:

ncl. suprachiasmatic.

Medial row:

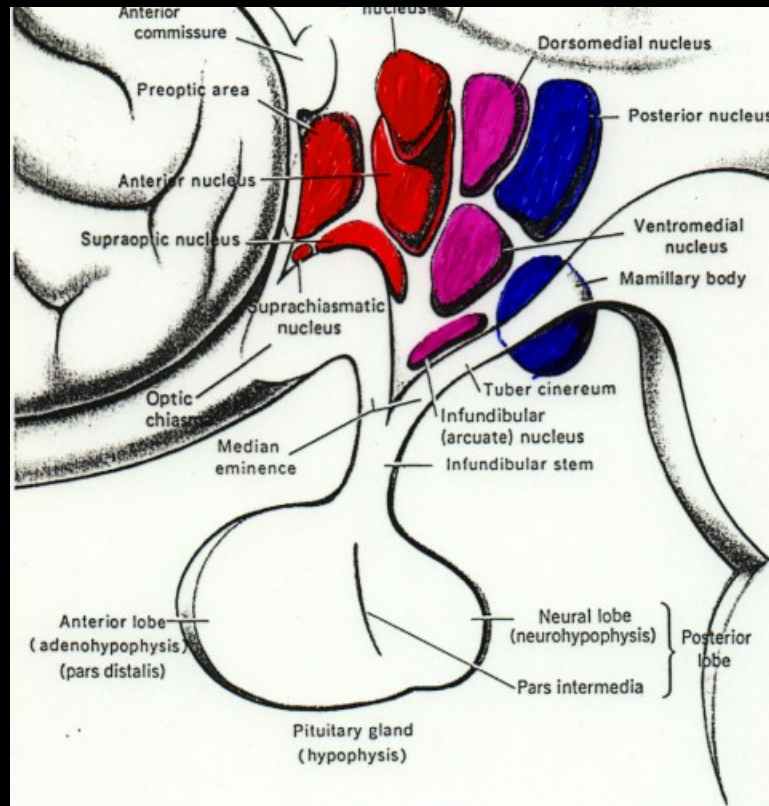
ncl. preopticus, ncl. supraopticus, ncl. ant., ncl. paraventr.



Medial nuclei

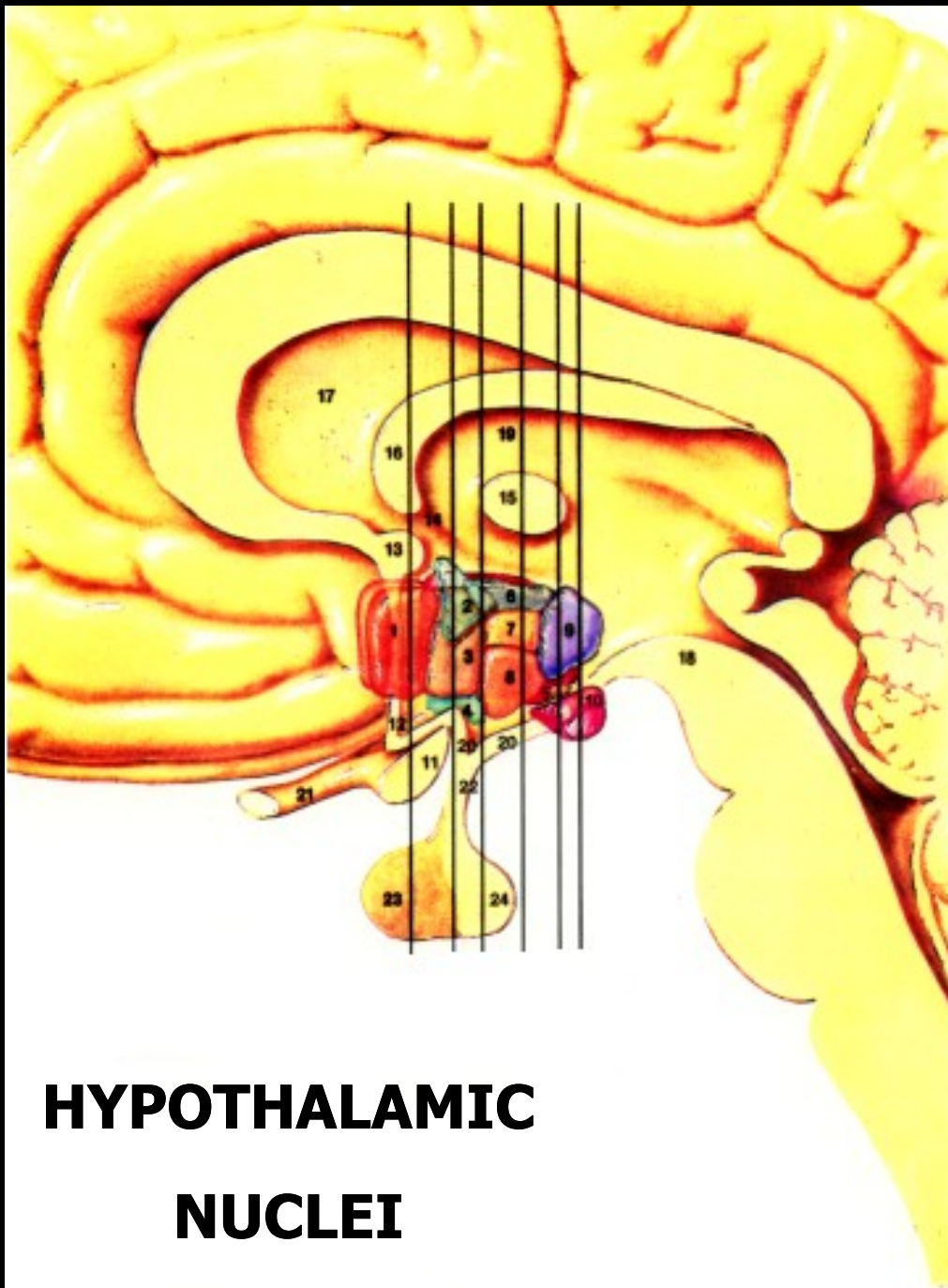
periventricular row: **ncl. arcuatus**

medial row: **ncl. ventromed. et ncl. dorsomed.**



Posterior nuclei

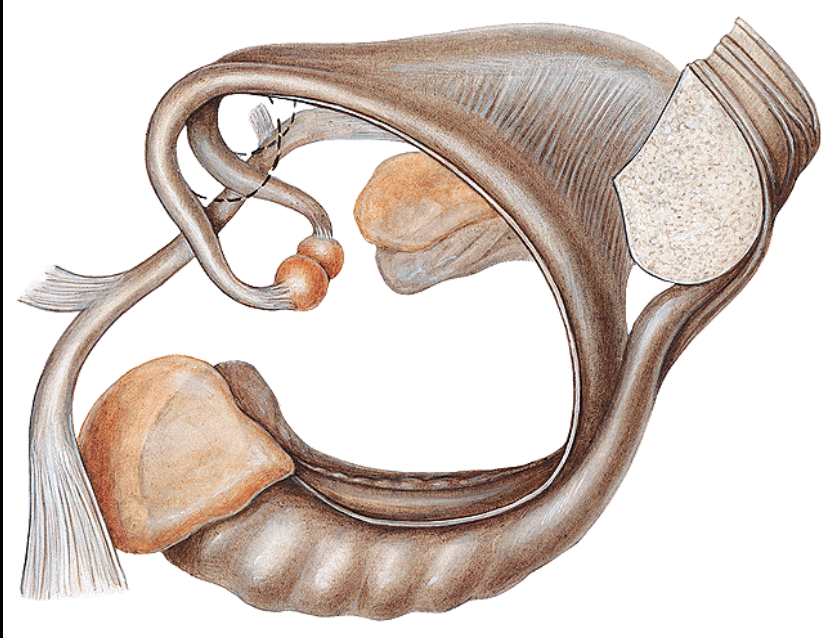
periventricular + med. rows: **ncl. post. et ncl. mamillaris**



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 mammillaris
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:

Thyrotropin

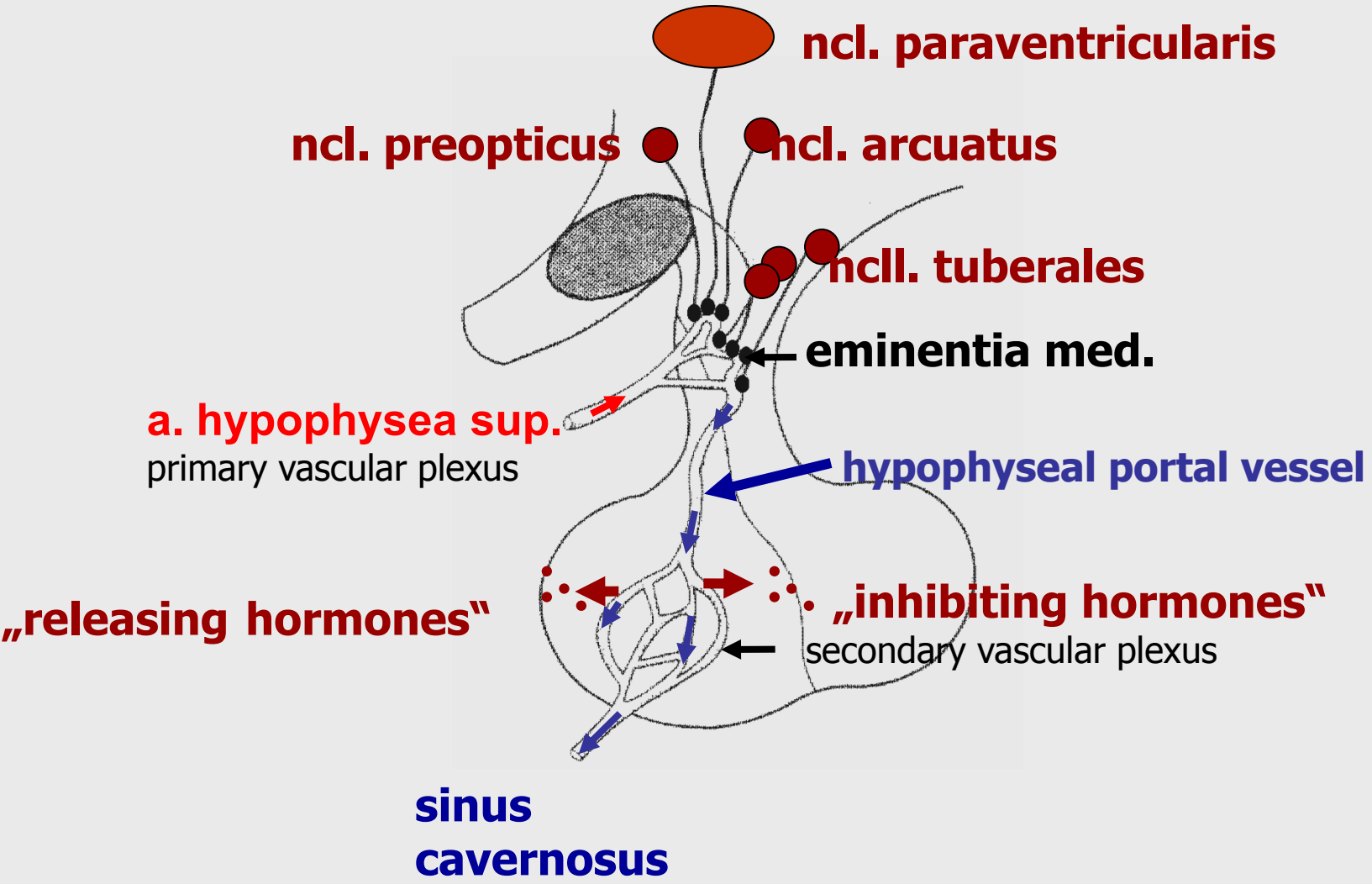
Gonadotropic

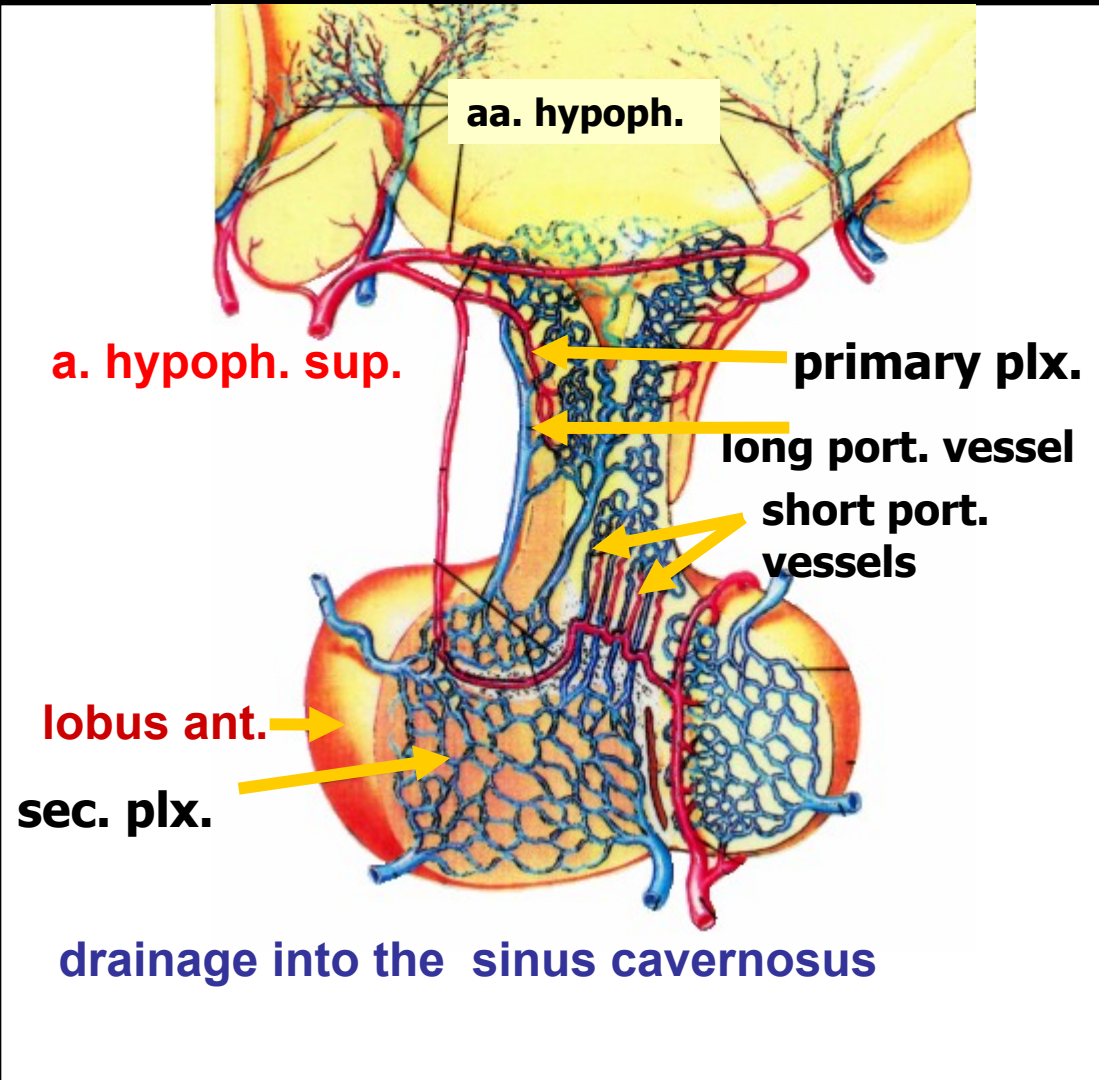
Growth

Adrenocorticotropic ...

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

- ✓ parvocellular neurons reach the median eminence
- ✓ from the infundibulum are transported to the adenohypophysis by the **portal vessels**





Neurohypophysis

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

developmentally – part of diencephalon

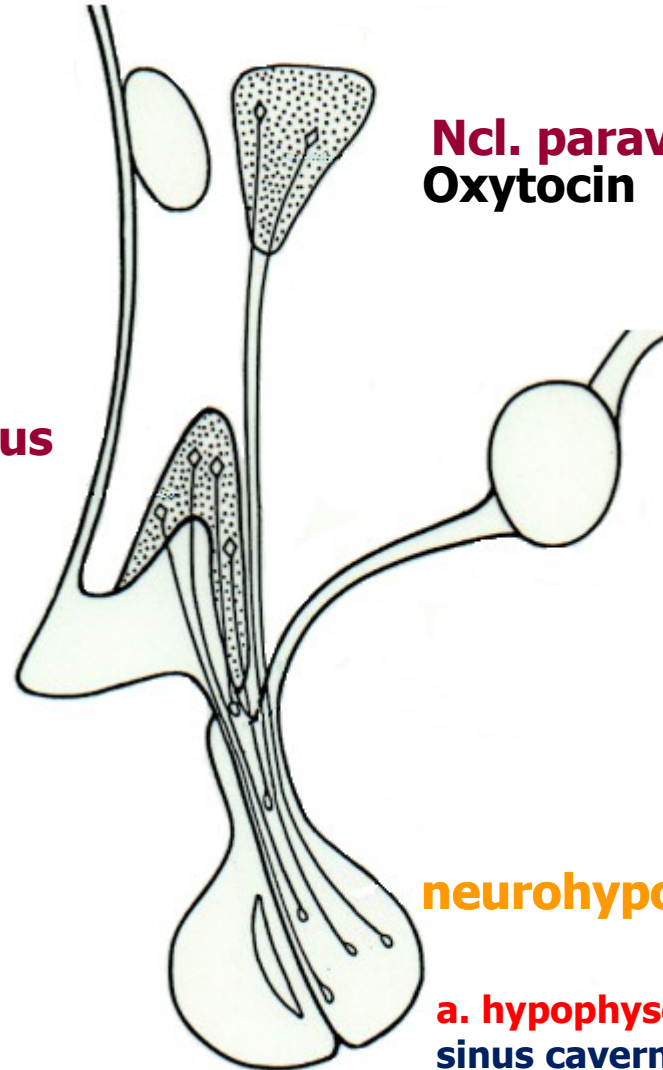
oxytocin and **ADH**

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

Tr. hypoth.-hypophysialis

Ncl. supraopticus
Antidiuretic h.
(Vasopresin)

Ncl. paraventricularis
Oxytocin

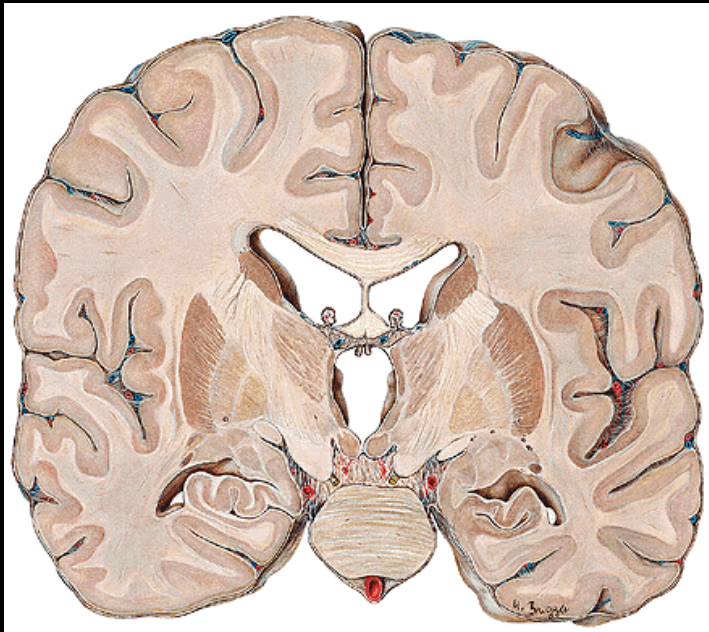


neurohypophysis

a. hypophyseae inf.
sinus cavernosus

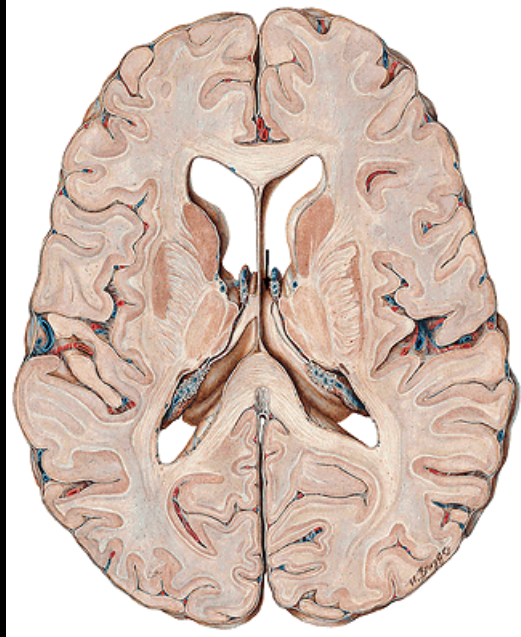
Telencephalon





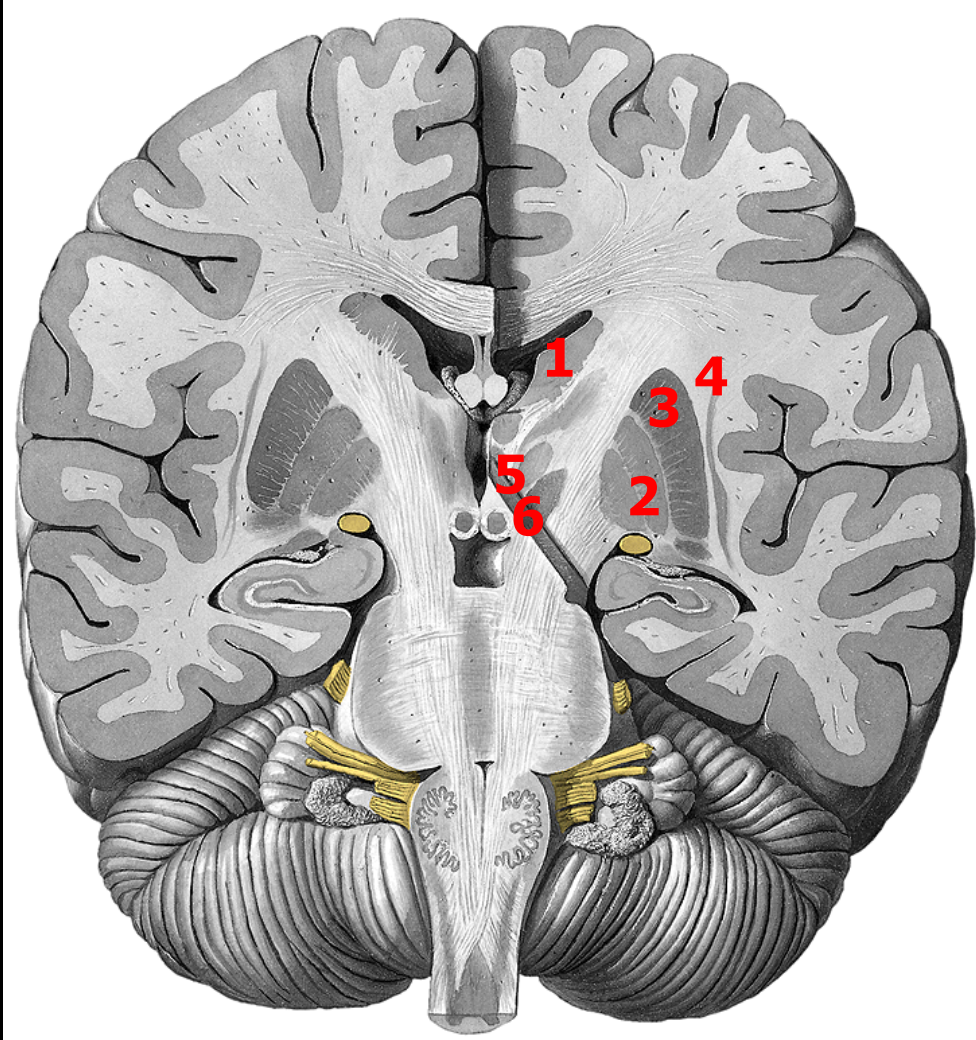
Structure of telencephalon

Gray matter
Basal ganglia
Cortex



White matter -
pathways
Projection
Commissural
Association

Basal ganglia



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

Functionally

- 5 ncl. subthalamicus
- 6 substantia nigra

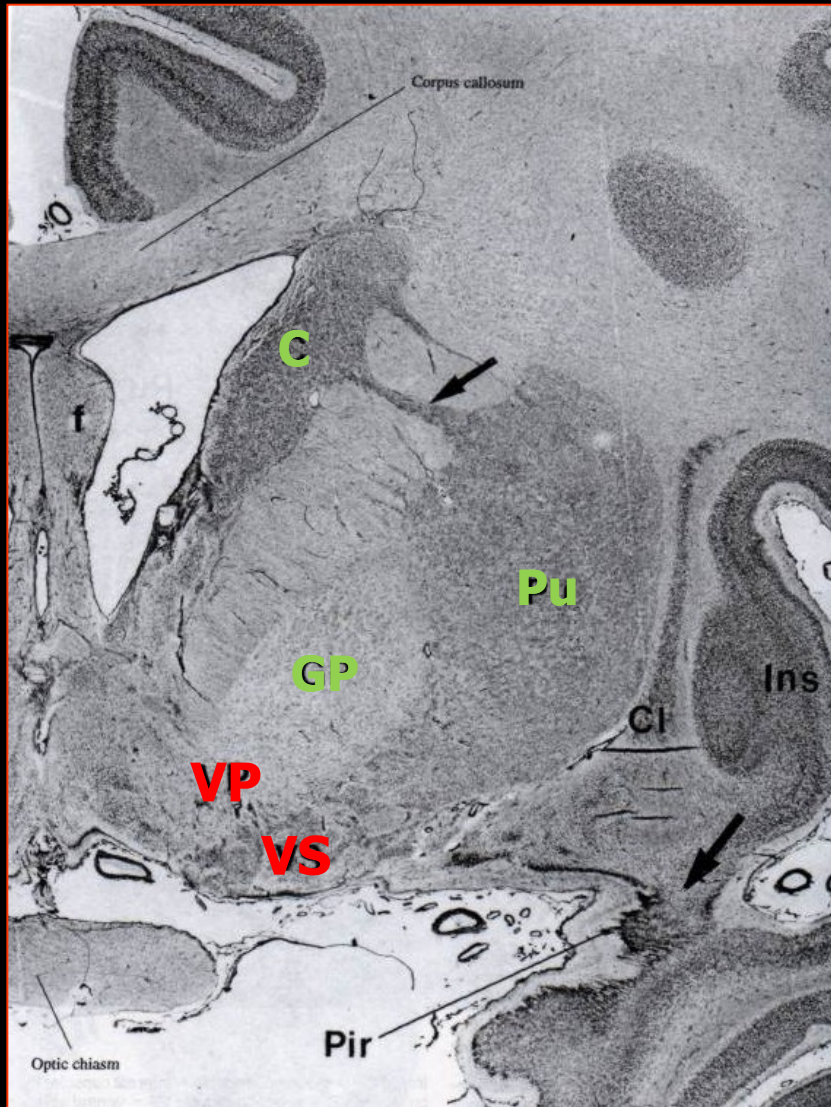
globus pallidus +
putamen = **ncl. lentif.**
ncl. caudatus + putamen
= **corpus striatum**

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

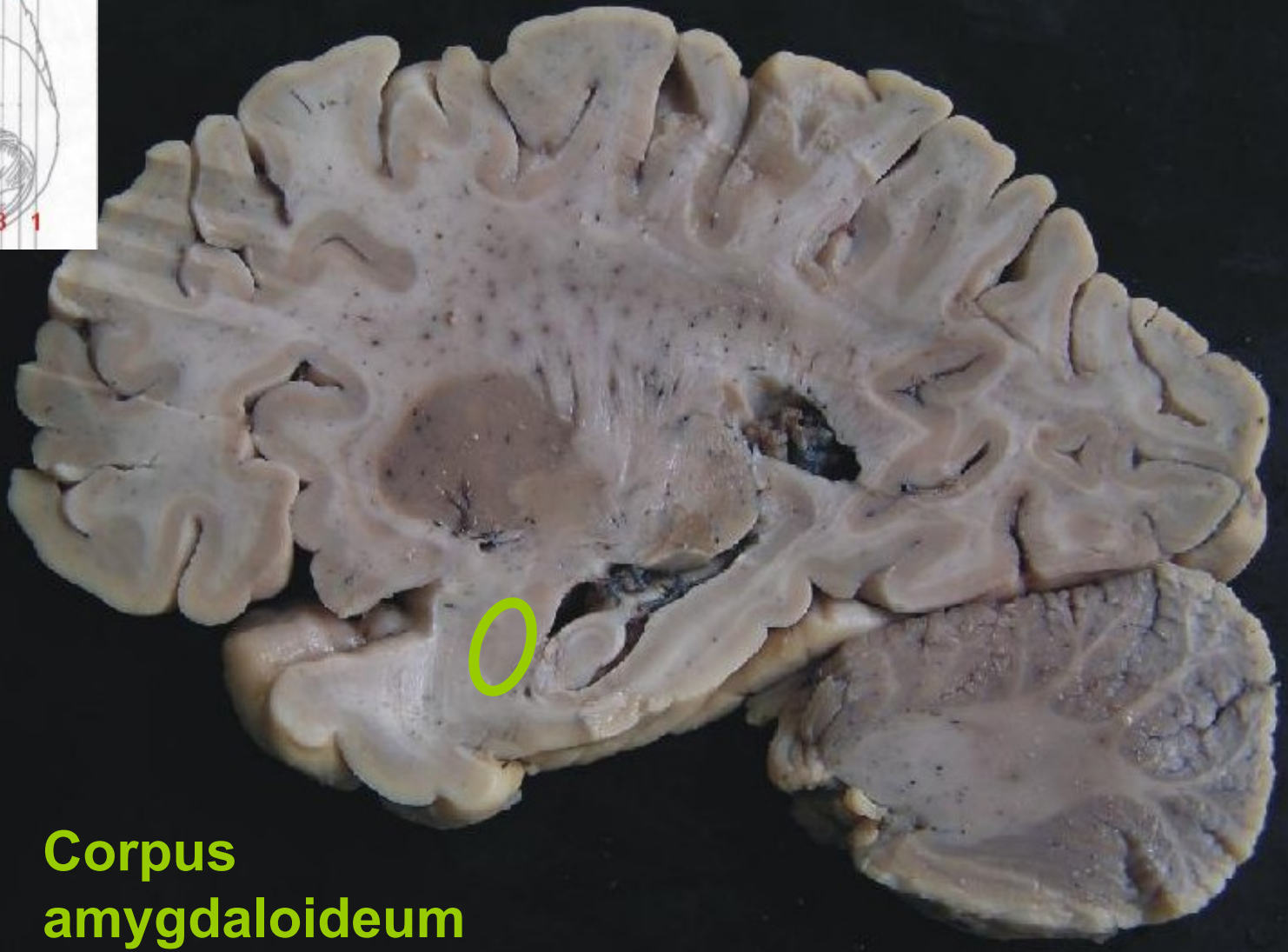
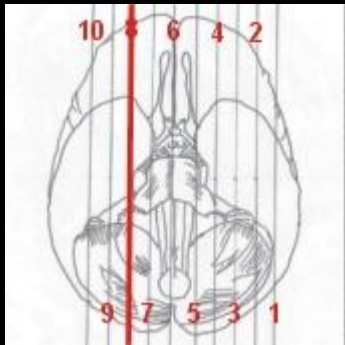


Ncl caudatus + putamen
= dorsal striatum

Globus pallidus
= dorsal pallidum

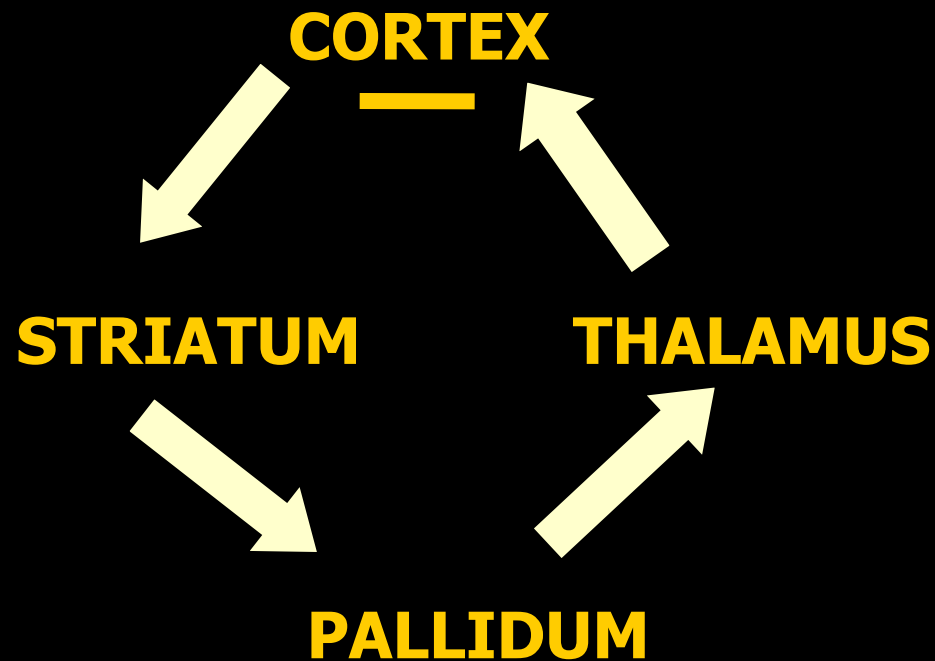
VS = ventr. striatum (ncl.
accumbens septi)

VP = ventral pallidum
(ncl. basalis Meynerti)



**Corpus
amygdaloideum**

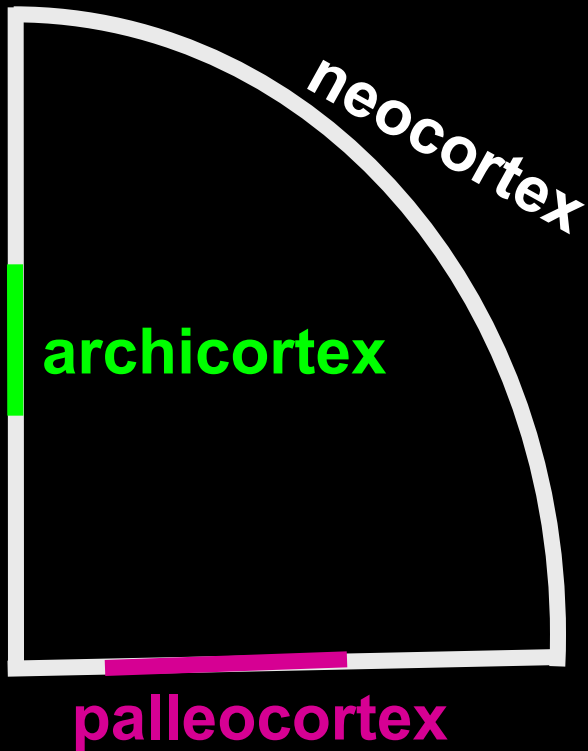
Functional connections of BG



Function of BG

inhibition of cortical and subcortical motor functions

Cerebral cortex



ALLOCORTEX

3-4 layers

a) **paleocortex** (rhinencephalon)

b) **archicortex**

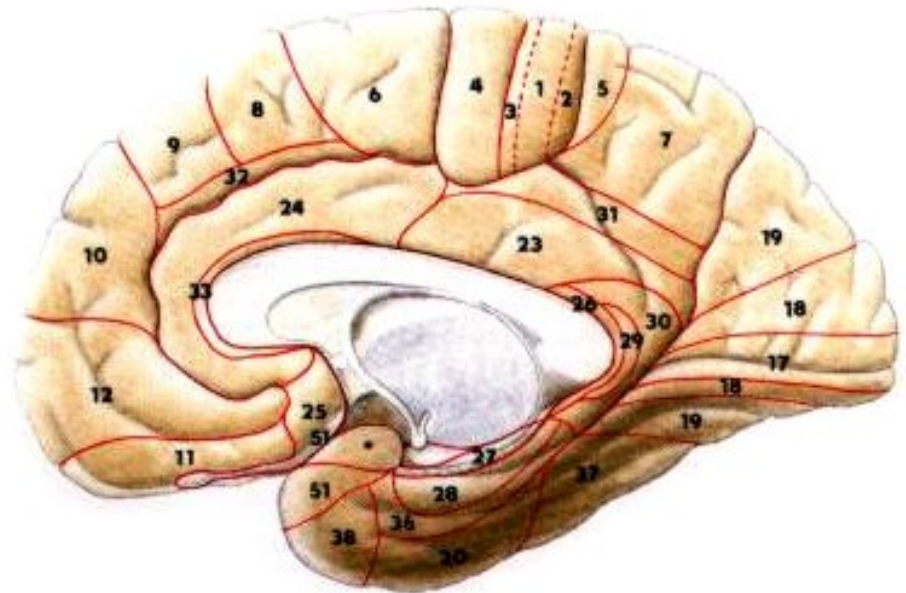
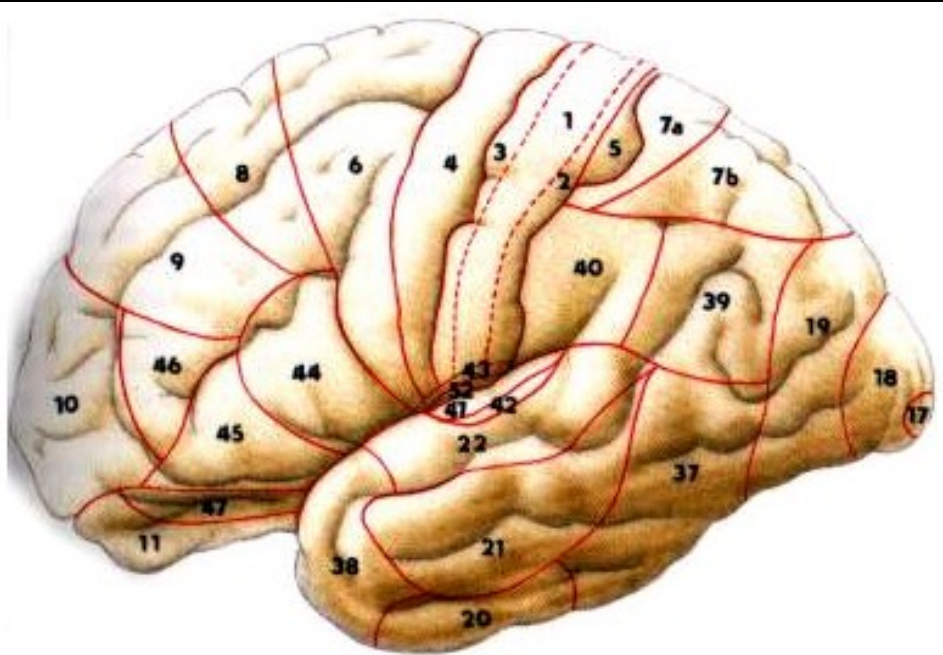
NEOCORTEX

6 layers

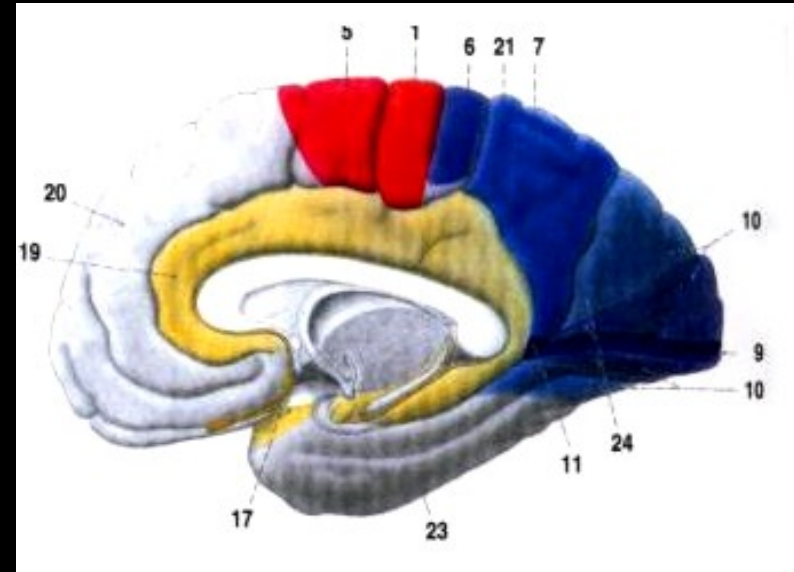
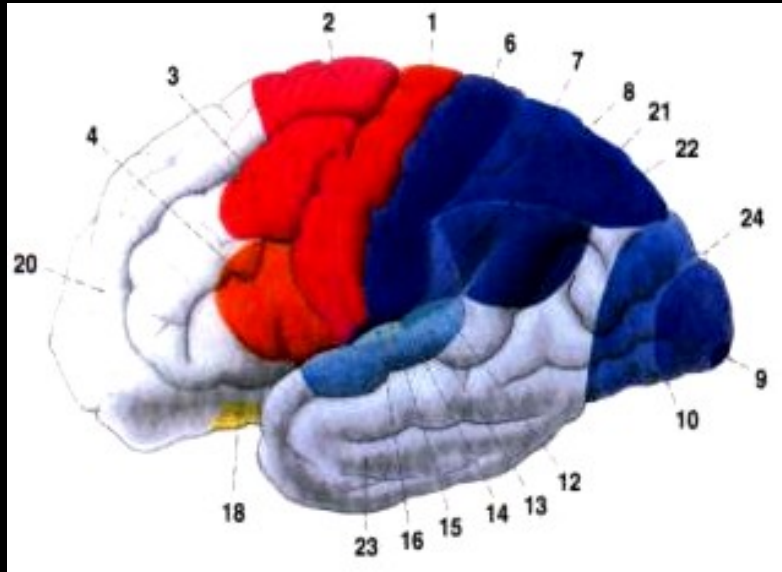
Brodman's map (cytoarchitectonic map of cortex)

11 regiones

52 areae



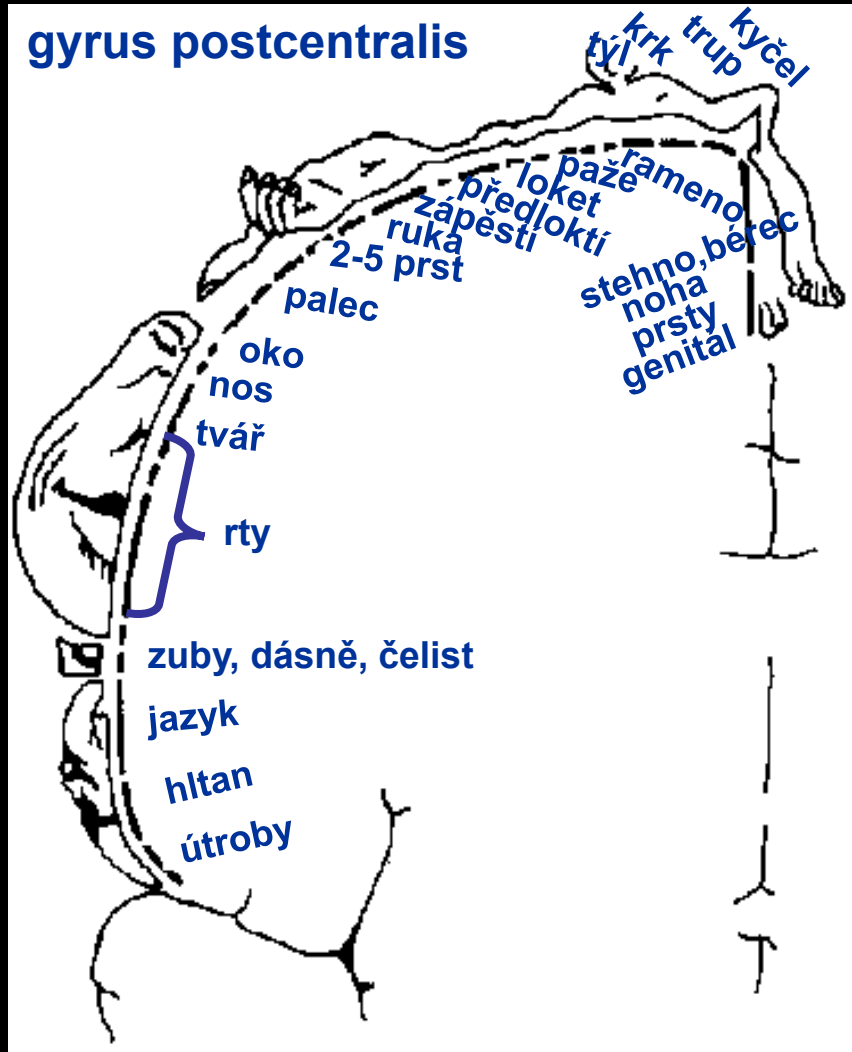
Functional regions of cortex



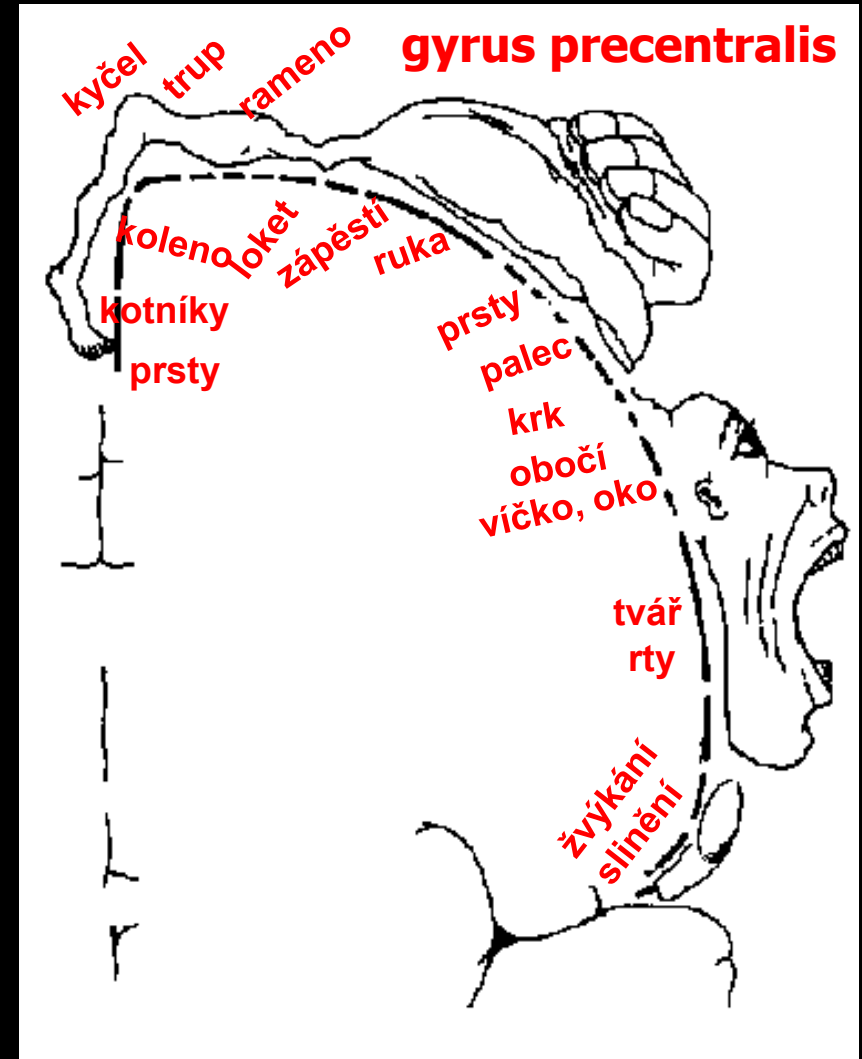
Primary motor c. (a 4), primary somatic sensory c. (a 3,1,2), primary visual c. (a 17), primary auditory c. (a 41,42)

Secondary and association areas

Representation of contralateral body parts

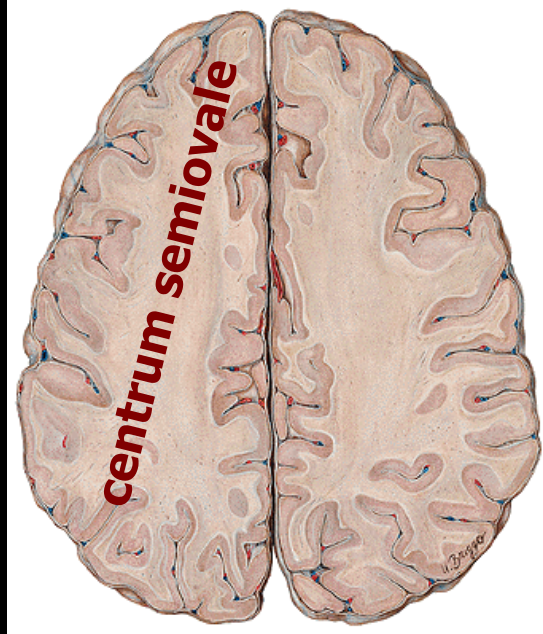


„sensory homunculus“



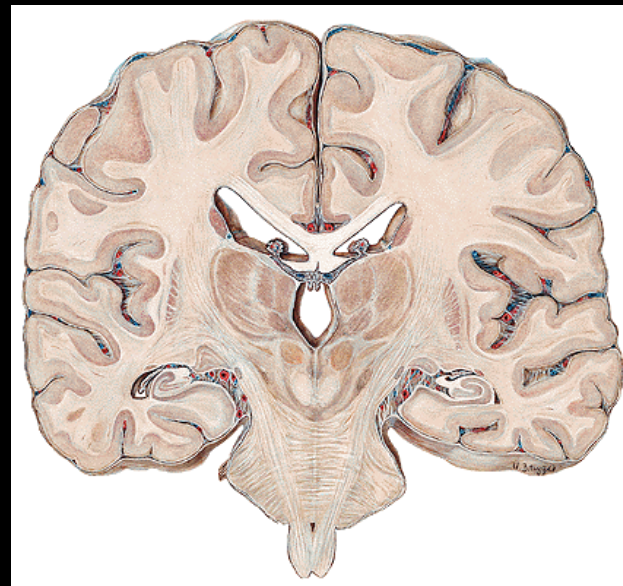
„motor homunculus“

White matter of the telencephalon - **corpus medullare**

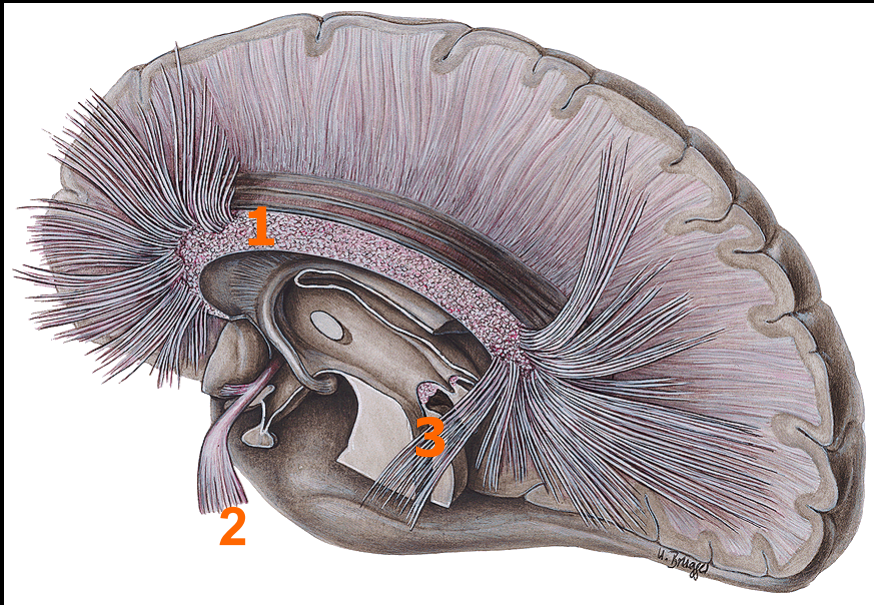


Fibers

commissural
projection
association



Commissural fibers



1 corpus callosum
neocortex

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

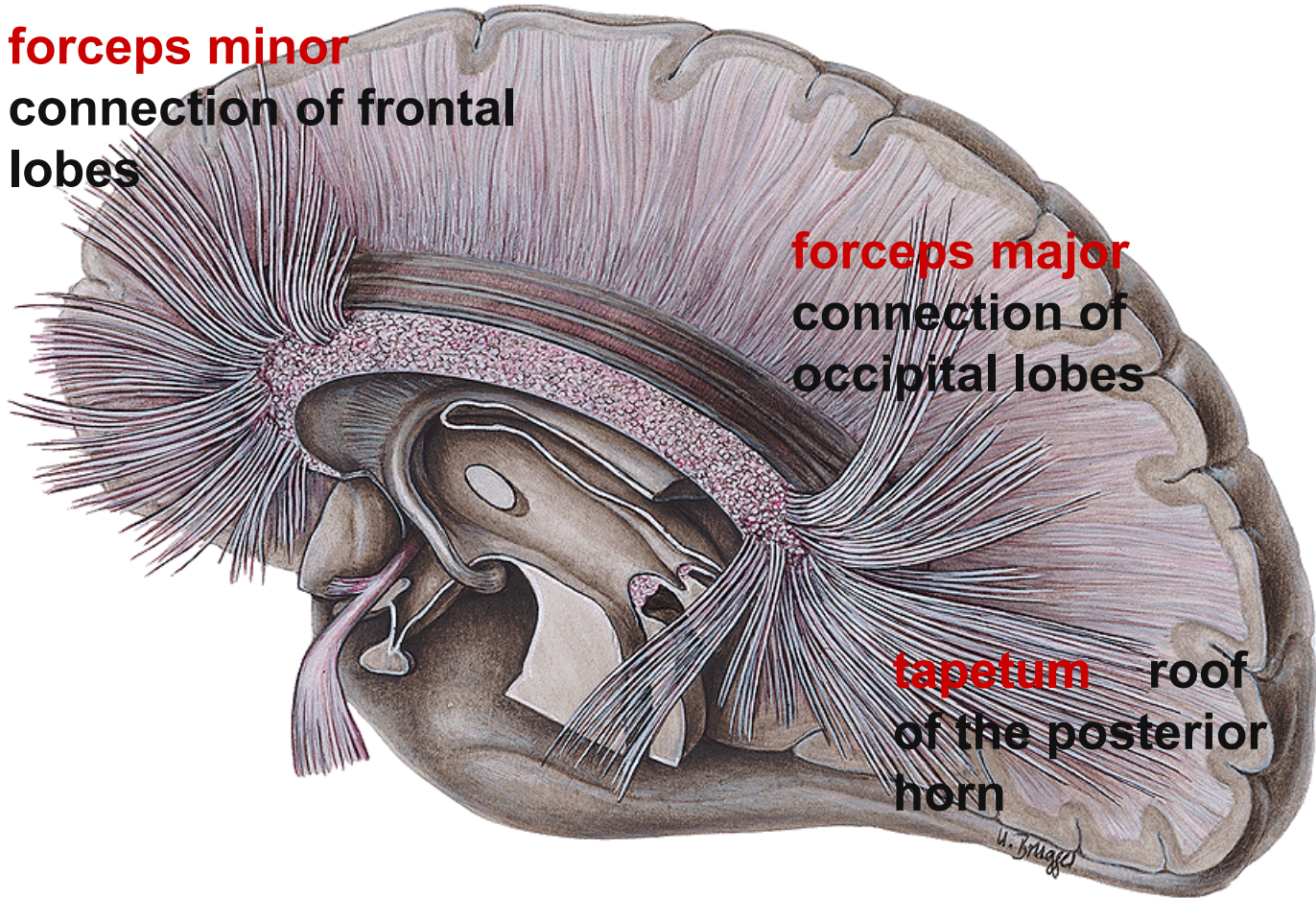
3 commissura fornicis
archicortex

Corpus callosum - 300 million fibers

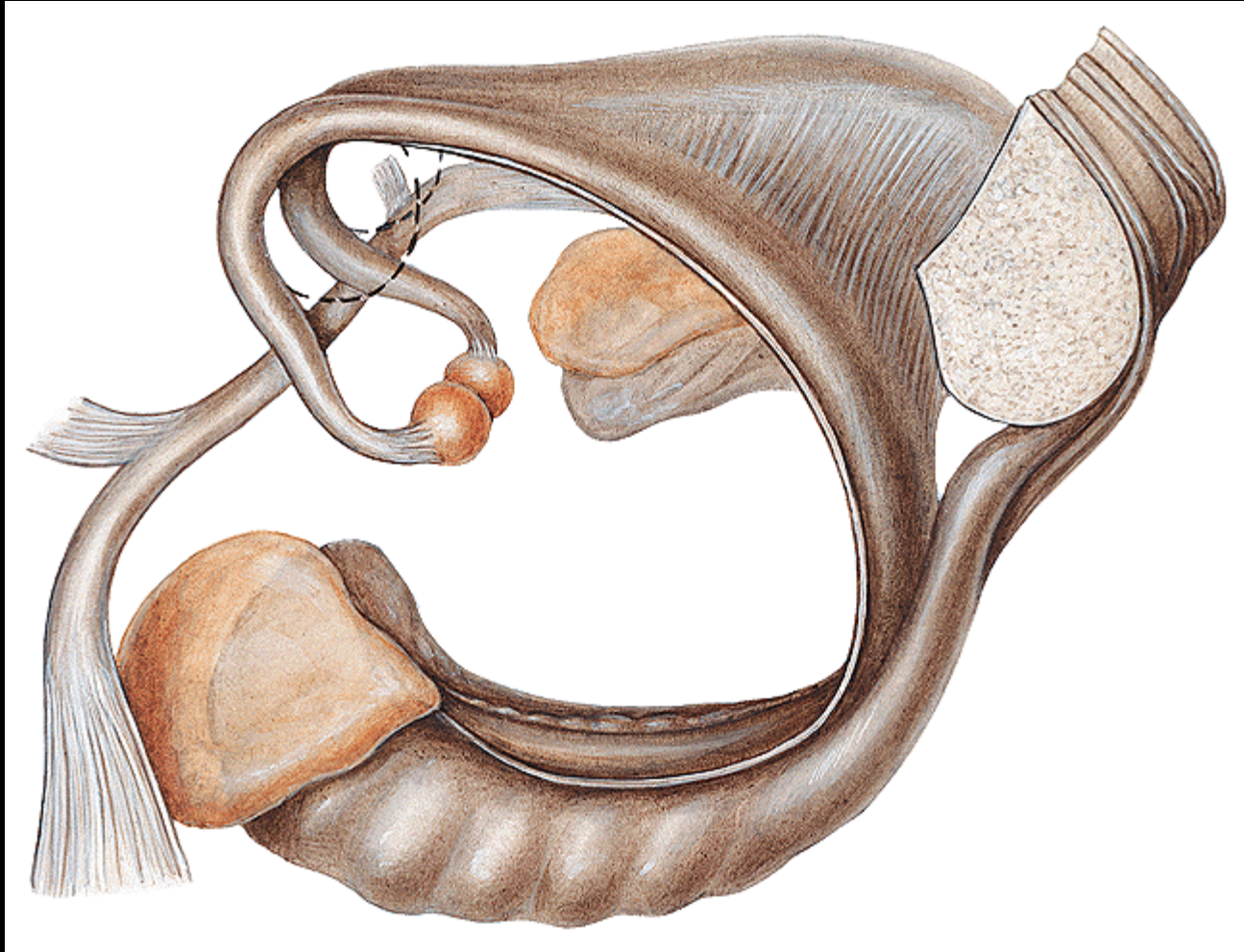
forceps minor
connection of frontal
lobes

forceps major
connection of
occipital lobes

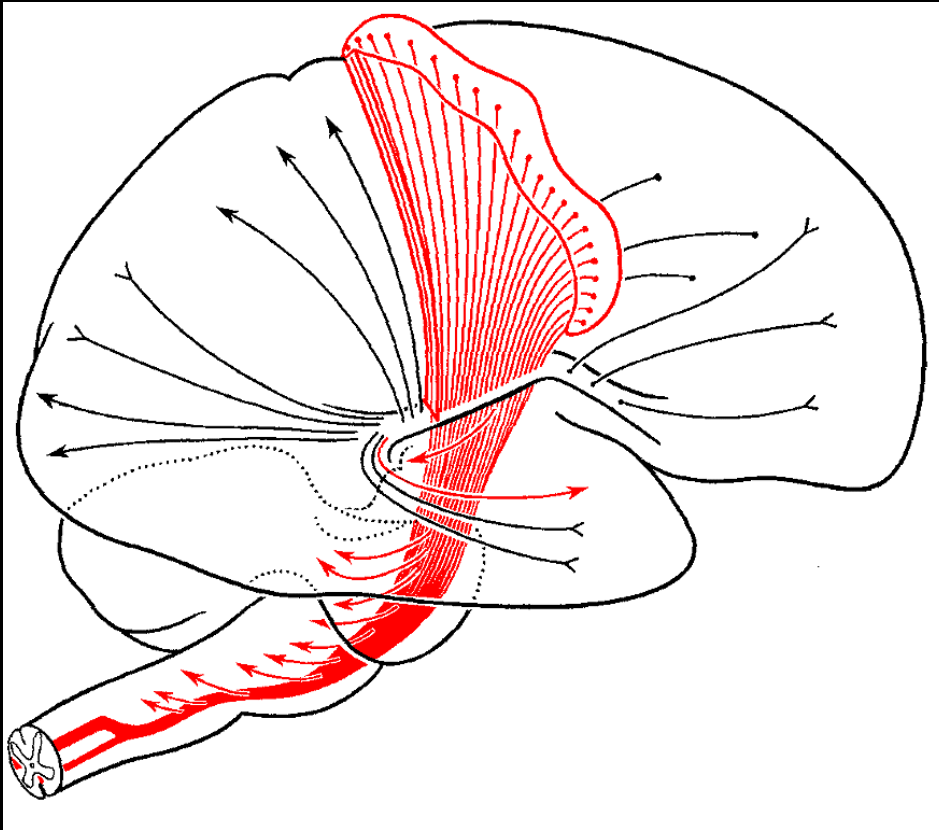
tapetum roof
of the posterior
horn



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

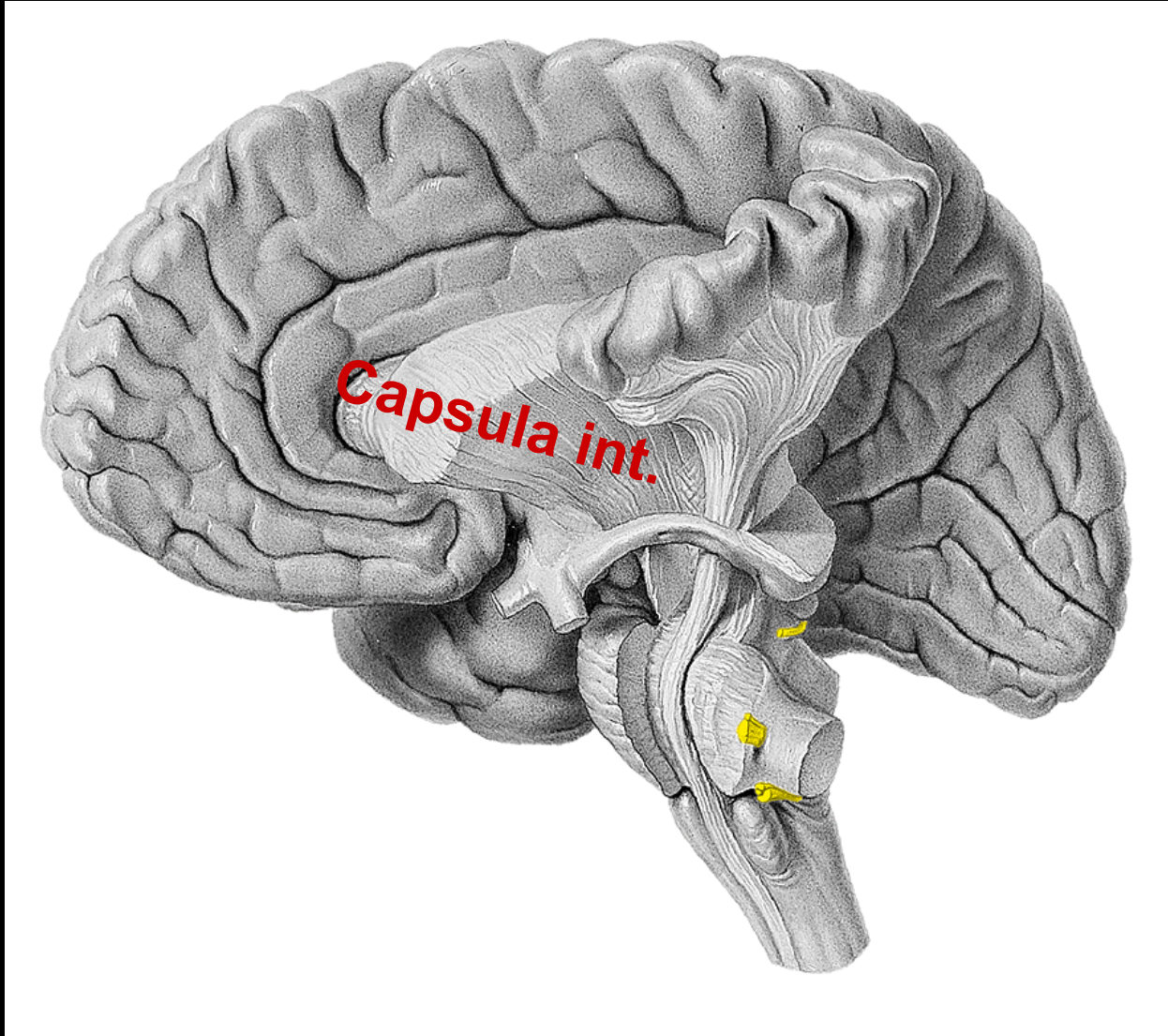
tr. co-tec

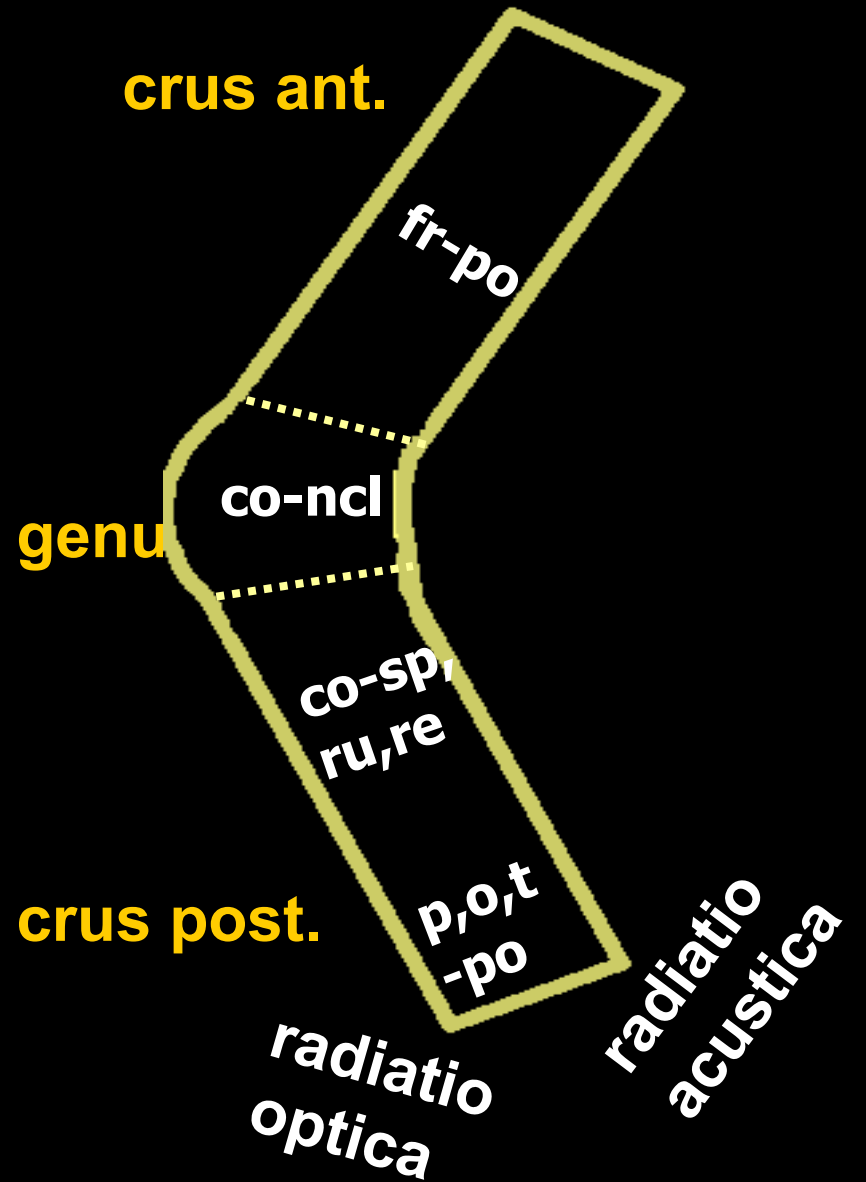
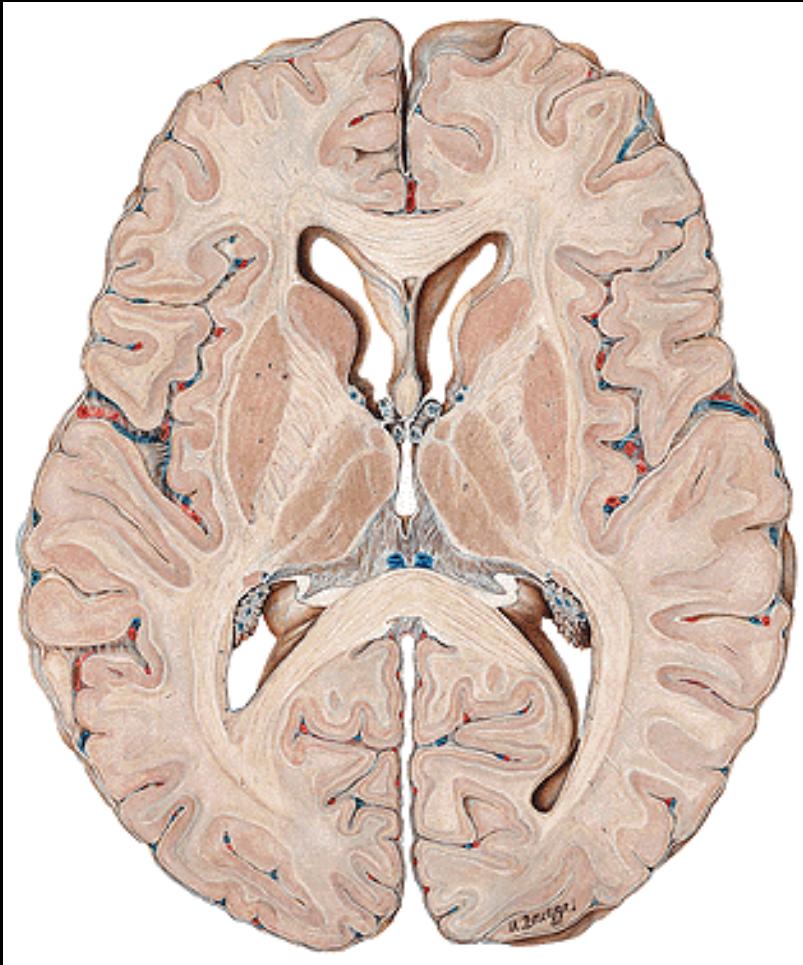
tr. co-ru

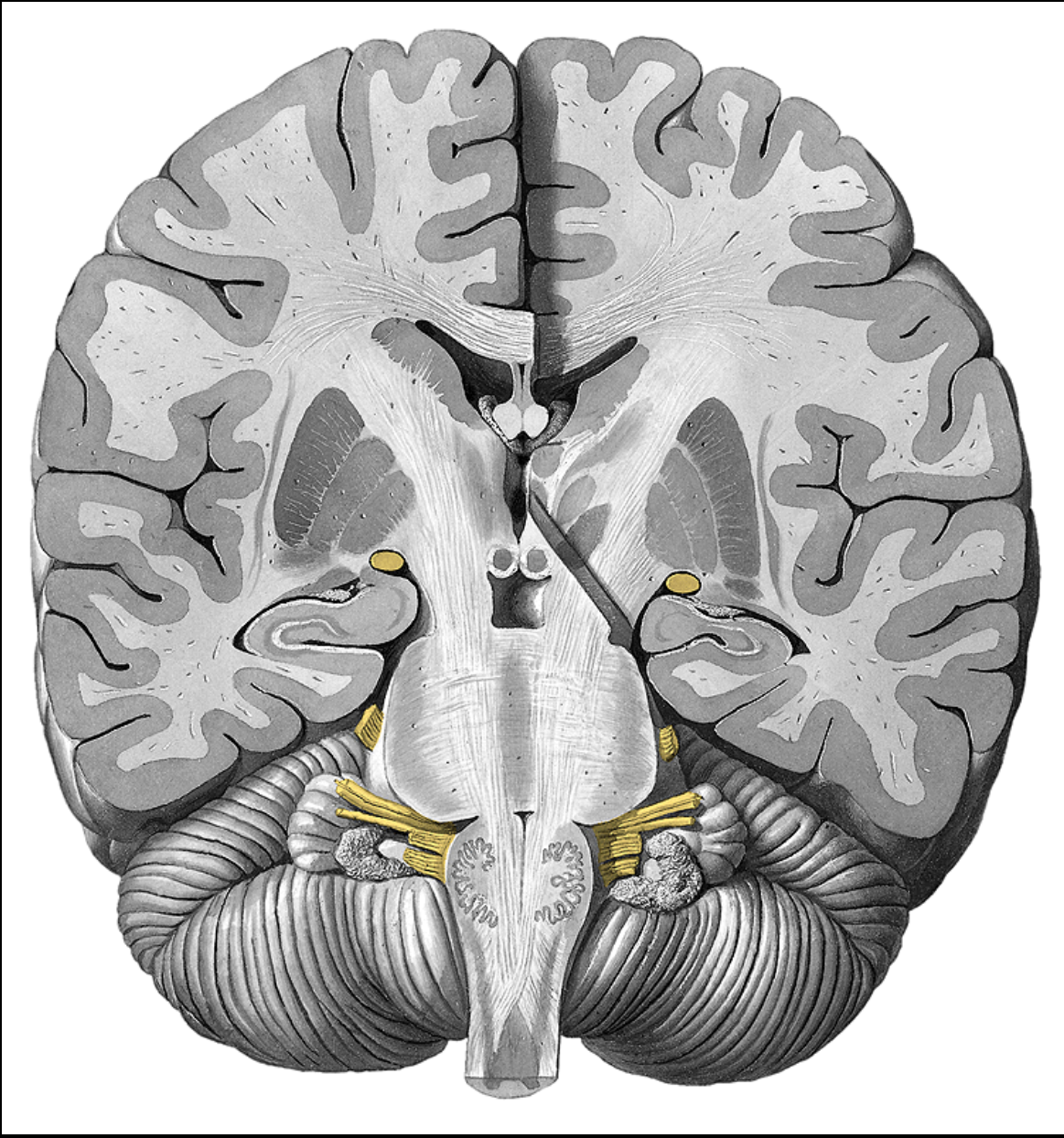
tr. co-bulb

tr. co-po

capsula
interna







Association fibers: short (fibrae arcuatae), long

