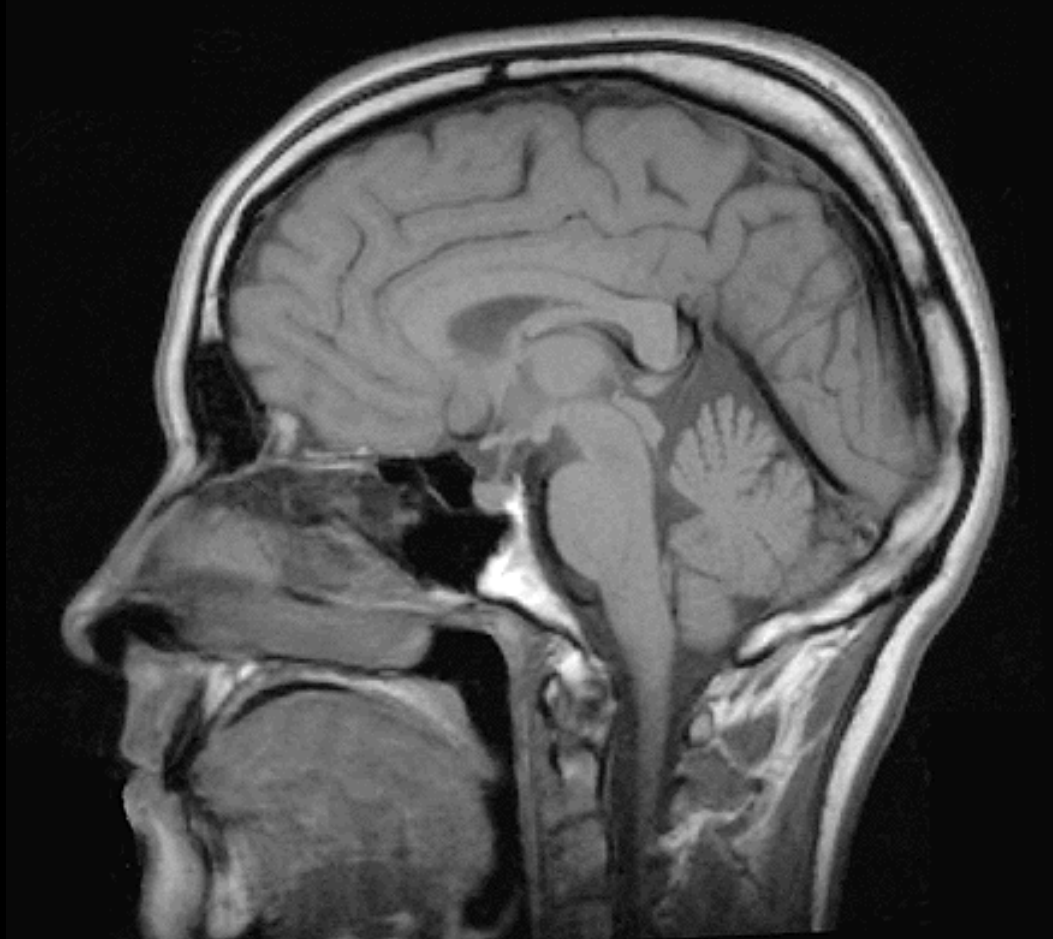
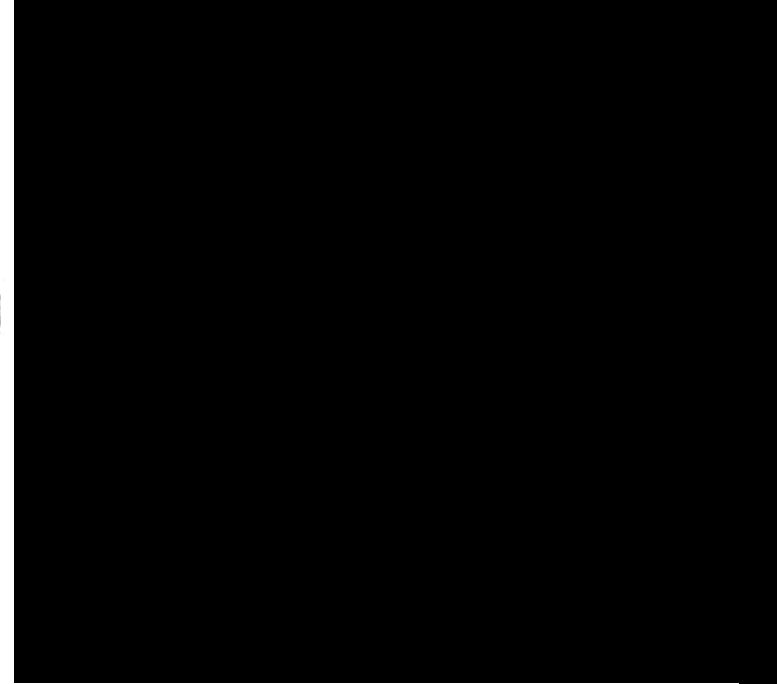
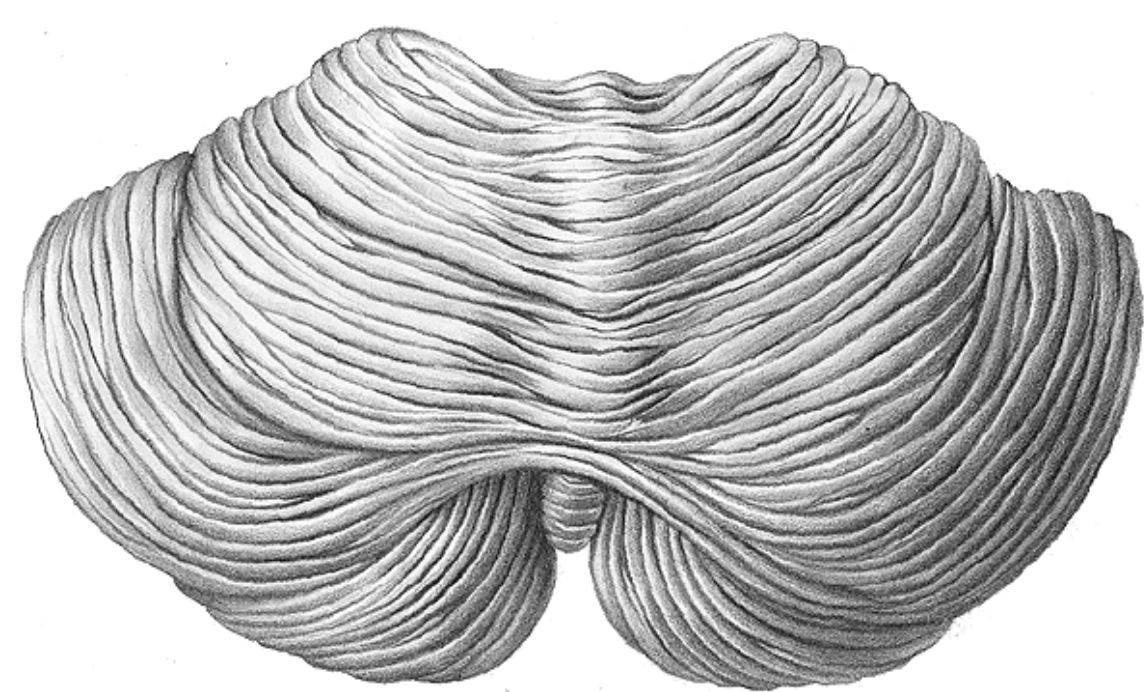


# Cerebellum

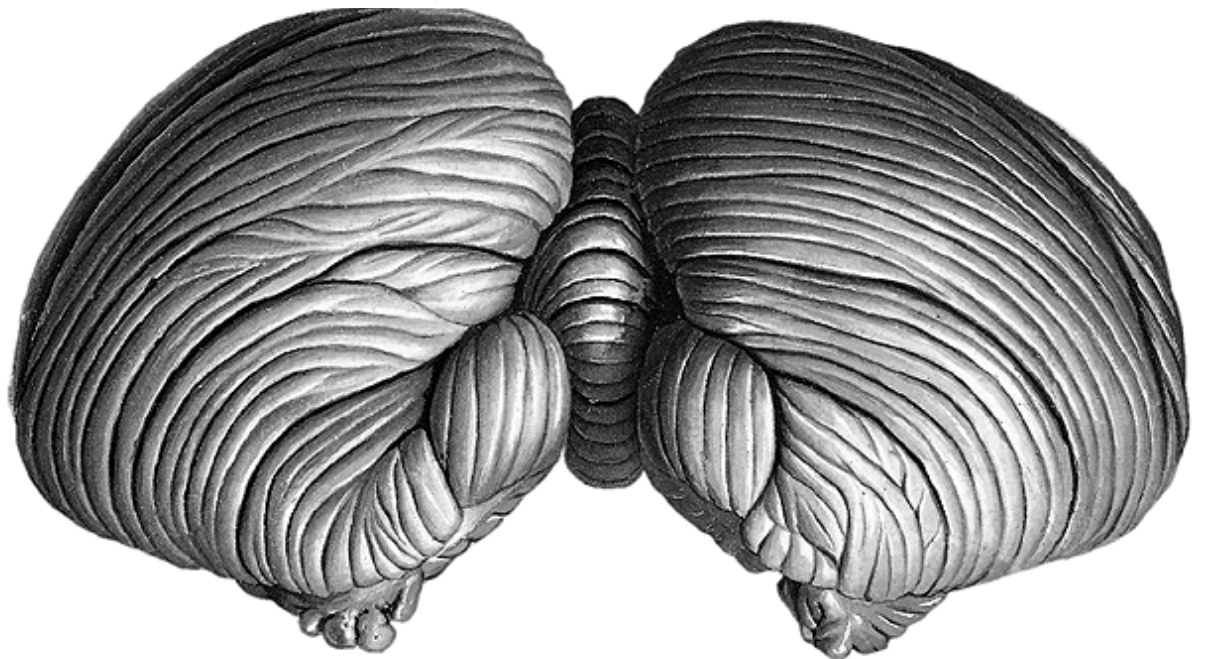


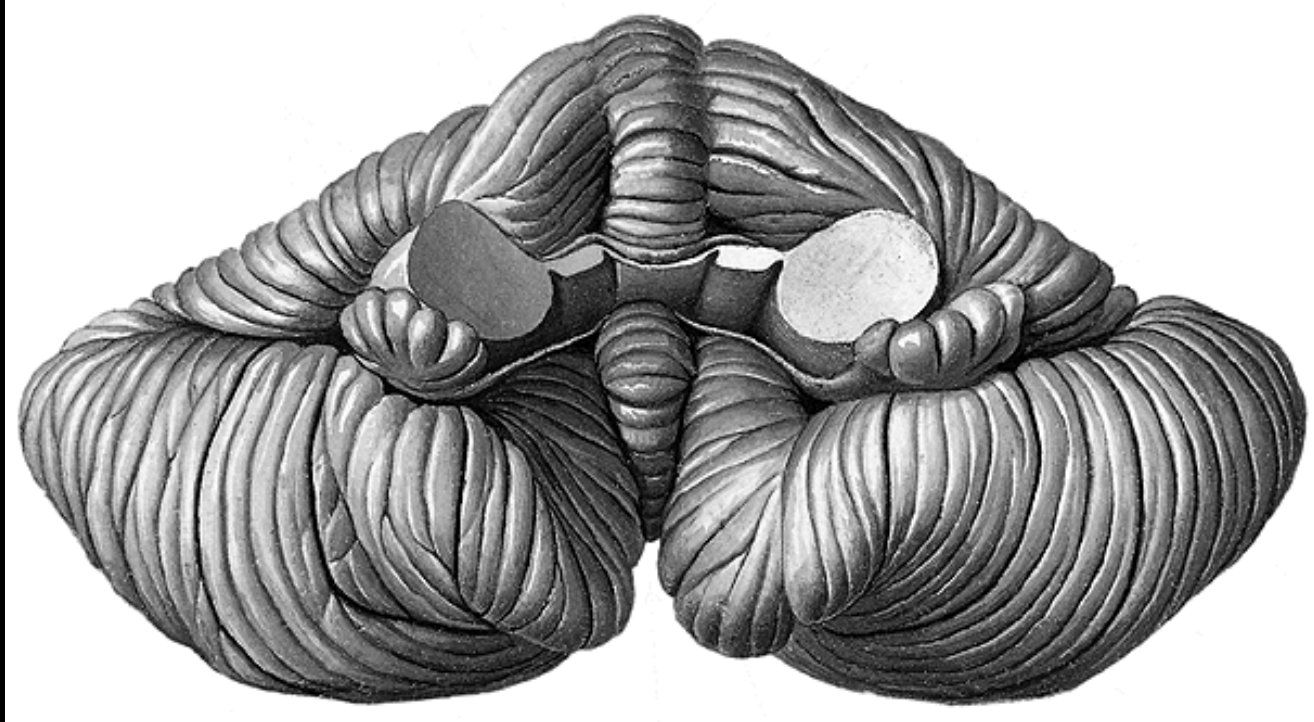
**Coordination of movements**



**Vermis**  
**Hemispheres**

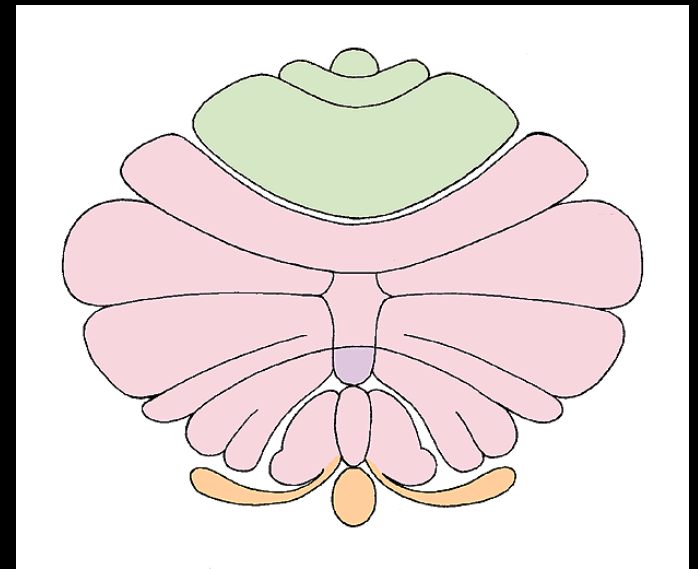
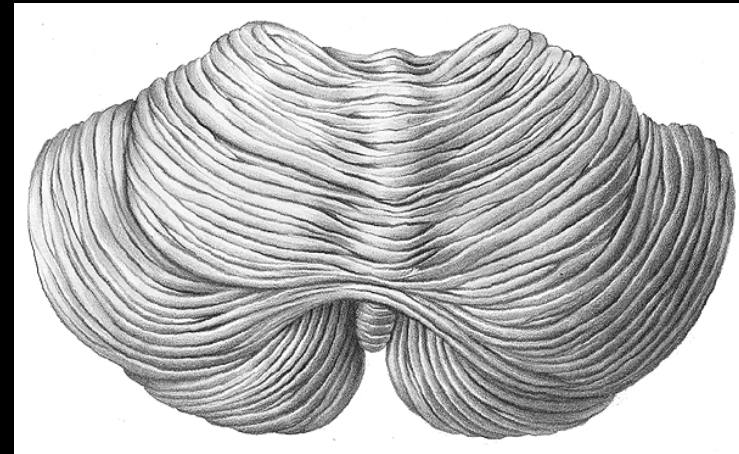
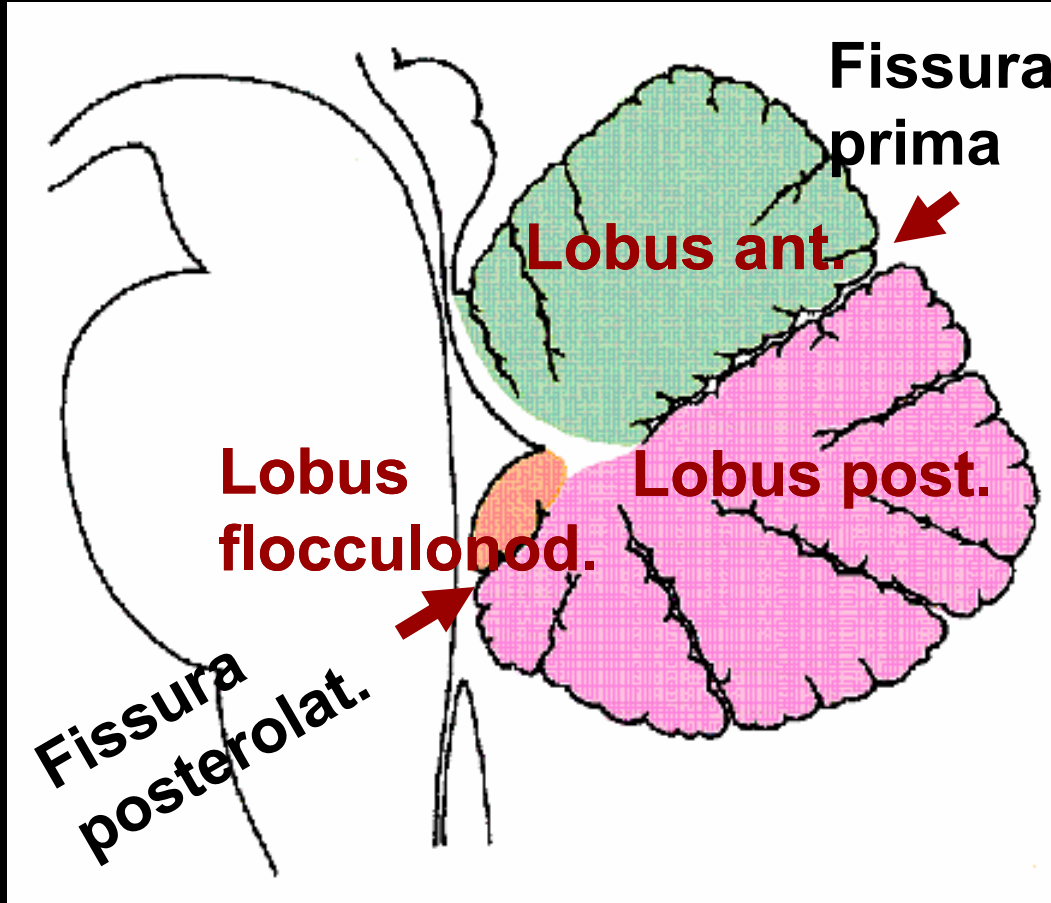
**Folia, lobuli, lobi**



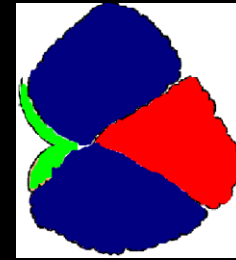


**Pars flocculonodularis**





# Developmental anatomy



**Afferents from vestib. labyrinth**  
fish, amphibians

**Archi-cerebellum**

**VESTIBULO - CEREBELLUM**

**Afferents from spinal cord and brainstem**  
reptiles, birds, mammals

**Paleo-cerebellum**

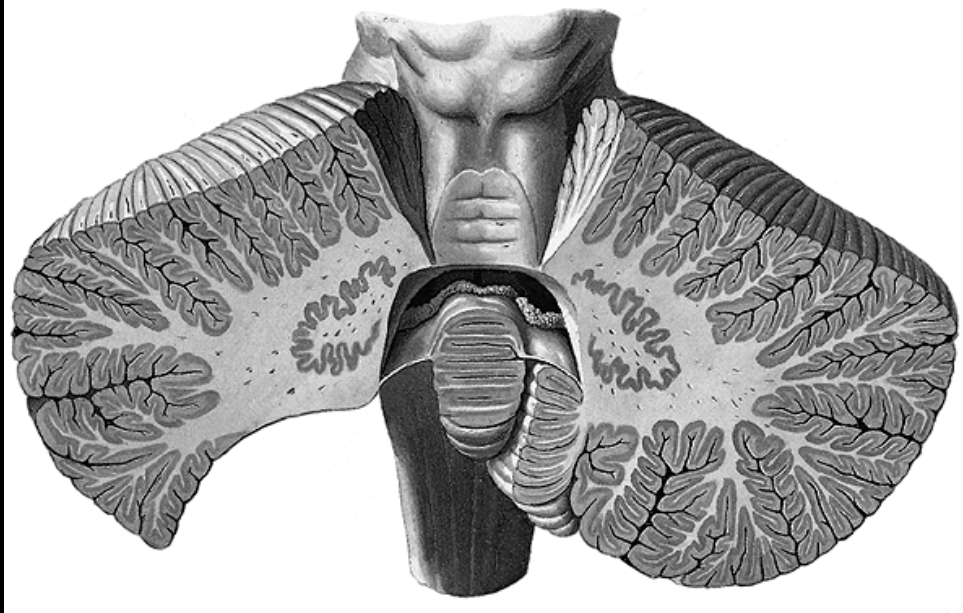
**SPINO - CEREBELLUM**

**Afferents from cortex telencephali**

**Neo-cerebellum**

**PONTO - CEREBELLUM**

# Structure of the cerebellum



Grey matter

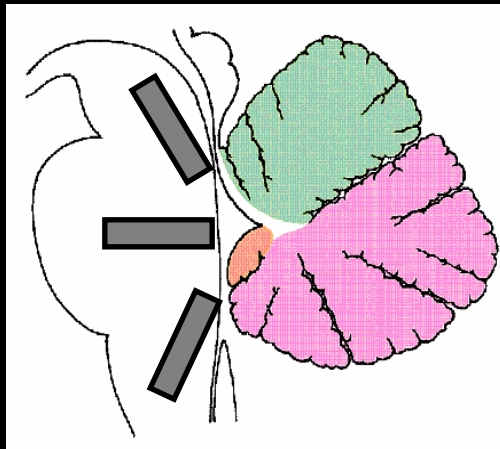
**Cortex cerebelli**

→ str. moleculare

← str. ganglionare

→ str. granulare

**Nuclei cerebellares**

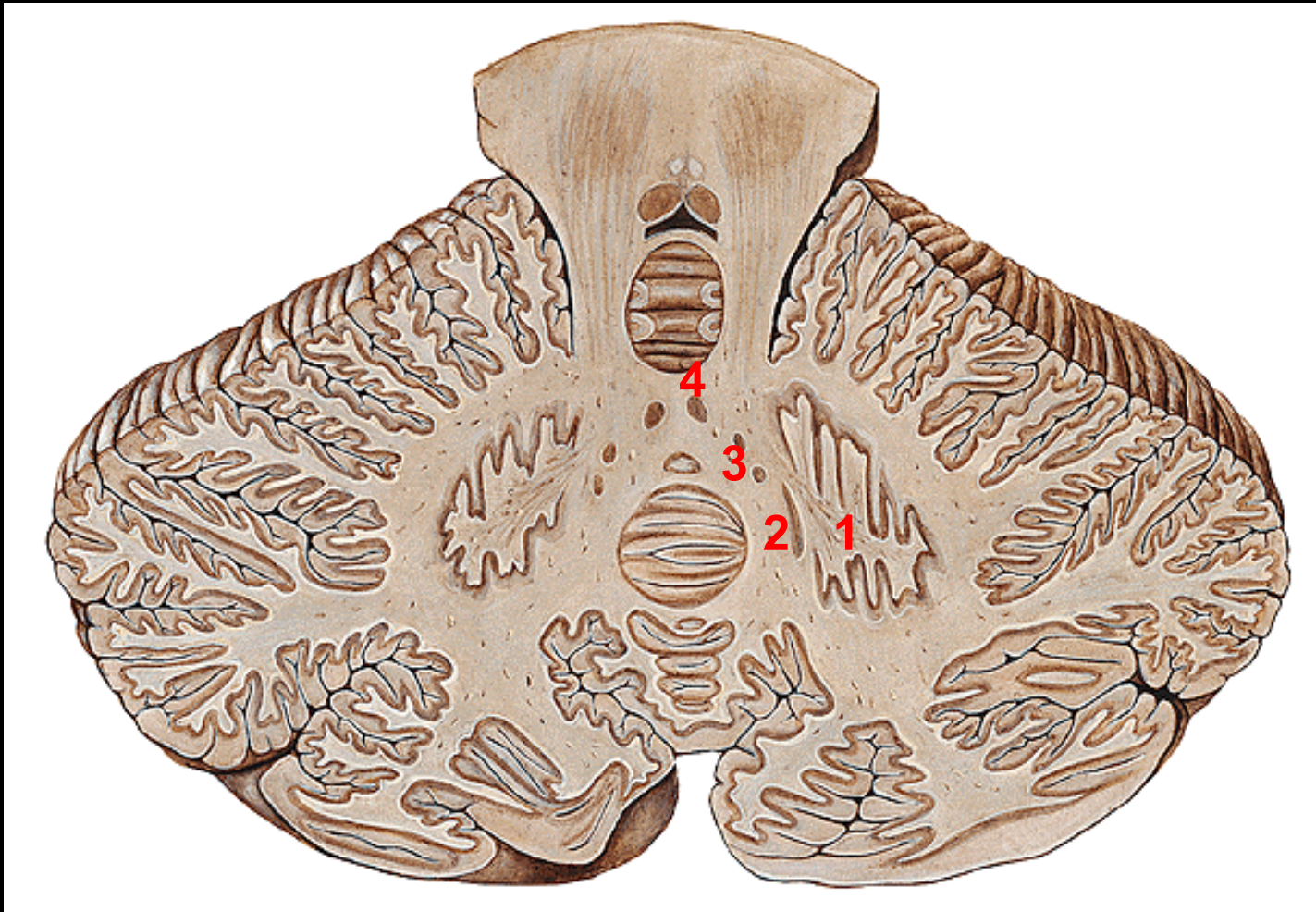


White matter

**Subst. medullaris**

laminae albae (arbor vitae)

**Pedunculi cerebellares**



**1** ncl. dentatus

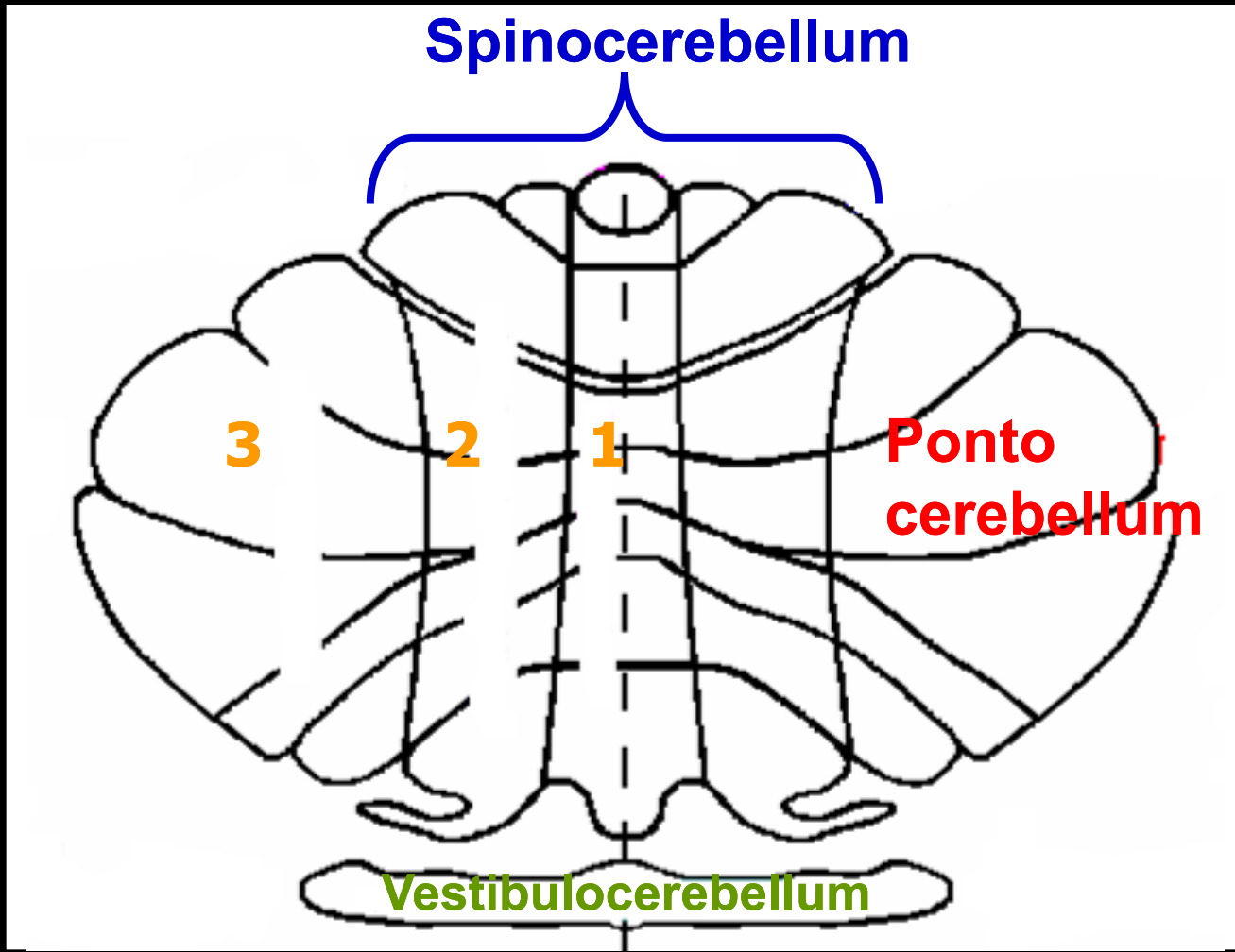
**2** ncl. emboliformis

**3** ncll. globosi

**4** ncl. fastigii

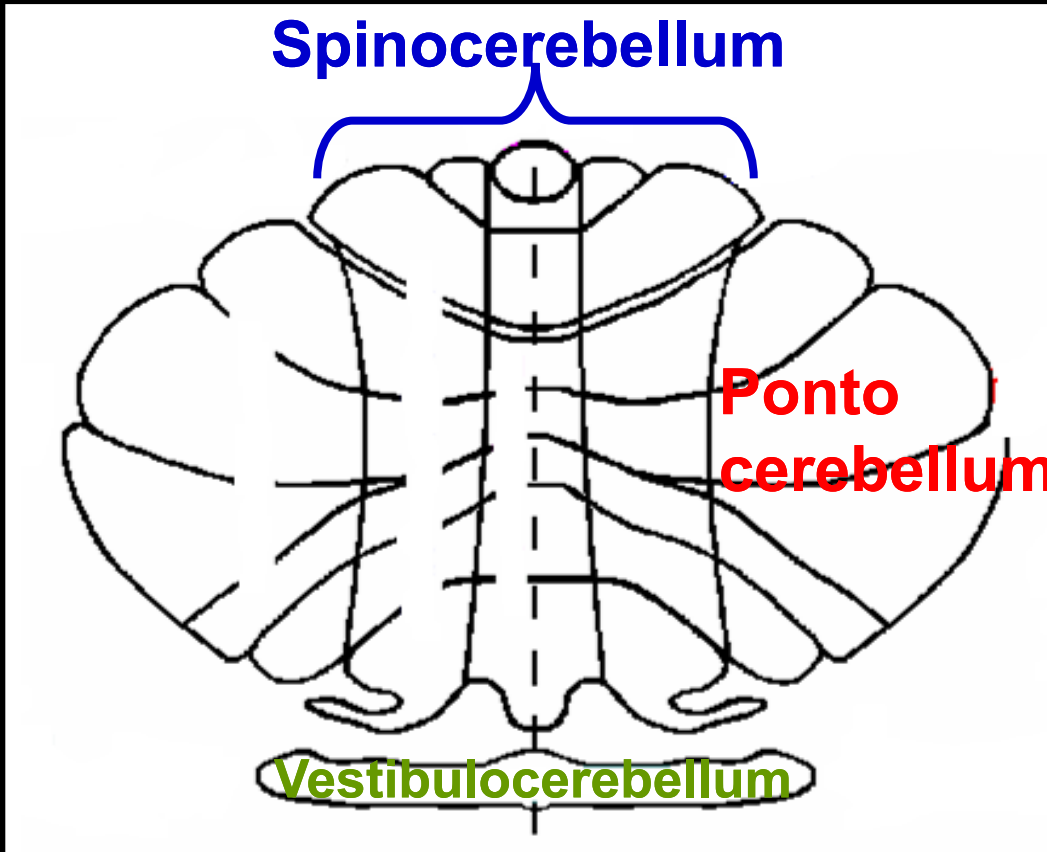
## **Nuclei cerebelli**





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

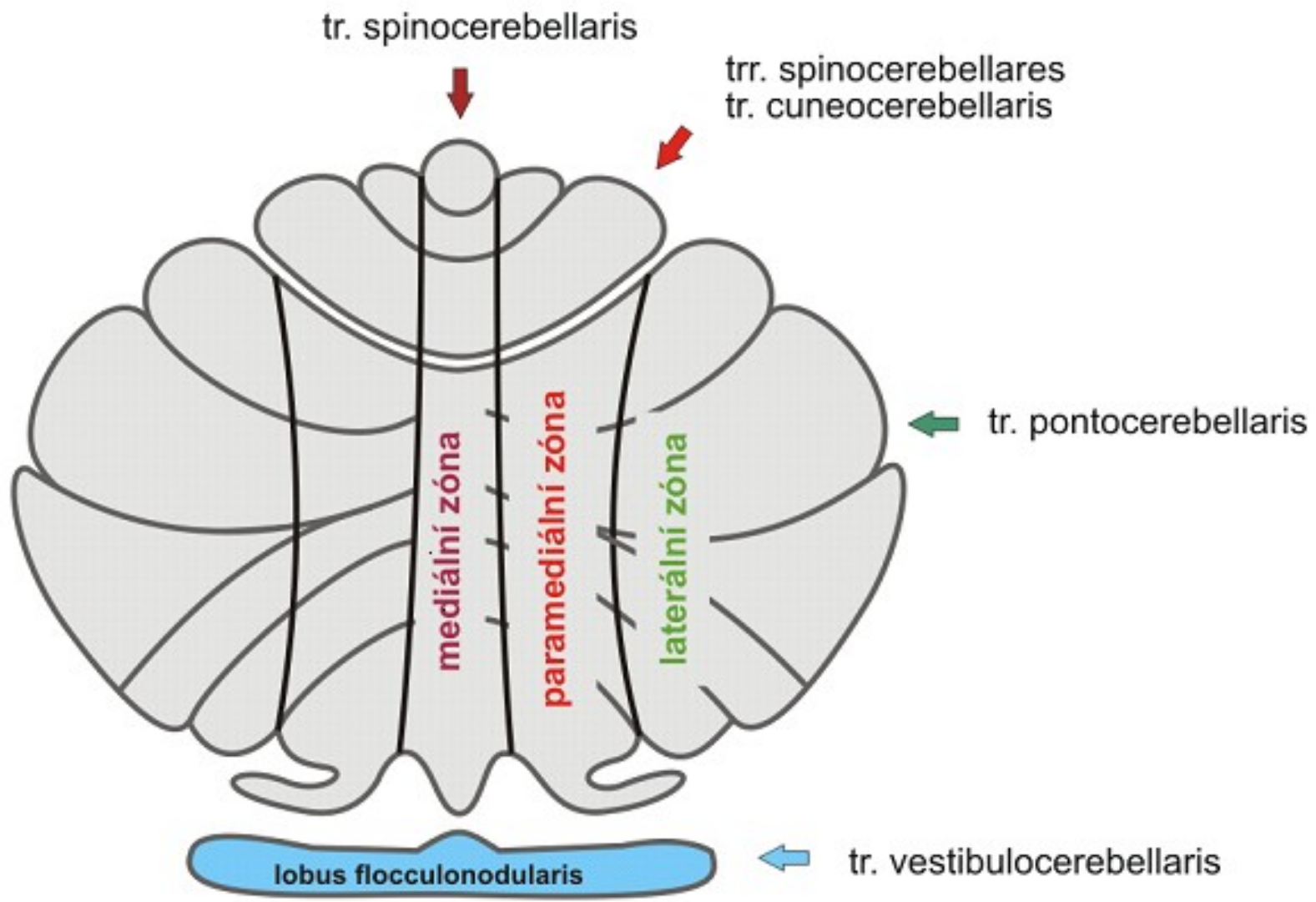




**Vestibulocereb. ncl. vestibulares**

**Spinocereb. ncl. fastigii, emboliformes, globosi**

**Neocereb. ncl. dentatus**



tr. spinocerebellaris

trr. spinocerebellares  
tr. cuneocerebellaris

tr. pontocerebellaris

tr. vestibulocerebellaris

mediální zóna

paramediální zóna

laterální zóna

lobus flocculonodularis

## **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

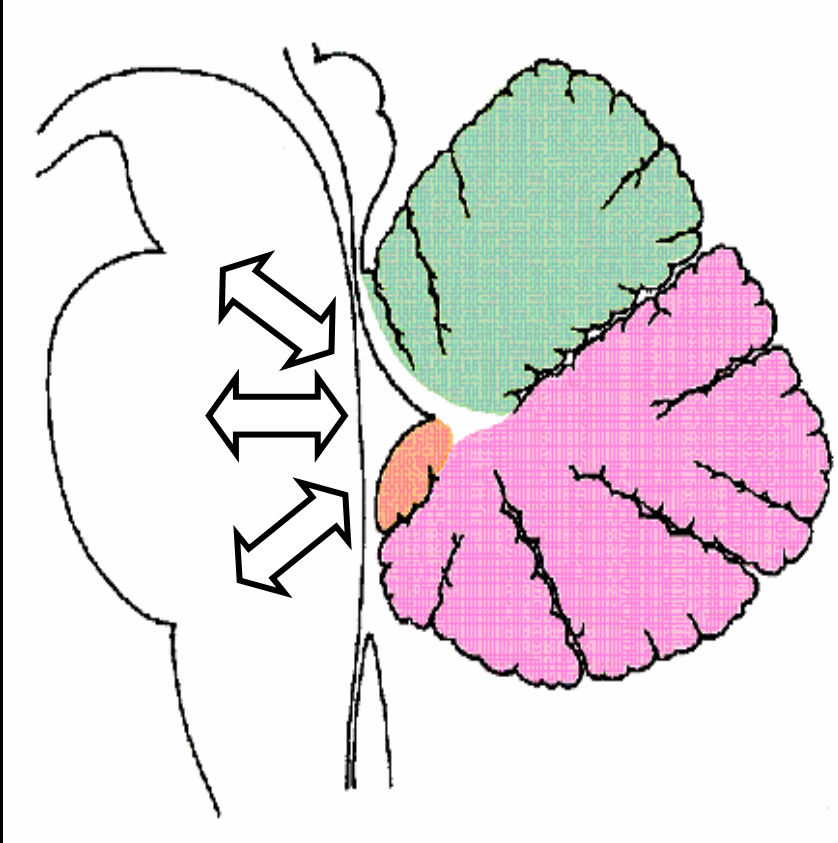
## **Pedunculi cerebel. sup.**

→ 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

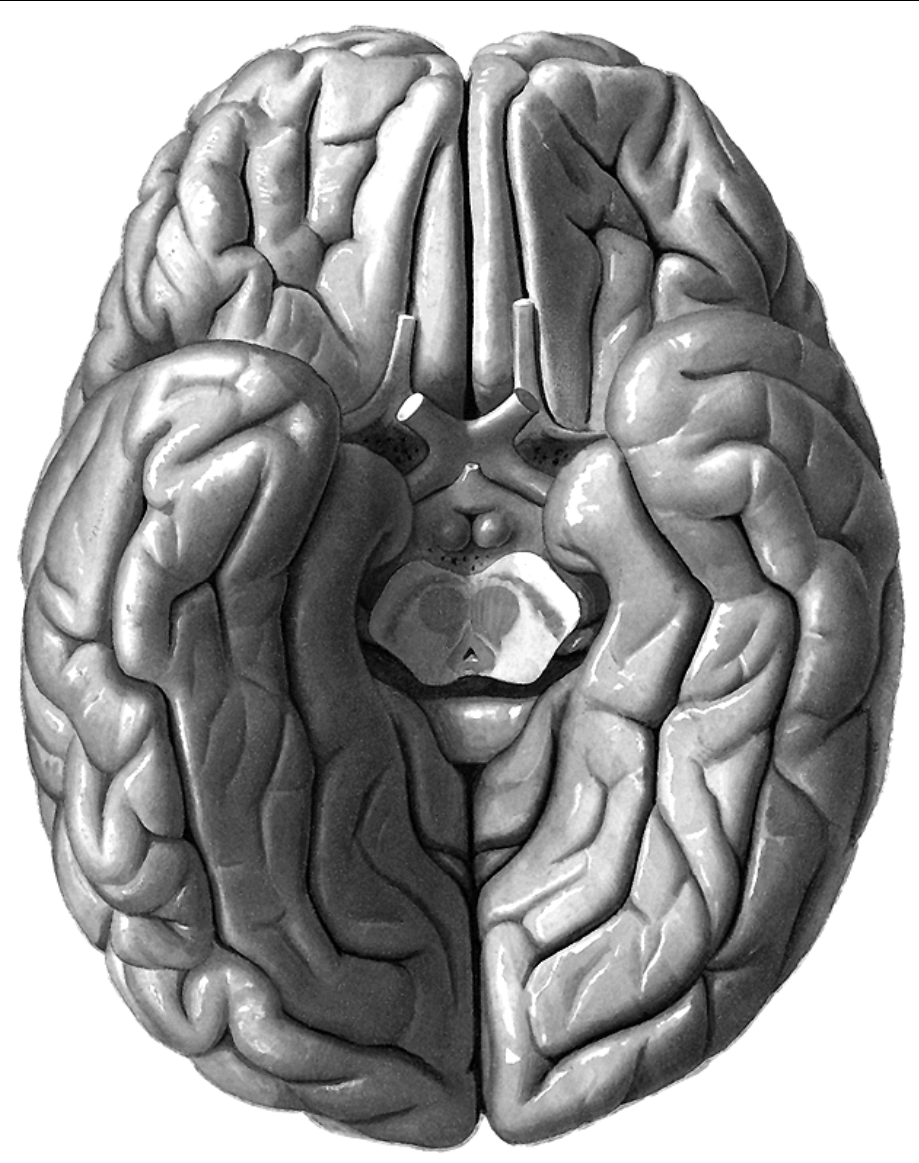
# CEREBELLAR DISORDERS

**Ataxia** inability to stand upright without support

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

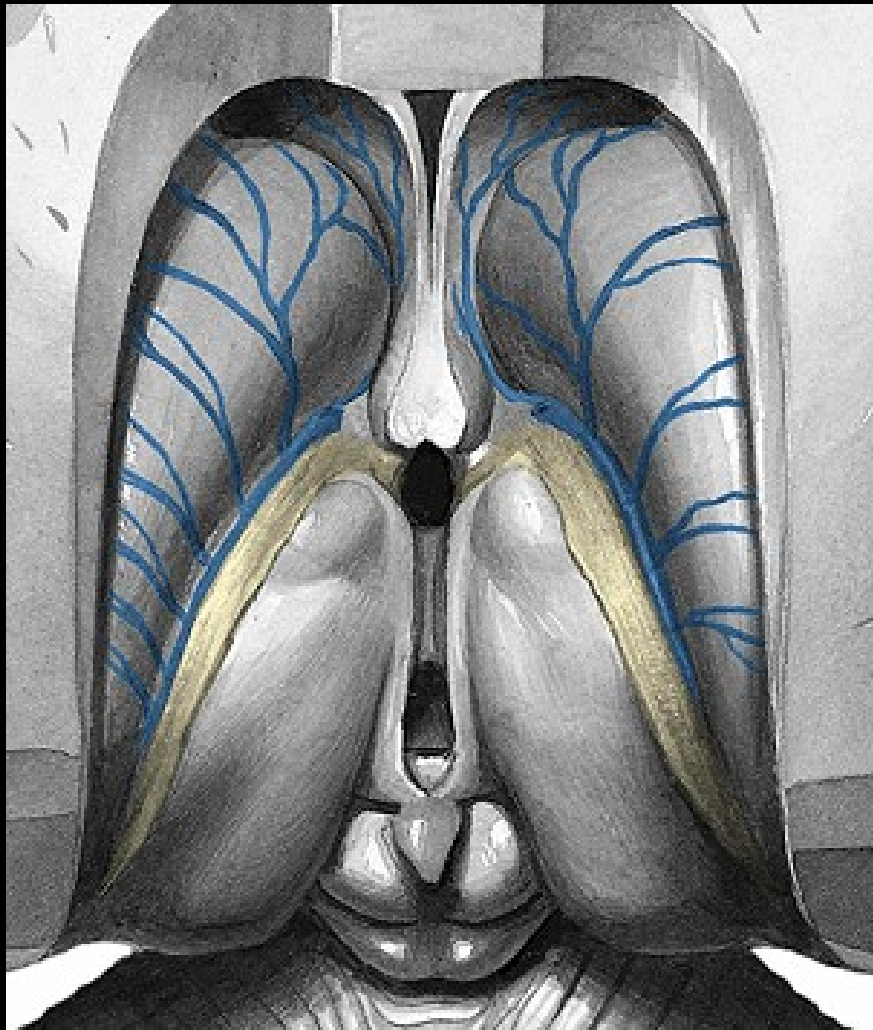
**Dyssynergia** incoordination

**Adiadochokinesia** inability to perform rapid alternating movements



## **DIENCEPHALON**

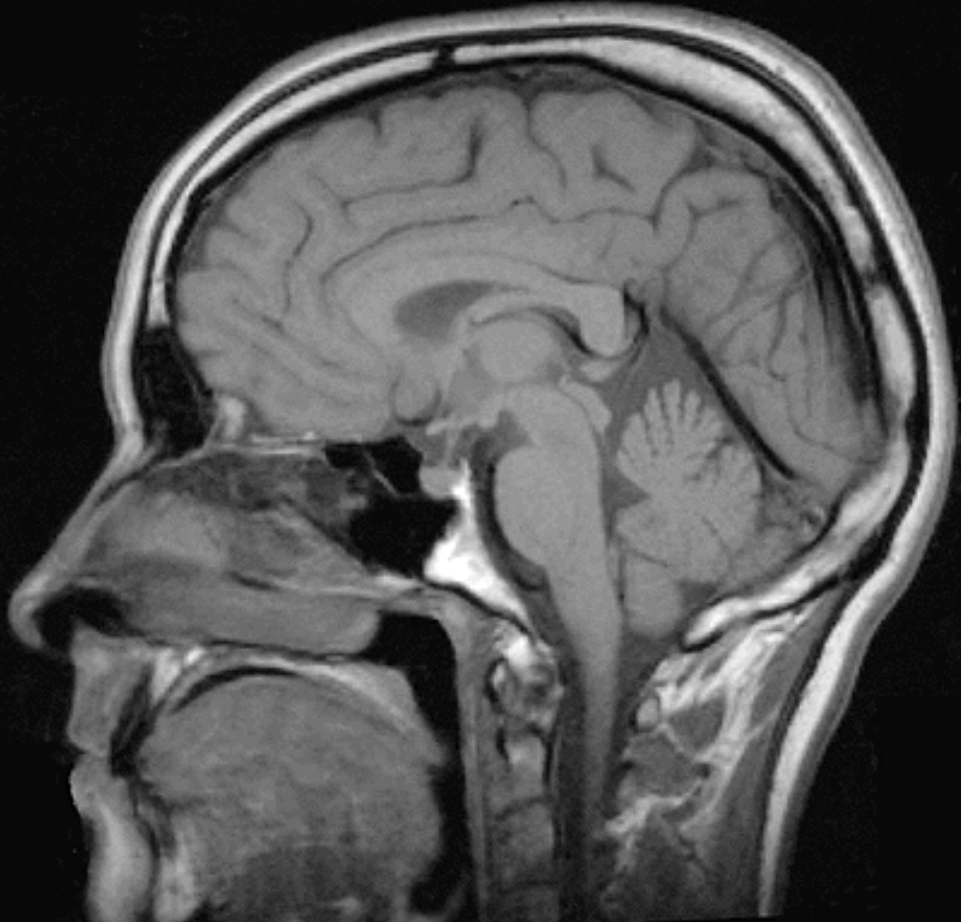
- **thalamus**  
**(metathalamus)**
- **epithalamus**
- **subthalamus**
- **hypothalamus**



## Thalamus

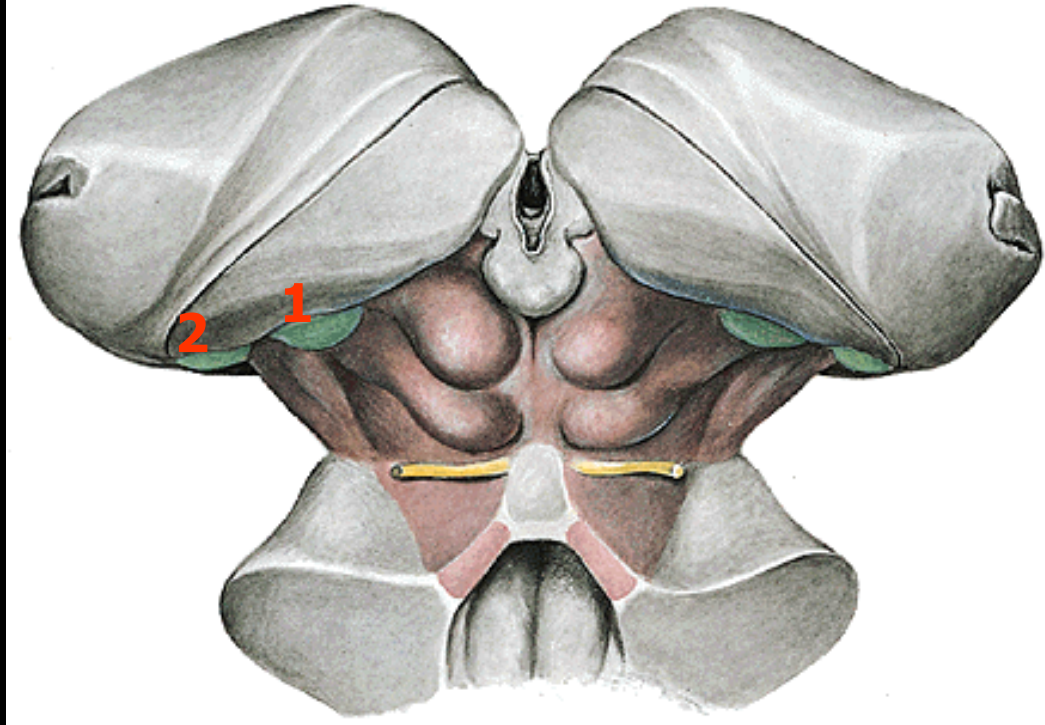
- tuberculum ant.
- pulvinar
- stria medullaris  
(tela choroidea ventr. III.)
- taenia choroidea  
(tela choroidea ventr. lat.)
- lamina affixa thalami
- stria terminalis





**Fissura transversa cerebri**

# Metathalamus

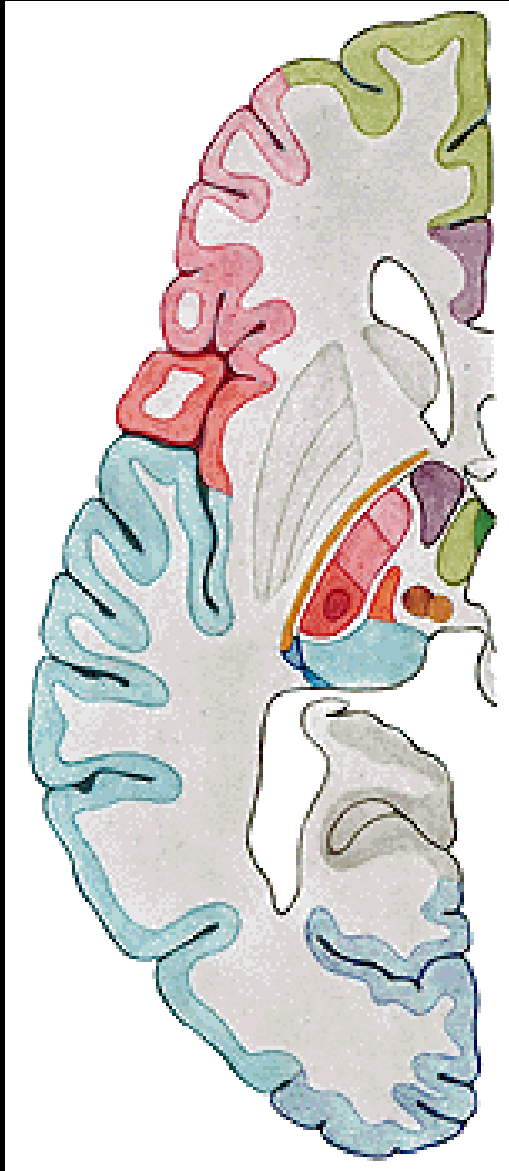


**1 corp. geniculatum med.**

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.

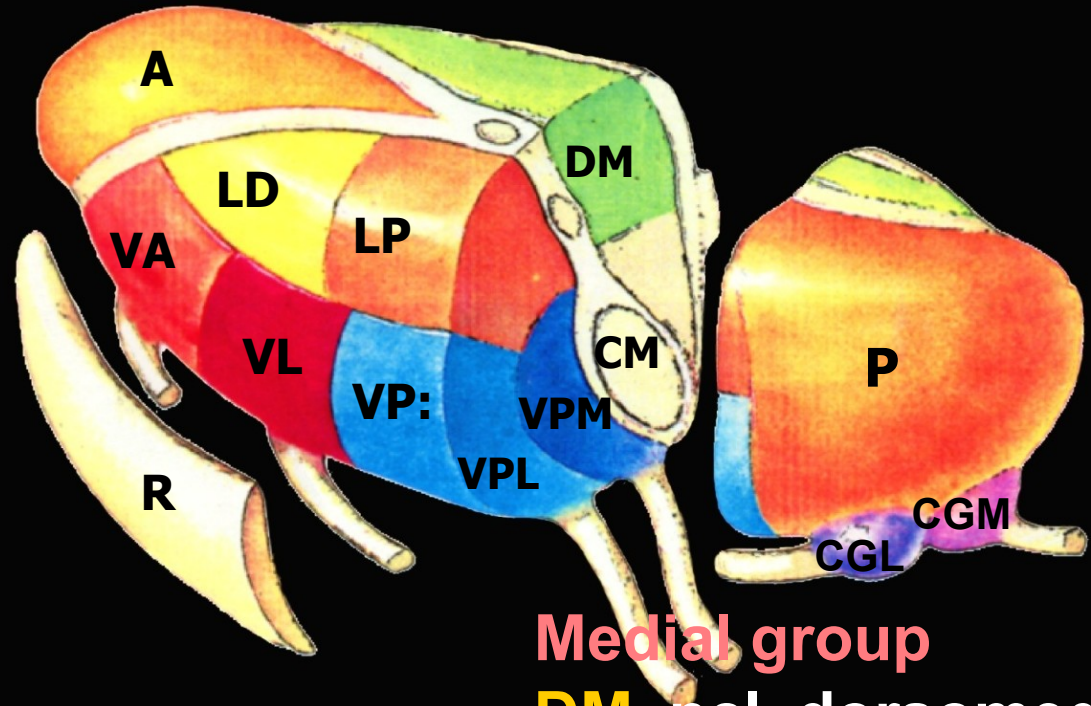
**VP** ncl. ventr. post.:

**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.

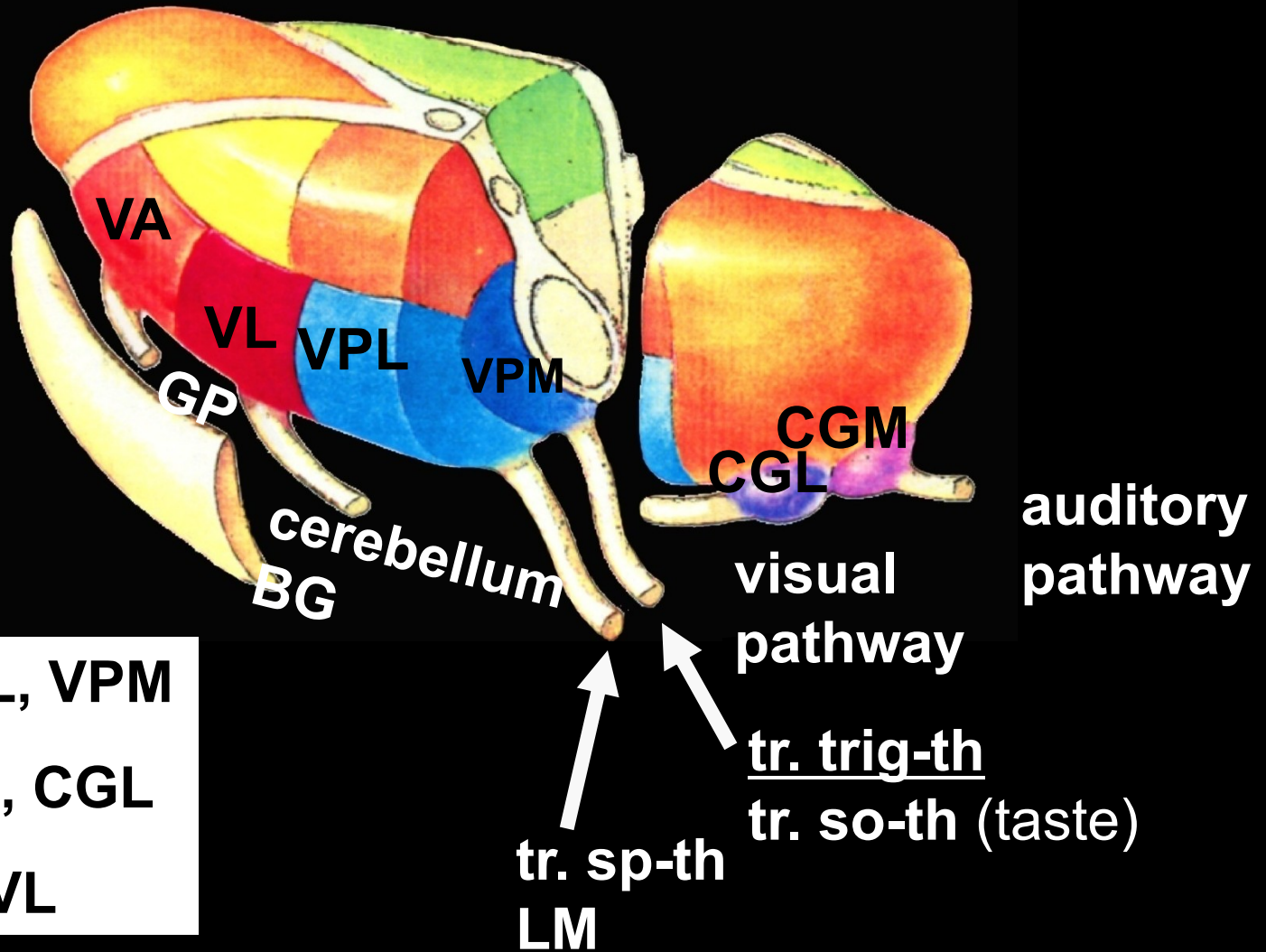
**R** ncll. reticulares



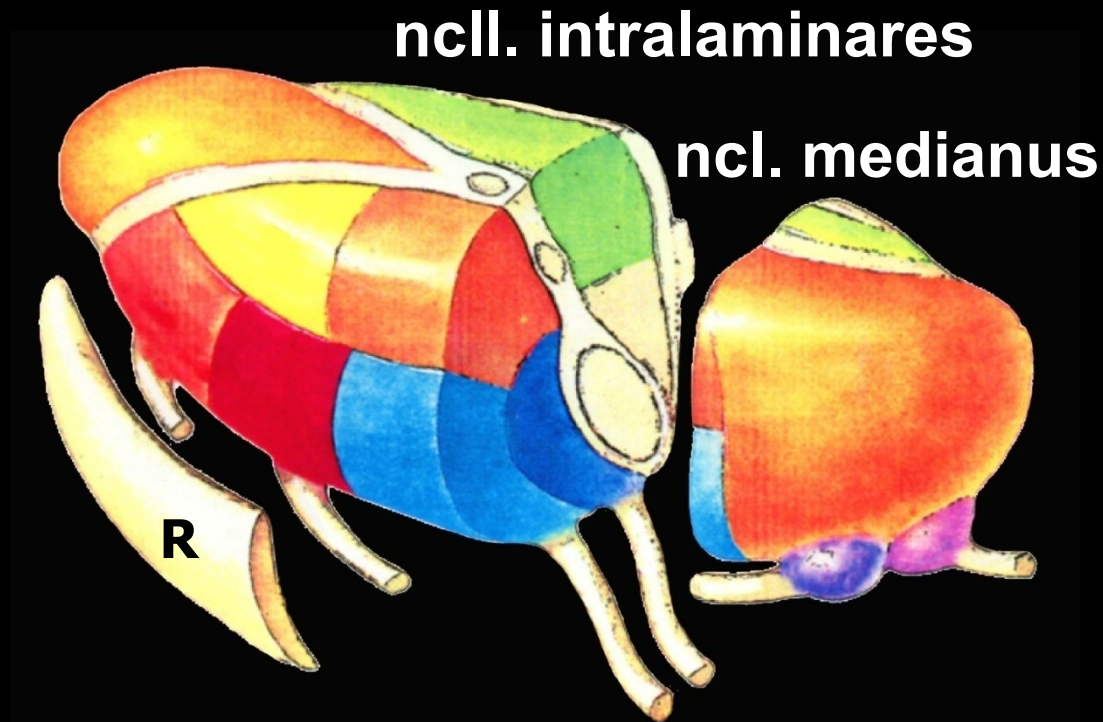
# Functional groups of nuclei

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

# Specific nuclei



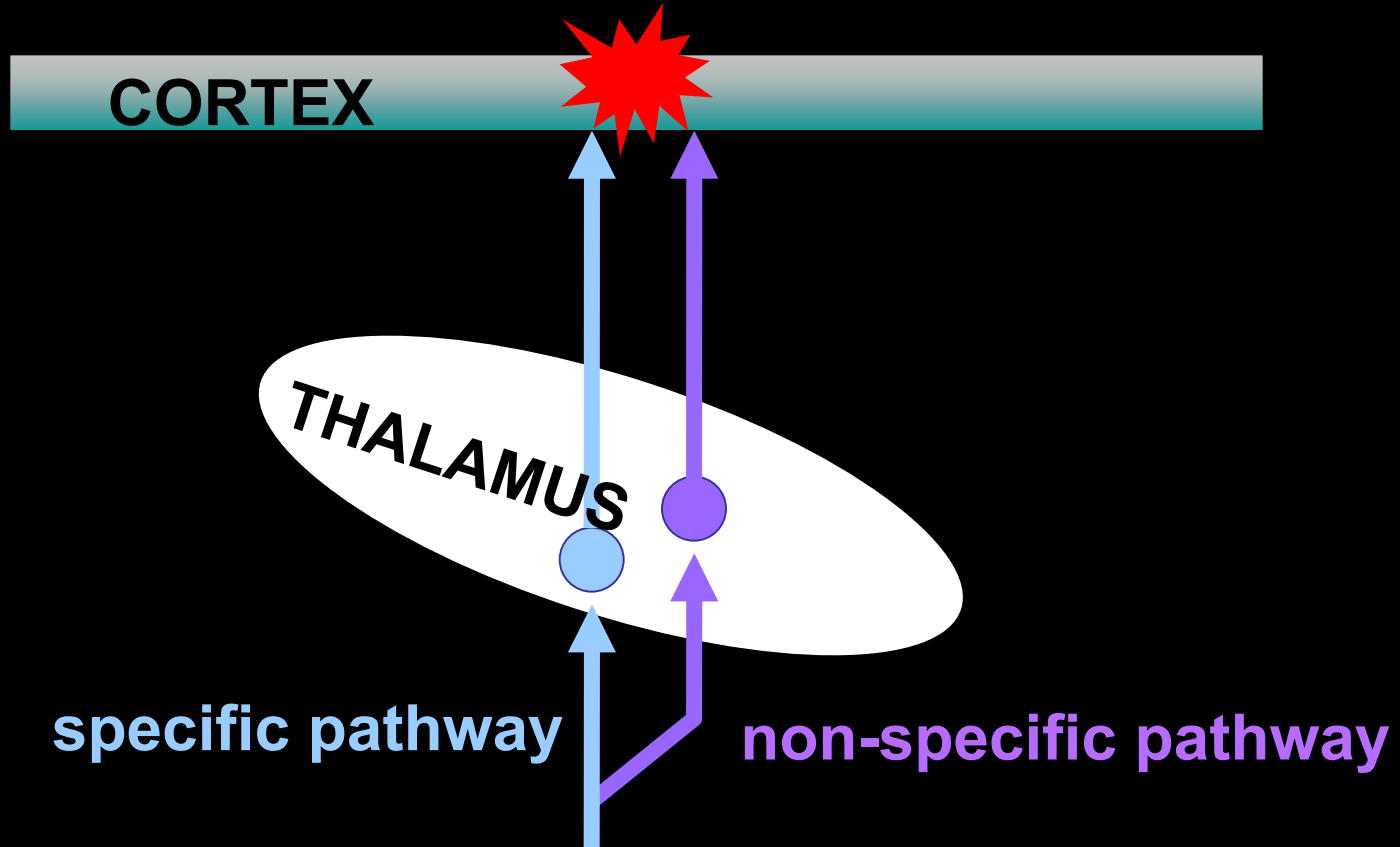
# Non-specific nuclei



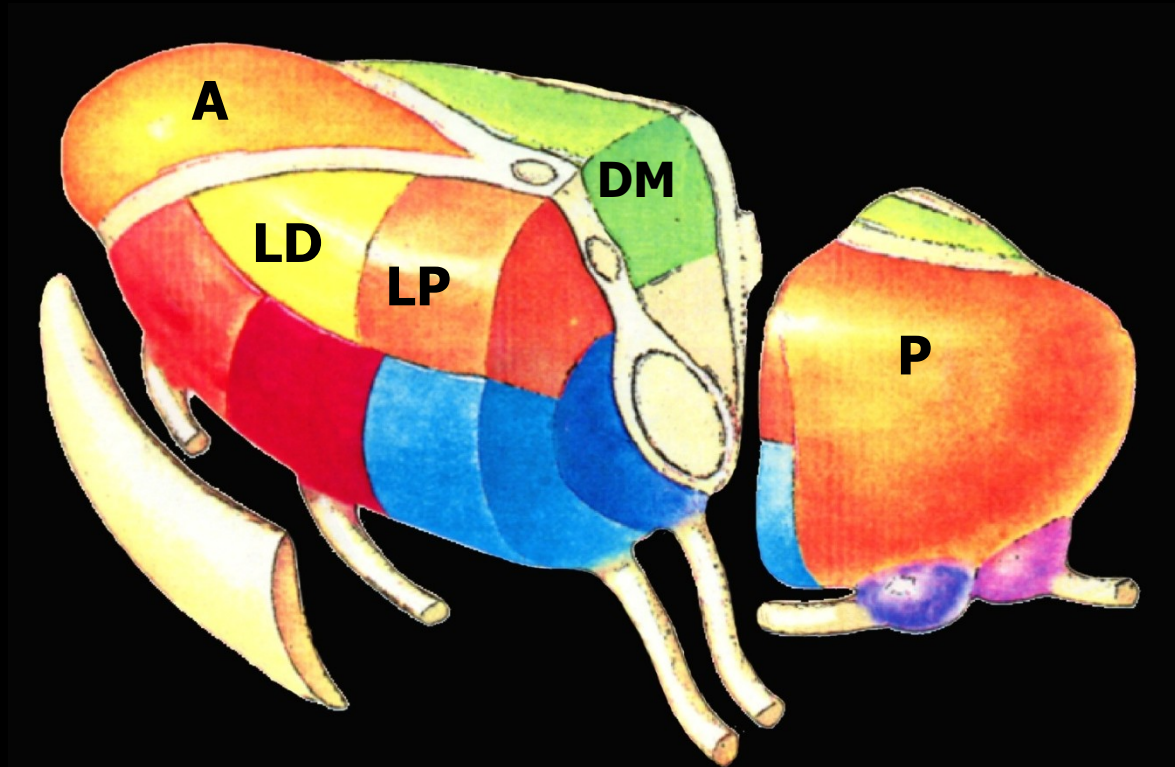
→ from FR of the brainstem and other thalamic nuclei

← to BG, thalamus, cortex (ARAS)

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



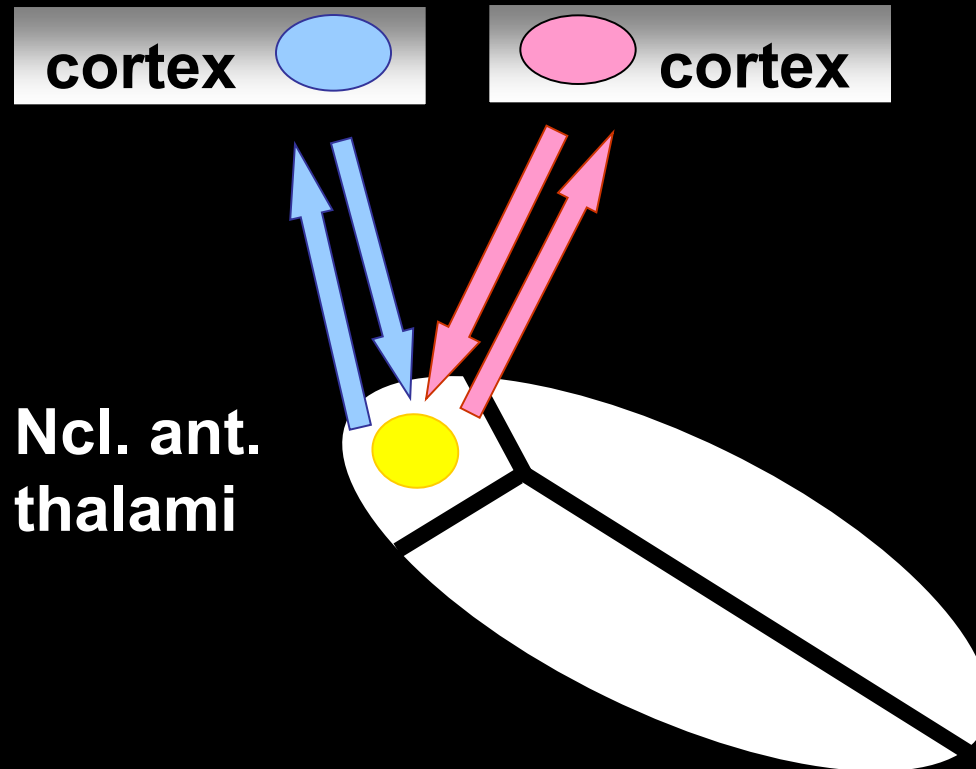
# Association nuclei



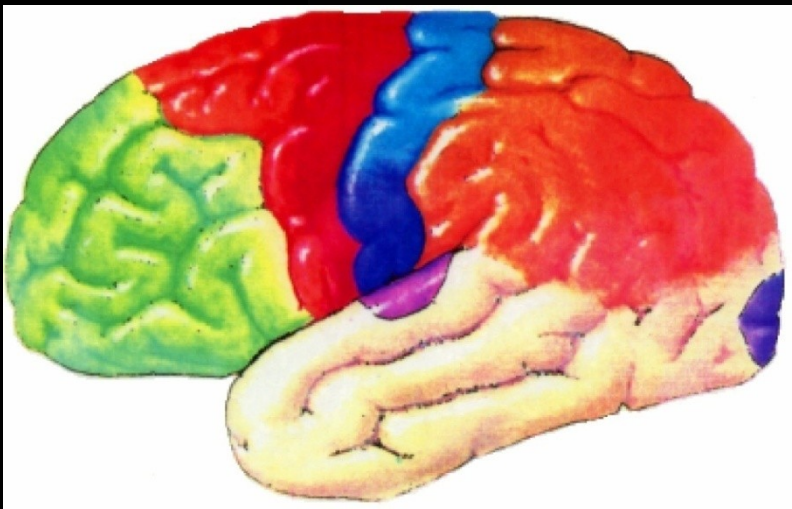
- integration of GSA a SA inputs  $\Rightarrow$  to cortex
- reciprocal connections with the association cortex

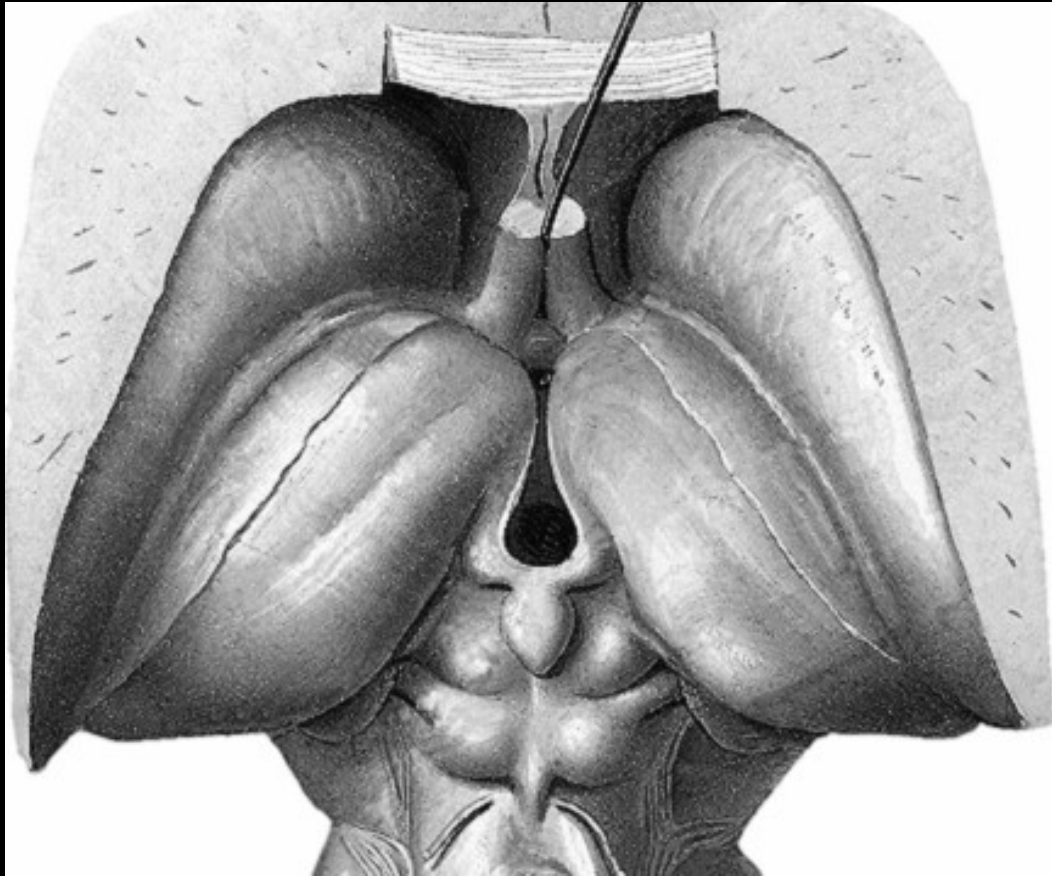


# Function of association nuclei



**Interconnection of association areas of the cortex**

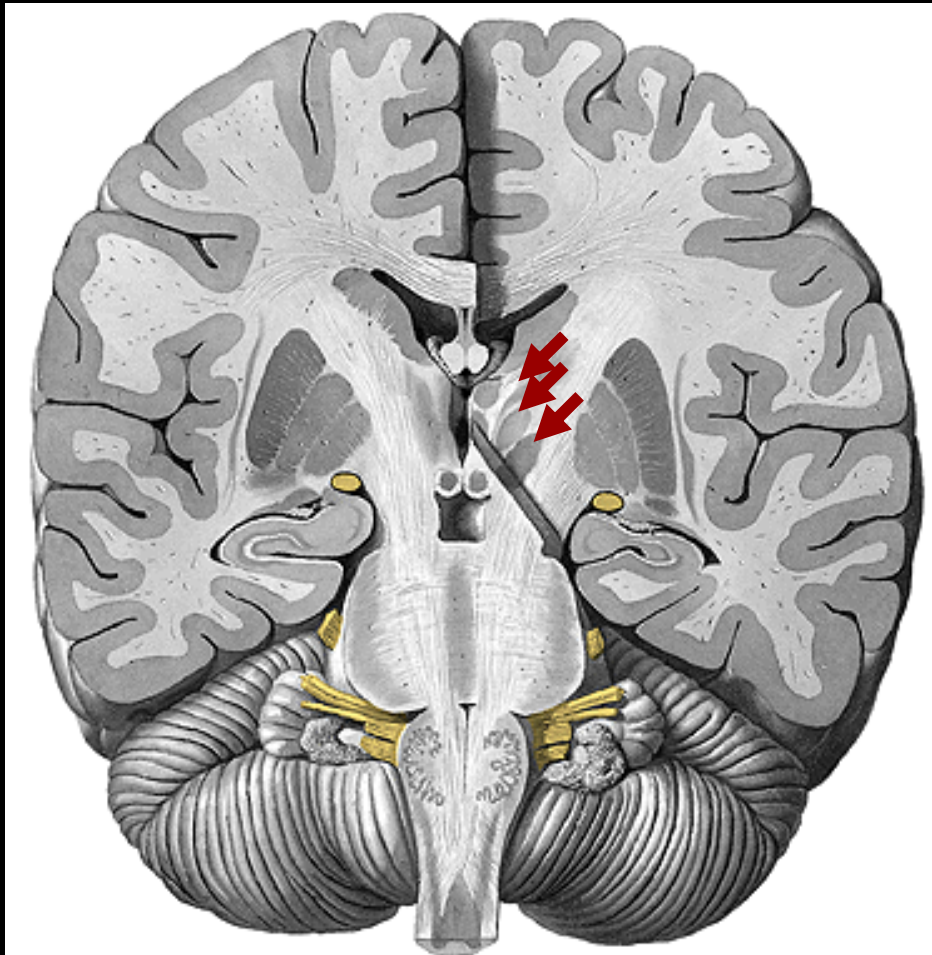




## Epithalamus

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

# Subthalamus



## Grey matter

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

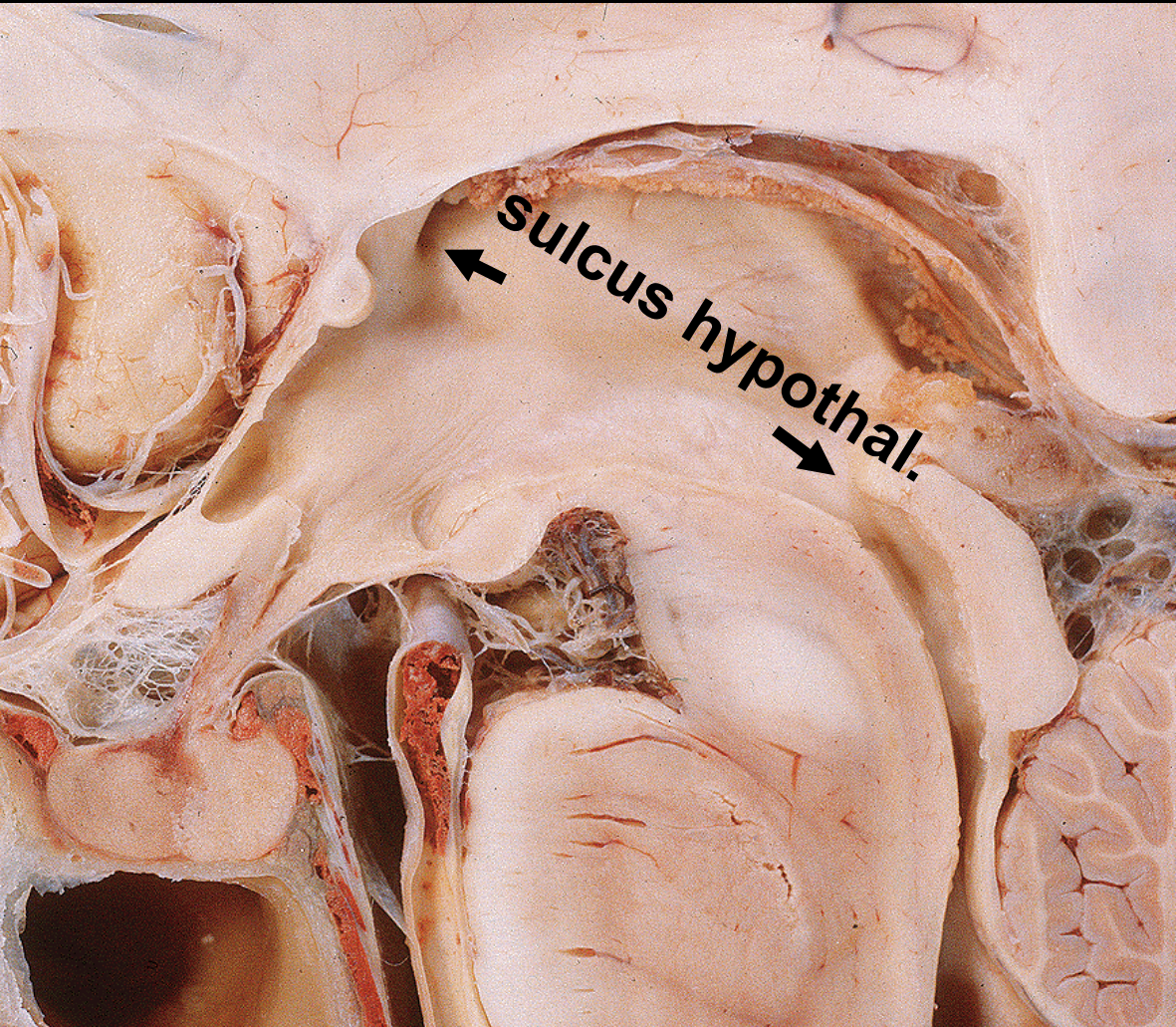
## White matter

- Fasc. thalamicus
- Fasc. lenticularis
- Ansa lenticularis
- Fasc. subthalamicus

**Involved in motor circuits**



# Hypothalamus



**Corp. mamillaria**

**Infundibulum**

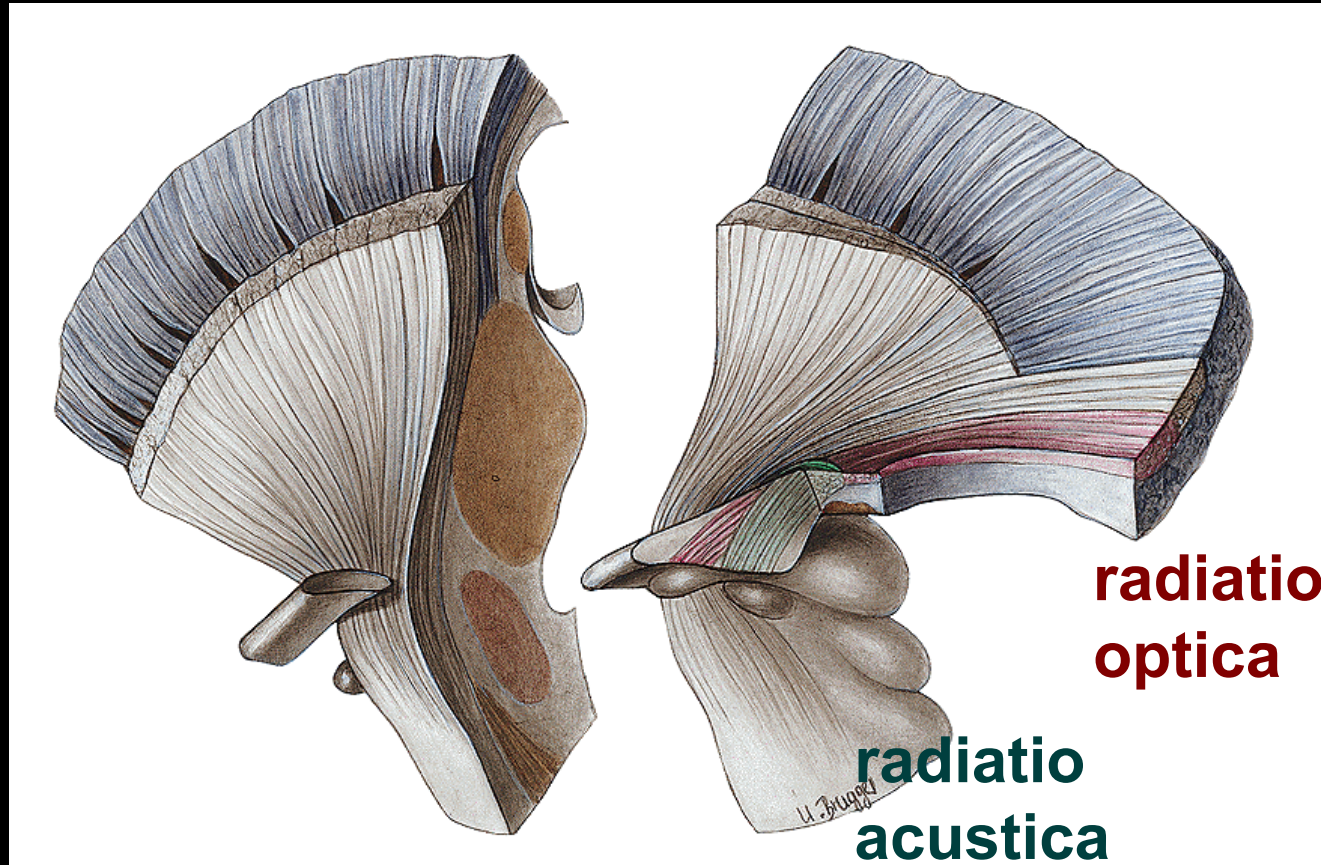
**Tuber cinereum**

**Hypophysis cerebri**





# Thalamic connections



# Hypothalamus



## Hypothalamus

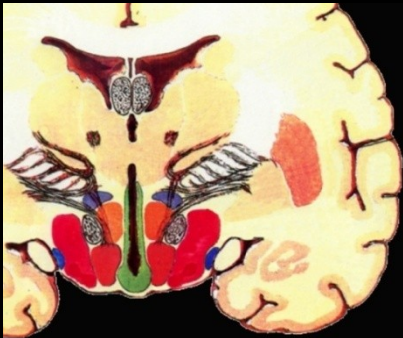
control of:

- ANS
- endocrine system

Function of the hypothalamus is related to:

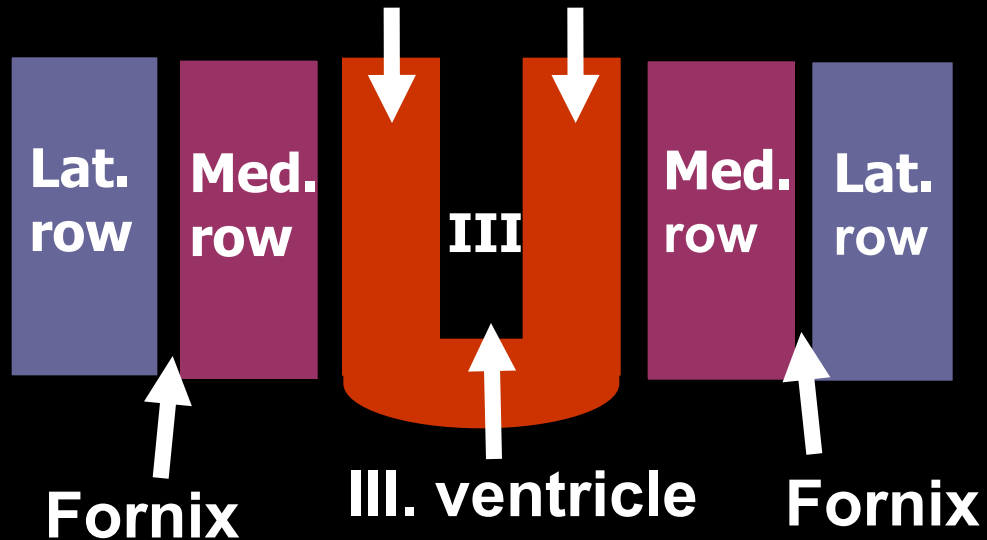
- control of vital functions that maintain **homeostasis**
- control of emotions



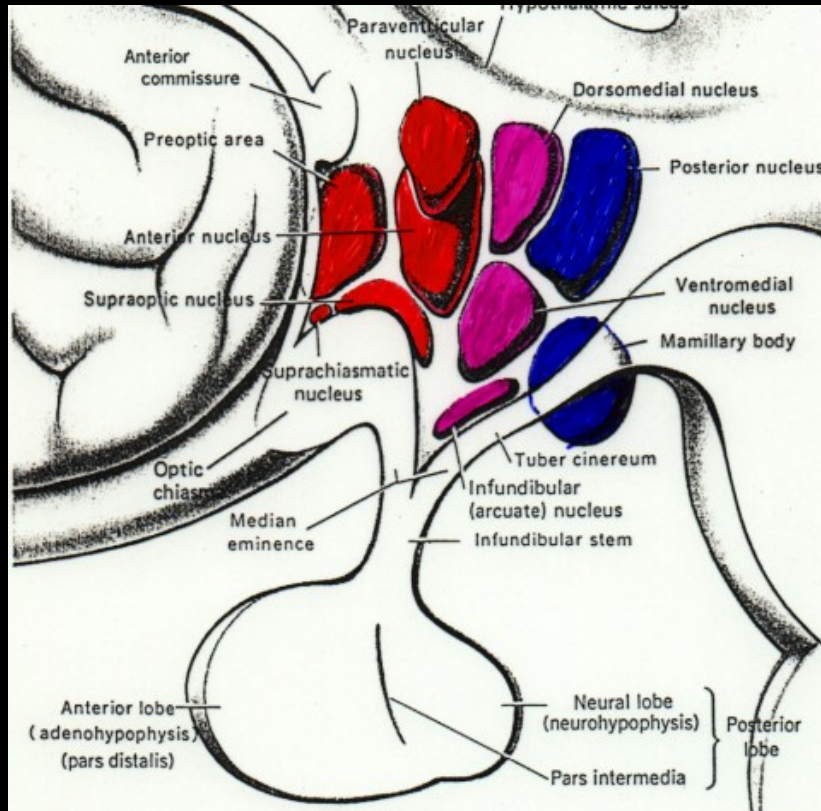


## Hypothalamic nuclei at the frontal section

### Periventricular row



ant. middle post.



## Hypothalamic nuclei

- sagittal section

### Anterior nuclei

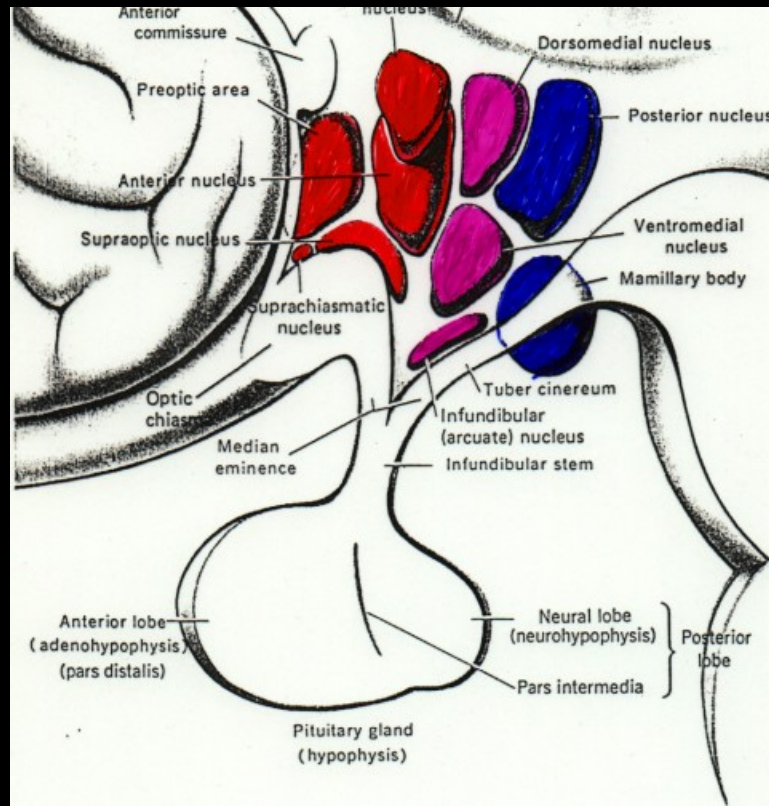
Periventricular row:

ncl. suprachiasmatic.

Medial row:

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

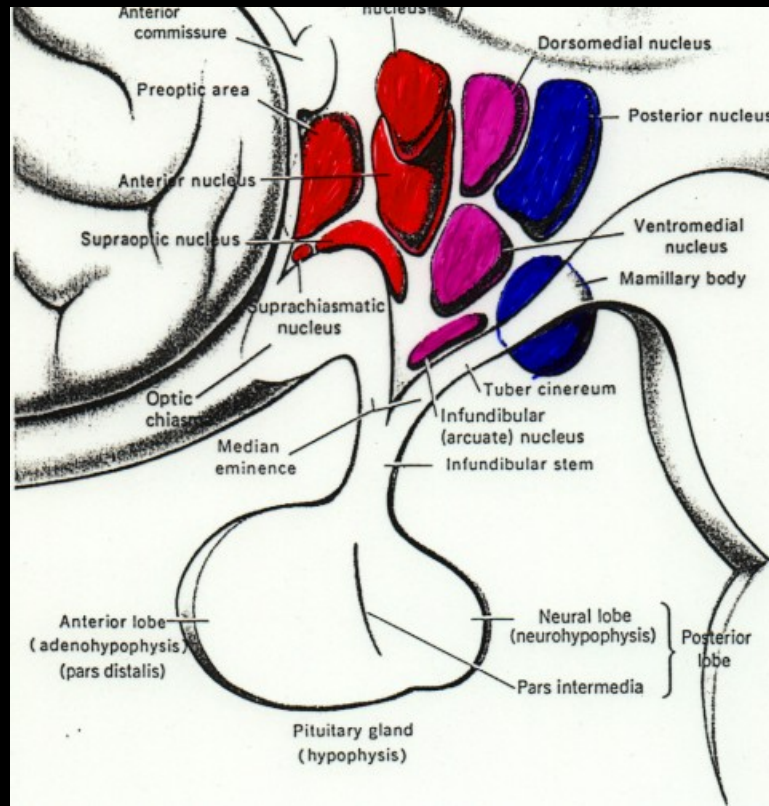




## Middle nuclei

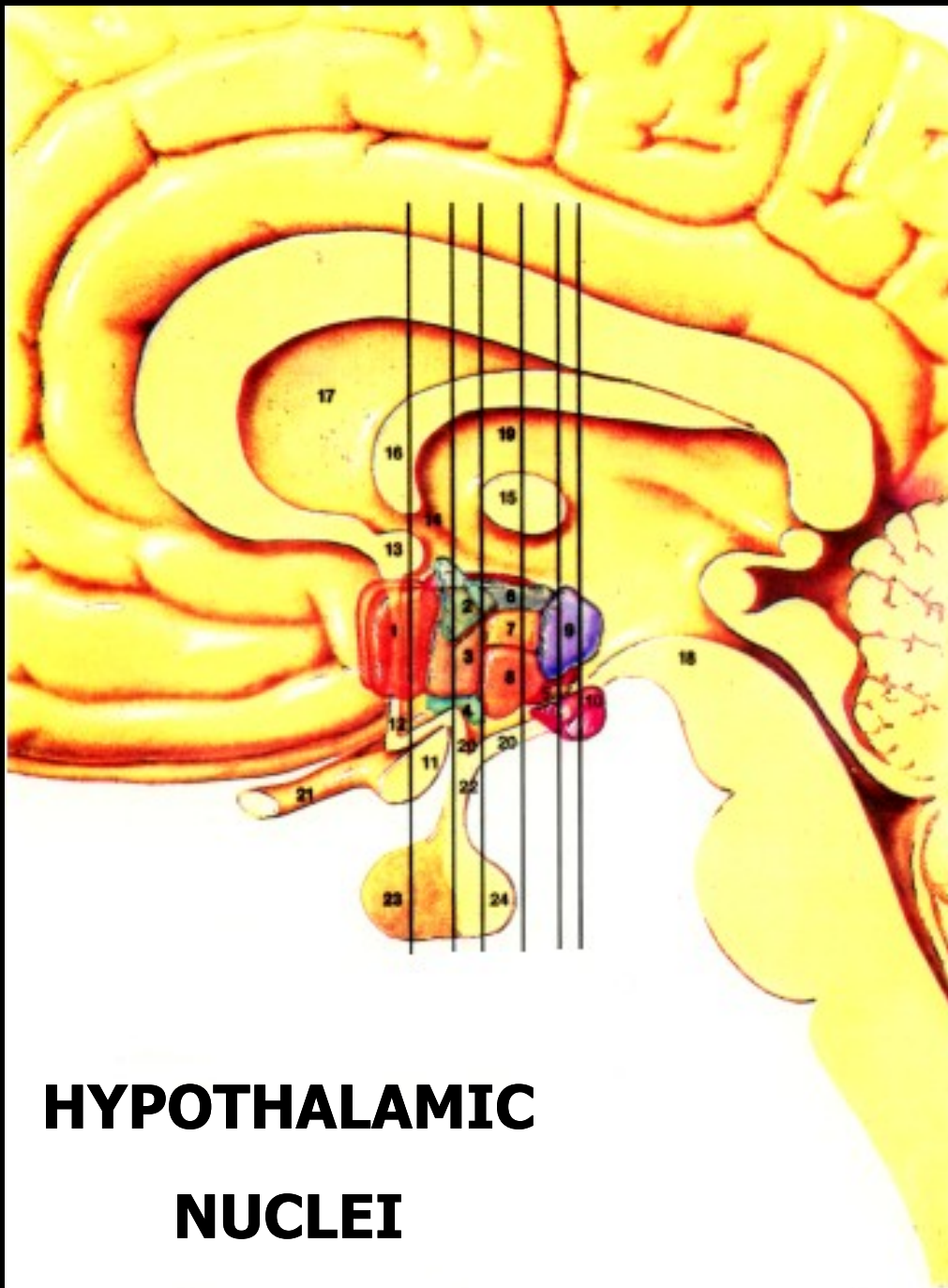
Periventricular row: **ncl. arcuatus**

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



## Posterior nuclei

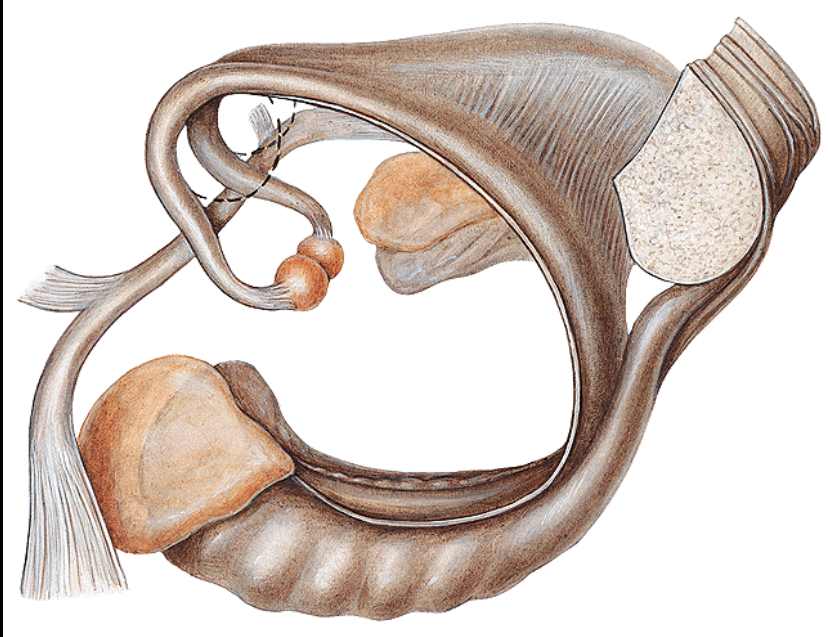
Periventricular + med. rows: **ncl. post. et ncl. mamillaris**



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.

## **HYPOTHALAMIC NUCLEI**

# White matter of the diencephalon



**Fornix**

**Stria medullaris**

**Stria terminalis**

**FLD**





# Hypophysis cerebri



Lobus ant.  
**adenohypophysis**

Pars intermedia

Lobus post.  
**neurohypophysis**  
(eminencia mediana  
infundibular stalk  
lobus post.)



# Adenohypophysis

Secretion of hormones:

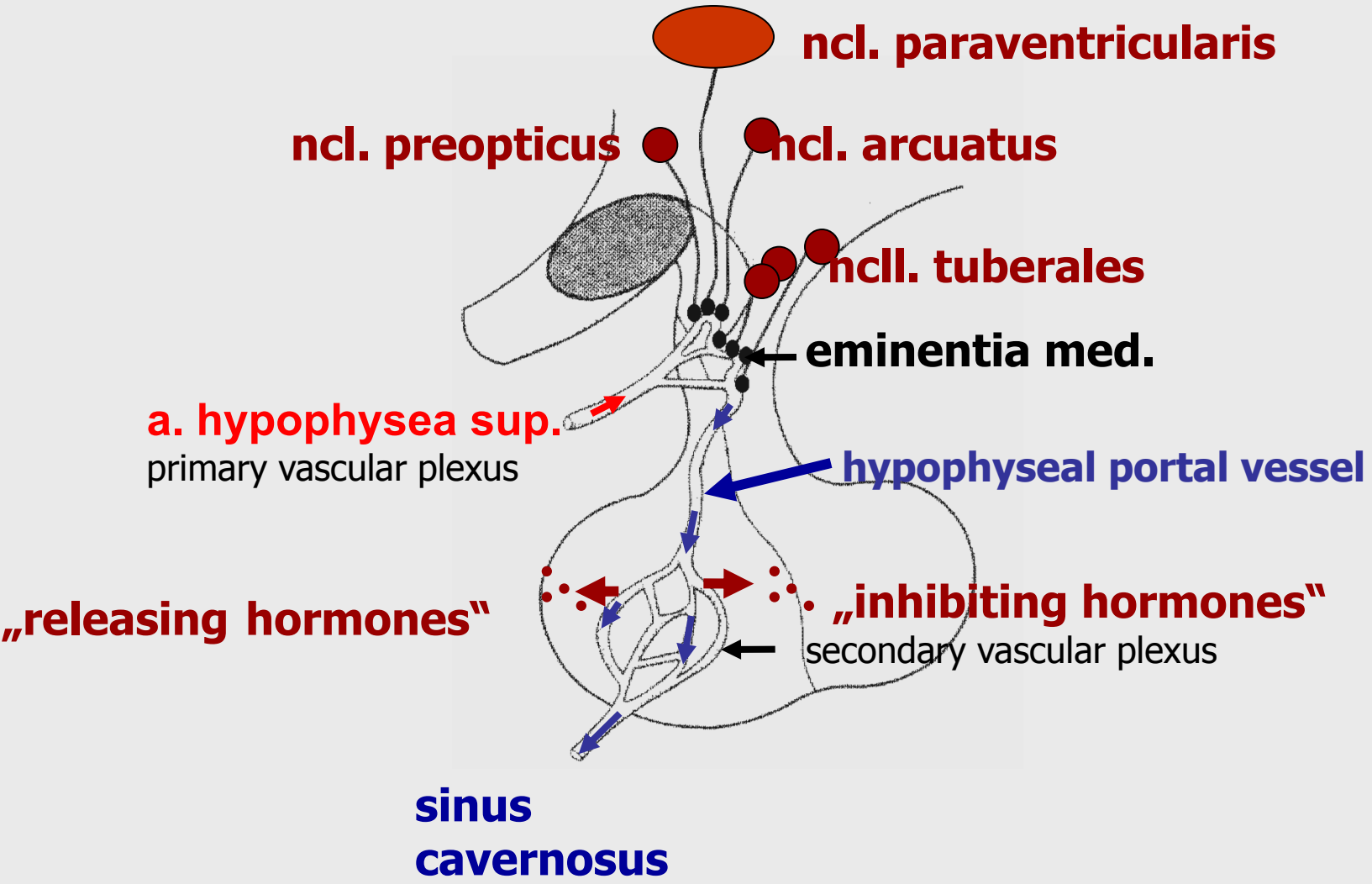
**Thyrotropin**

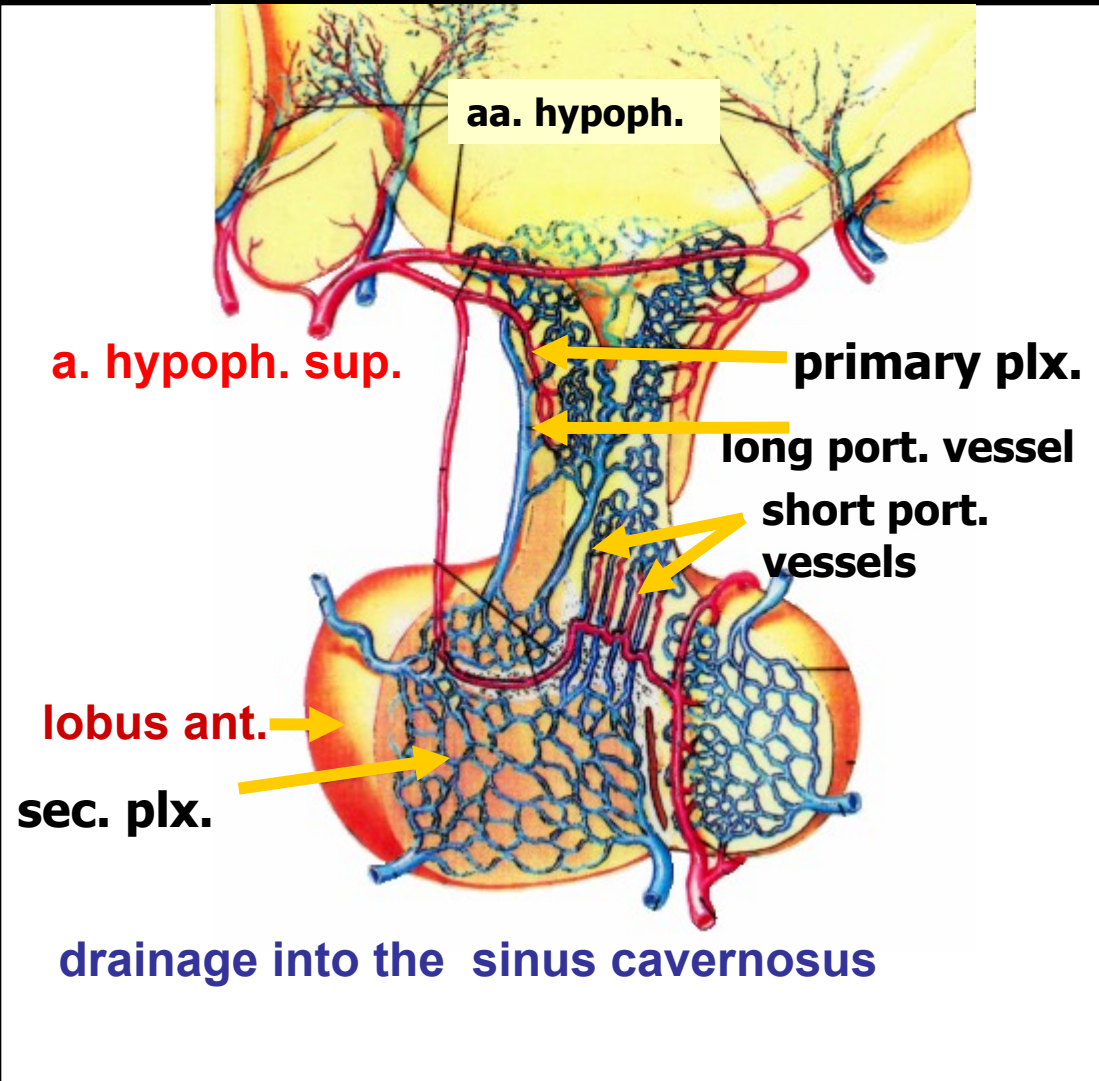
**Gonadotropic**

**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**





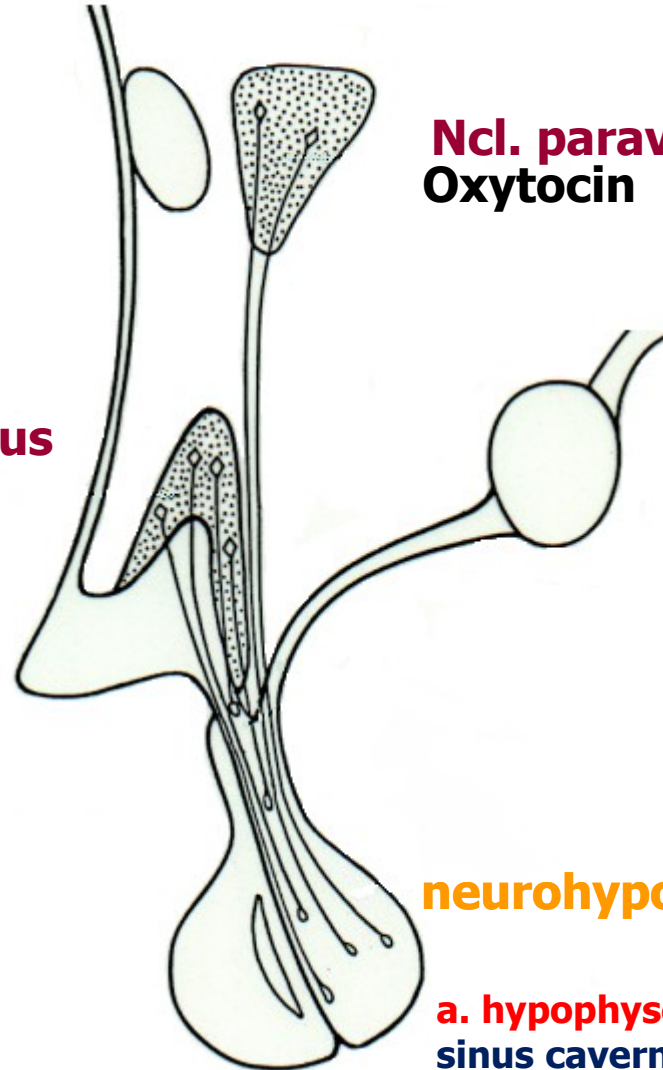
# Neurohypophysis

- 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**



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**