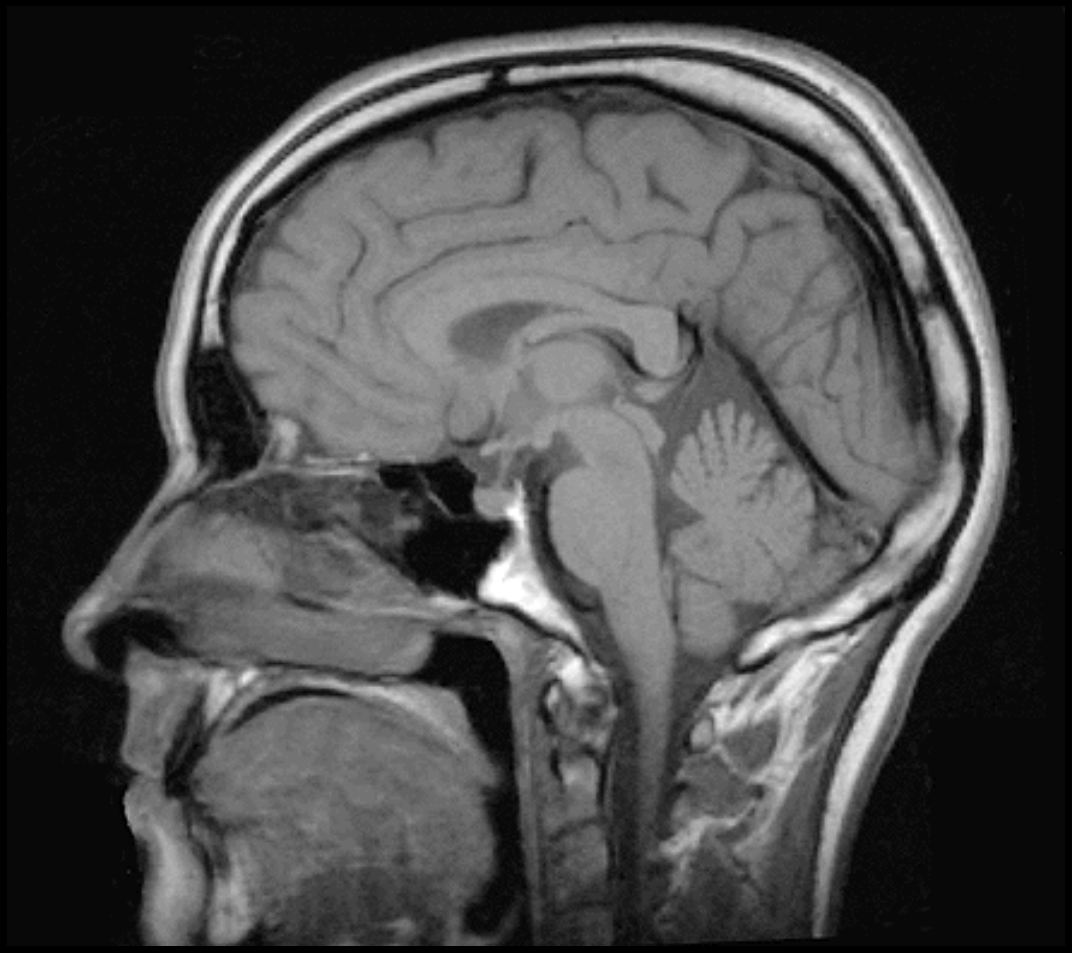
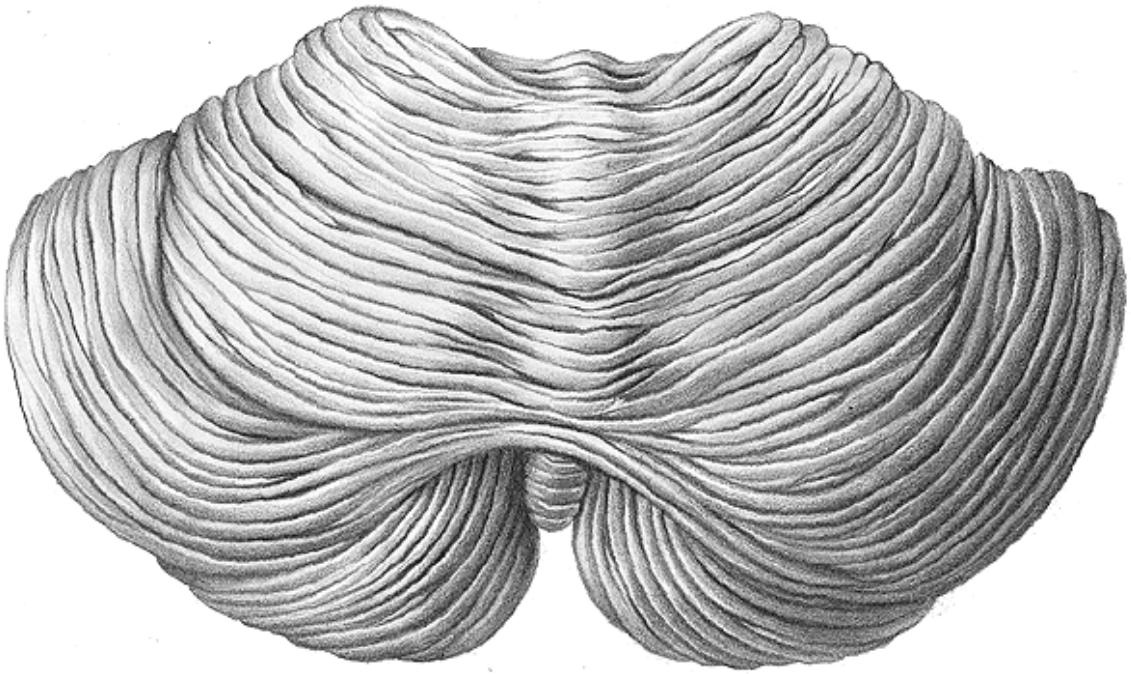
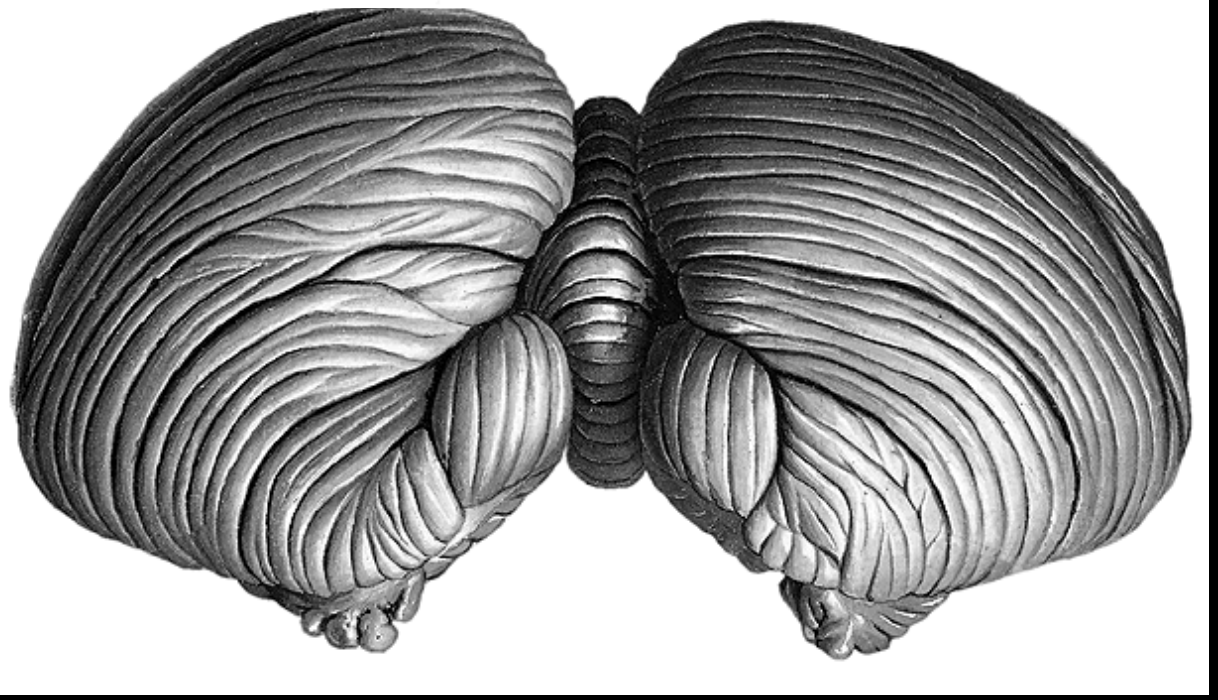
Cerebellum



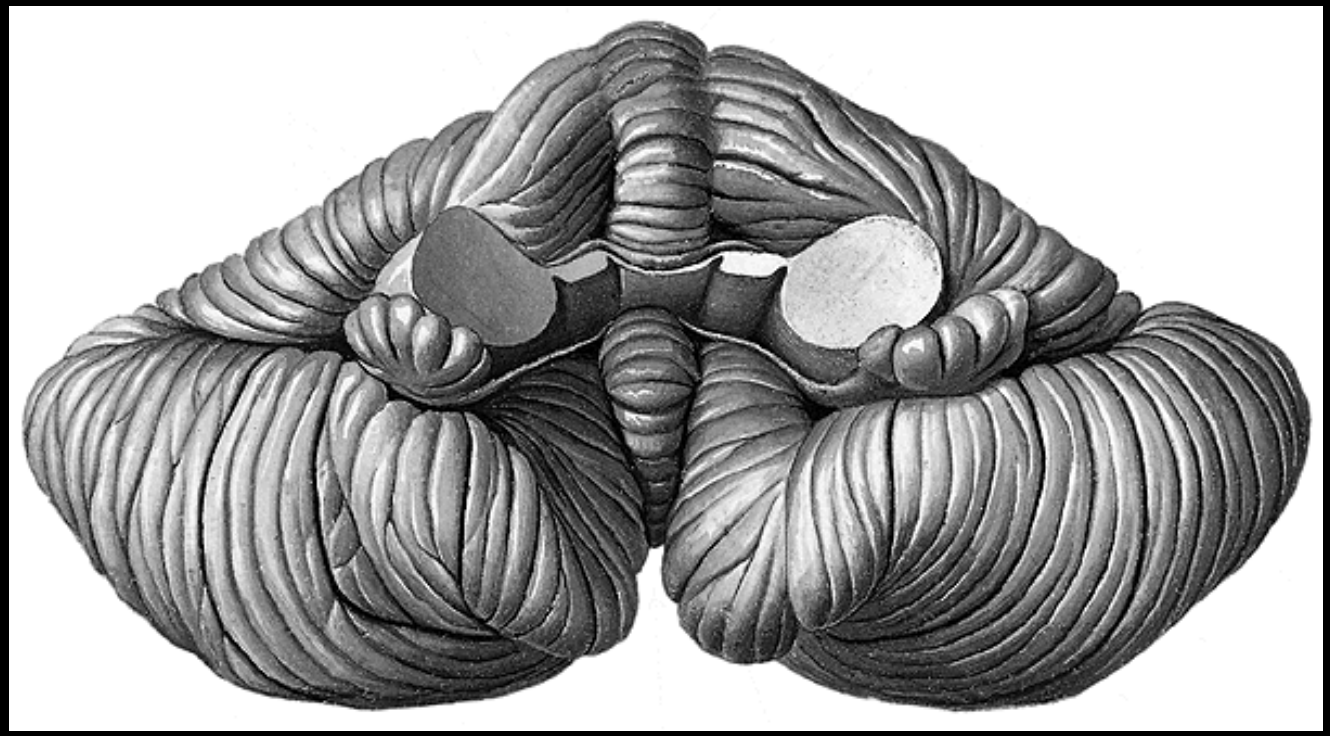
Coordination of movements



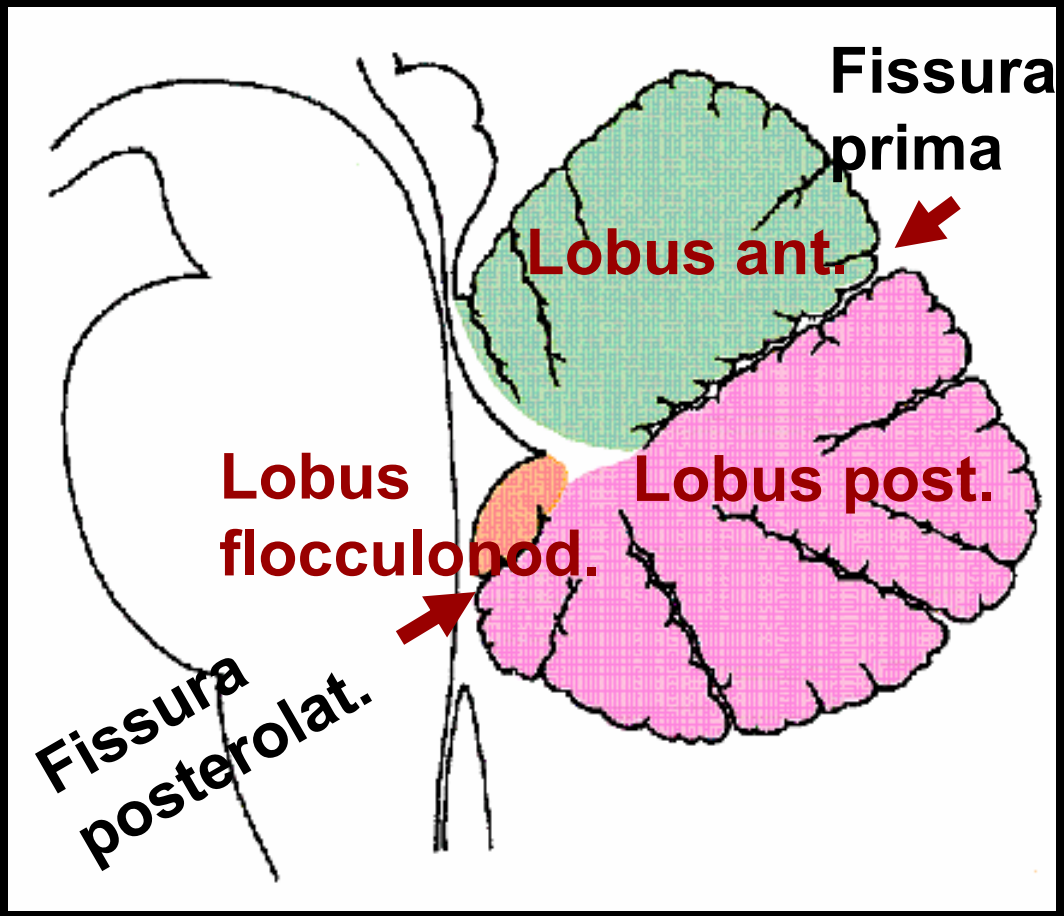


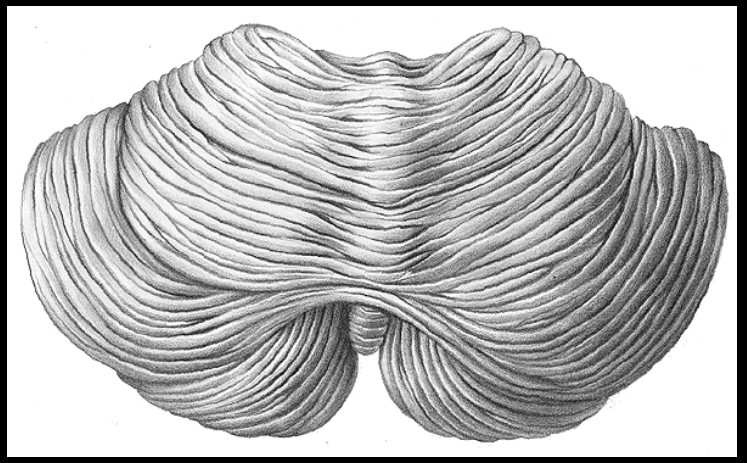
Vermis
Hemispheres

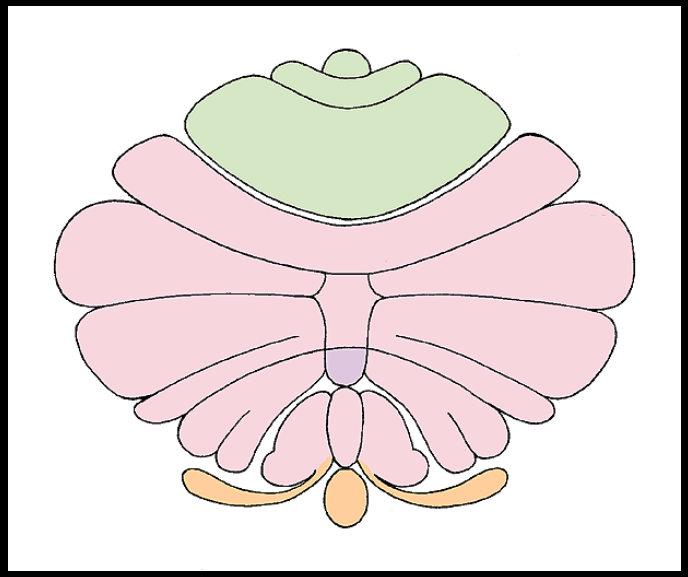
Folia, lobuli, lobi



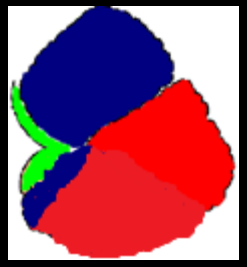
Pars flocculonodularis


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





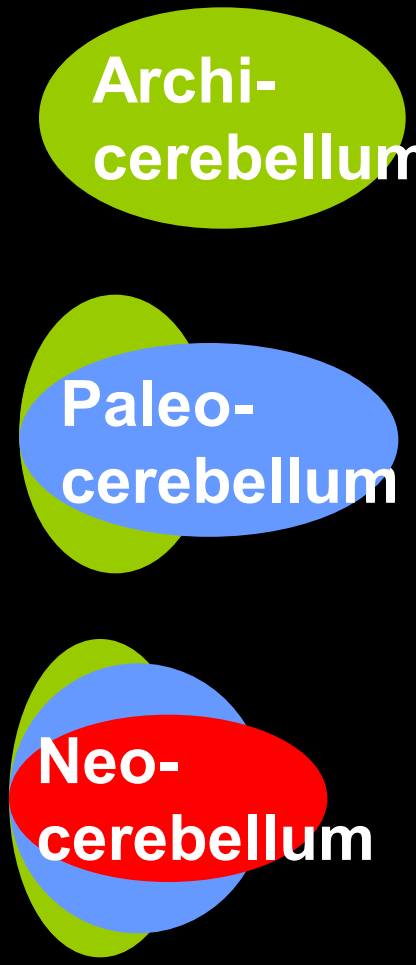
Developmental anatomy



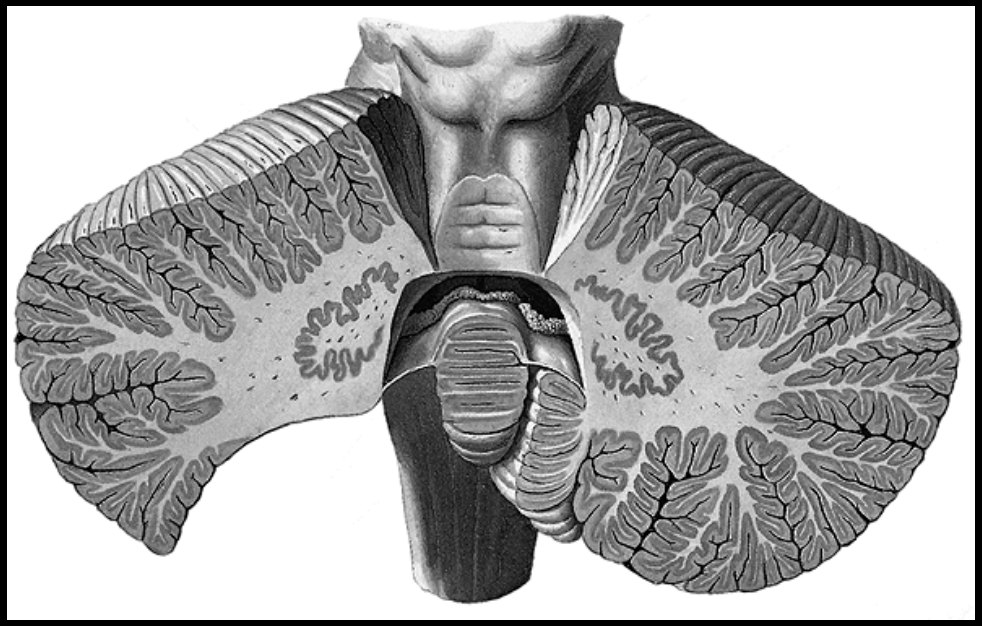
Afferents from vestib. labyrinth
fish, amphibians

Afferents from spinal cord and brainstem
reptiles, birds, mammals

Afferents from cortex telencephali



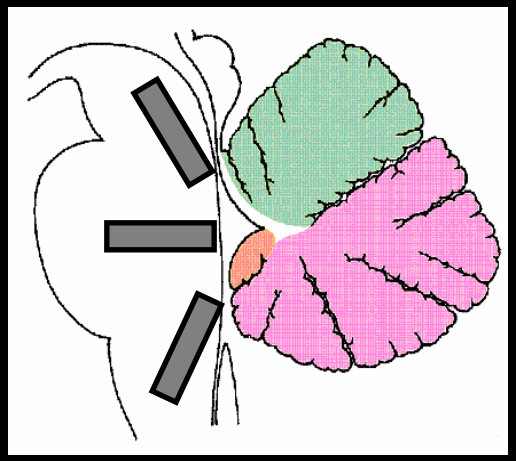
Structure of the cerebellum



Grey matter

Cortex cerebelli

Nuclei cerebellares

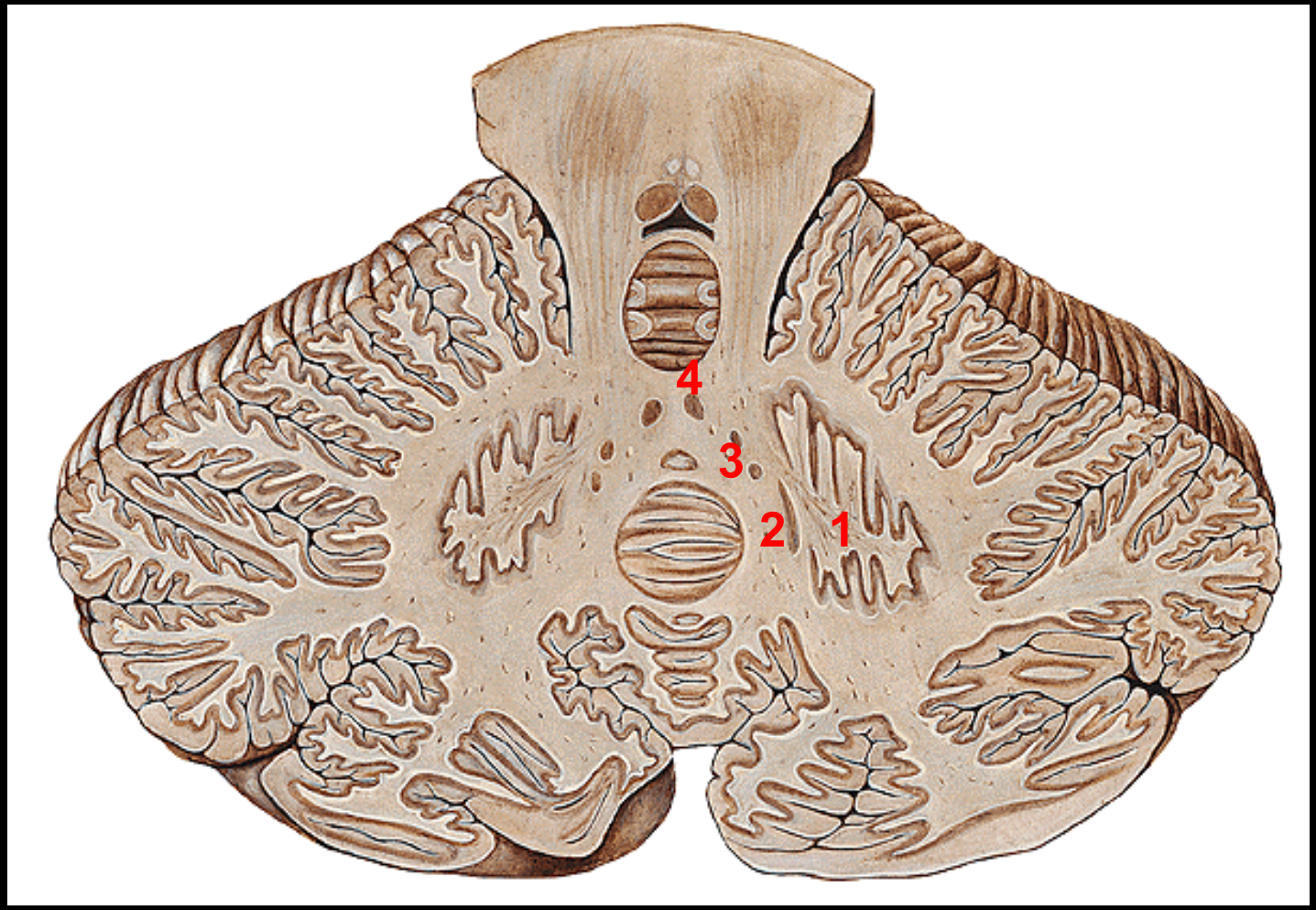


White matter

Subst. medullaris

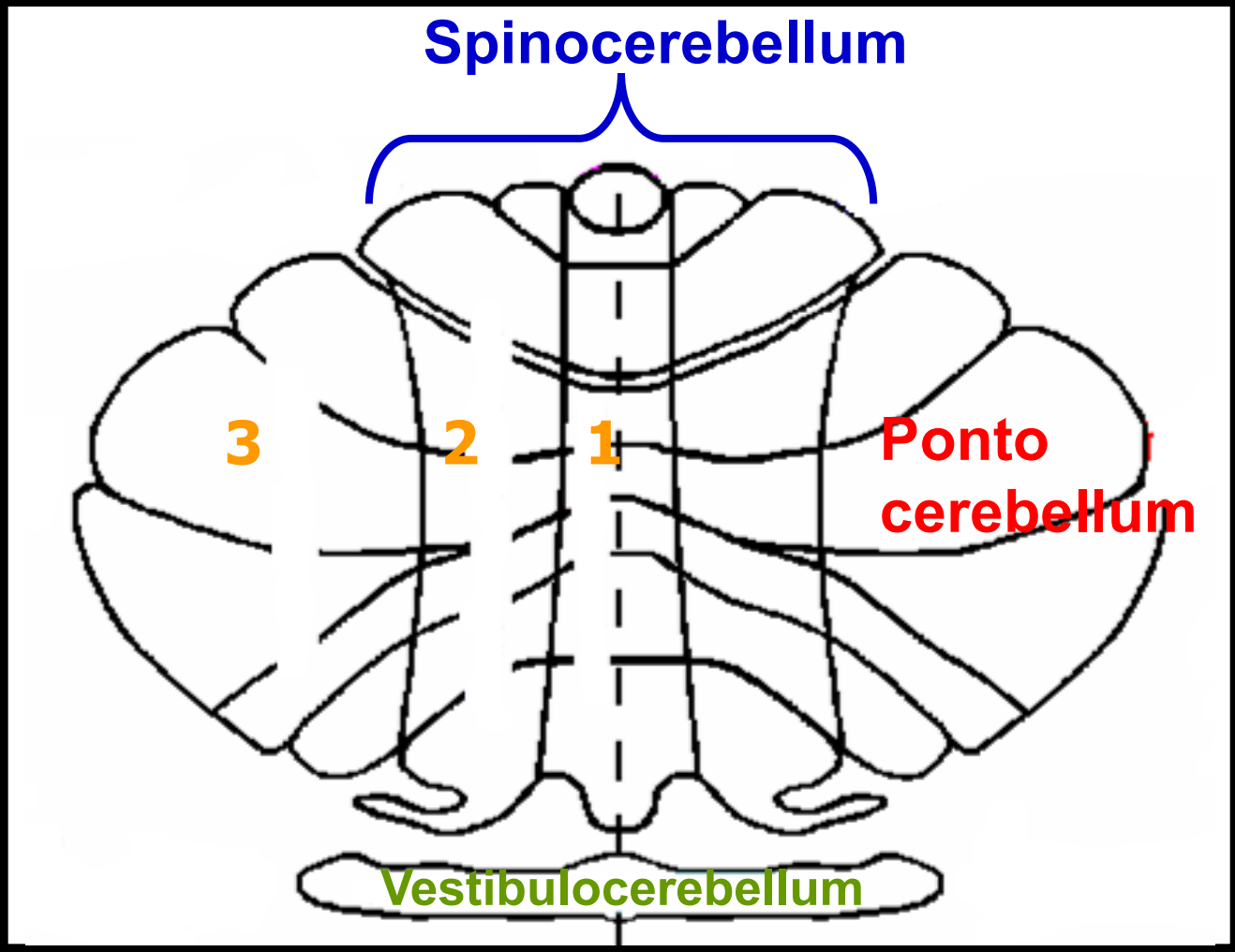
laminae albae (arbor vitae)

Pedunculi cerebellares

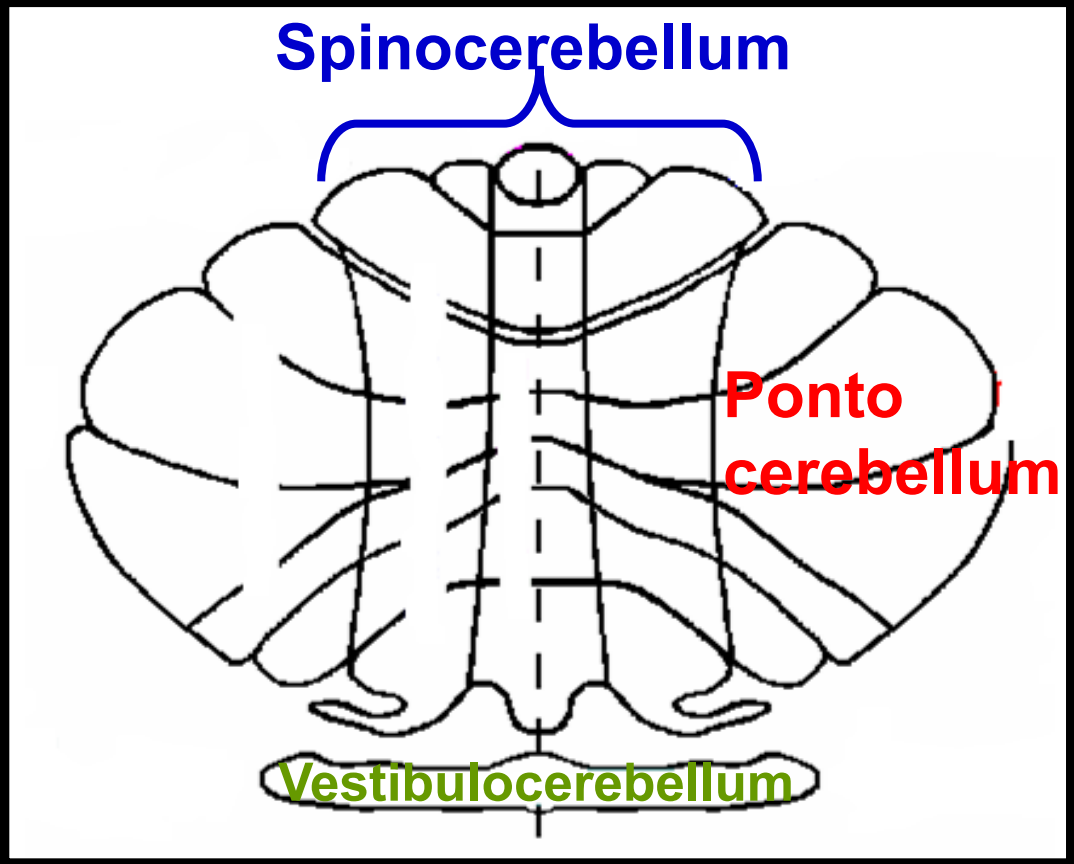


1 ncl. dentatus
2 ncl. emboliformis
3 ncll. globosi
4 ncl. fastigii

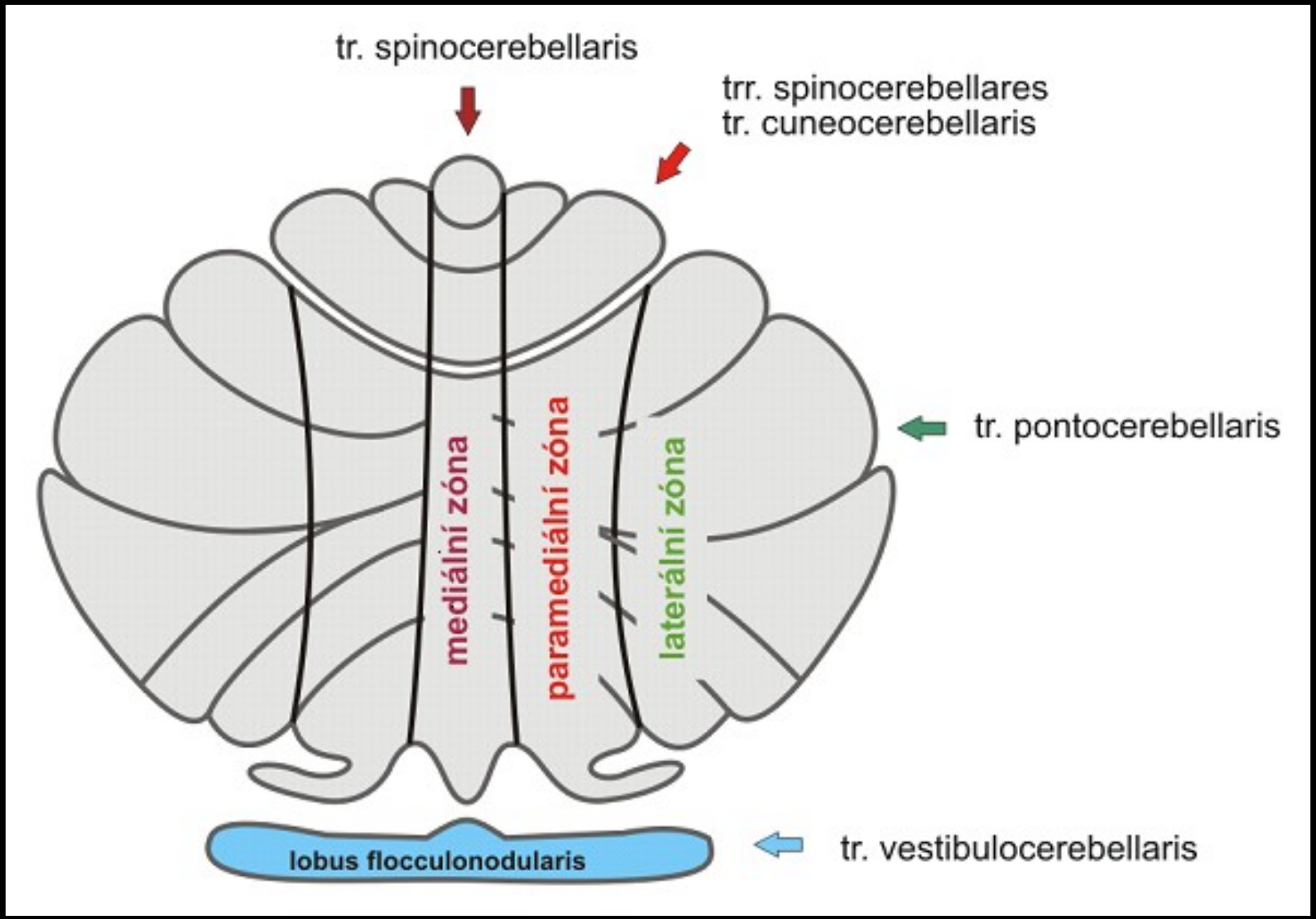
Nuclei cerebelli



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

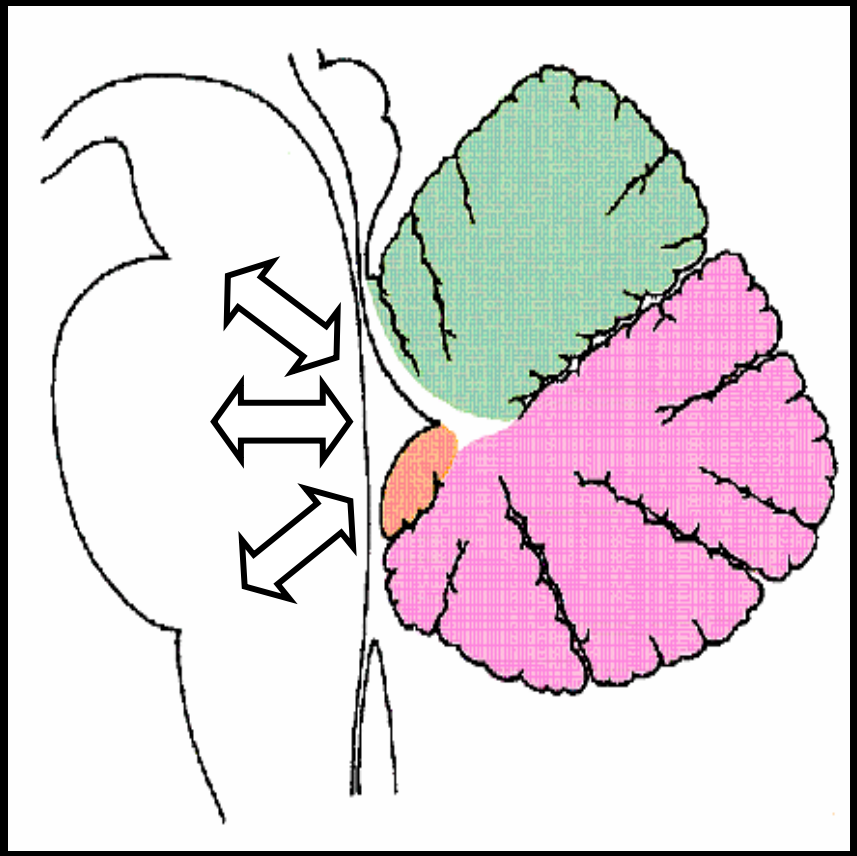
Pedunculi cerebel. sup.

→ 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

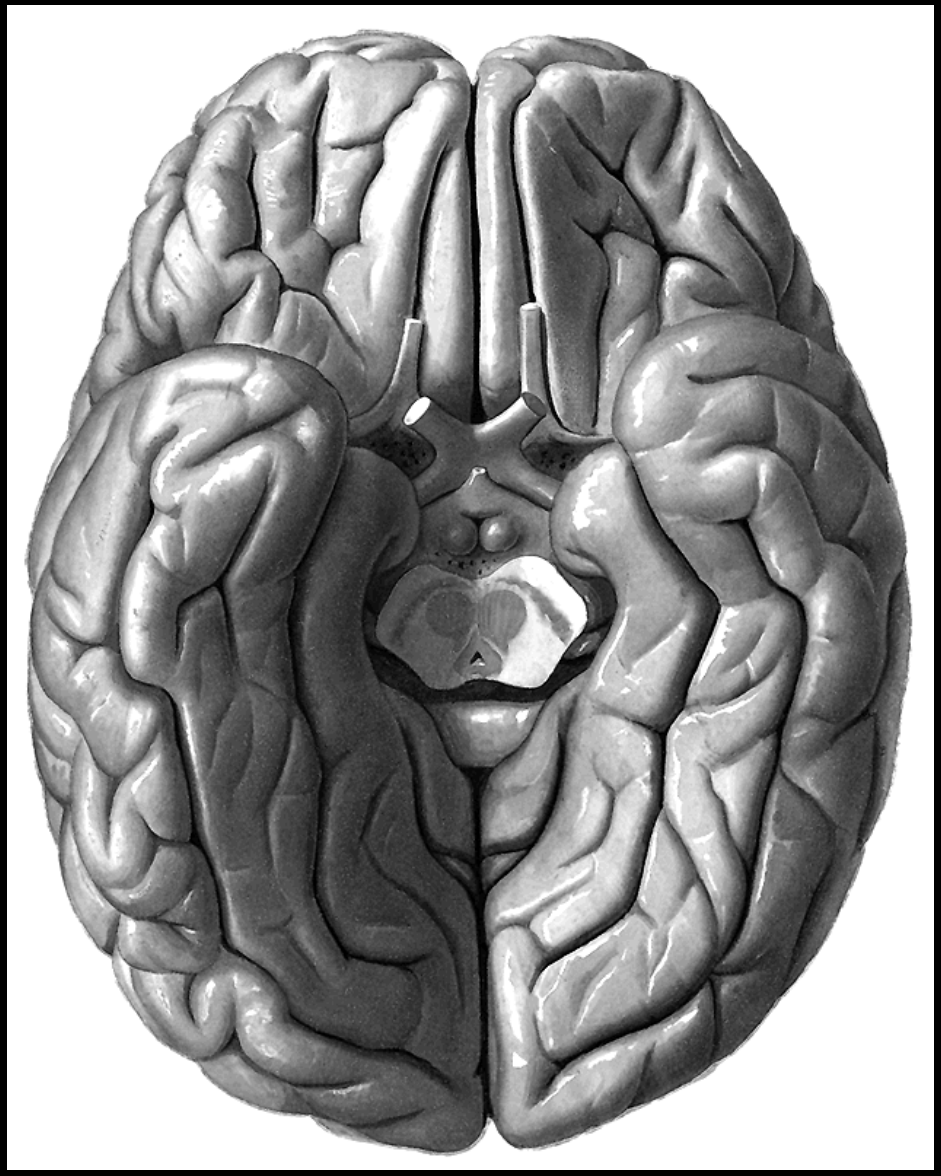
CEREBELLAR DISORDERS

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

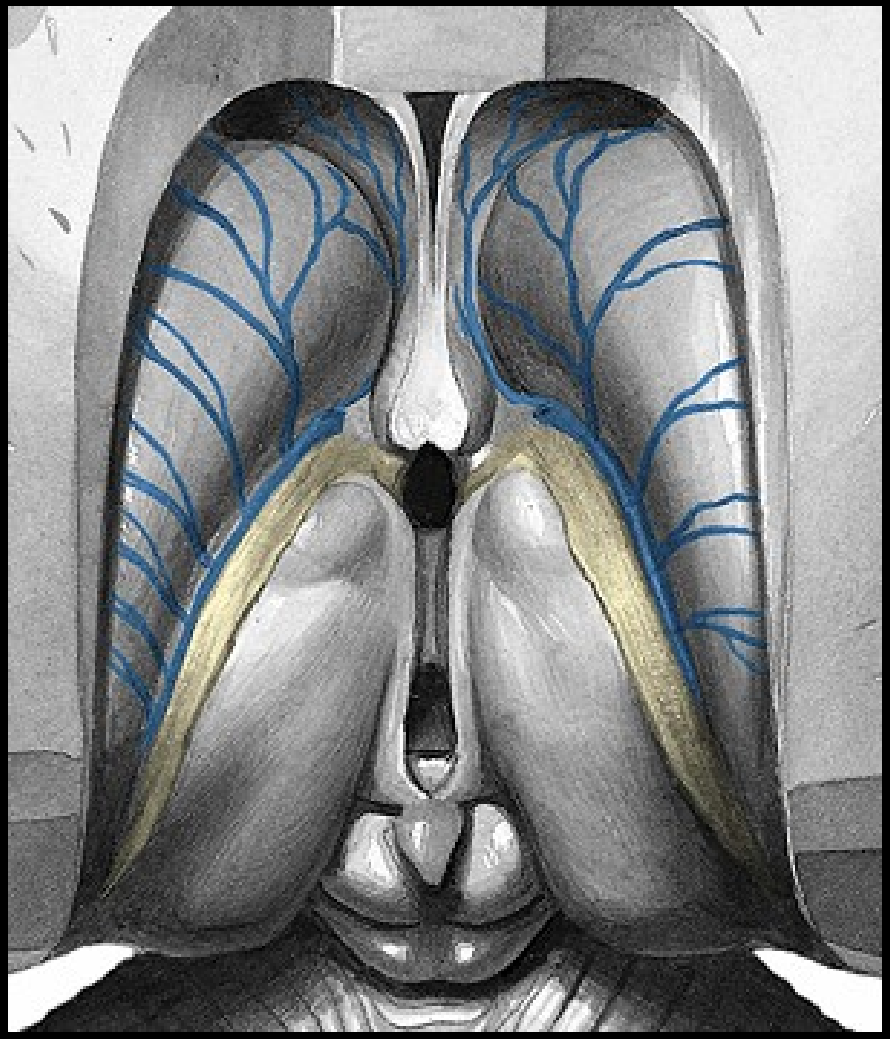


DIENCEPHALON

- thalamus

(metathalamus)

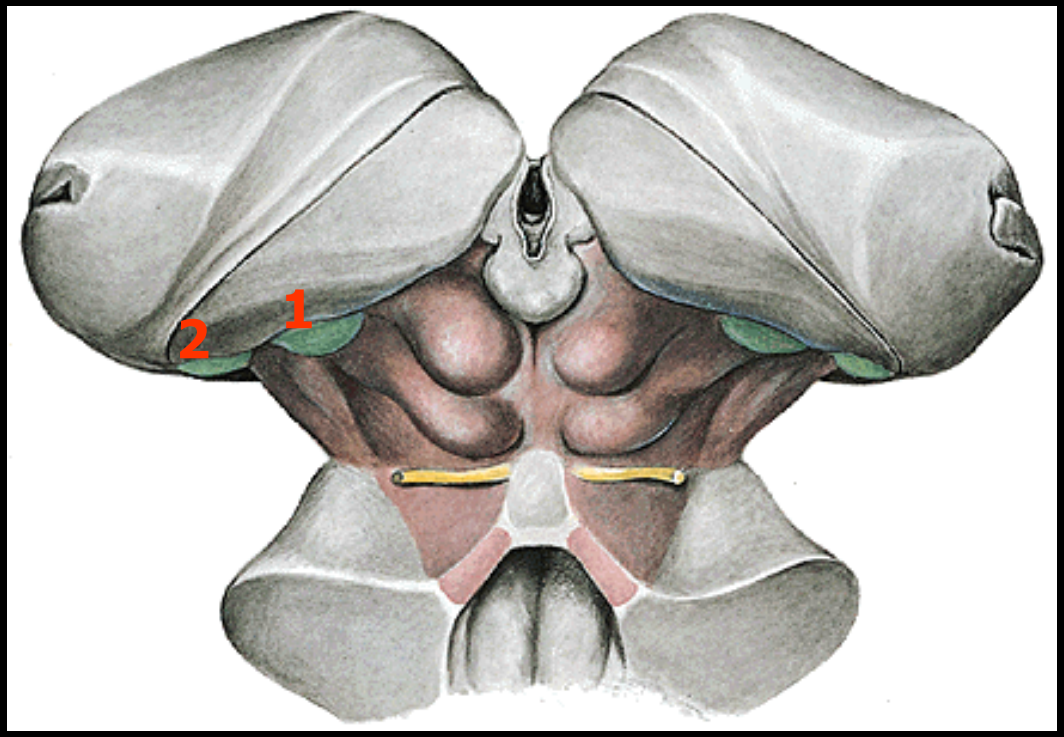
- epithalamus
- subthalamus
- hypothalamus



Thalamus

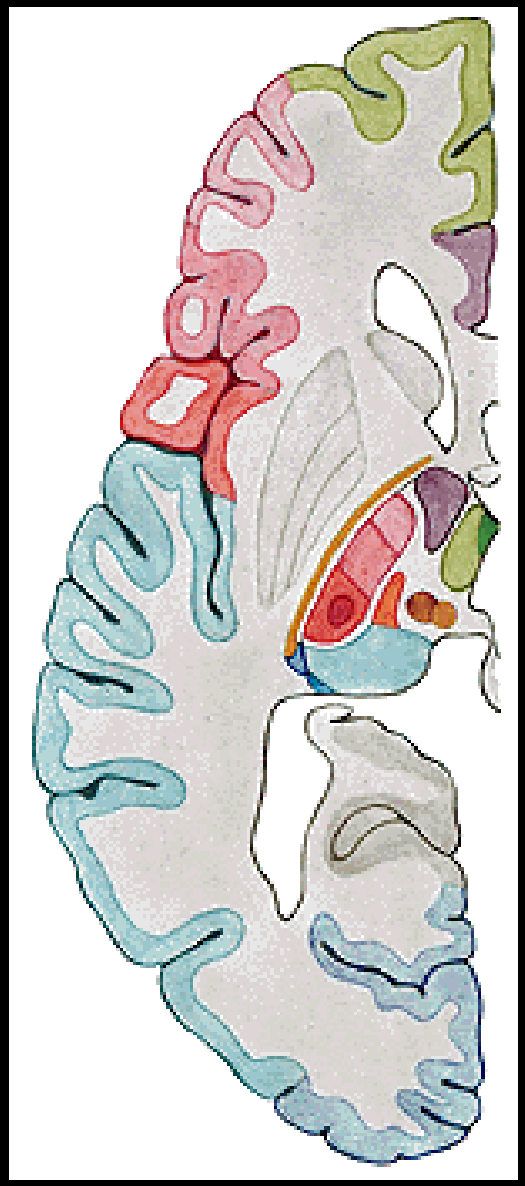
- **tuberculum ant.**
- **pulvinar**
- **stria medullaris**
(tela choroidea ventr. III.)
- **taenia choroidea**
(tela choroidea ventr. lat.)
- **lamina affixa thalami**
- **stria terminalis**
(vena thalamostriata)

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.

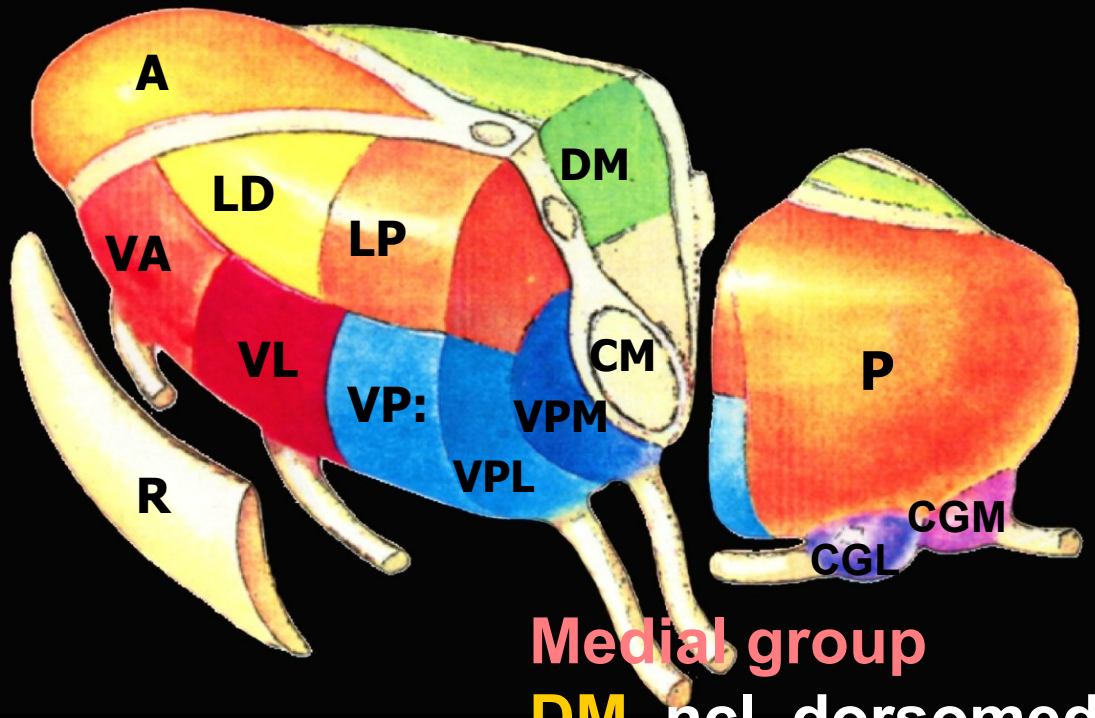
ventral row

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

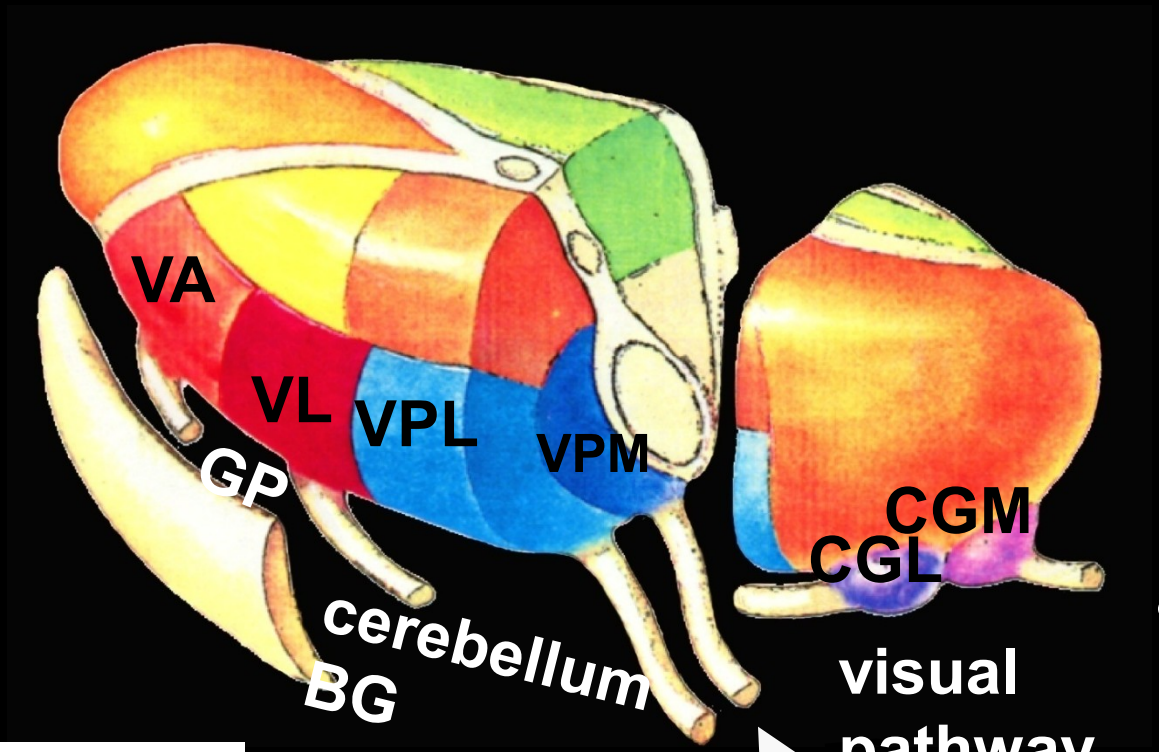
CM ncl. centromed.

R ncll. reticulares

Functional groups of nuclei

- specific nuclei
  - somatosensory
  - sensory
  - motor
- non-specific nuclei
- association nuclei

Specific nuclei

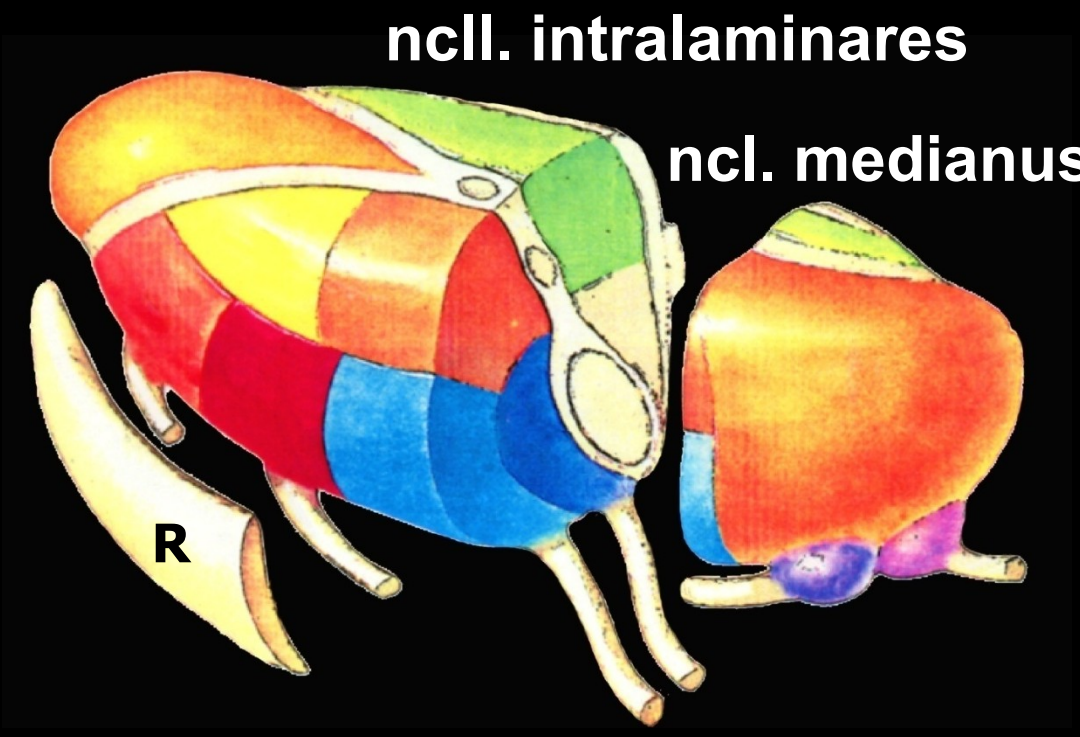


SS: VPL, VPM

S: CGM, CGL

M: VA, VL

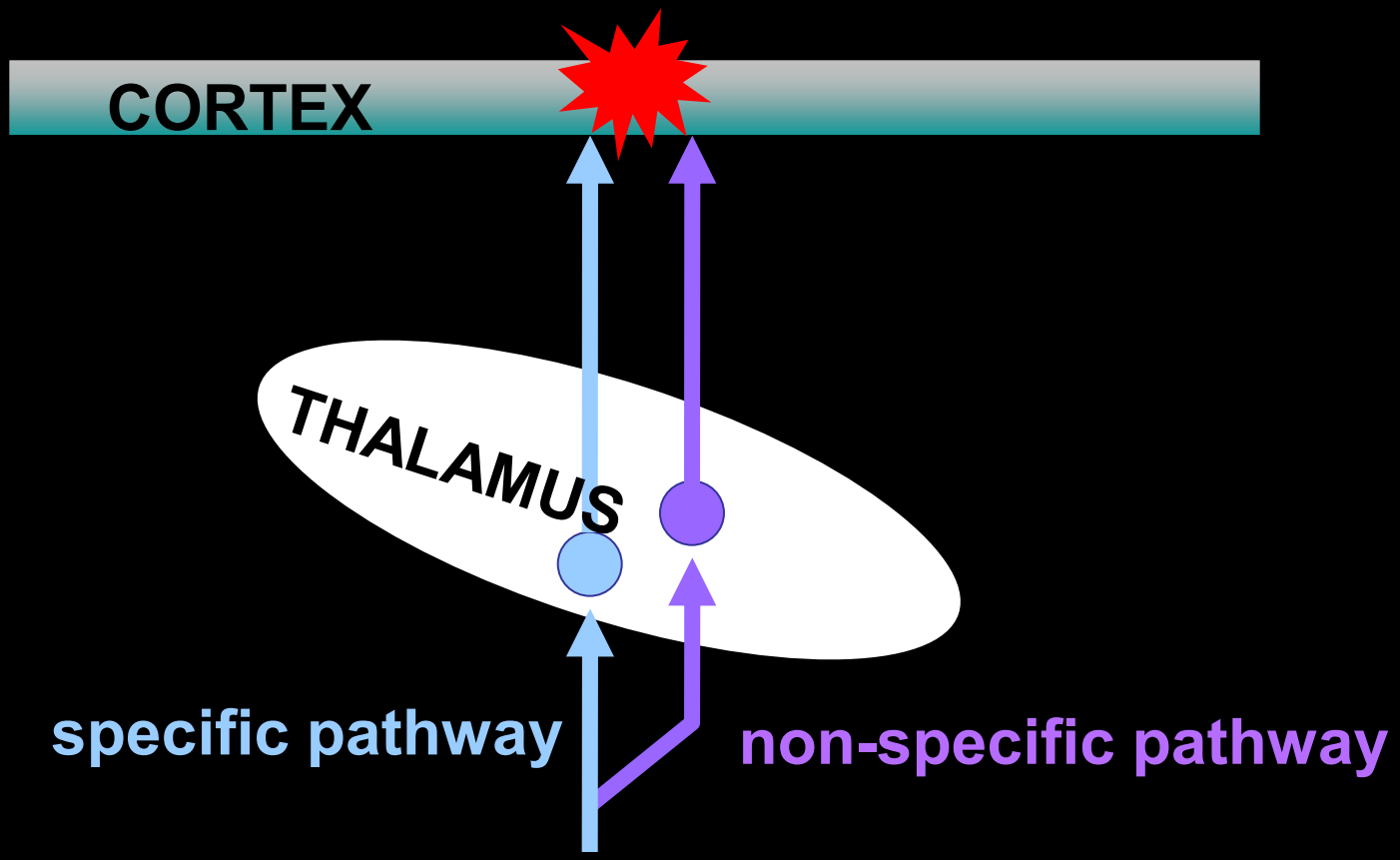
Non-specific nuclei



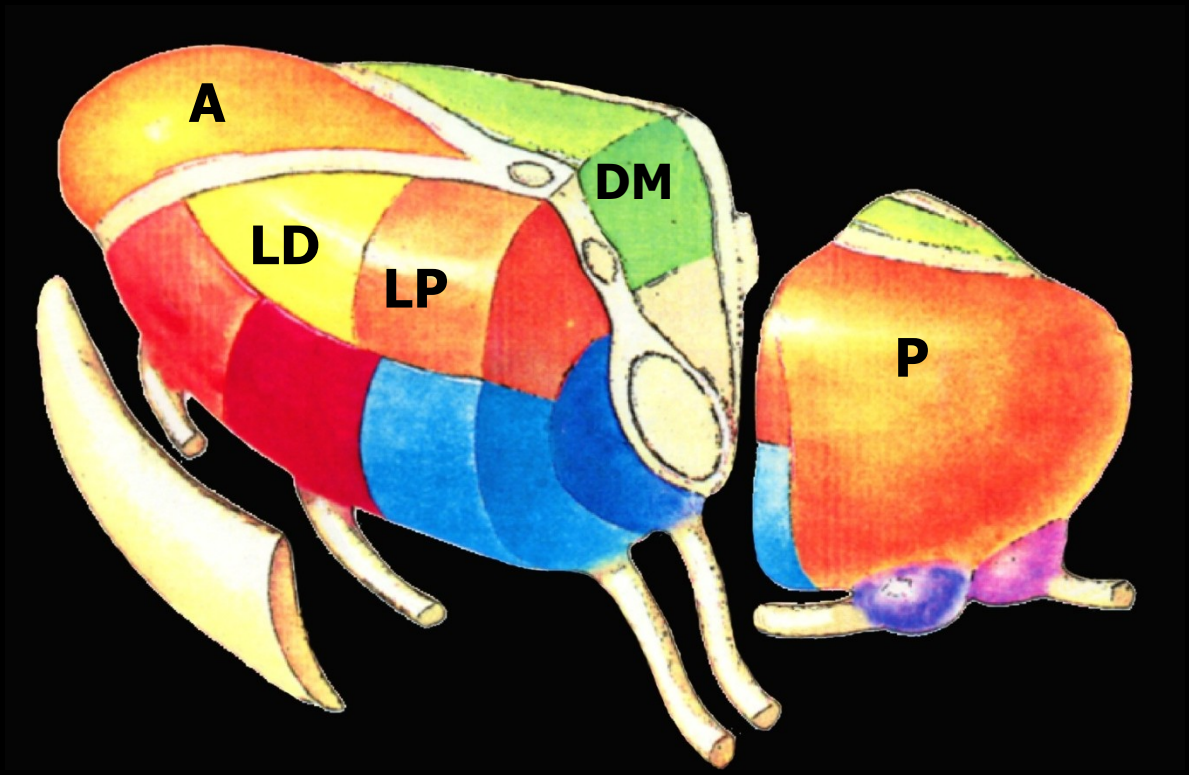
→ from FR of the brainstem and other thalamic nuclei

← to BG, thalamus, cortex (ARAS)

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

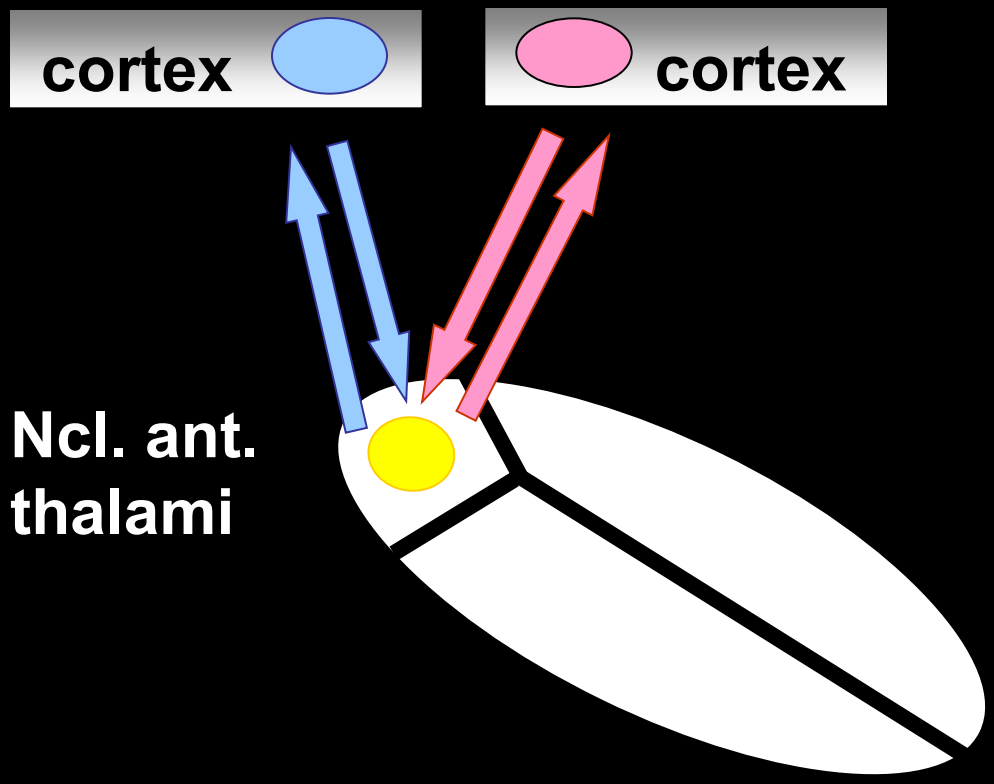


Association nuclei

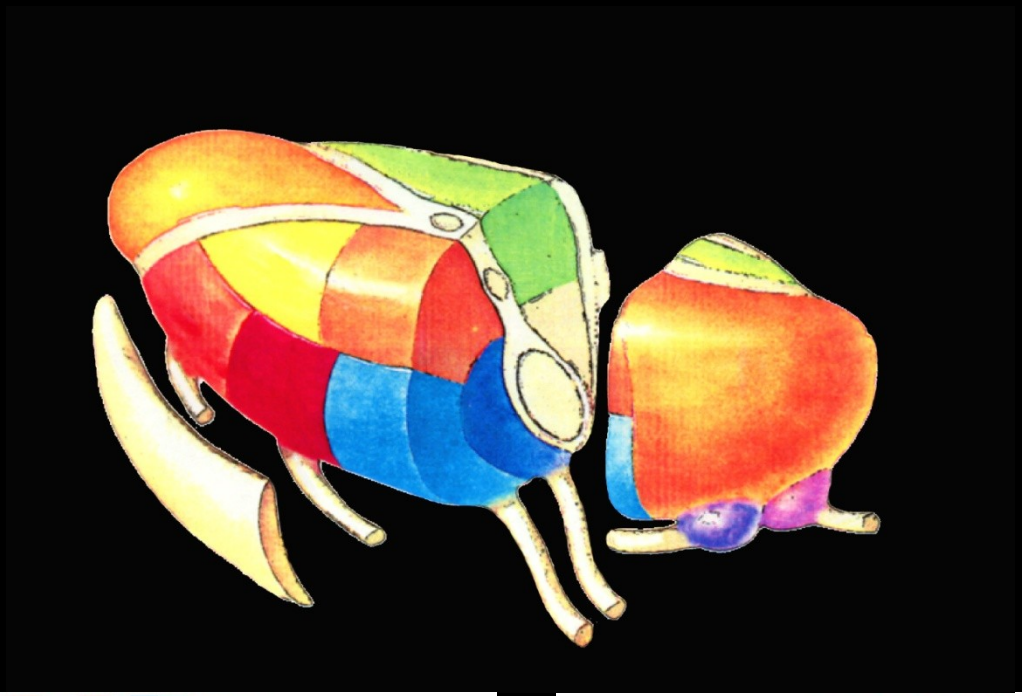


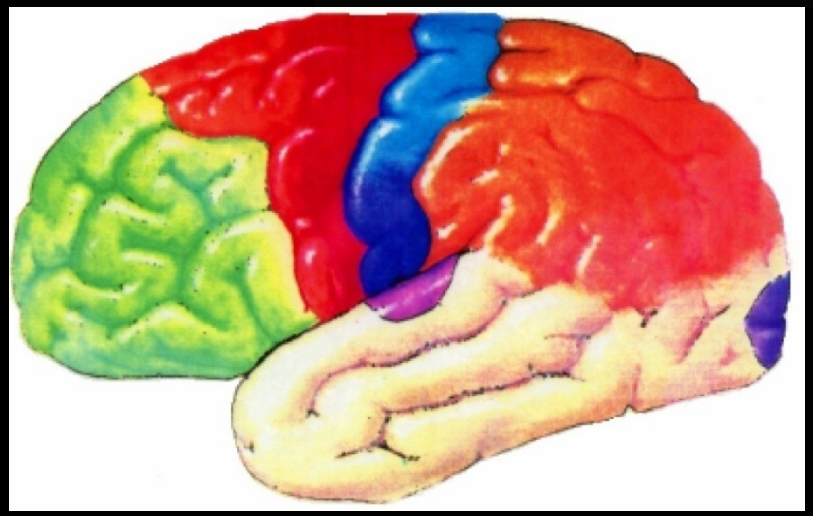
- integration of GSA a SA inputs ⇒ to cortex
- reciprocal connections with the association cortex

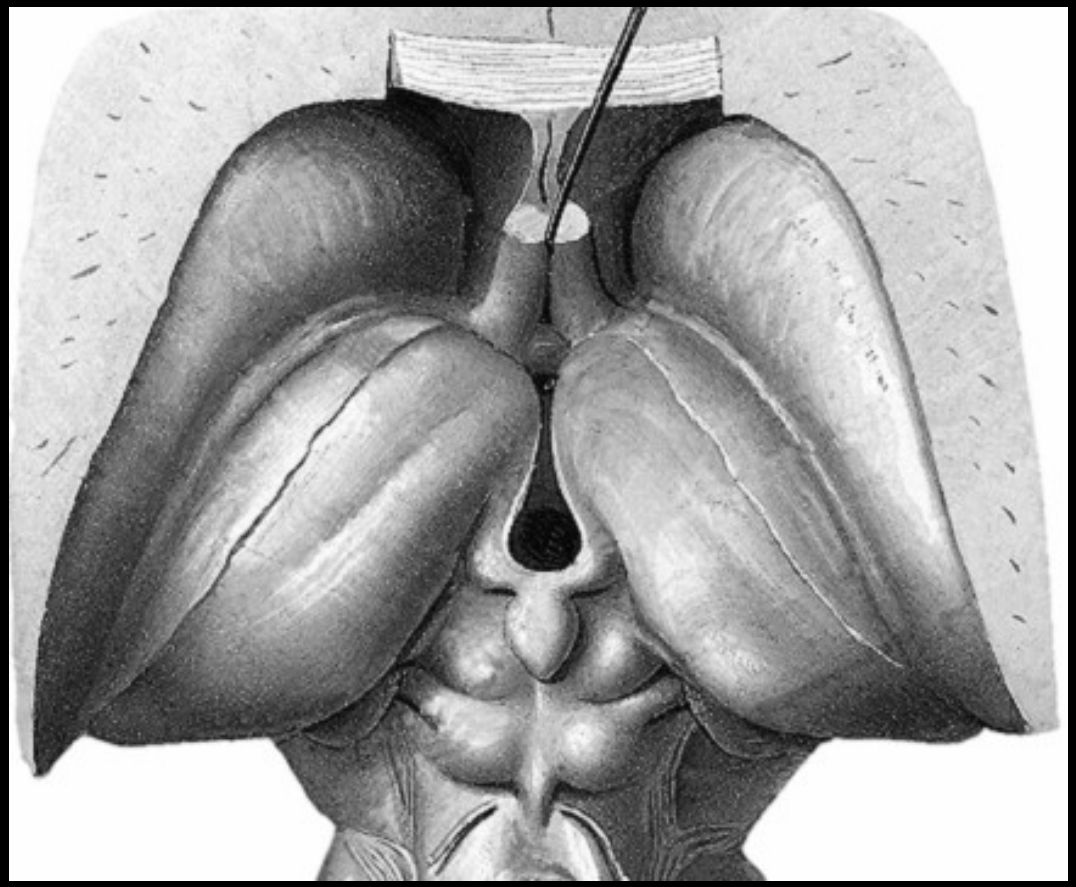
Function of association nuclei



Interconnection of association areas of the cortex



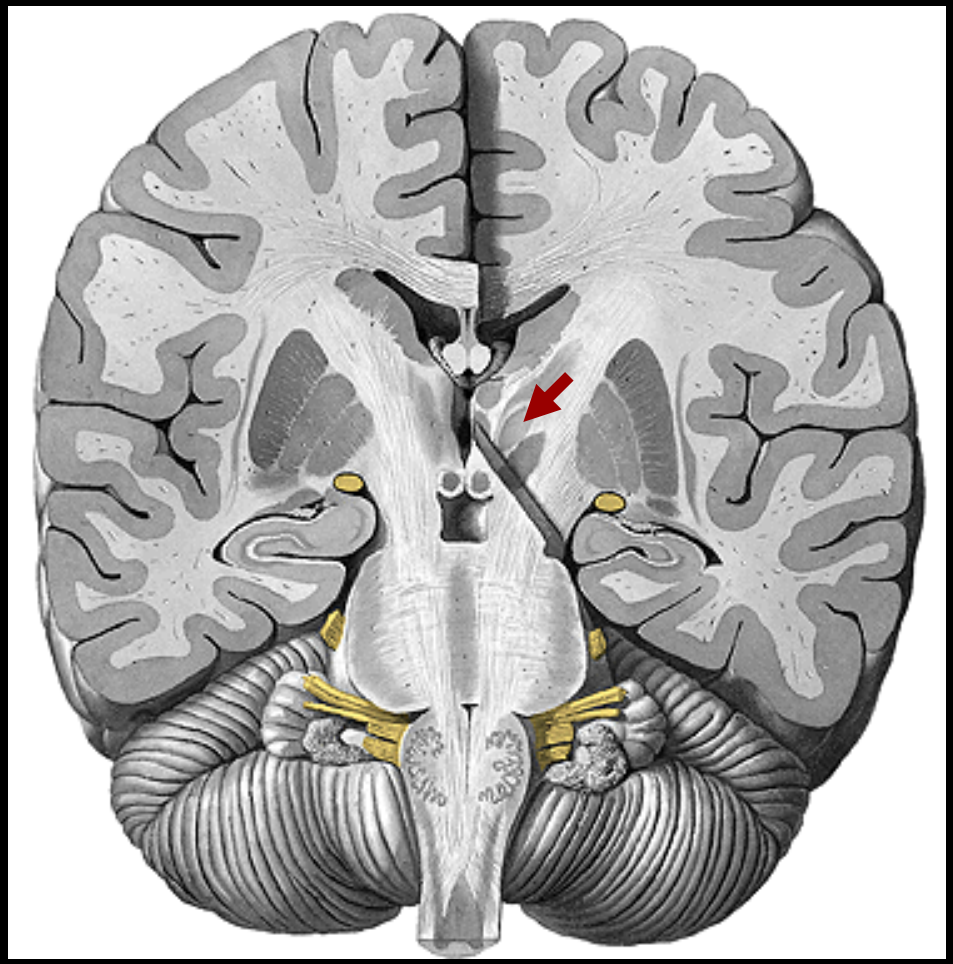




Epithalamus

- stria medullaris thalami
- trigonum habenulae
- commissura habenularum et post.
- corpus pineale (epiphysis cerebri)

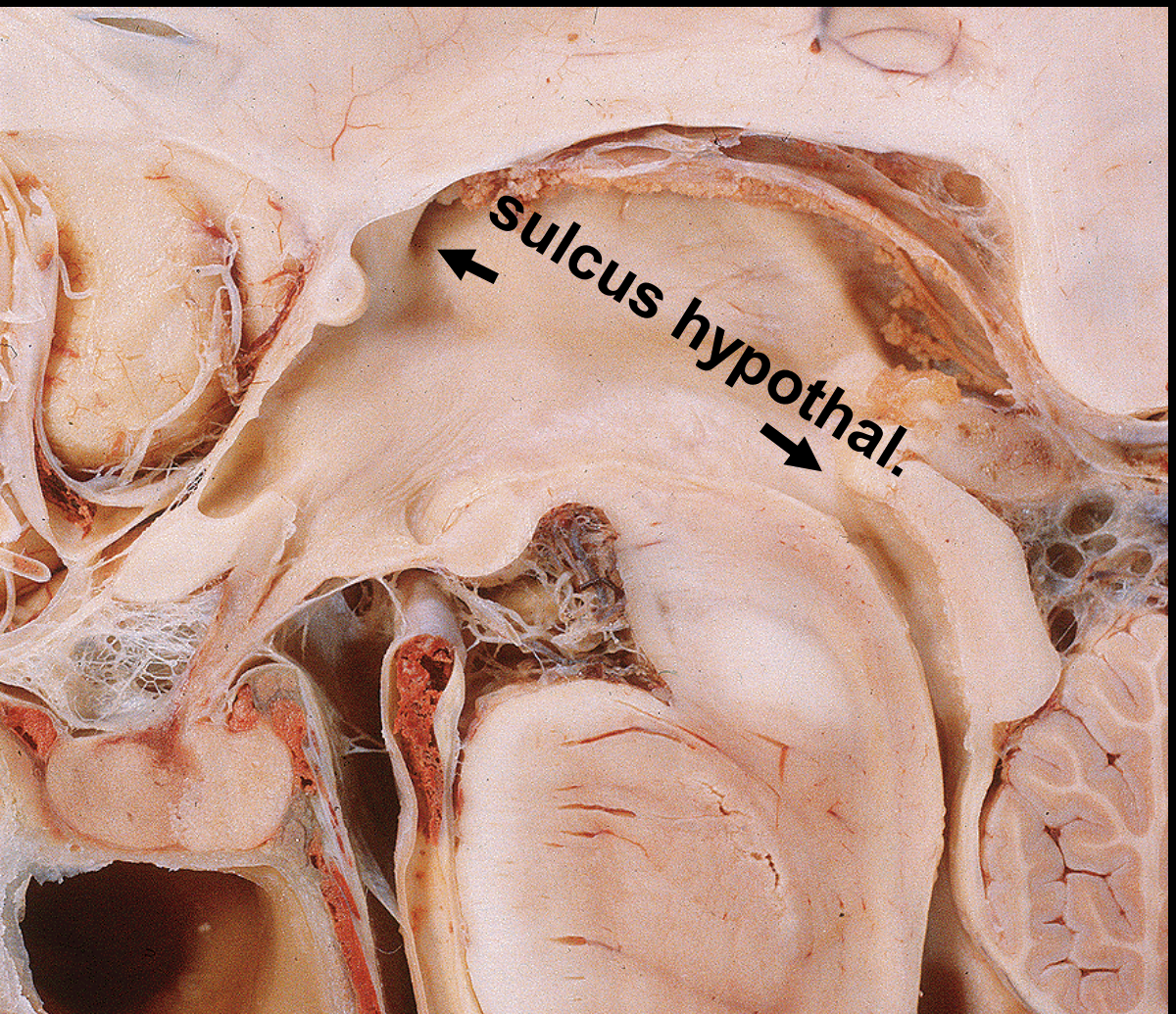
Subthalamus



- zona incerta
- ← ncl. subthalamicus
- part of subst. nigra

Involved in motor circuits

Hypothalamus



Corp. mamillaria

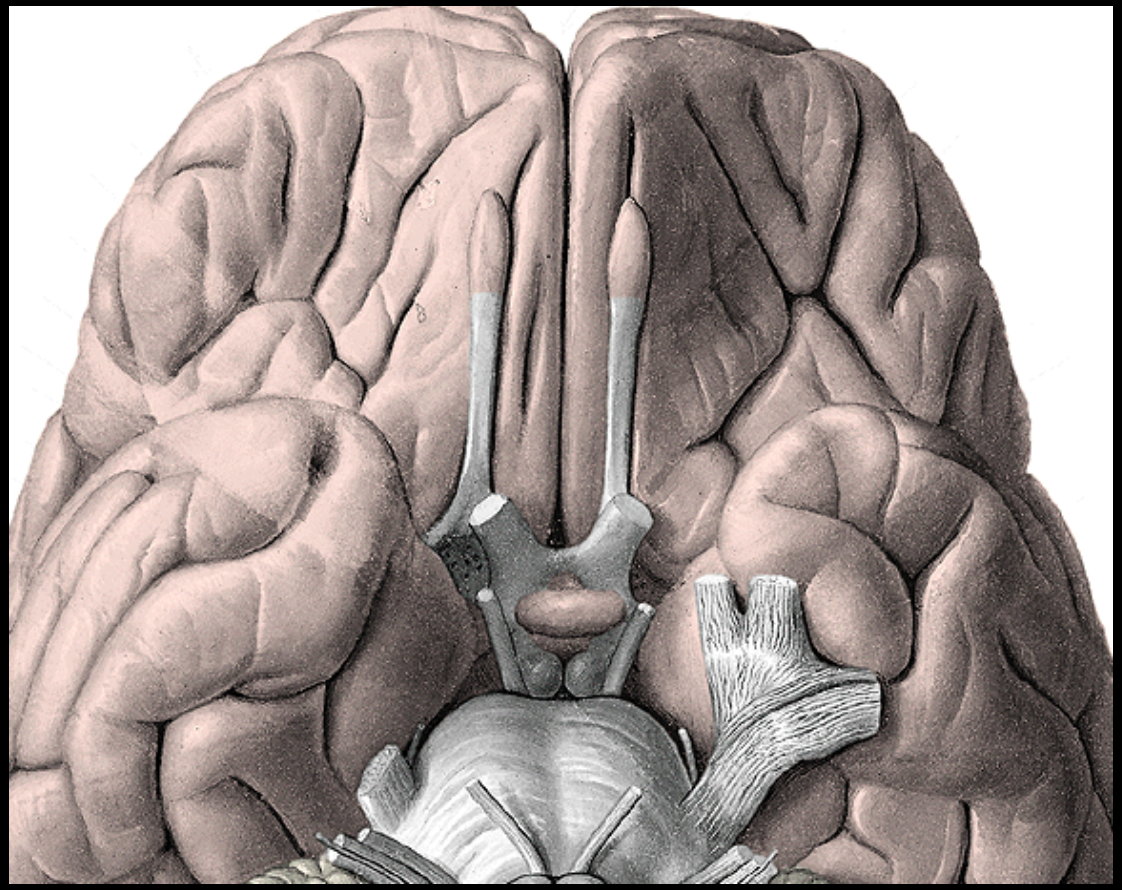
Tuber cinereum

Infundibulum

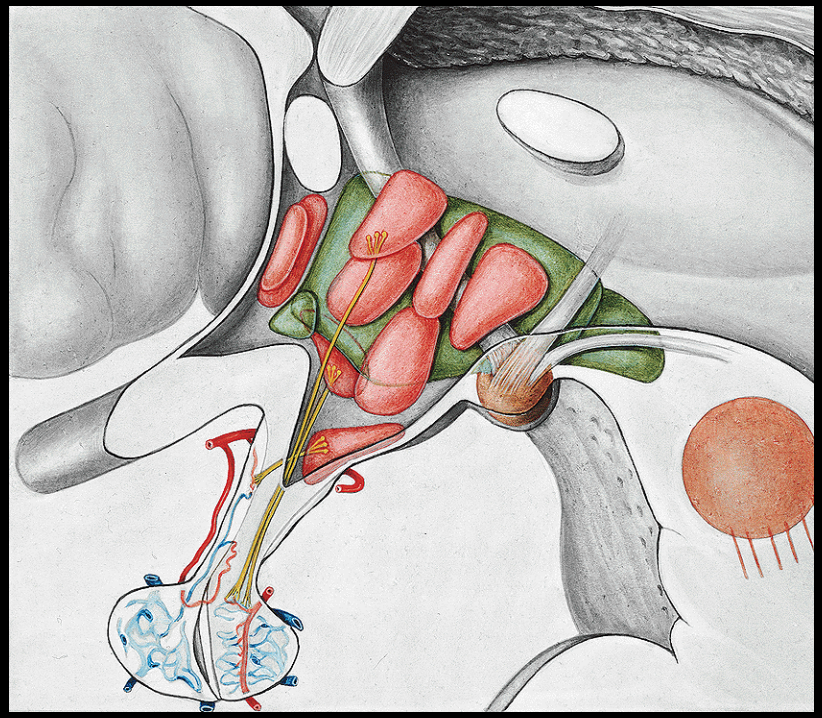
Eminentia mediana

Hypophysis cerebri

Chiasma opticum



Hypothalamus



Hypothalamus

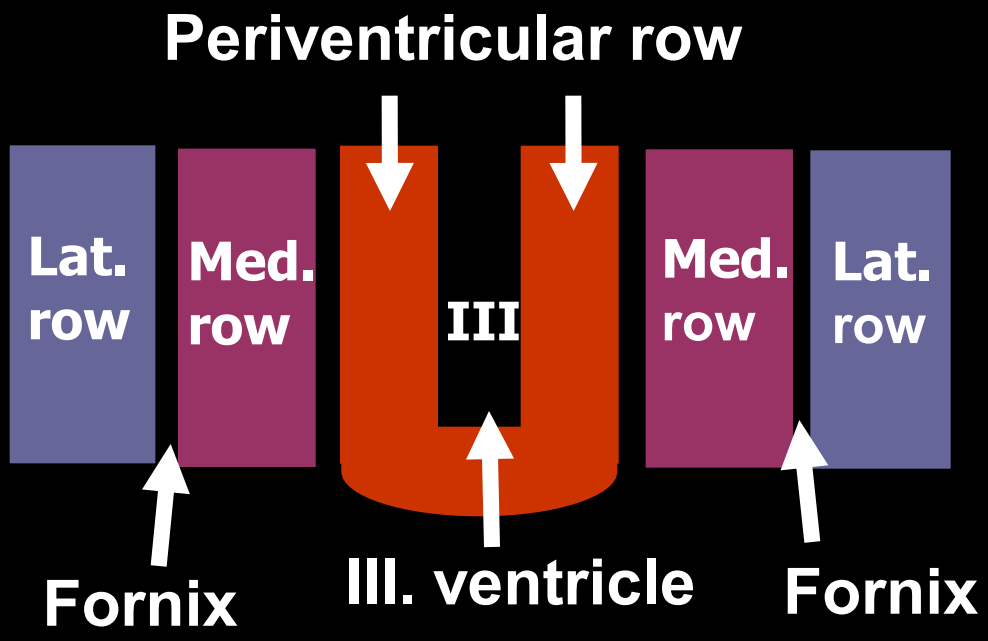
control of:

- ANS
- endocrine system

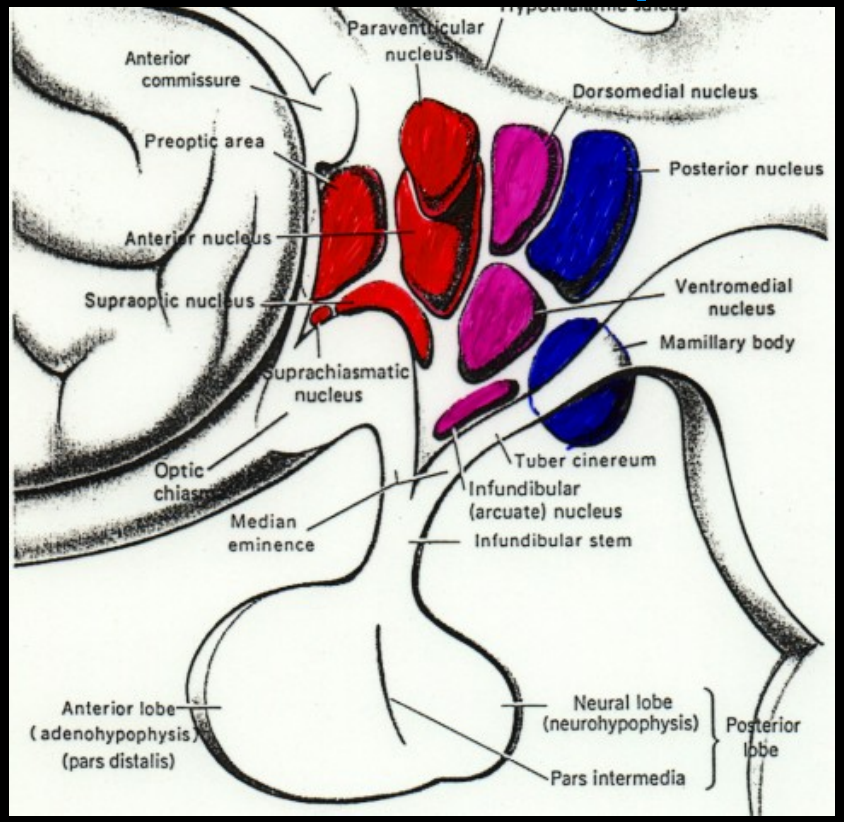
Function of the hypothalamus is related to:

- **regulation of vital functions that maintain homeostasis**
- **regulation of emotions**

Hypothalamic nuclei
at the frontal section



ant. middle post.



Hypothalamic nuclei

- sagittal section

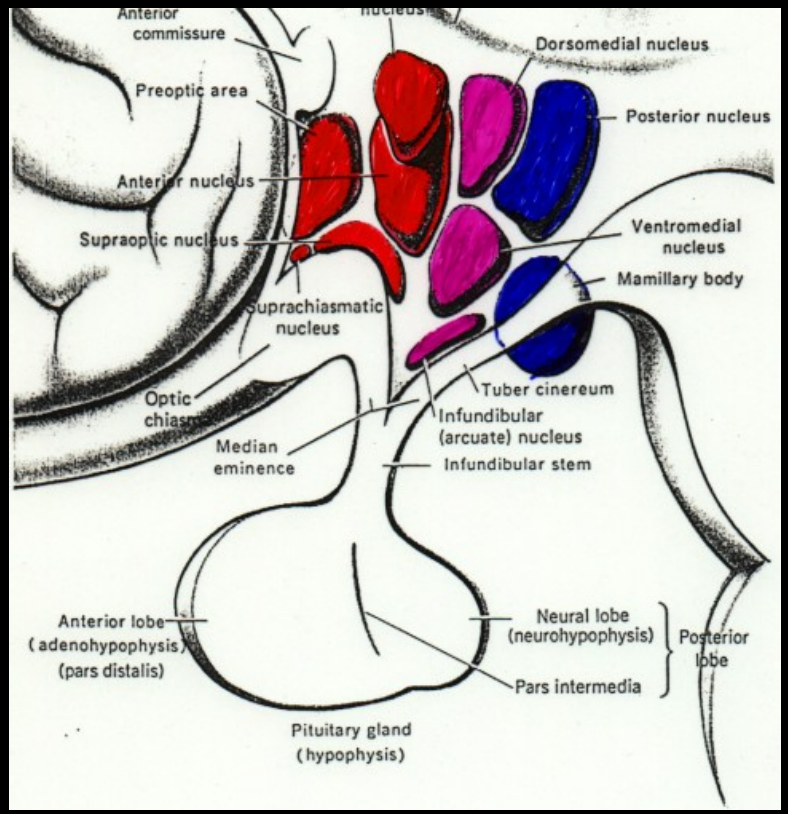
Anterior nuclei

Periventricul row:

ncl. suprachiasmat.

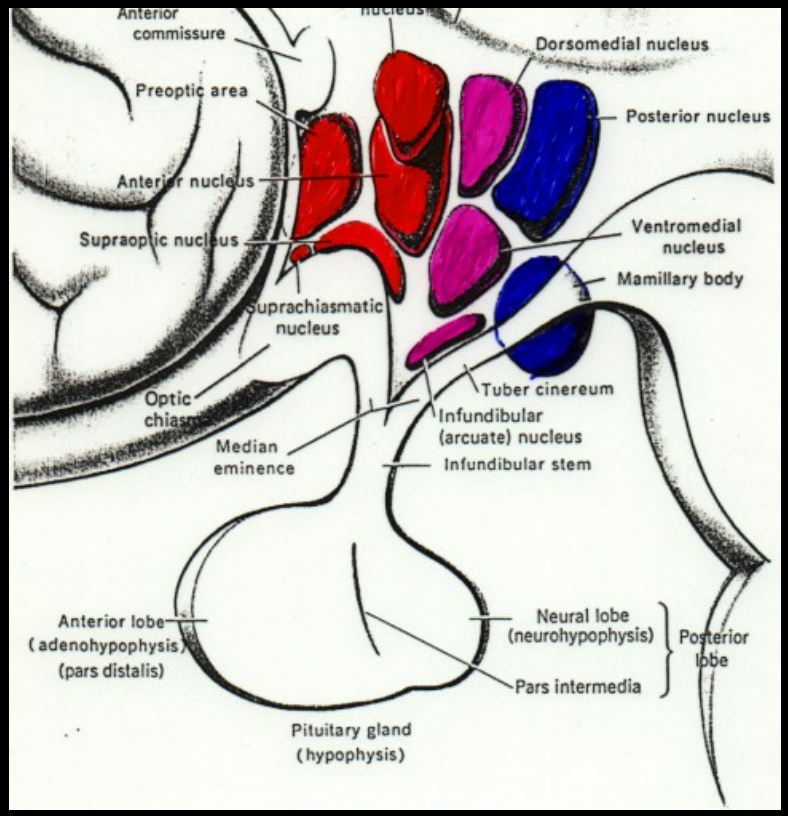
Medial row:

ncl. preopticus, ncl. supraopticus, ncl. ant., ncl. paraventricularis



Middle nuclei

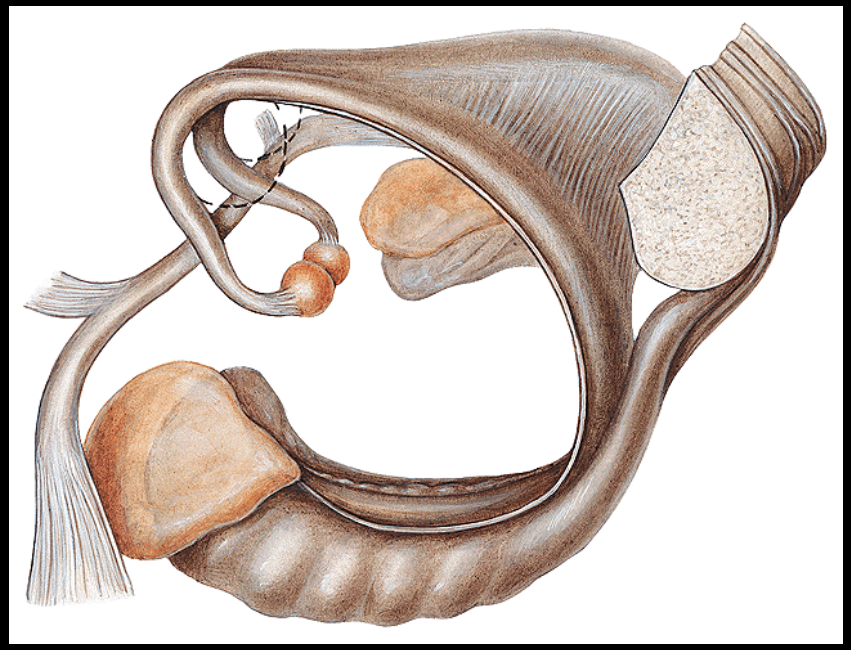
Periventricular row: ncl. arcuatus
Medial row: ncl. ventromed. et ncl. dorsomed.



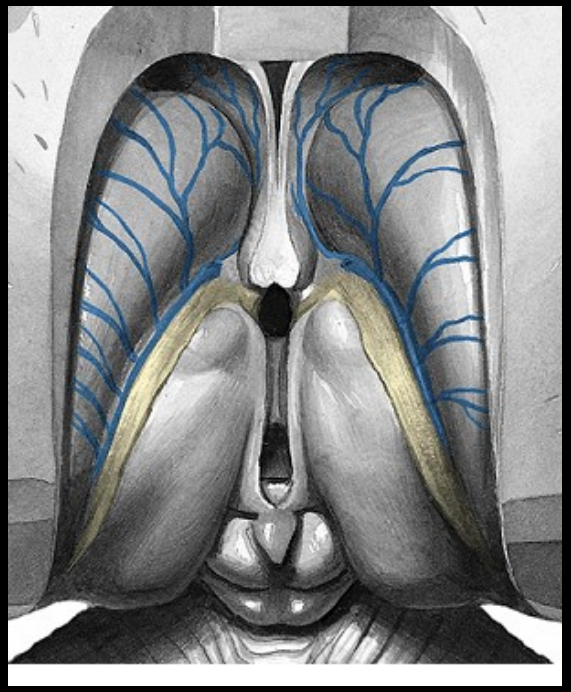
Posterior nuclei

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

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.)

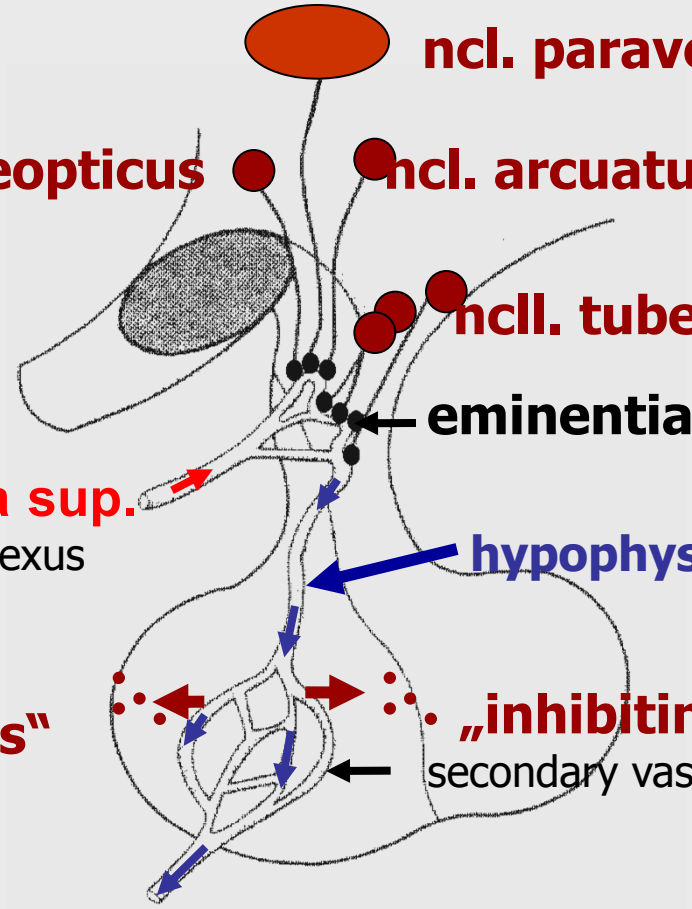
Adenohypophysis

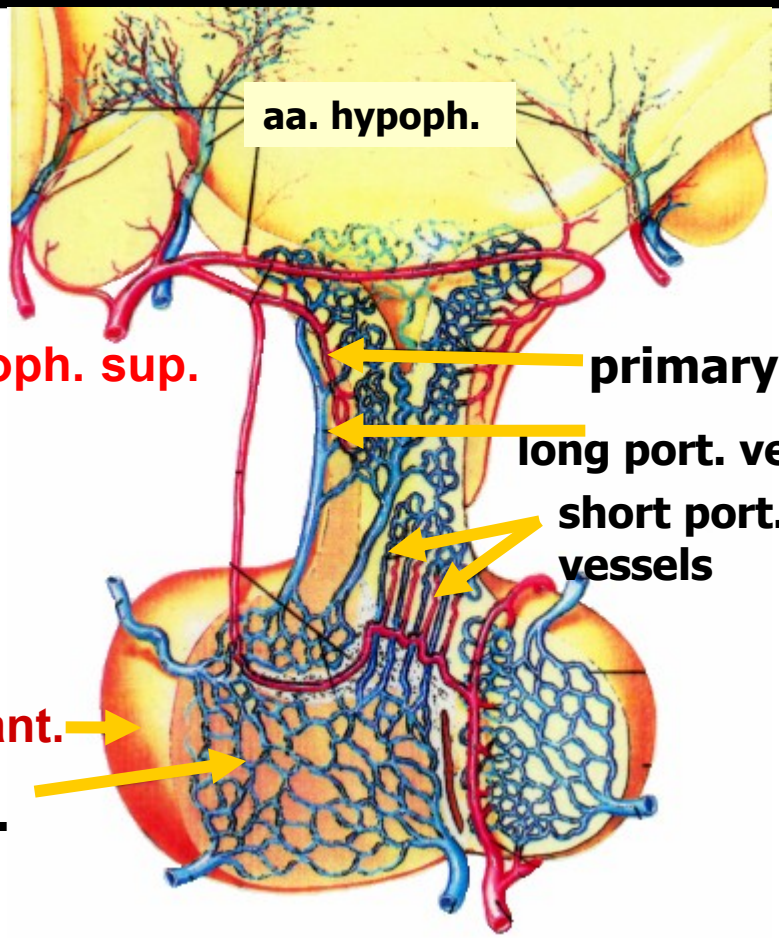
Secretion of hormones:
Thyrotropic
Gonadotropic
Growth
Adrenocorticotropic

- 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

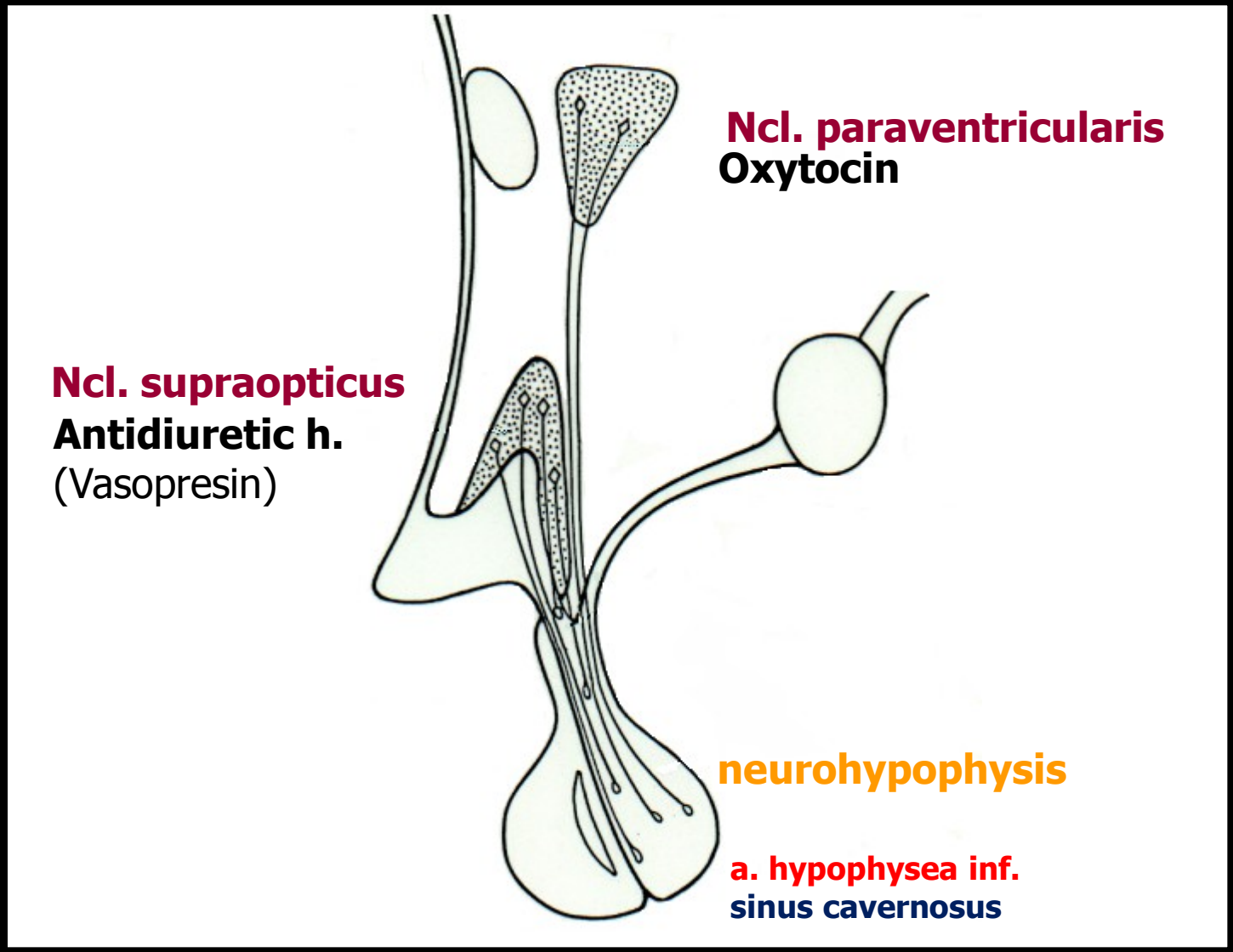


drainage into the sinus cavernosus

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



Illustrations were copied from:

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

Netter: Interactive Atlas of Human Anatomy. Windows Version 2.0