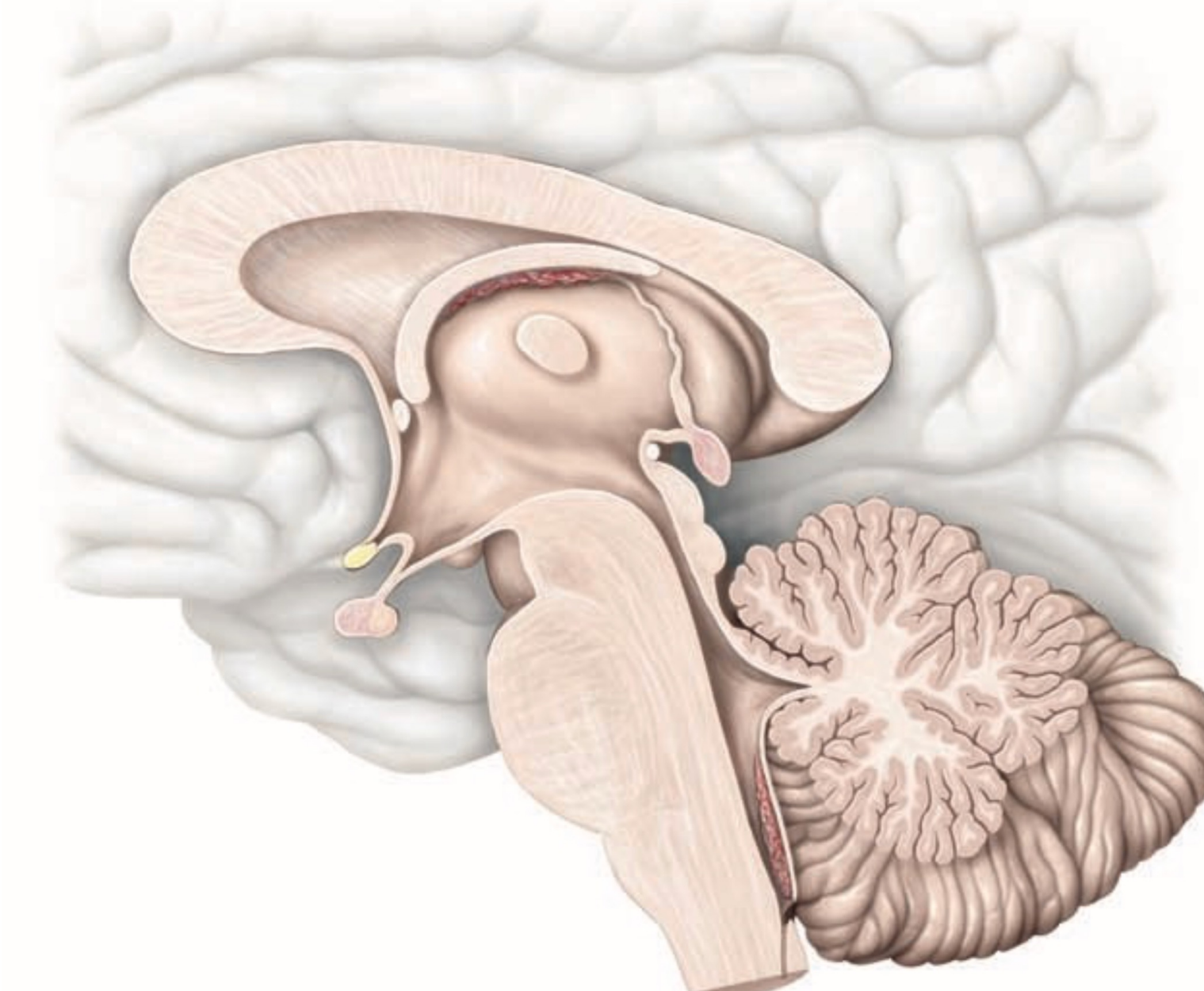
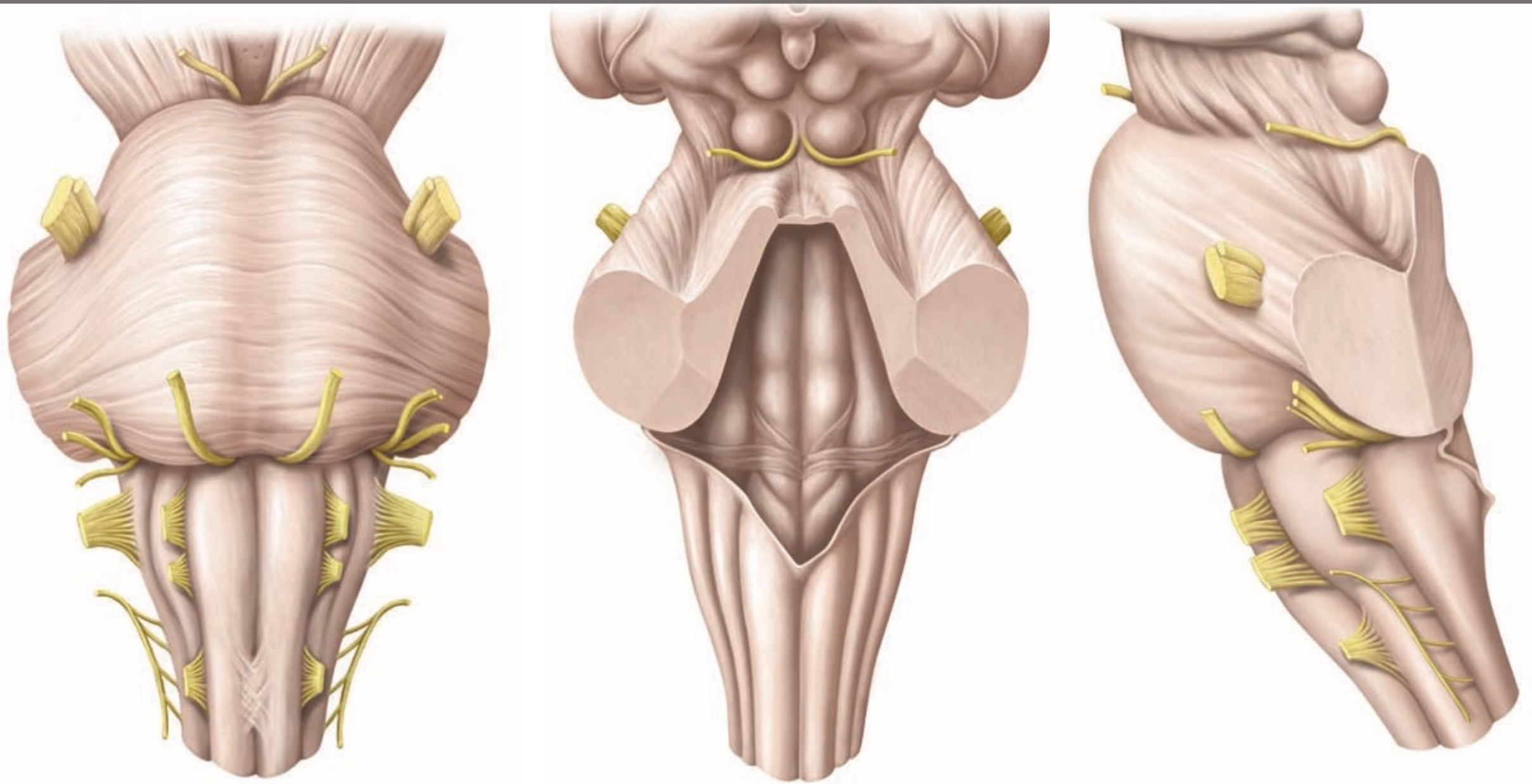
Neuroanatomy – diencephalon and basal ganglia

Brain stem

- Medulla oblongata
- Pons Varoli
- Mesencefalon

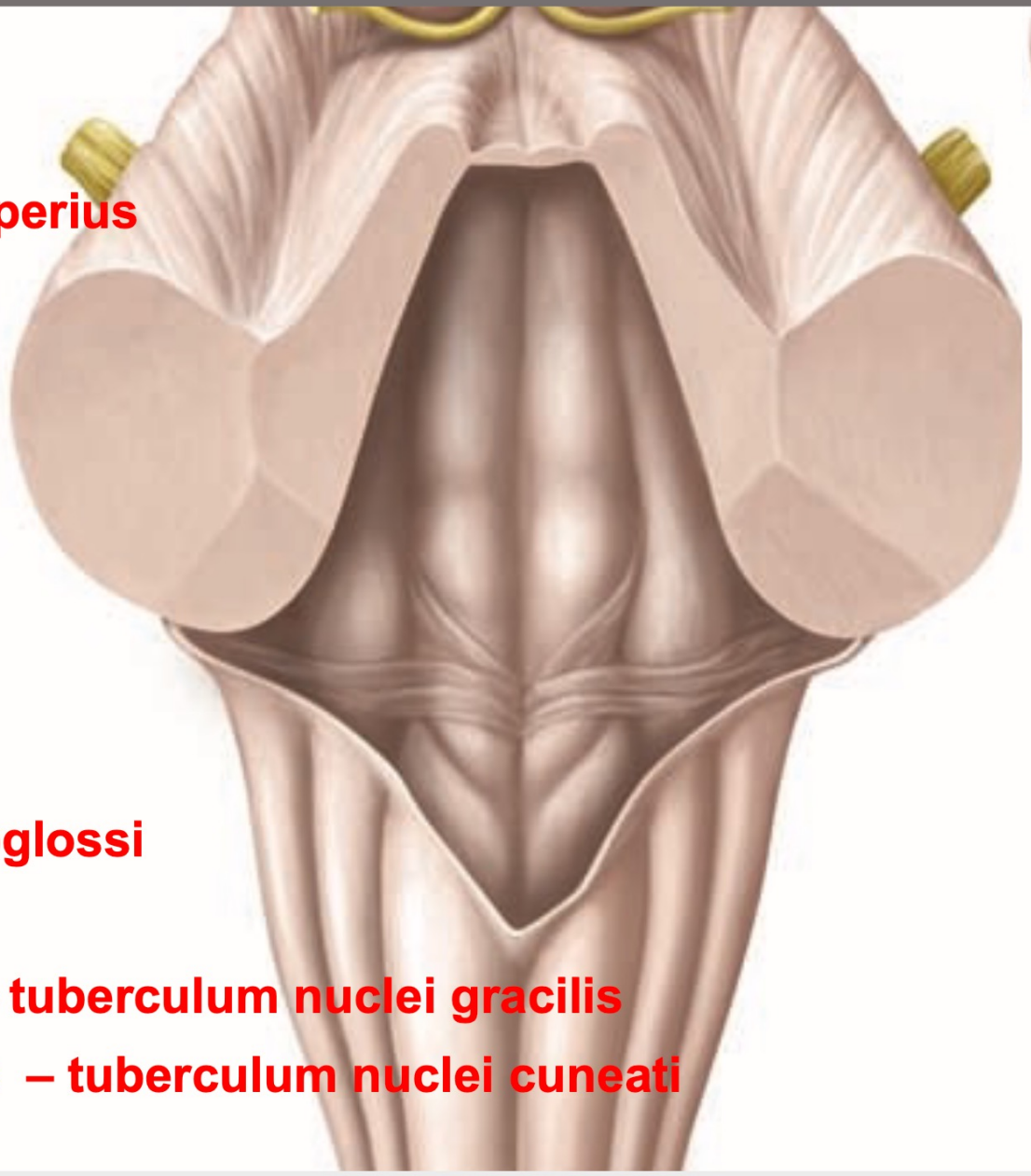


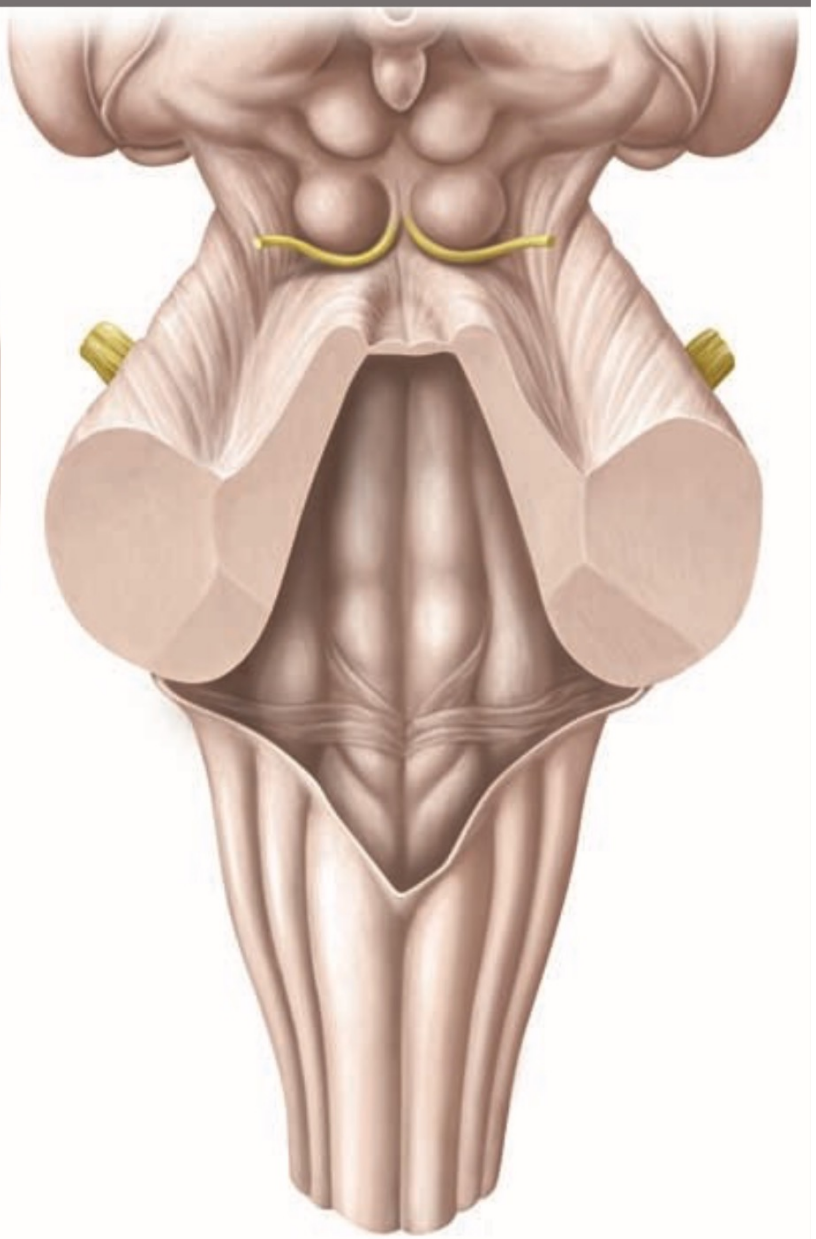
mozkový kmen – brain stem



Medulla oblongata

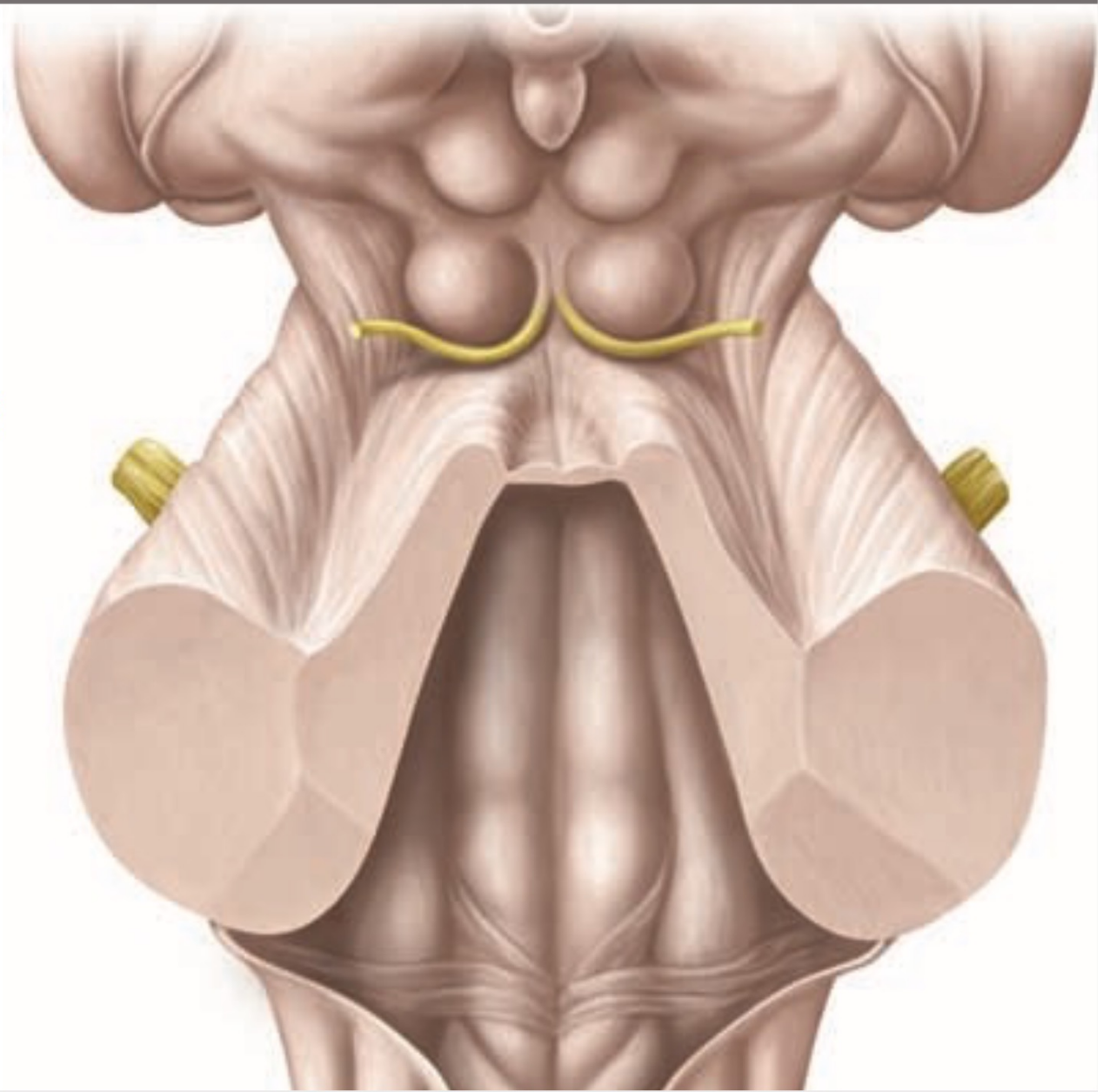
- Fossa rhomboidea
- Pedunculi cerebelli
- Vellum medullare superius
- Taenia cinerea
- Sulcus medianus
- Eminentia mediana
- Sulcus limitans
- Striae medullares
- Colliculus facialis
- Area vestibularis
- Trigonum nervi hypoglossi
- Trigonum nervi vagi
- Fasciculus gracilis – tuberculum nuclei gracilis
- Fasciculus cuneatus – tuberculum nuclei cuneati





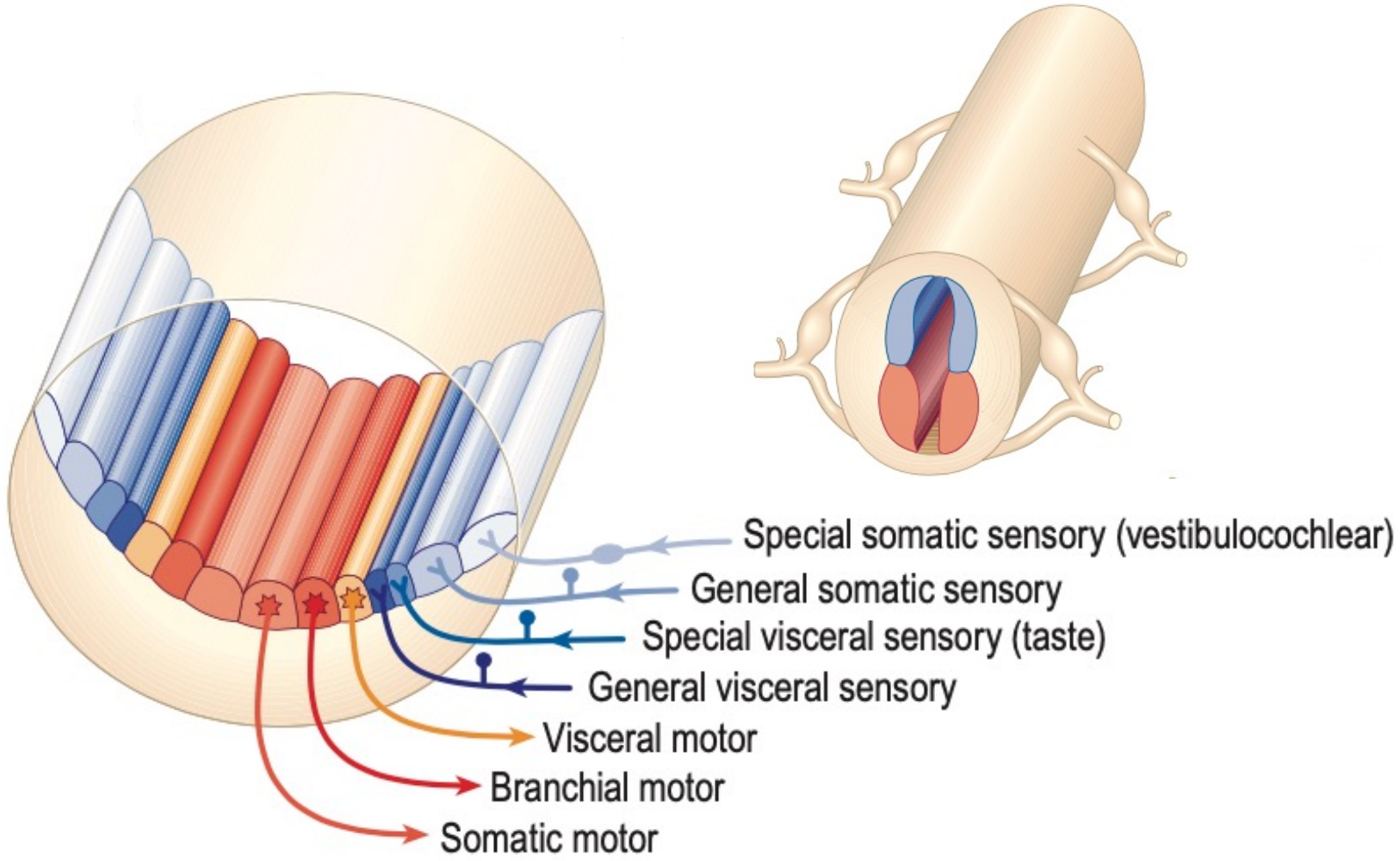
Pons Varoli et mesencefalon

- Pedunculus cerebelli inferior
- Pedunculus cerebelli medius
- Pedunculus cerebelli superior
- Vellum medullare superius
- Frenulum velli
- Lamina qudrigeminalis (tectum mesencephali)
- Colliculus inferior
- Brachium colliculi inferioris
- Colliculus superior
- Brachium colliculi inferioris
- Nervus trochlearis (N. IV)



Brain stem – medulla oblongata

- **Basal plate**
  - *Somatomotor nuclei*
  - *Branchiomotor nuclei*
  - *Visceromotor nuclei*
- **Alar plate**
  - *Viscerosensoric nuclei*
  - *Gustatoric nuclei*
  - *Somatosensoric nuclei*
  - *Special sensoric nuclei*



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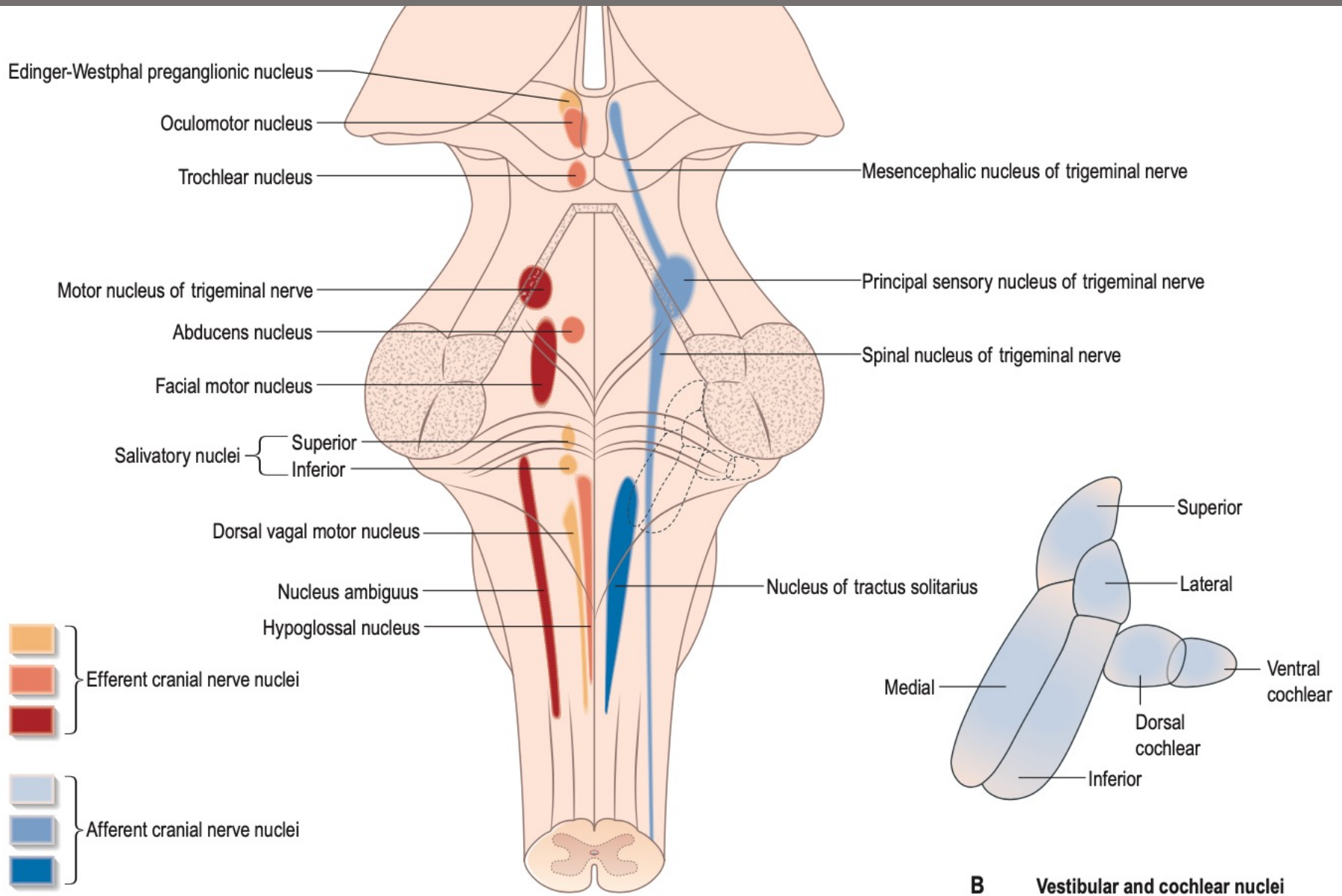
Arangement of nuclei in brain stem



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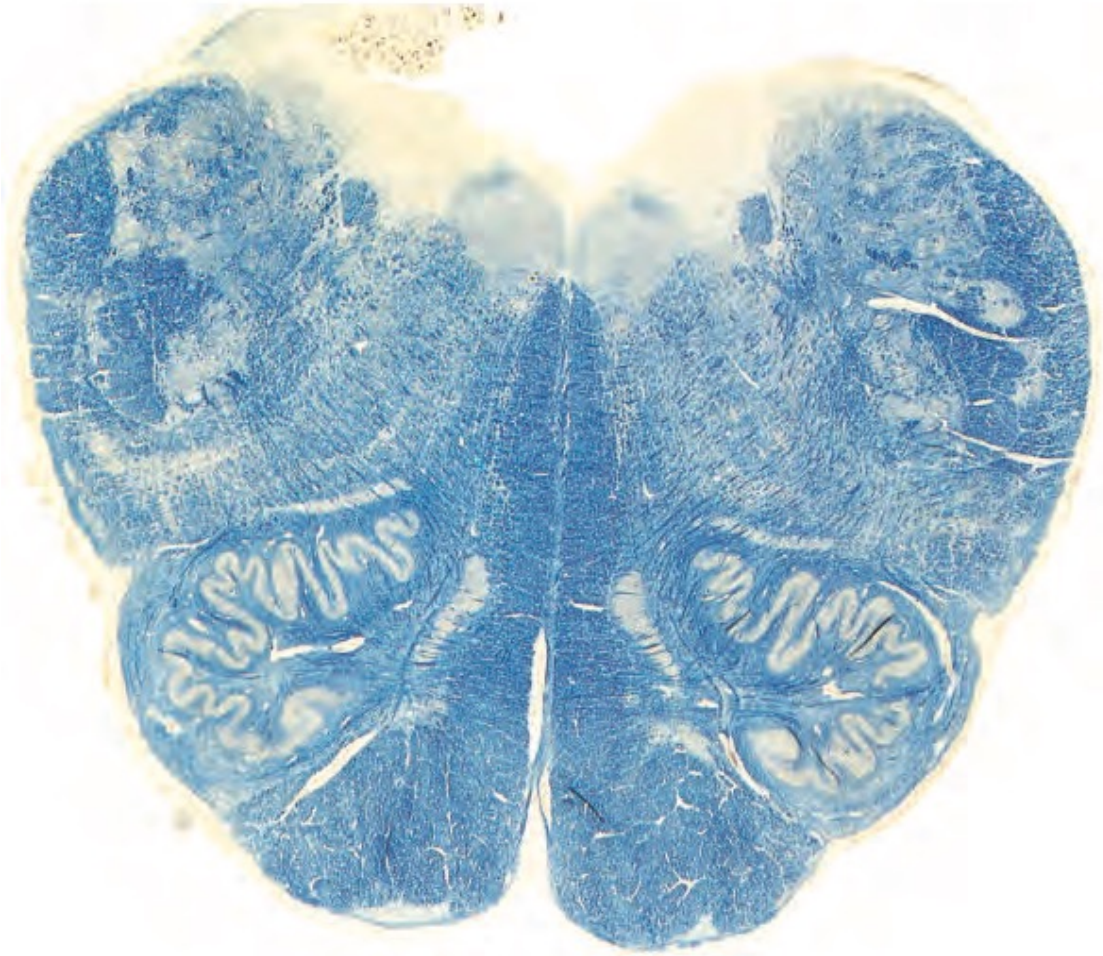
Specific nuclei

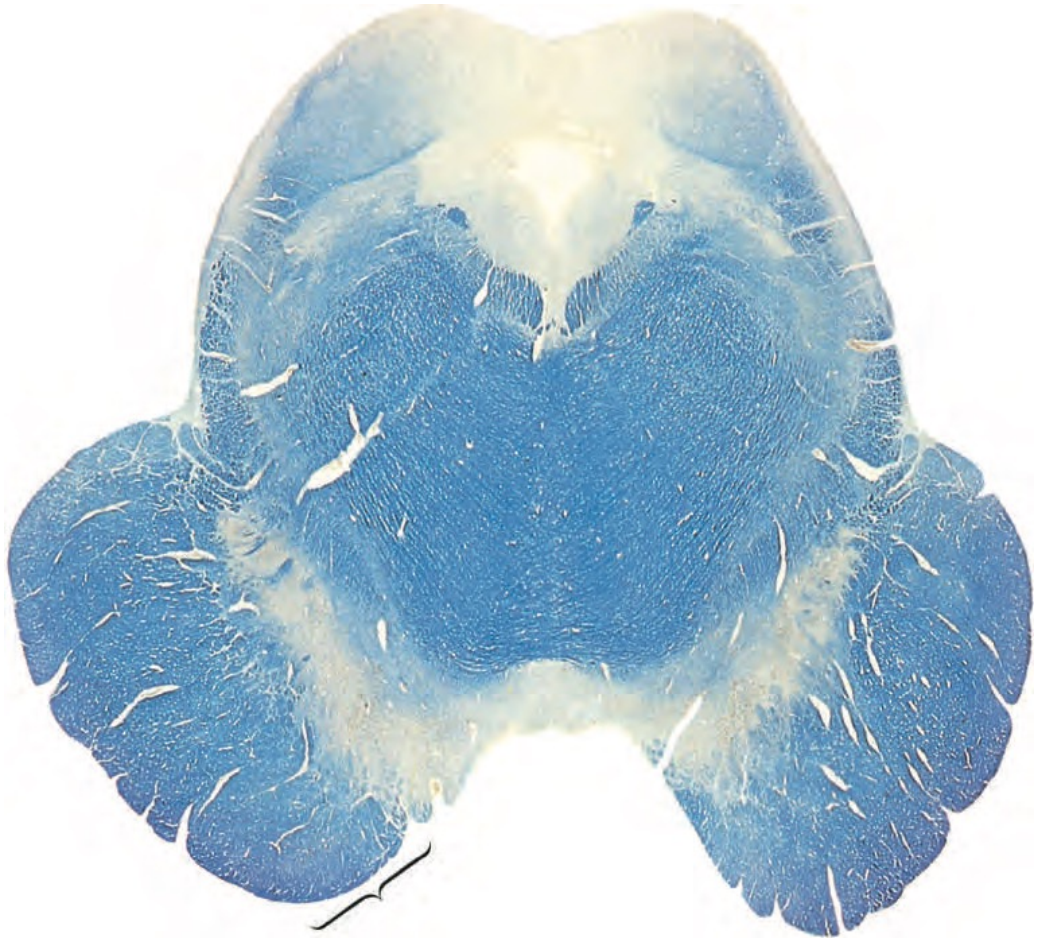
- Nucleus gracilis a nucleus cuneatus
- Nuclei olivares

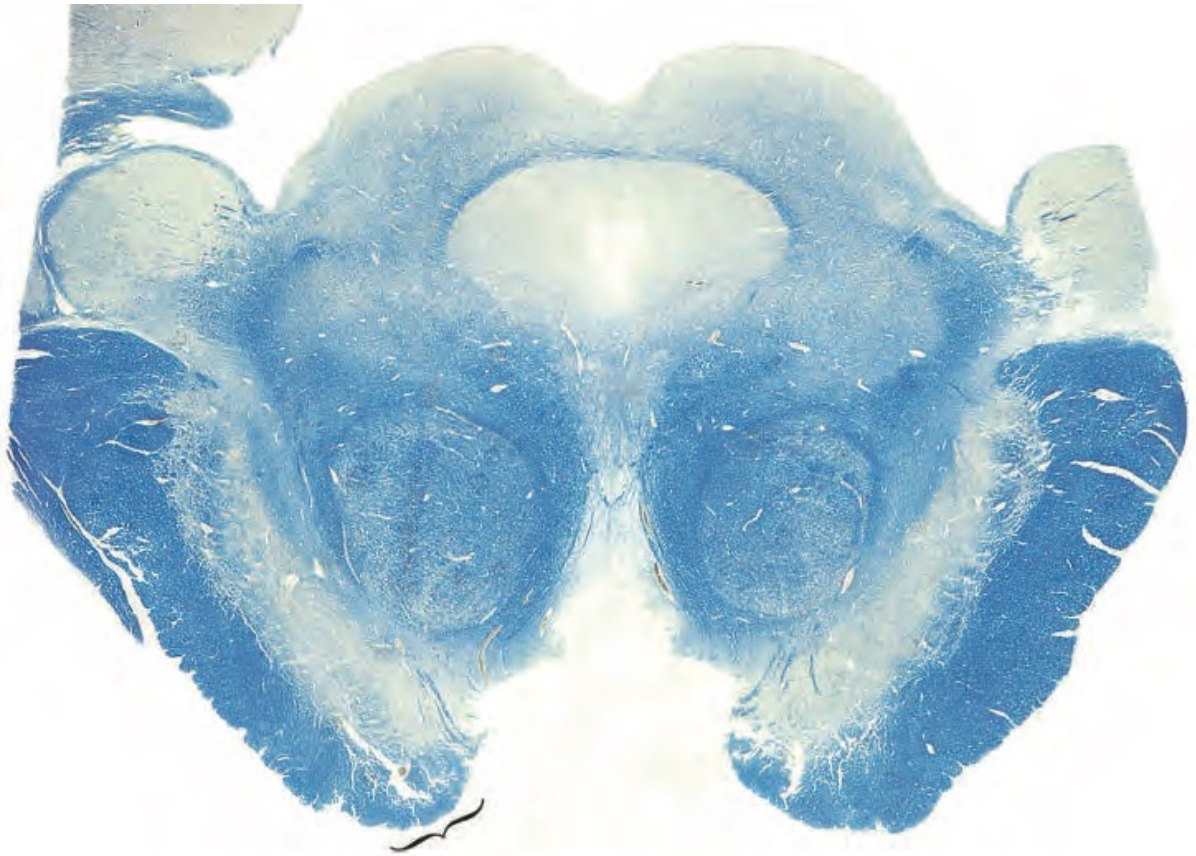


Tectum - tegmentum

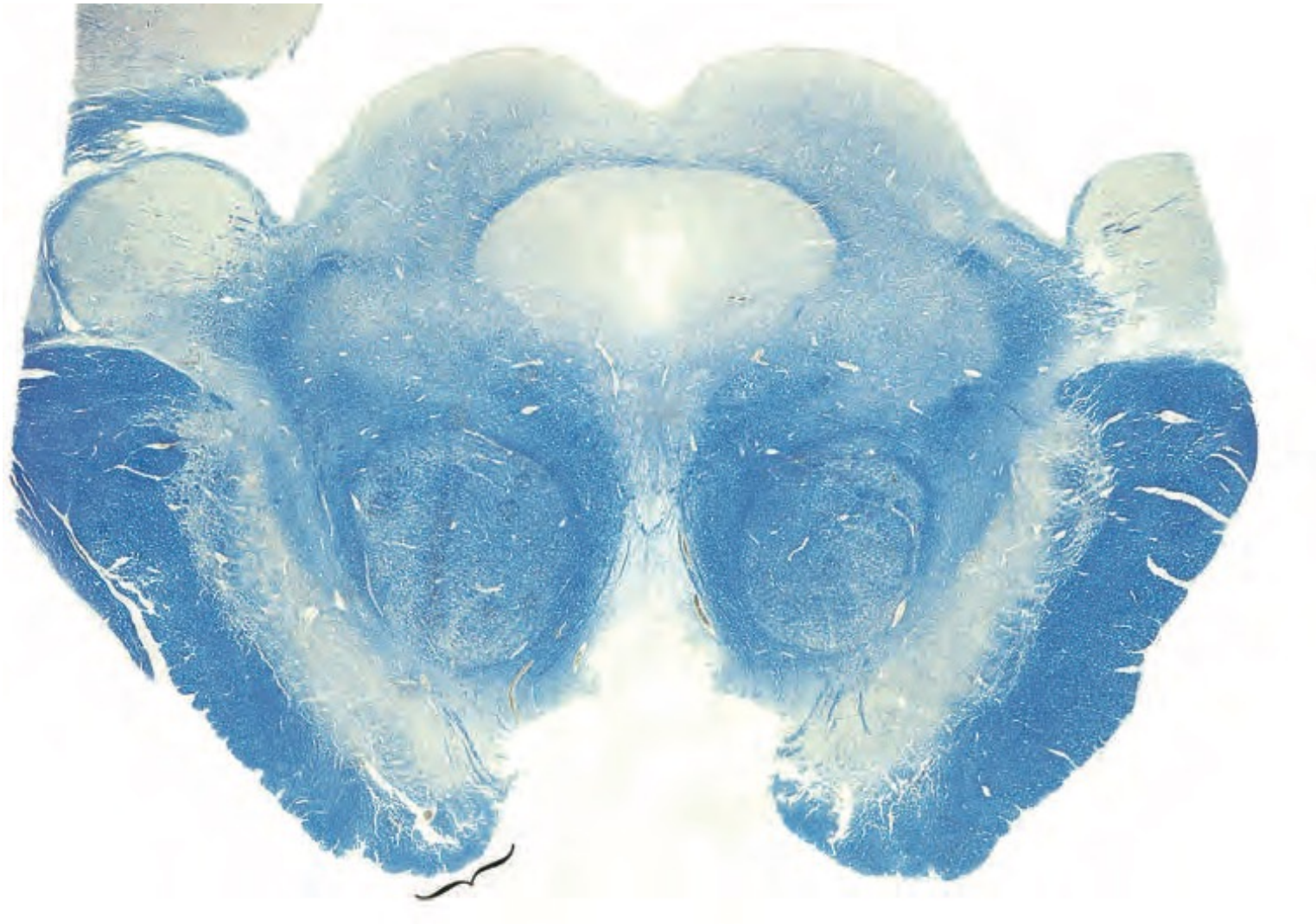
- Tectum – dorsálně – lamina quadrigeminalis
  - Colliculus superior
  - Colliculus inferior
- Tegmentum – ventrálně – nc. ruber, substantia nigra
  - V pontu a medulla oblongta dorsální část
- Přední část – dlouhé spoje – především kortikopontinní, kortikospinální spojení

Colliculi superior et inferior





Substantia nigra et nucleus ruber

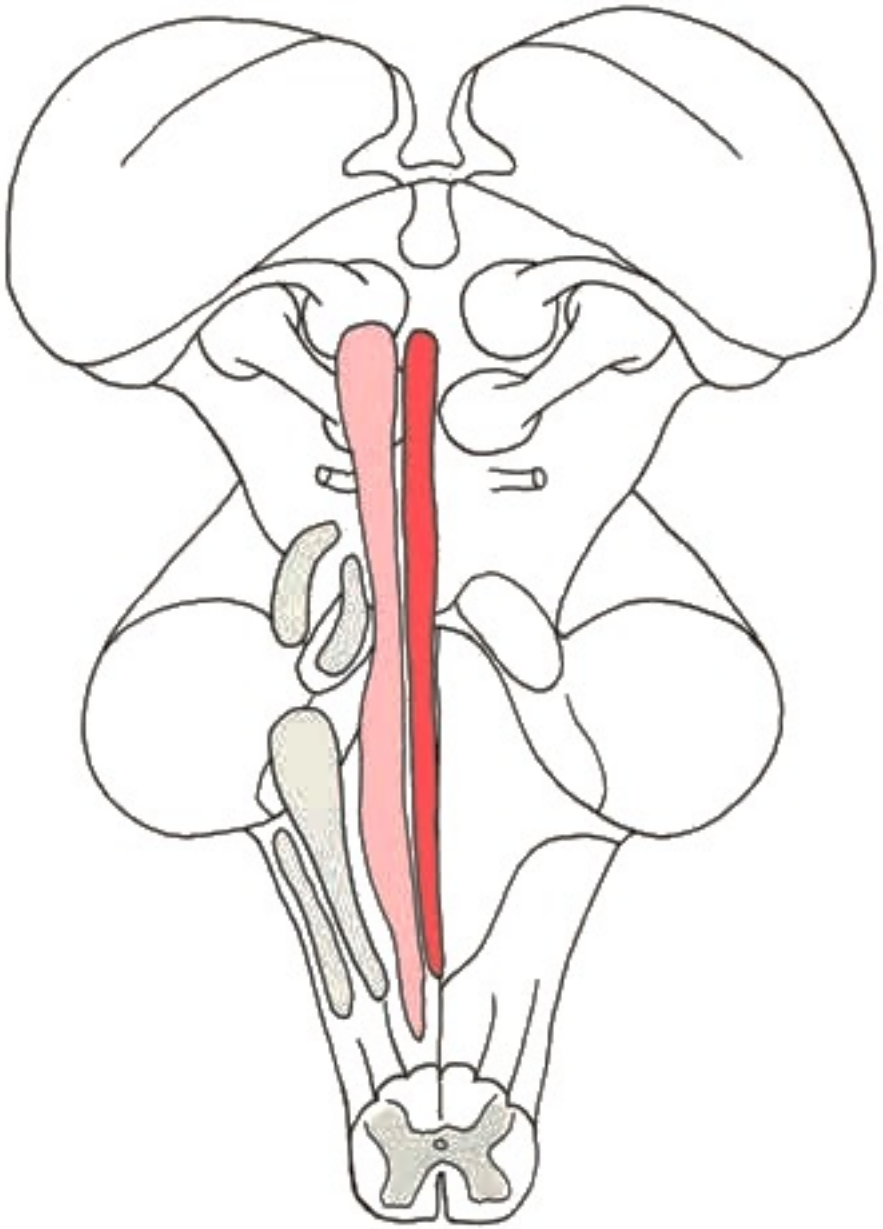


Reticular formation

Archaic neuronal systém in the depth of brain stem

Three linear systems of nuclei

- **rapheal**
  - *Impaired*
  - *Serotonine*
  - *Ascendent and descendent connections, polymorhic functions*
- **medial**
  - *The largest*
  - *Giant-cellular nuclei*
  - *Long ascendent and dscendent connections*
- **lateral**
  - *Medulla oblongata and pons Varoli*
  - *Small-cellualr nuclei*
  - *Short fibers end in medial system of nuclei*
- **Cerebellar system**
- **Monoaminergic system**
- **Cholinergic system**



Reticular formation

Ceters of life-functional system

Respiration center

Inspiration and exspiration parts

In the bottom of fossa rhomboidea

Pneumotactic centre

Supervising respirátory center

Reaction to O_2 and CO_2 blood content

Chemoreceptors in glomus caroticum and in organnon of the fourth ventricle

Body temperature and blood pressure

Heart action regulation centre

Near to nc. dorsalis n. vagi

Two parts – acceleration and deceleration

Arisitn preganglionic fibers of autonomous neurons

Vasomotor center

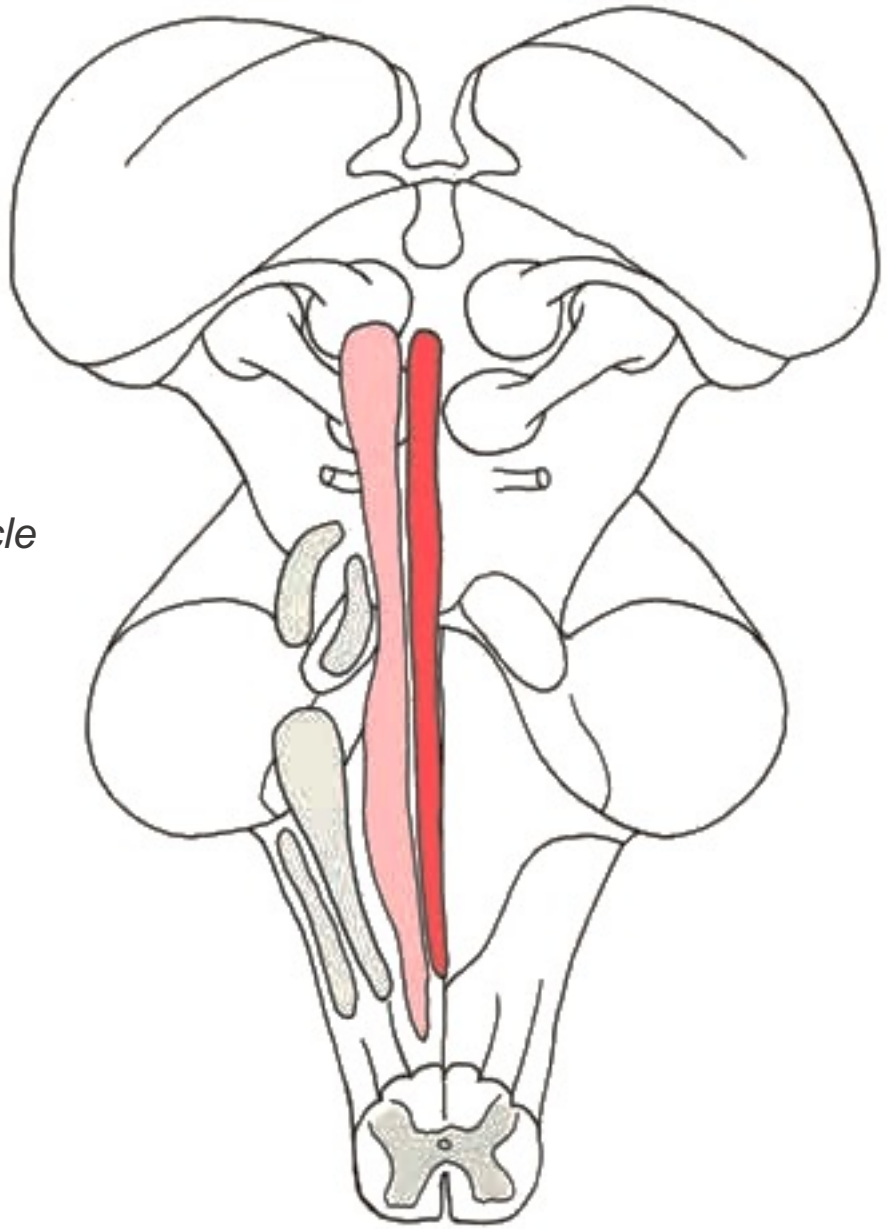
below trigonum n. vagi

Regulation of hte lumina of arterioles and precapillares

Vomiting center

Bilateral connected to nc. dorsalis nervi vagi and nc. solitarius

Reaction to pressure in IV. ventricle and intracranila pressure



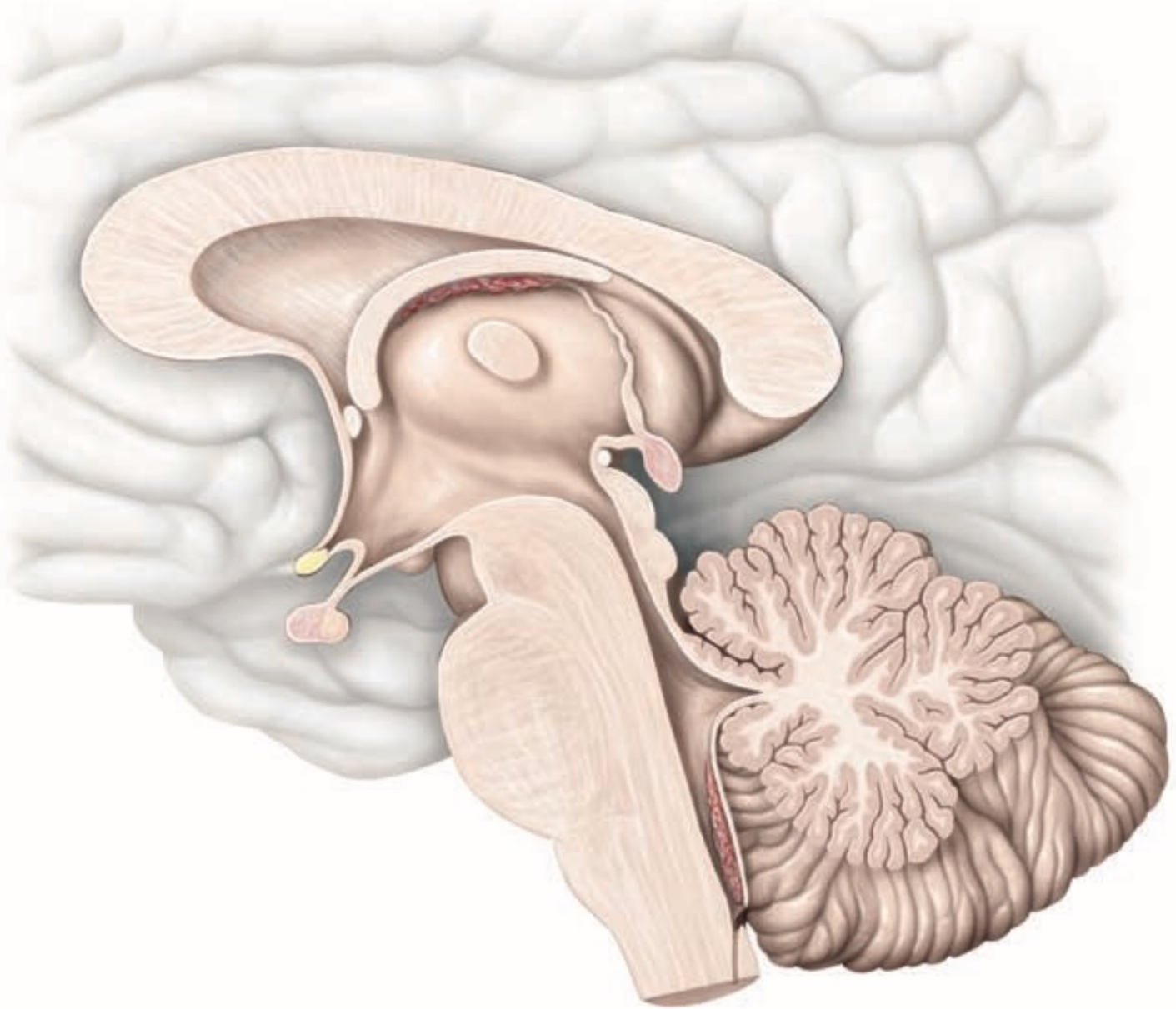
cerebellum

- **Vermis**
- **Haemispherae**

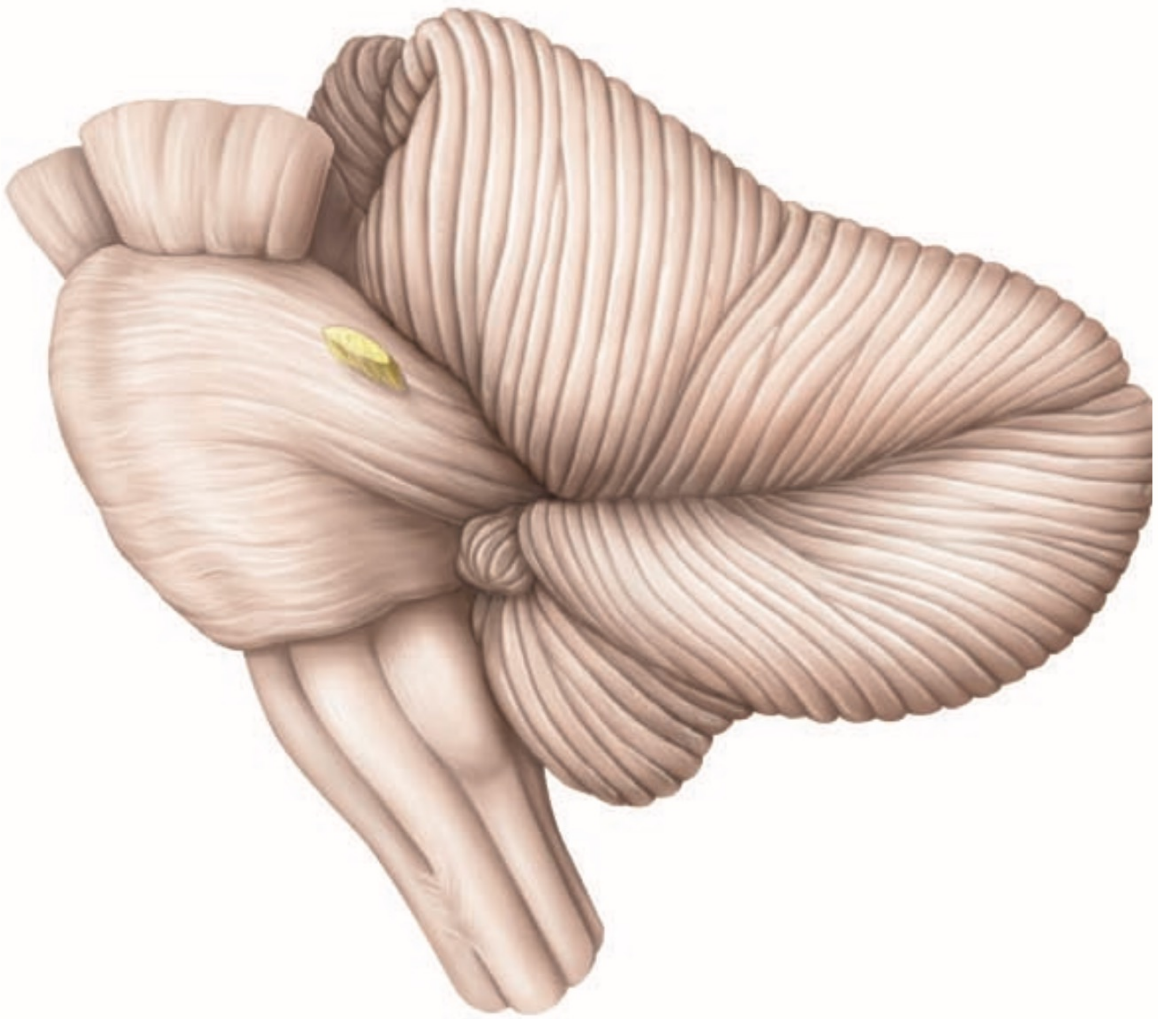
- **Arbor vitae**

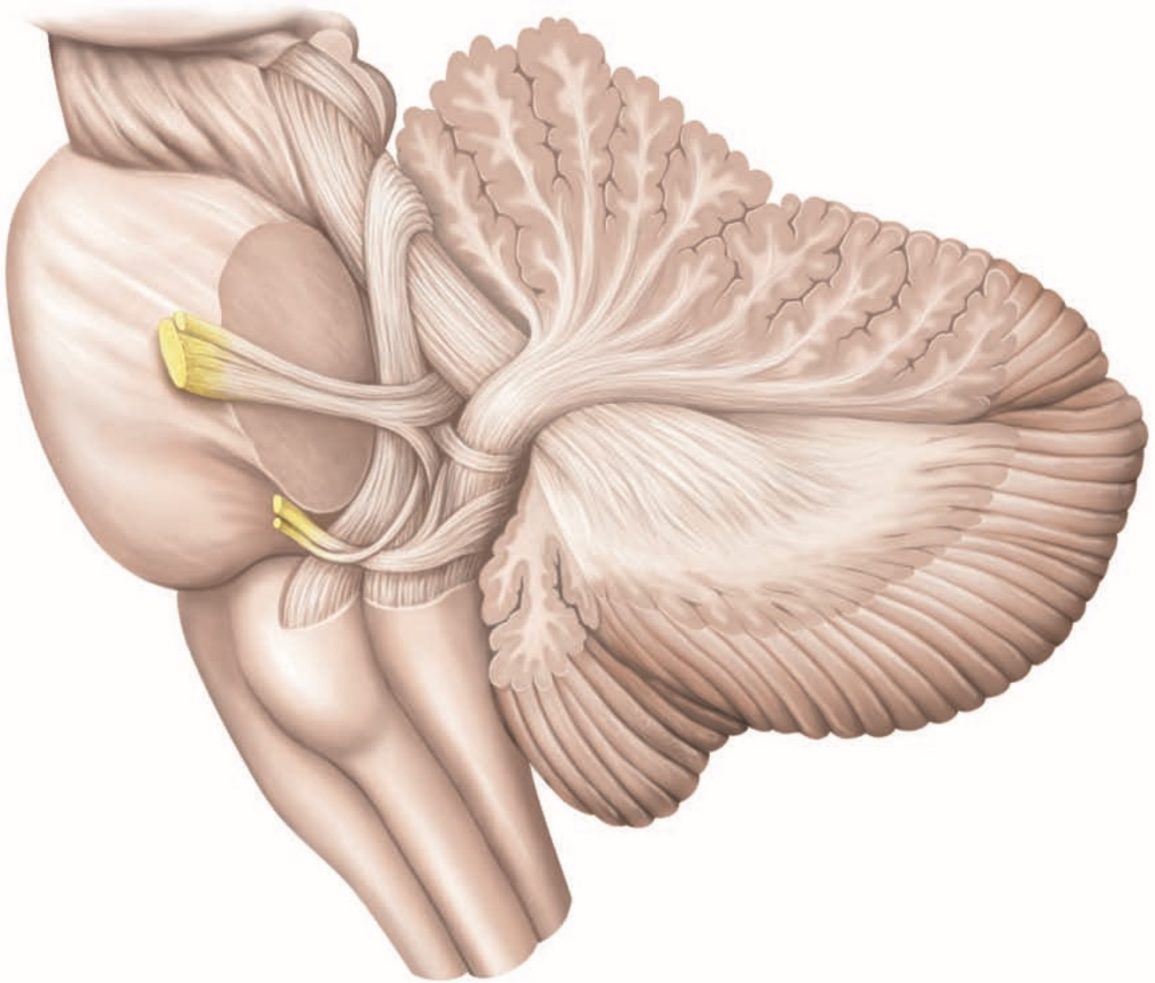
- **Substantia grissea**
- *Cortex*
- *Nuclei*

- **Substantia alba**
- *Corpus medullare*



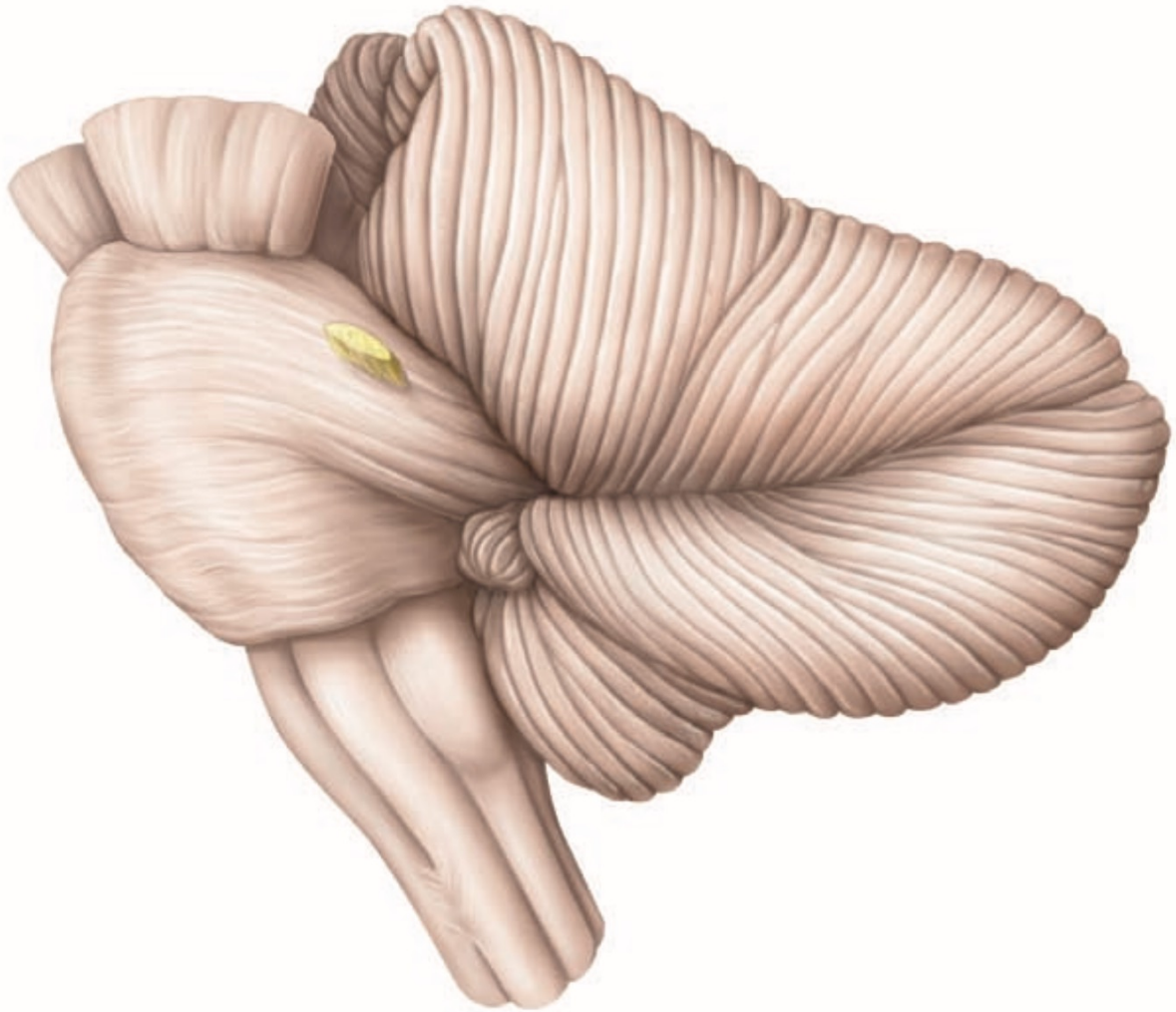
Pedunculi cerebelli





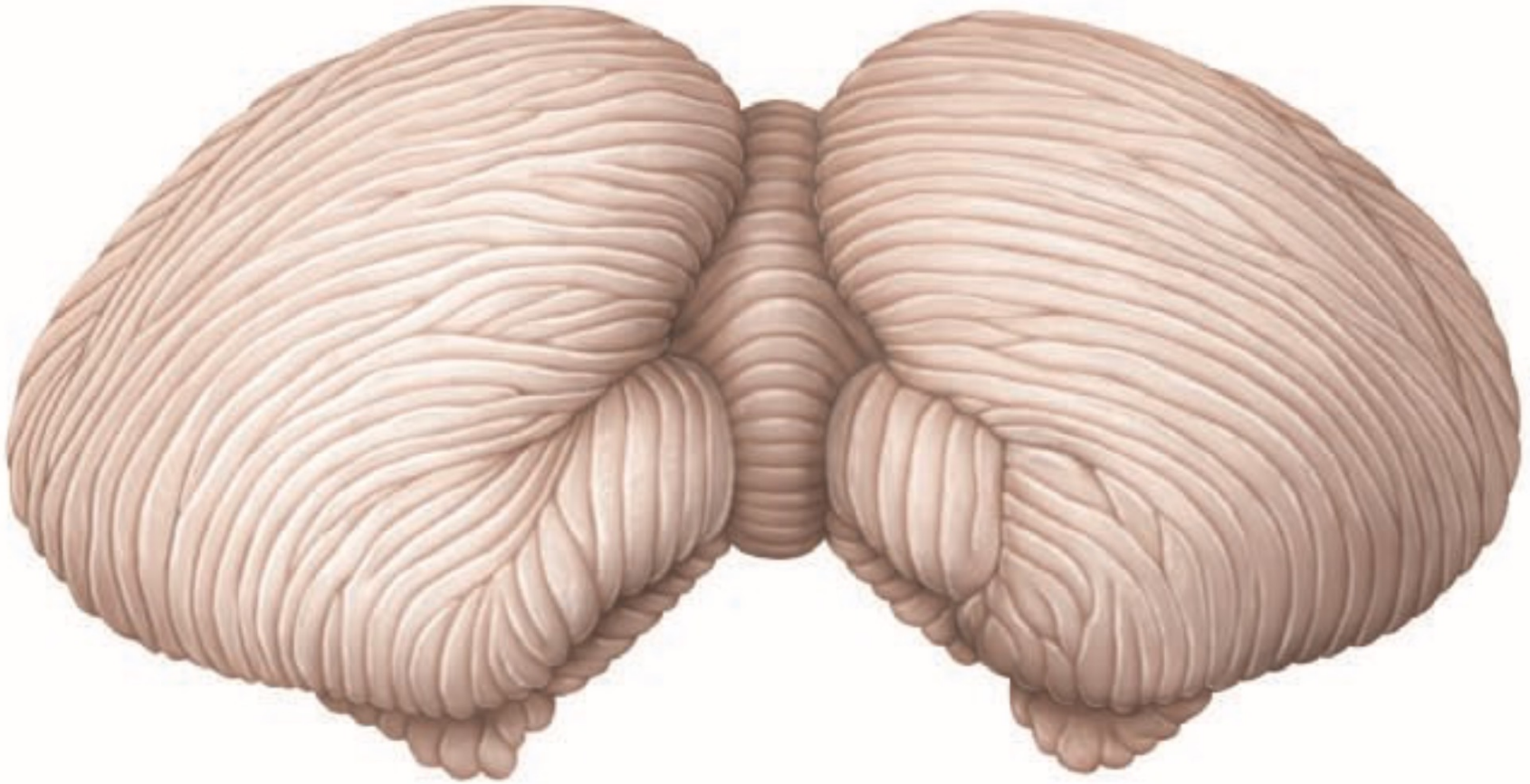
cerebellum

- Lobus anterior
- Fissura horizontalis
- Lobus posterior
- Fissura posterolateralis



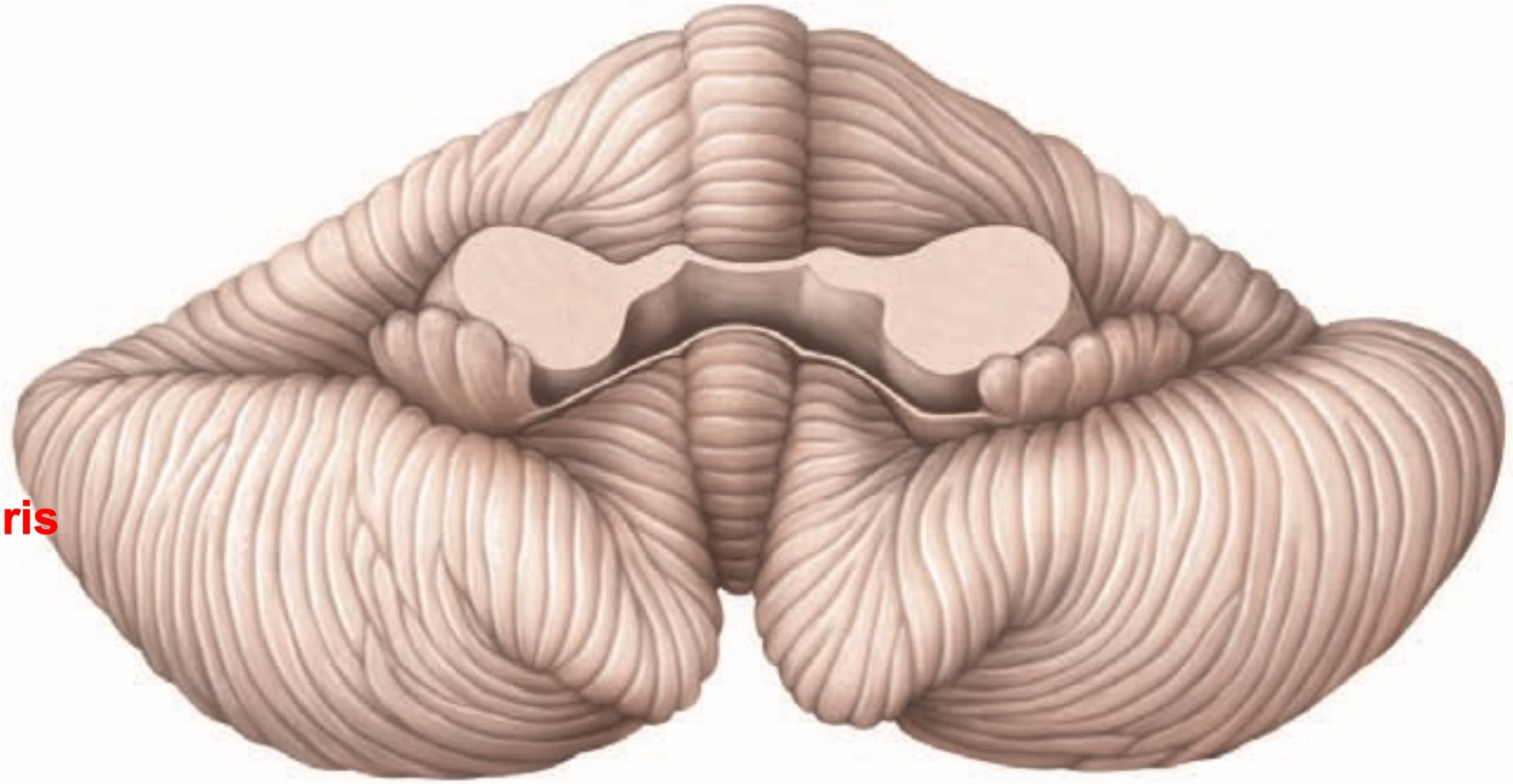
cerebellum

- Vermis
- Valecula vermis
- Uvula vermis
- Haemisphera
- Flocculus



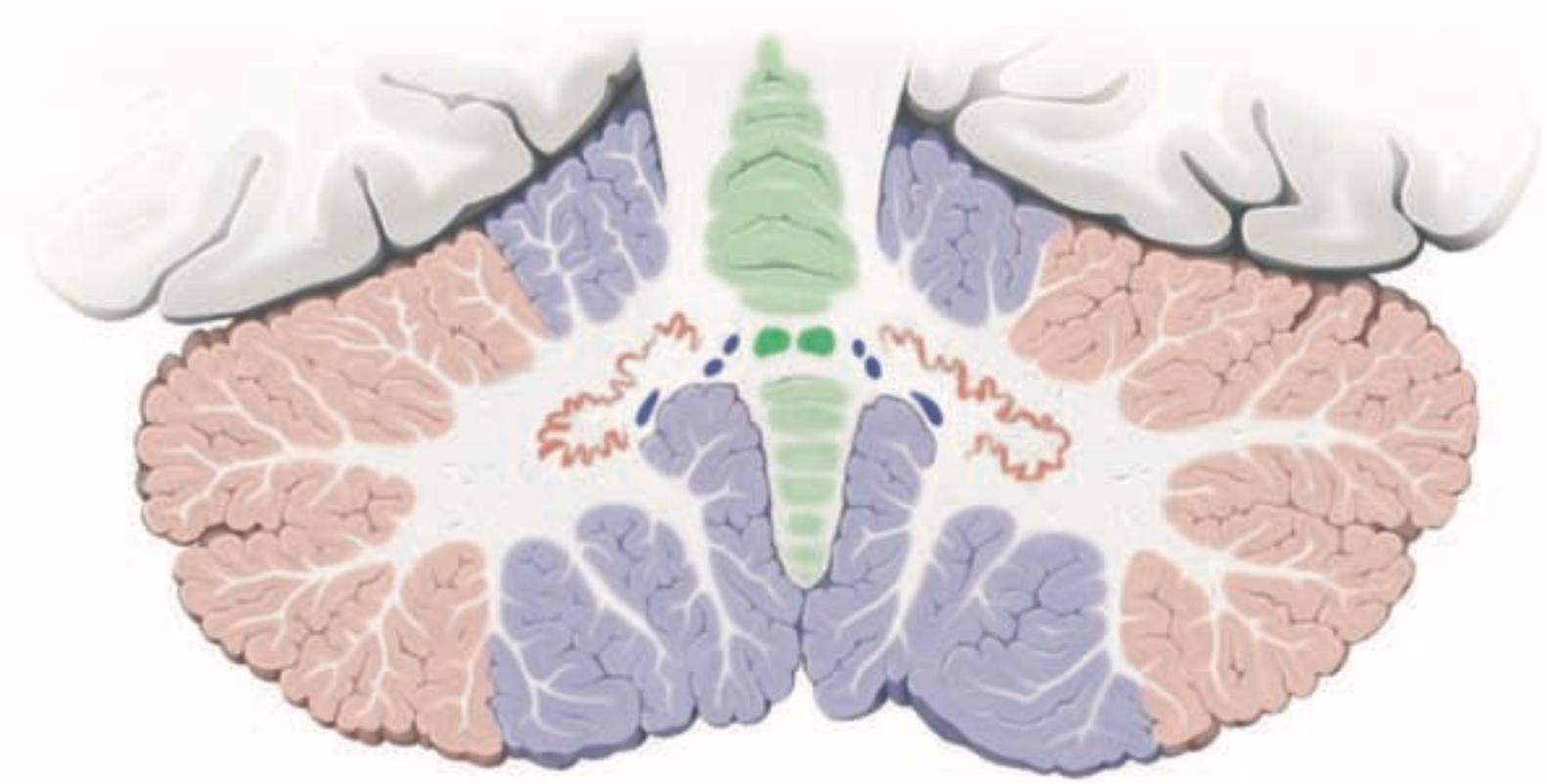
cerebellum

- Vermis
- Lobulus centralis
- Ventriculus
- Pyramis
- Pyramis vermis
- Valecula vermis
- Nodulus
- Flocculus
- Lobulus flocculonodularis
- Haemisphera
- Fissura horizontalis
- Tonsilla cerebelli



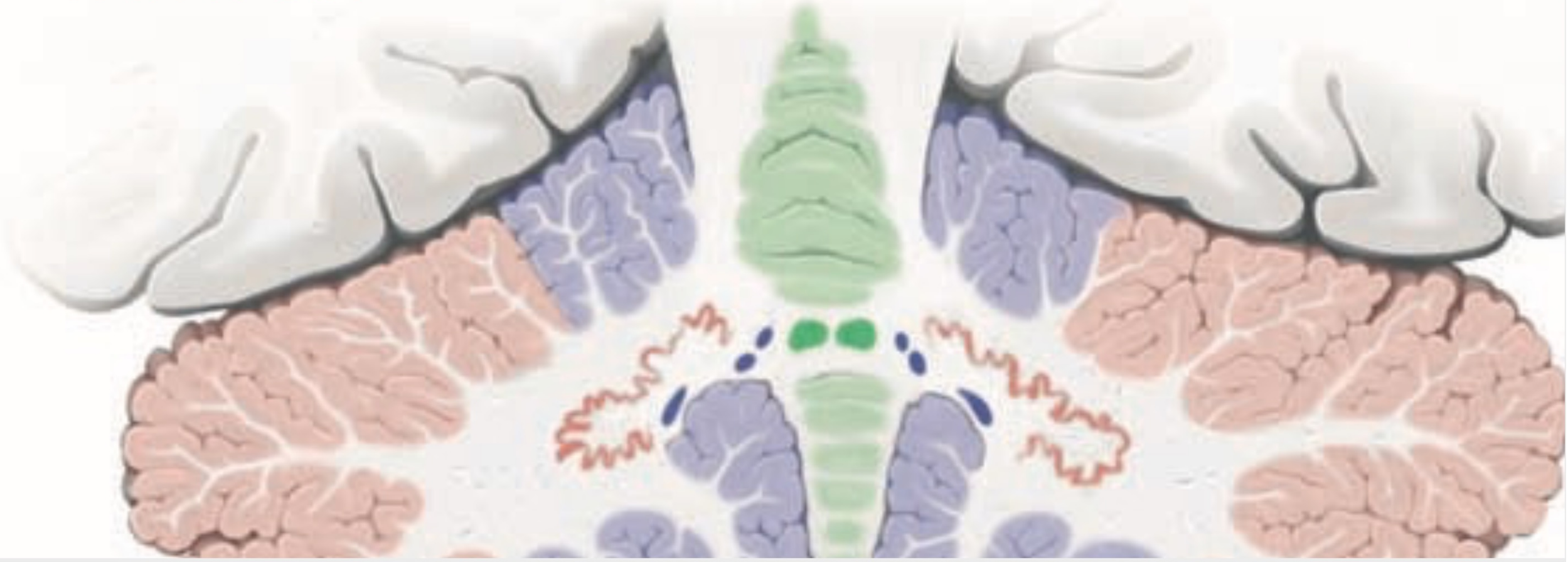
cerebellum

- **Vestibulocerebellum / archaeocerebellum**
  - nc. vestibulares
  - rovnováha
- **Spinocerebellum / paleocerebellum**
  - medulla spinalis, medulla oblongata, pons, mesencephalon
  - Udržování svalového tonusu
- **Neocerebellum**
  - Hemisféry telencefala
  - Odměřování a koordinace pohybů



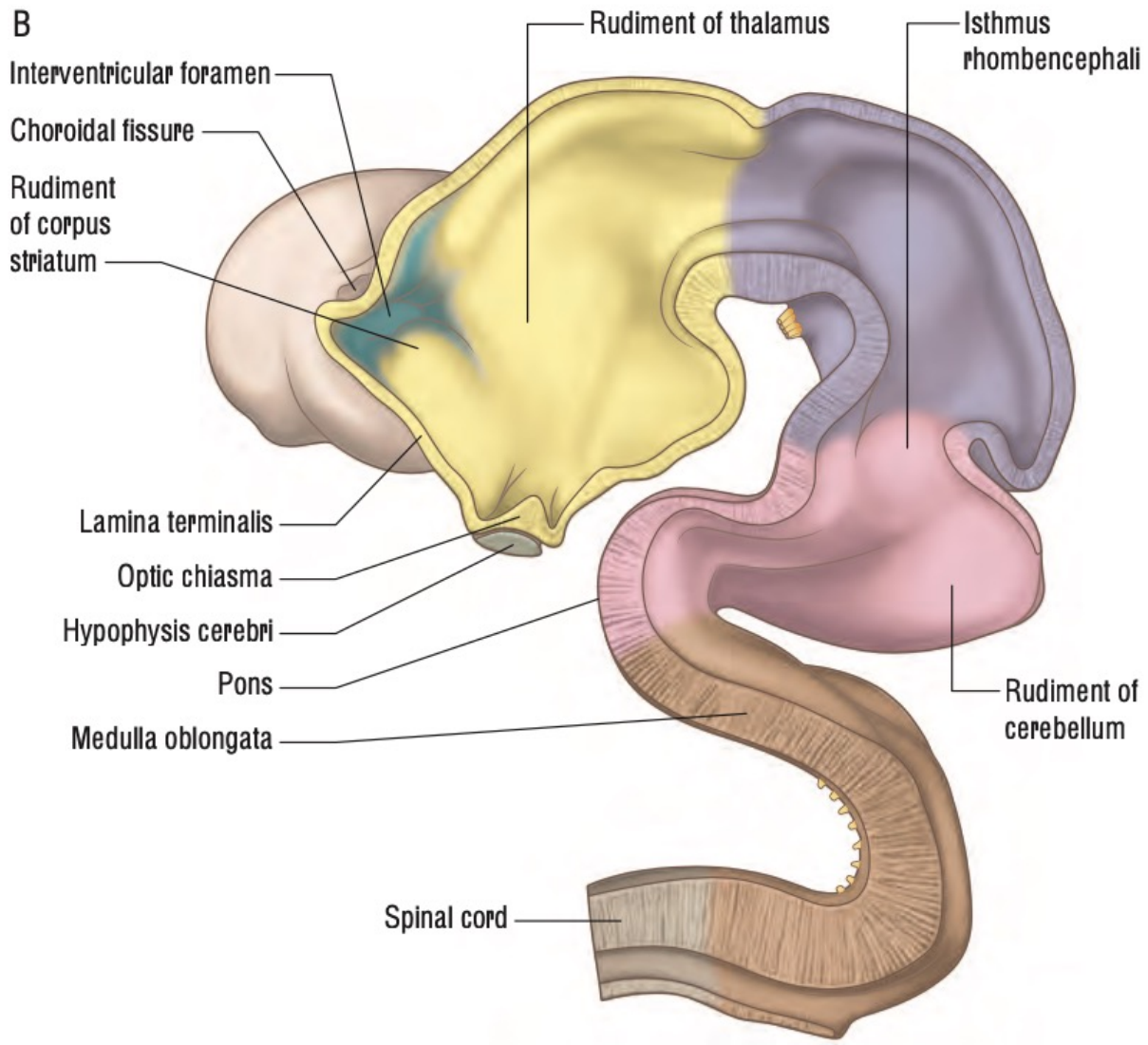
Cerebellum - nuclei

- Nucleus fastigii
- Nuclei globosi
- Nucleus emboliformis
- Nucleus dentatus



Diencephalon

- Developing from prosencephalon
- Originally tube-form
- Structures around III. ventricle
- Ventrally development of hypothalamus
- Dorsally development of thalamus thalamus
- Laterllaly eye forming sacs
- Neurons
  - Periventricular development
  - Peripheral migration to nuclei



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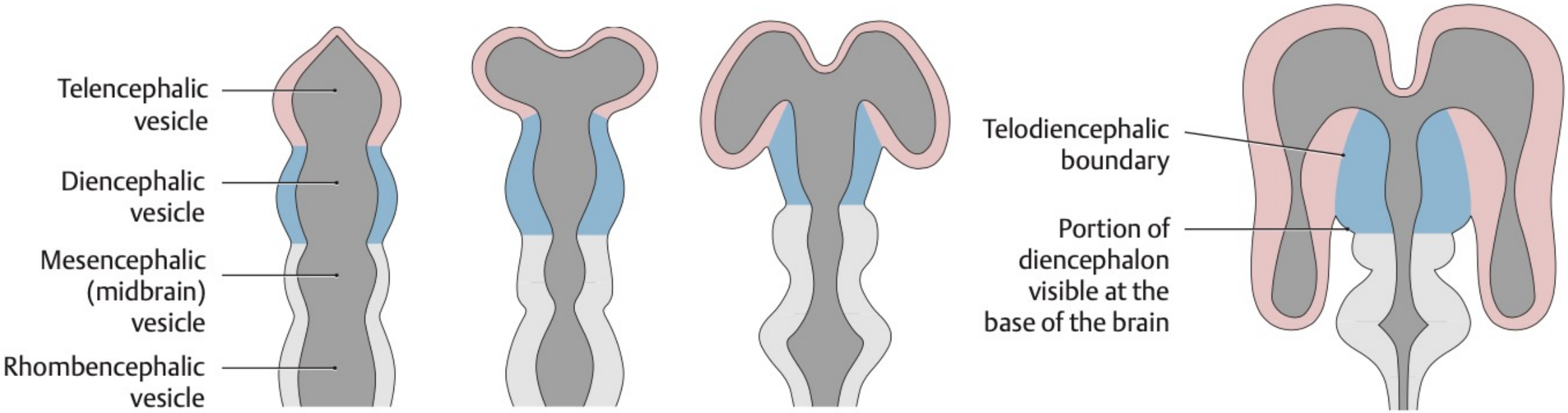
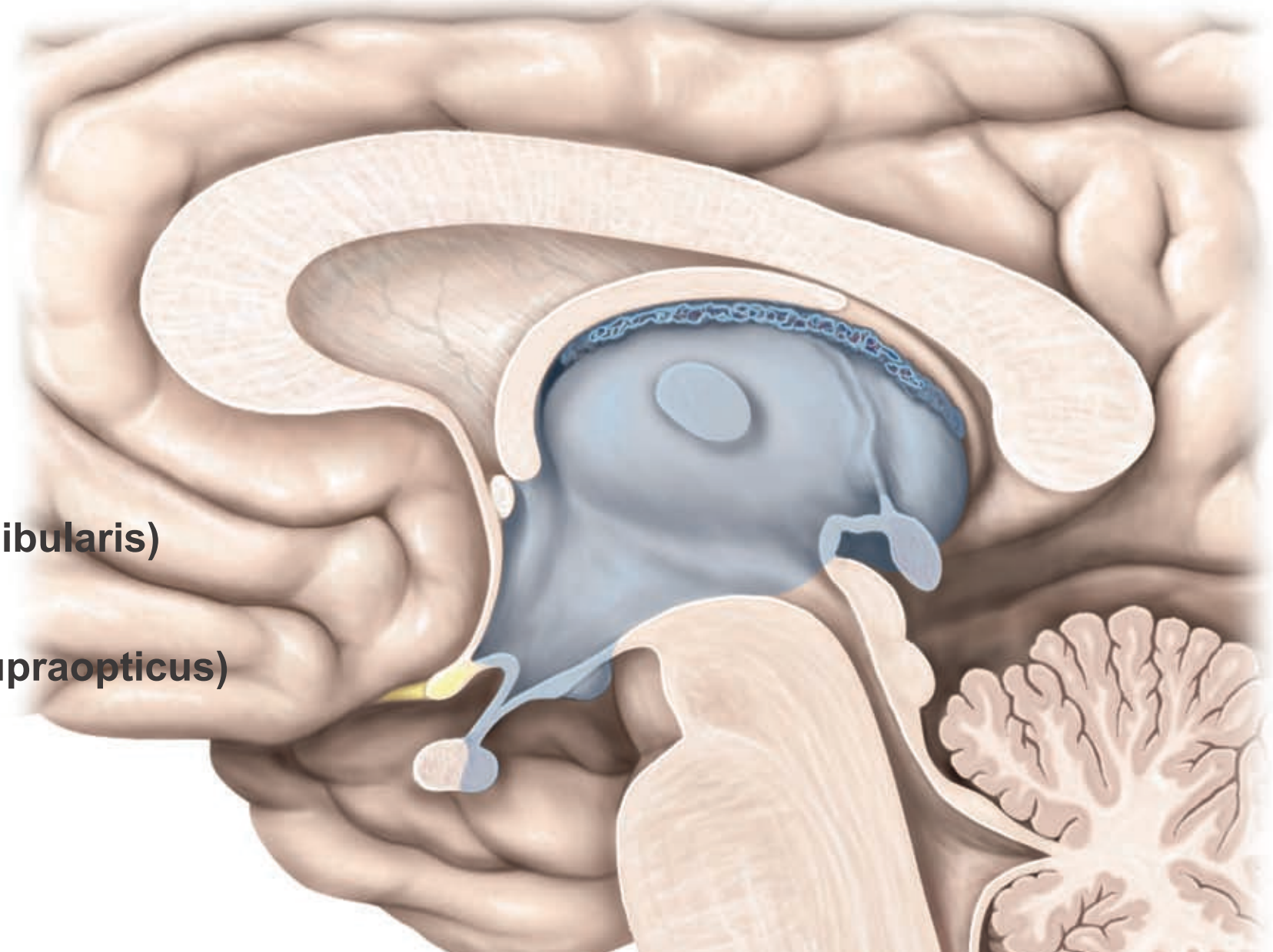
Diencephalon



Diencephalon

- Plexus chorioideus
- Thalamus
- Adhaesio interthalamica
- Stria medullaris thalami
- Glandula pinealis
- Habenula
- Tuber cinereum
- Corpus mammilare
- Infundibulum (recessus infundibularis)
- Hypothalamus
- Chiasma opticum (recessus supraopticus)
- Area praeoptica
- Commisura anterior
- Fornix
- Lamina quadrigeminalis

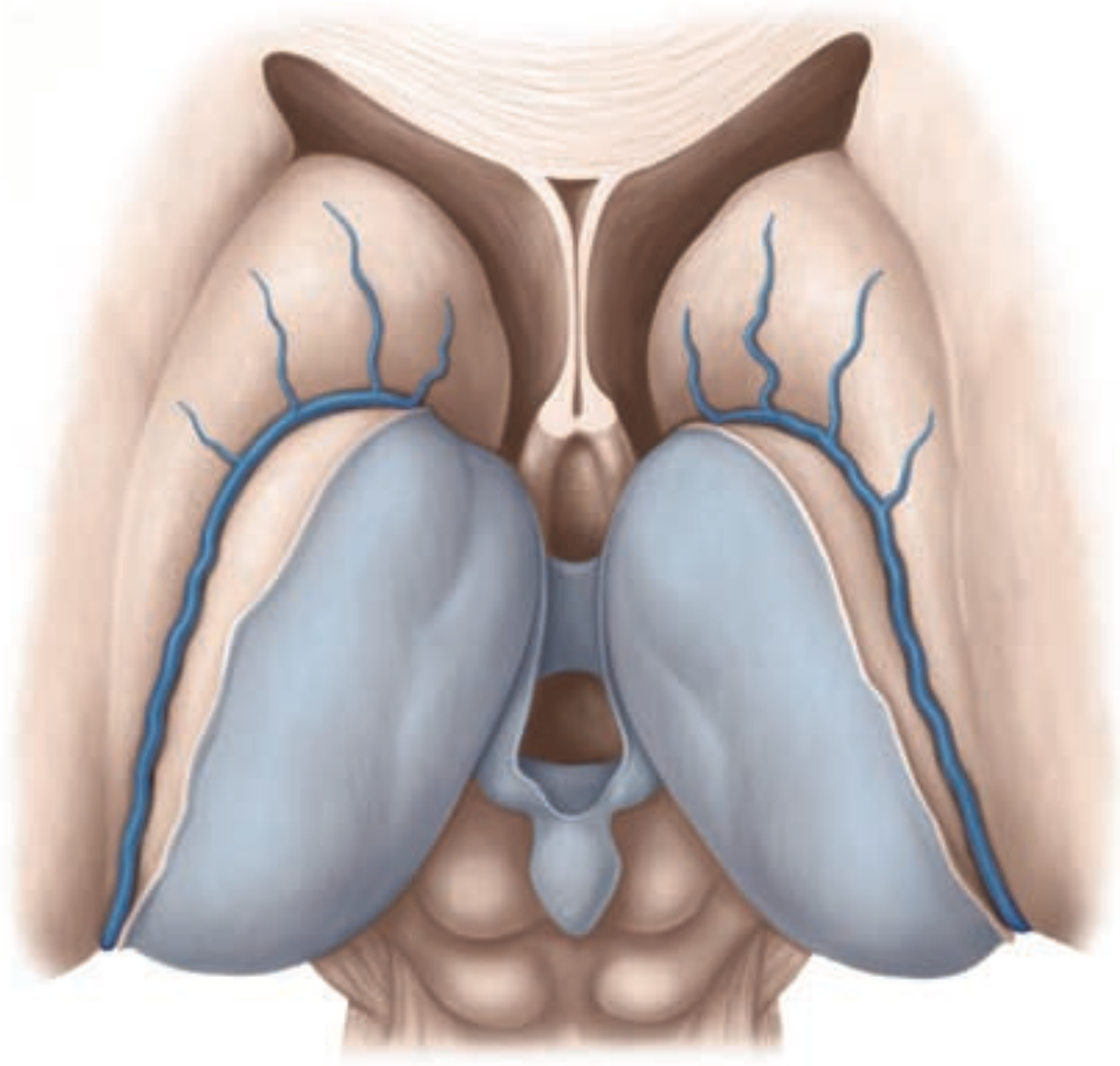


Diencephalon

- Thalamus
- Pulvinar thalami
- Glandula pinealis
- Brachium colliculi inferioris
- Corpus geniculatum laterale
- Tractus opticus
- Nervus opticus
- Infundibulum
- Corpus mammilare
- Lamina quadrigeminalis
- Pedunculus cerebri

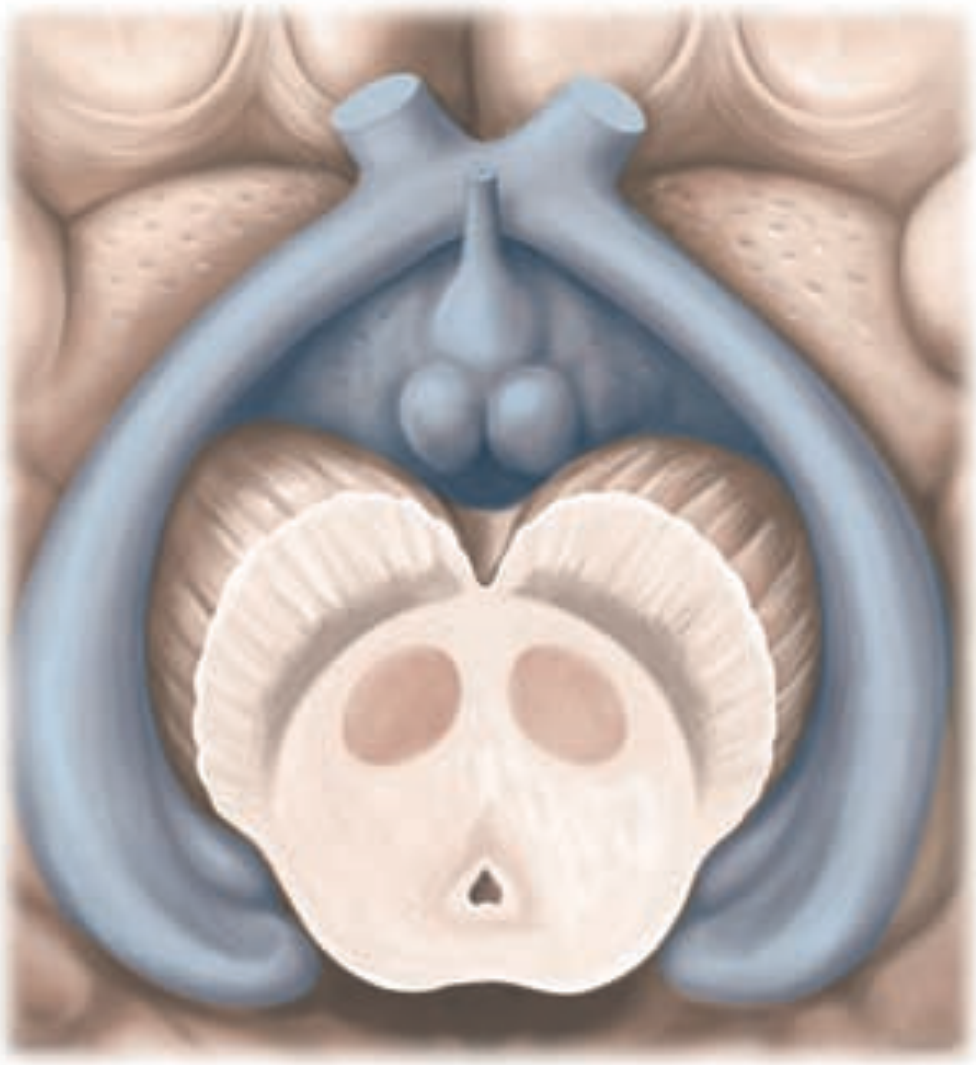
Diencephalon

- Thalamus
- Adhaesio interthalamica
- Pulvinar thalami
- Taenia choroidea
- Lamina affixa
- Habenula
- Glandula pinealis
- Lamina quadrigeminalis
- Vena thalamostriata
- Fornix
- Nucleus caudatus
- Septum pellucidum
- Corpus callosum



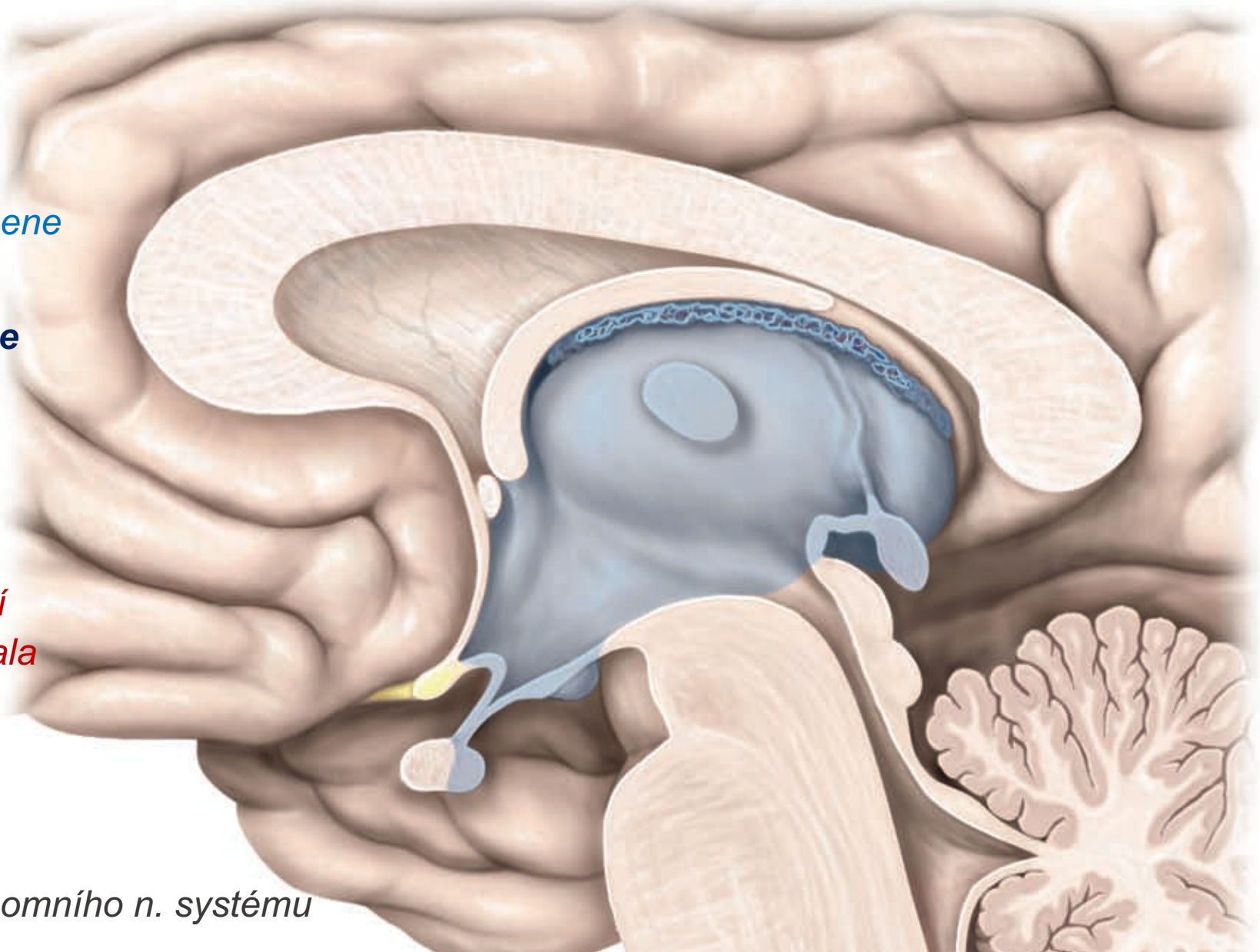
Diencephalon

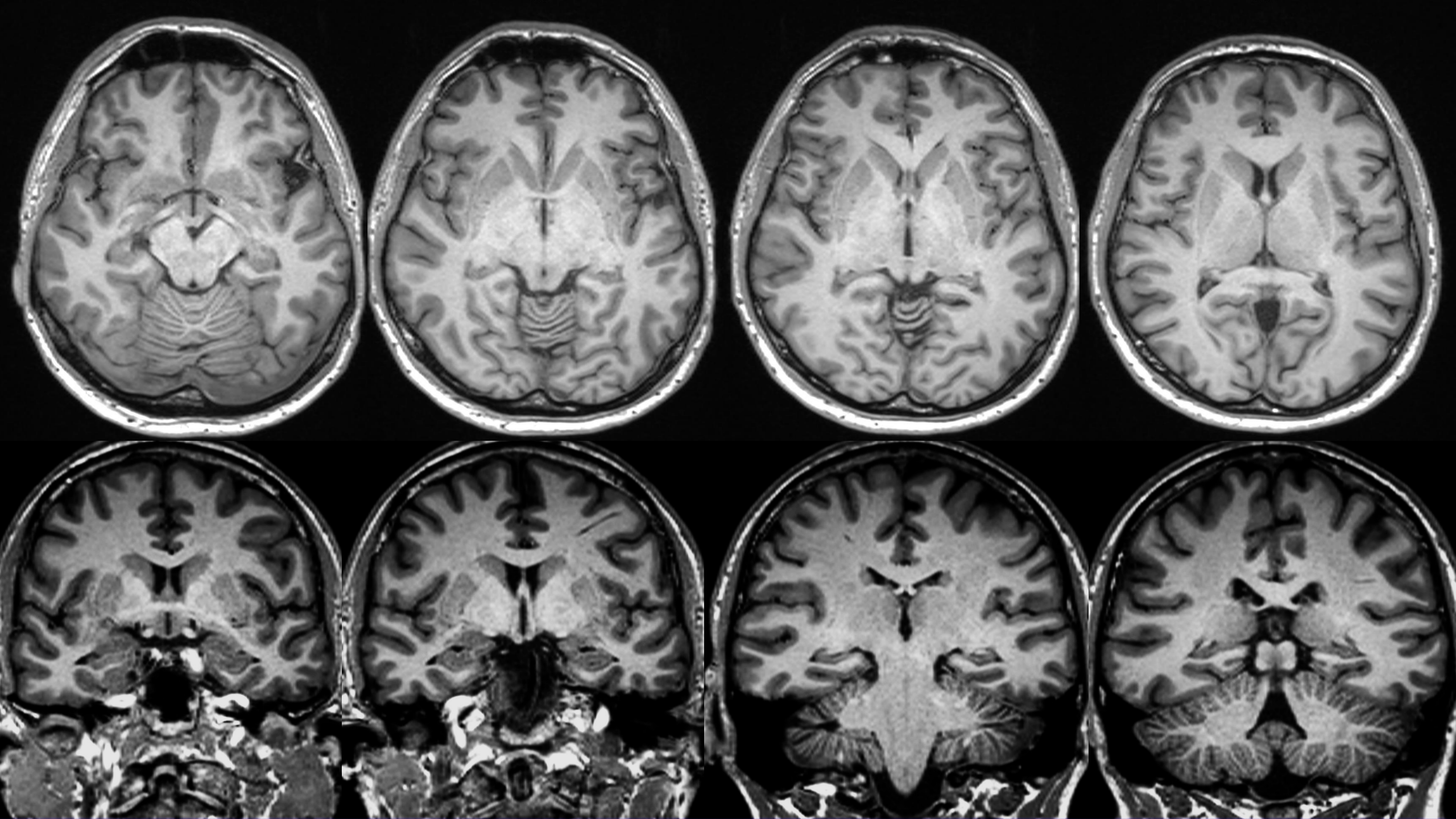
- Nervus opticus
- Chiasma opticum
- Tractus opticus
- Corpus geniculatum laterale
- Infundibulum
- Tuber cinereum
- Corpora mammilaria
- Pedunculus cerebri
- Substantia nigra
- Nucleus ruber
- Tectum (lamina quadrigeminalisú
- Aquaeductus mesencephali



Diencephalon

- **Epithalamus**
  - **Glandula pinealis**
  - **Habenulae**
  - *Regulace cirkandiánních rytmů*
  - *Převod olfaktorních vjemů do kmene*
- **Thalamus**
  - ***Přepojení senzorické informace***
- **Subthalamus**
  - **Nucleus subthalamicus**
  - **Zona incerta**
  - **(globus pallidus)**
  - *Přepojení senzorických inforamcí*
  - *Somatomotorická oblast diencefala*
- **Hypothalamus**
  - **Chiasma opticum, tractus opticus**
  - **Tuber cinereum, neurohypofýza**
  - **Corpora mammilaria**
  - *koordinace endokrinního a autonomního n. systému*

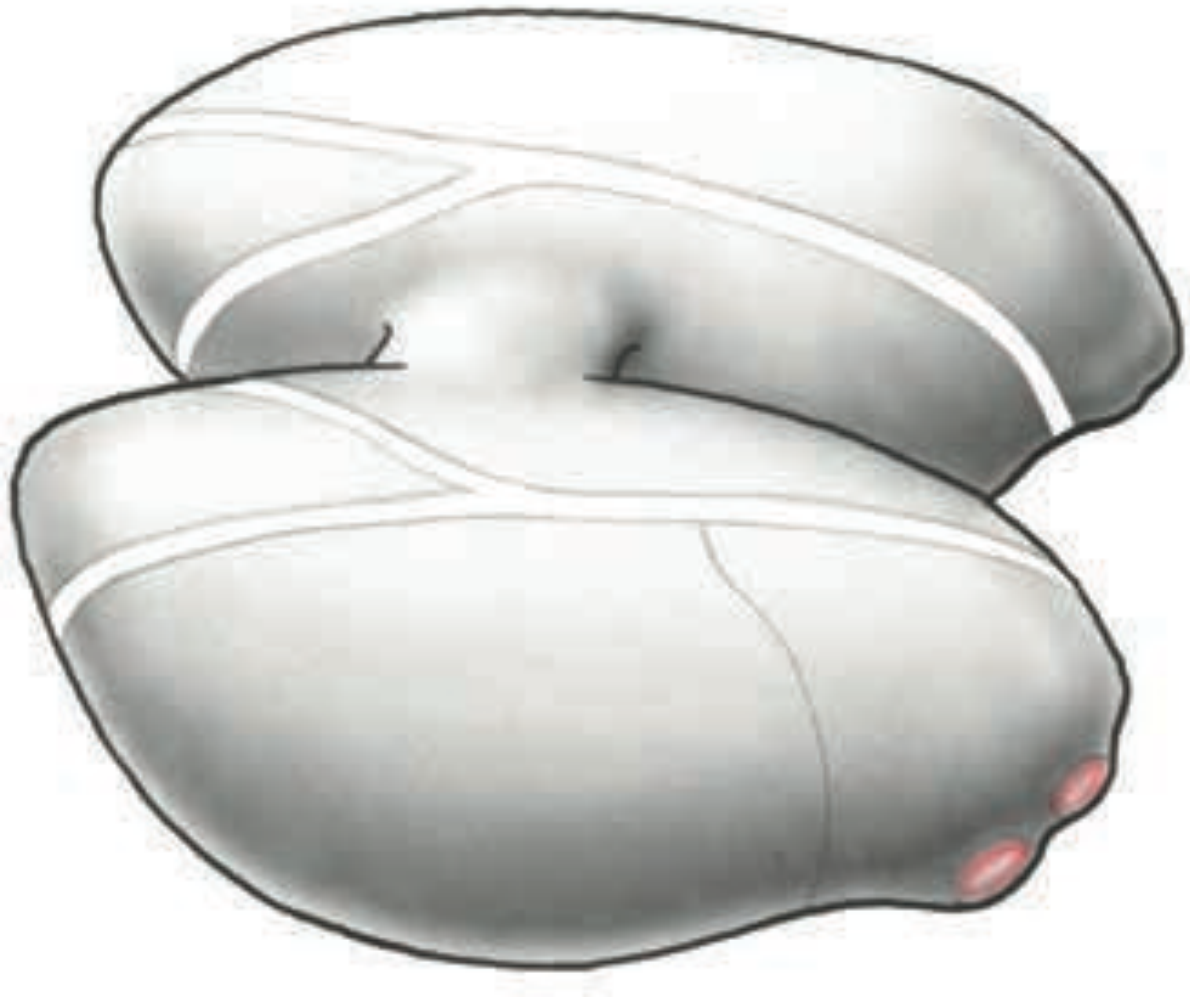




Thalamus

- **Tuberculum anterius thalami**
- **Lamina medullaris interna**
  - Y–like hhite matter bundle splitting the gray matter
- **Corpus geniculatum laterale**
- **Corpus geniculatum mediale**
- **Pulvinar thalami**
- **Adhesio interthalamica**

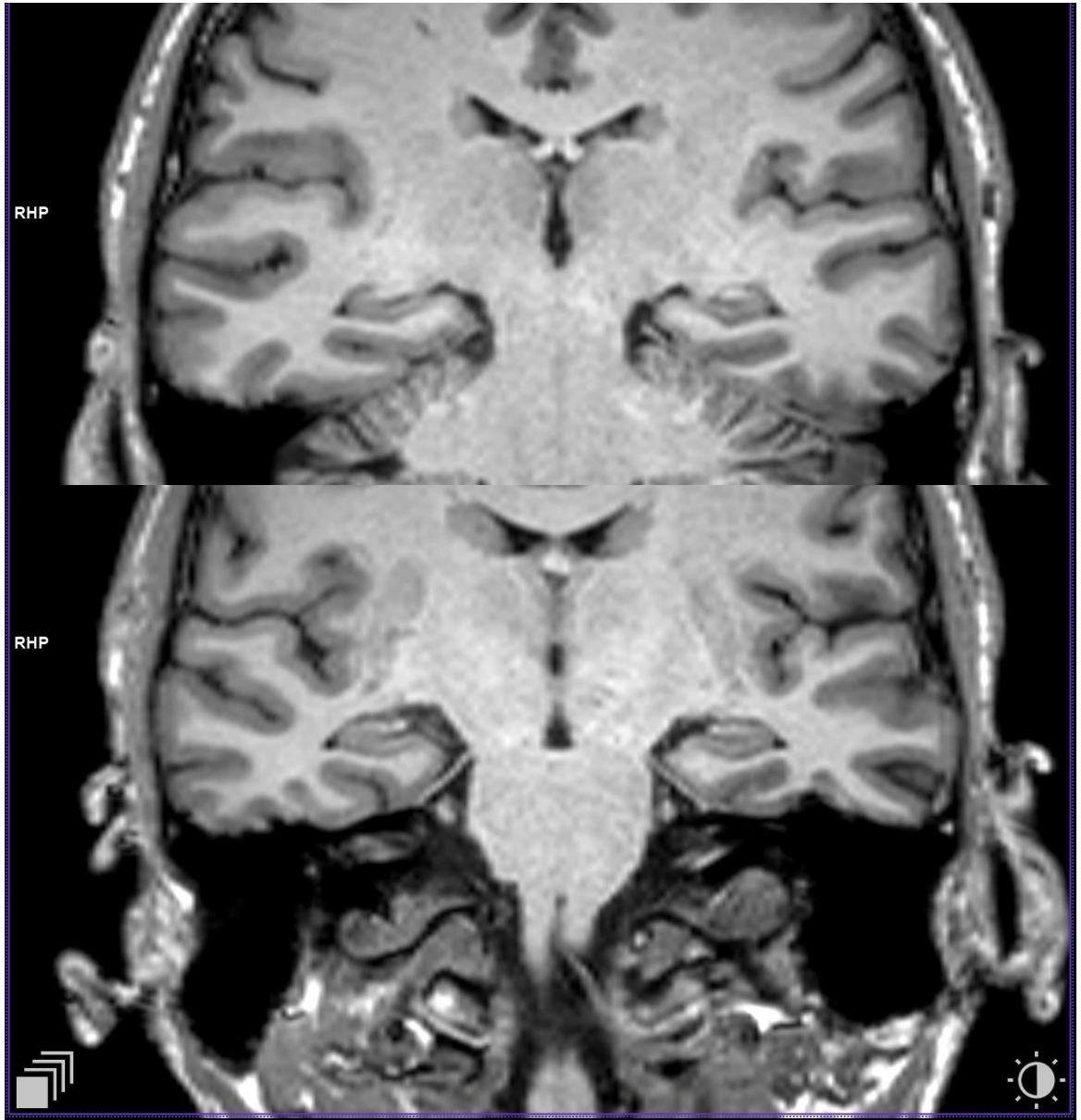
- ***function***
- *heterogenous*
  - *formerly „gate to mining “*
  - *Function based on the afferentation and projection*
- *Sensoric functions*
- *Motorics control*
- *Limbic system*



Grim M, Druga R, et al. Základy anatomie, Galén, Karolinum 2014

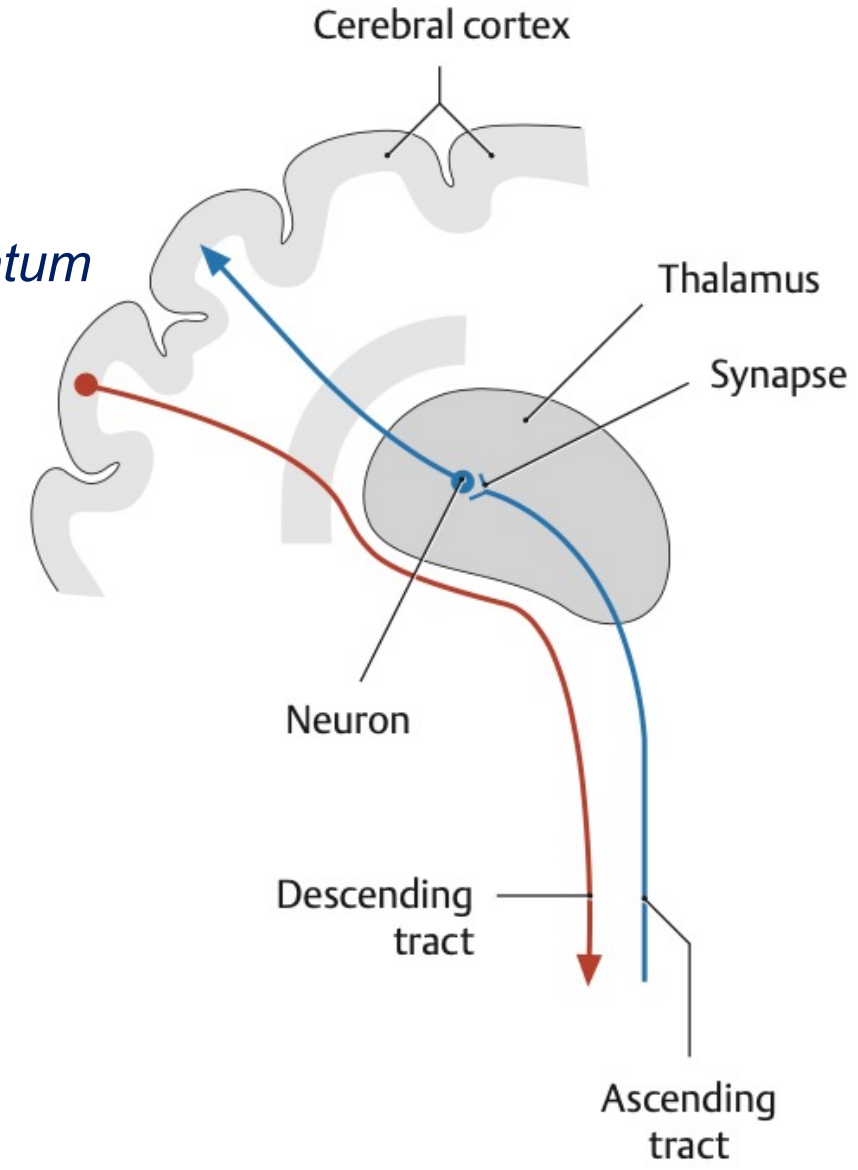
Thalamus

- Space relations
- Medial surface
- III. ventricle
- Interthalamic adhesion – gray matter bridge
- Dorsolateral - nc. caudatus
- between thalamus and nc. caudatus
  - stria terminalis
- Dorsally on the surface of thalamus
- Epithalamus
  - Trigona habenularum
  - ncc. habenulares ending of stria terminalis
  - Trigona connected by commisura habenularium
  - on comissura habenularium hanged corpus pineale
  - Below comissura posterior epithalmica



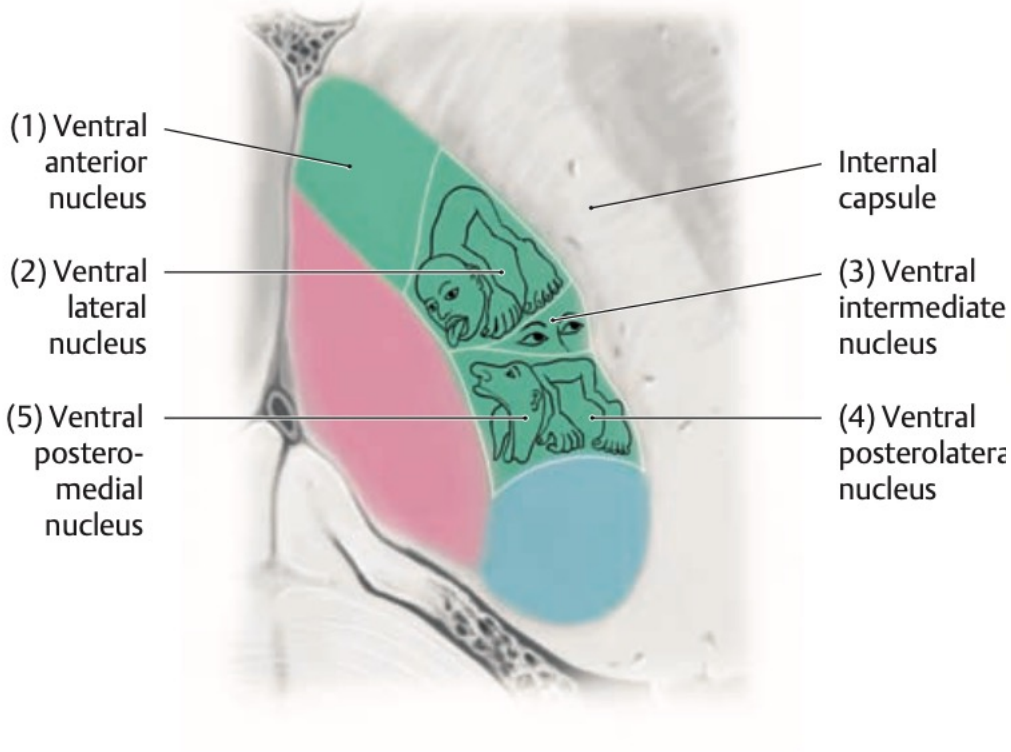
Thalamus

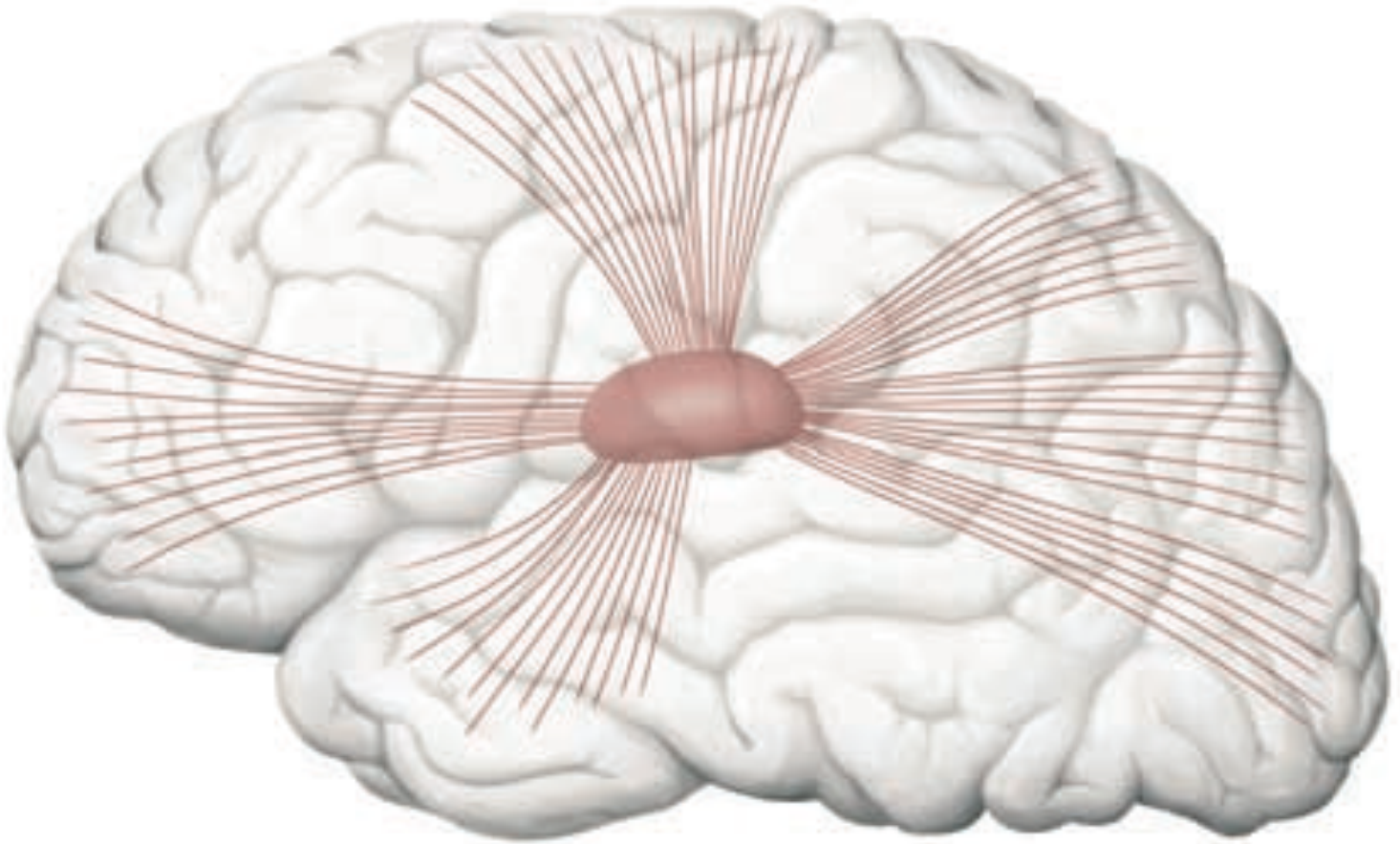
- **Specific thalamic nuclei**
  - *Cortical telencephalic projection (palium)*
- **Non-specific thalamic nuclei**
  - *Projection to brainstem, diencephalon and striatum*
- **Integrating thalamic nuclei**
- **Intralaminary nuclei**
  - *In lamina medullaris interna*



Thalamus

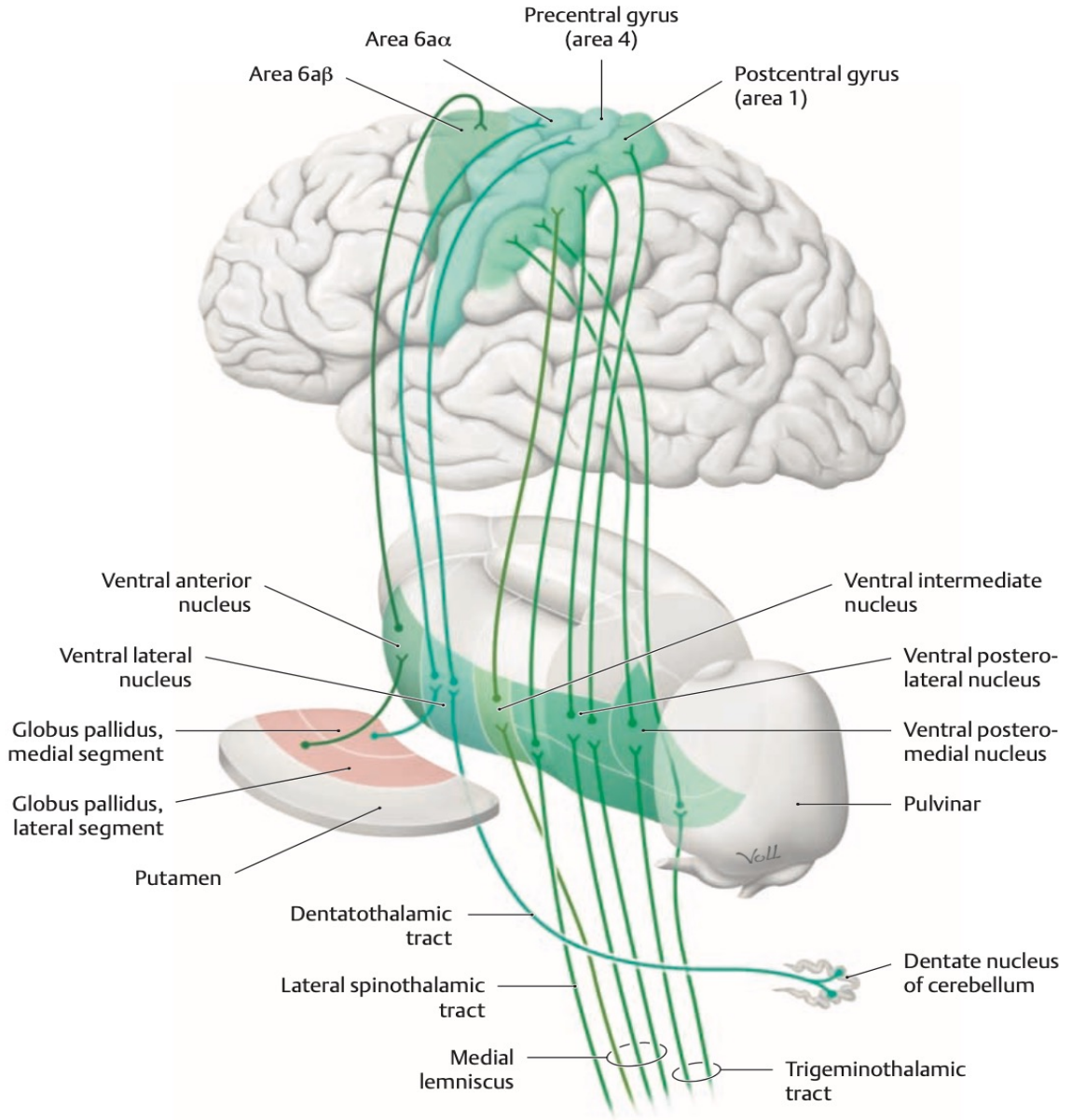
- **Specific thalamic nuclei**
  - *Cortical telencephalic projection (palium)*





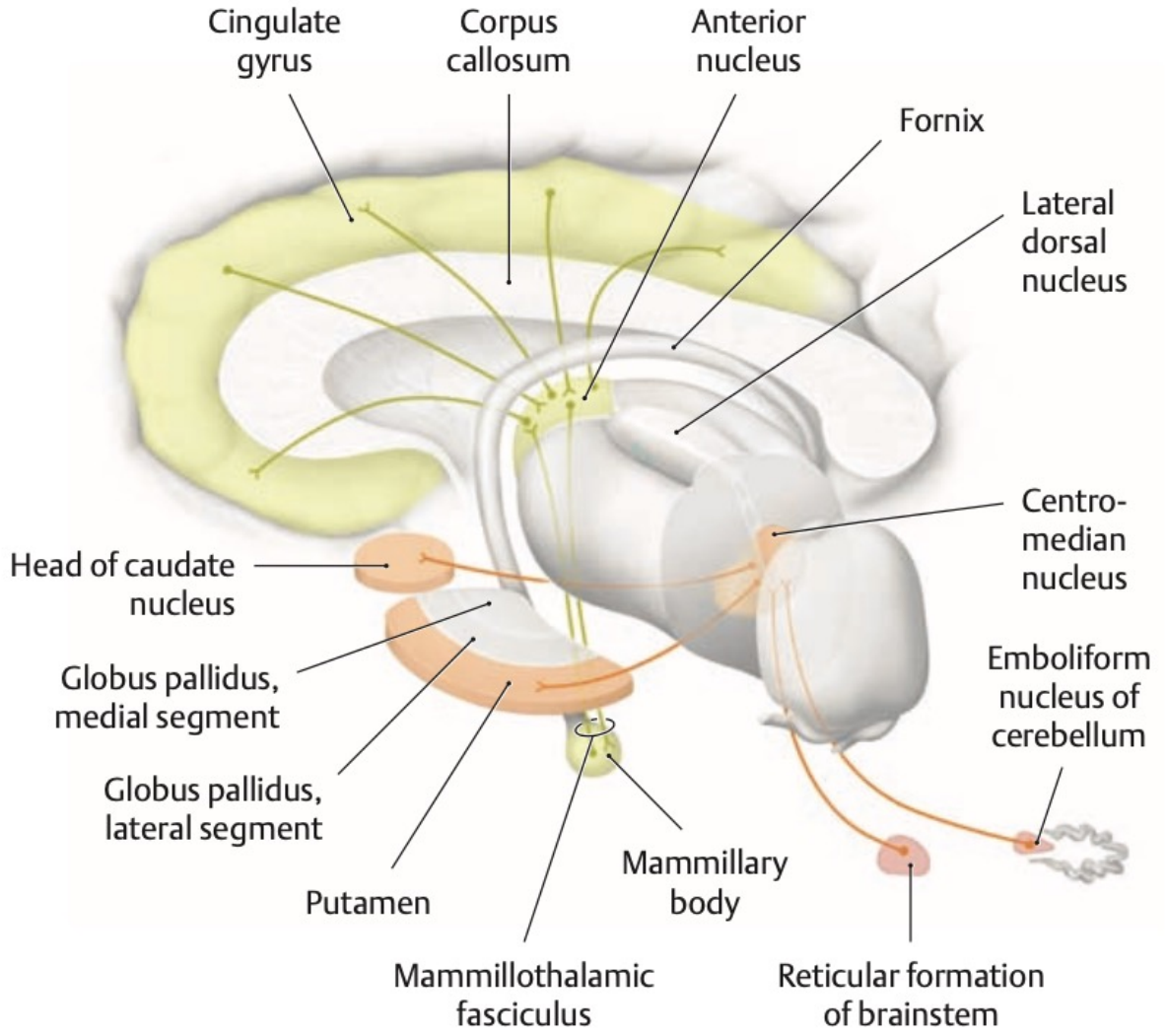
Thalamus

- **Specific nuclei**
- **Relaying of sensoric information**
- **Ventrolateral nuclei**
  - ***Nc. ventralis posterolateralis VPL***
  - *Lemniscus medialis*
  - *Tractus gracilis + cuneatus*
    - *Tactile and discrimination sensation*
  - *Tractus spinothalamicus*
    - *Pain, heat and cold*
  - ***Nc. ventralis posteromedialis***
  - *Tractus trigeminothalamicus*
    - *Head – pain, heat and cold*



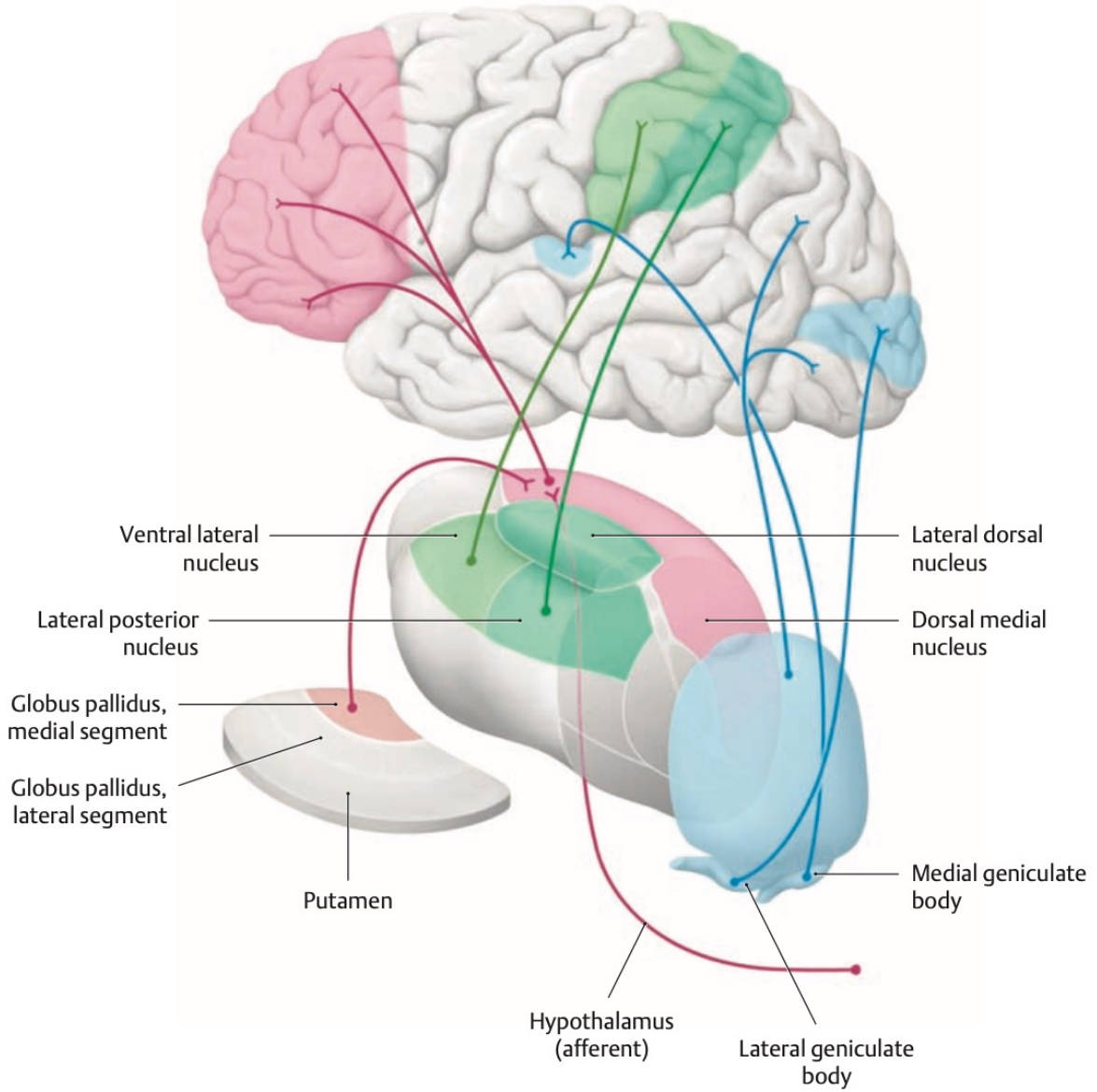
Thalamus

- **Specific nuclei**
- **Limbic systém**
- **Nc. anterior**
  - ***Gyrus cinguli***
- **Non-specific nuclei**
  - ***Nc. centromedianus***
  - *Ascending reticular activation system*
  - *(ARAS)*
  - *Connection to reticular formation*
  - *Connection to cerebellum*



Thalamus

- **Medial nuclei**
  - *Projection to frontal cortex*
  - *„frontal syndrome“*
  - *behaviour*
  - *Hypothalamic afferentation*
- **Lateral nuclei**
  - *Projection to aprietal lobe*
  - *Integration*
- **Dorsal nuclei**
  - ***Pulvinar***
  - ***Corpora geniculata***
  - *Auditory pathway– mediale*
  - *Visual pathway- laterale*



Epithalamus

- **Brainstem circle fo the limbic system**
- Trigonum habenulare
- Nuclei habenulae medialis et lateralis
- **Afferent connections**
  - imput – stria medullaris thalami
  - septum verum
  - Olfactory areas of paleocortex, piriform area
  - archicortex (hippocampus)
  - hypothalamus
  - pallidum internum
- Comissura habenularia – vice-versa connection
- **Efferent connections**
  - Nc. interpeduncularis
  - Formatio reticularis

- Corpus pineale
- Commisura posterior

Commisura posterior

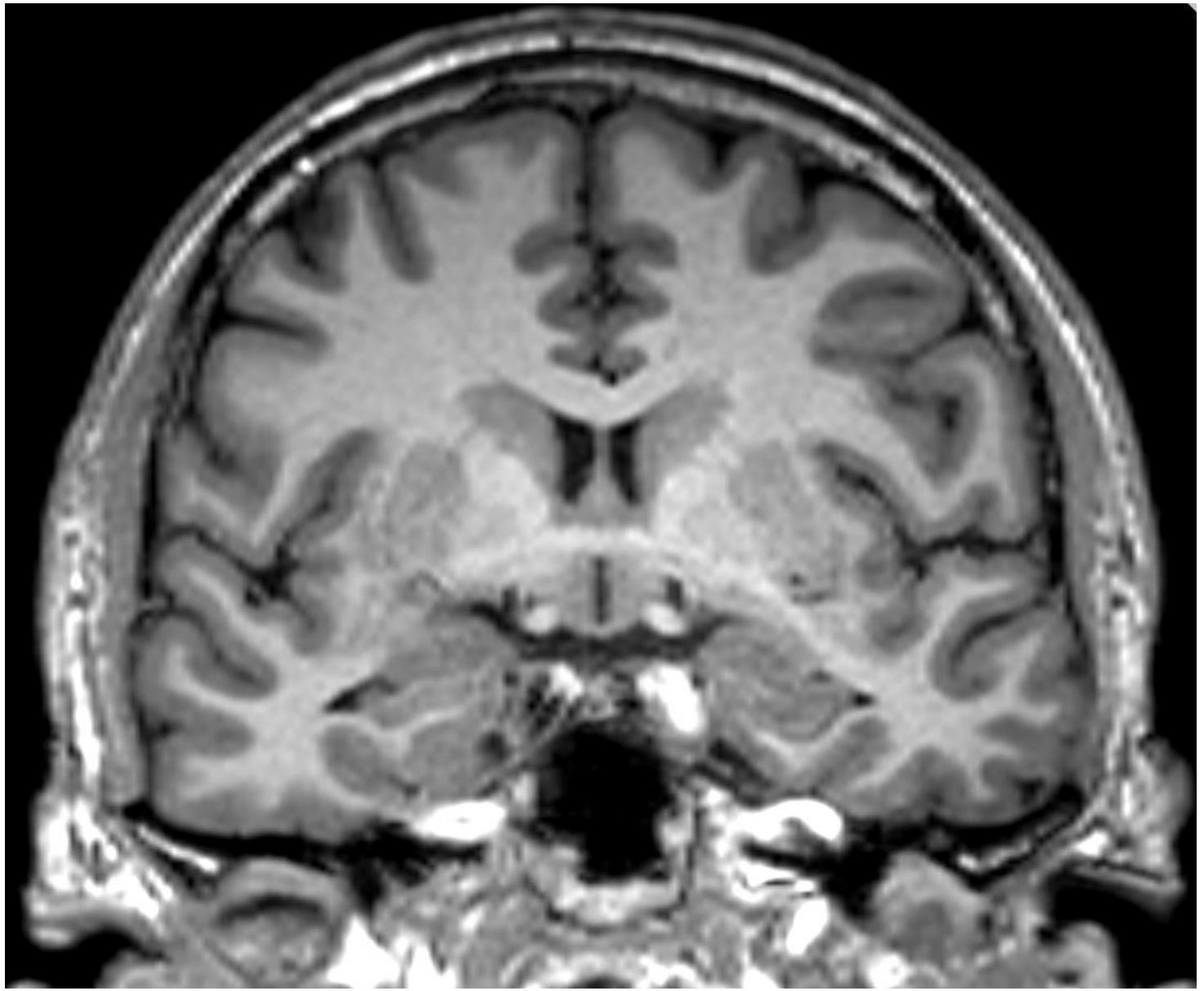
- connecting epithalamus and rostral mesencephalon
- Fibers
  - from interstitial nucleus of Cajal
  - From pretectal nuclei
- Habenulotectal fibers

Corpus pineale –pineal gland

- Hanged on commisura habenularium
- Related to III. ventricle roof
- Epitheloid cells – pinealocytes – modified neurons
- Fibrilary astrocytes
- photoreceptors of primitive vertebrates up to
  - new-zealand hateria („the third eye“)
- Pineal gland
  - obtaining information form multineuronal system from retina
  - with interposition of hypothalamus and reticular formation
- Pinealocytes – serotonin –melatonin – biorythms and sexual behavior
- Cirkadian rhytms – regulated from anterior lobe of pituitary gland
- Melatonine production increases during darkness, drops down during light
- Calcifications – acervulus cerebri – cerebral sand
- Inhibitory influence to pituitary and other endocrine glands

Hypothalamus

- Nuclei
- White matter fibers
- Fornix
- Fasciculus mamillothalamicus
- Medial and lateral hypothalamus

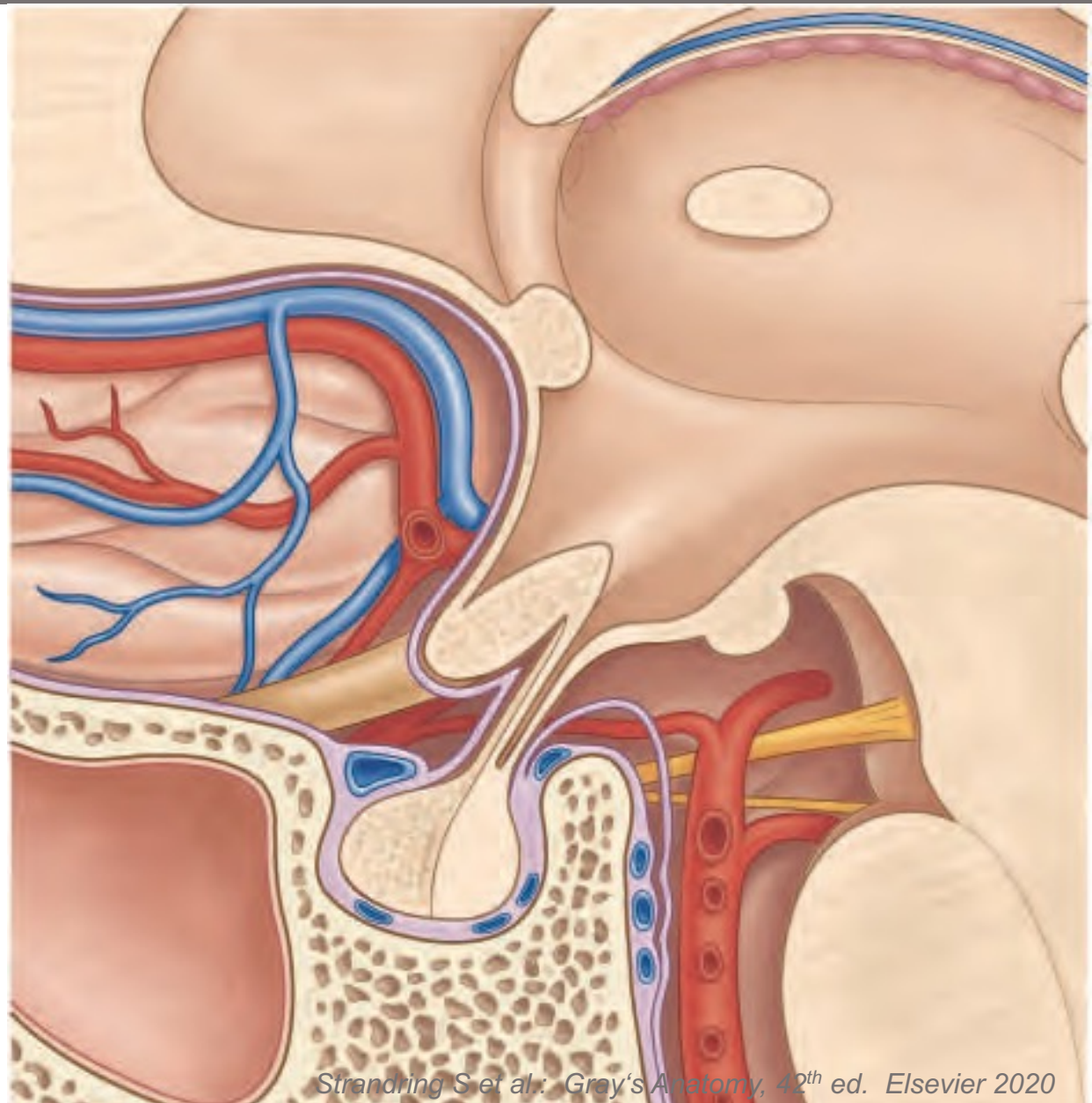


Hypothalamus

- **anterior**
  - ***Nc. preopticus*** – *body temperature (hypotermie)*
  - ***Nc. supraopticus*** – *ADH, oxytocin*
  - ***Nc. paraventricularis*** – *ADH, oxytocin*
  - *Food intake*
  - *Lateral injury– anorexie*
  - *Medial injury- obezita*
  - *Activating parasympatheticus*
- **middle**
  - ***Nc. ventromedialis***
  - ***Nc. dorsomedialis***
  - ***Ncc. tuberalia***
  - *Aktivating sympatheticcus*
- **dorsal**
  - ***Nc. posterior***
  - ***Corpora mammillaria***
  - *sweating*
  - *Injury - hypertermie*

Hypothalamo-hypophyseal system

- **Hypothalamus**
  - **Nuclei and their responses**
  - **Emotional and exteroreceptive stimmuli**
- **Sekretion of releasing factors/hormones**
  - **CRH – corticotropine releasing hormone - ACTH**
  - **TRH – thyreotropine releasing hormone - TSH**
  - **ĢnRH – gonadotropine releasing hormone – FSH, LH**
- *Inhibitory factors - somatostatine*
- **Hypophysis – pituitary gland**
- **Lobus anterior – adenohypophysis**
  - *Rathke pouch – stomodeum – accesor. nasopharynx*
  - *Pars principalis, intermedia, tuberalis*
- **Lobus posterior – neurohypophysis**
  - **Processus of hypothalamus**
  - **Modified glial cells - pituicytes**
  - **Neural fibers**
  - **Transportation of peptidic hormones**



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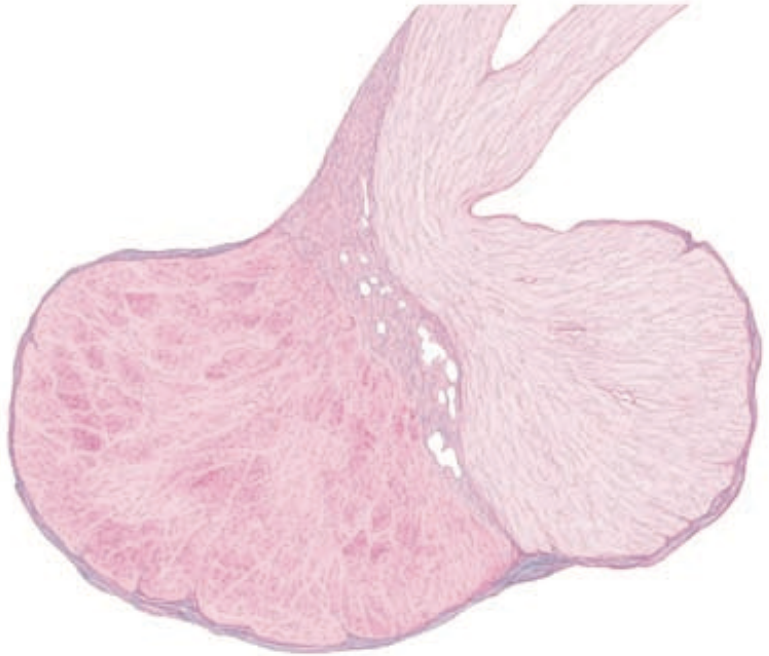
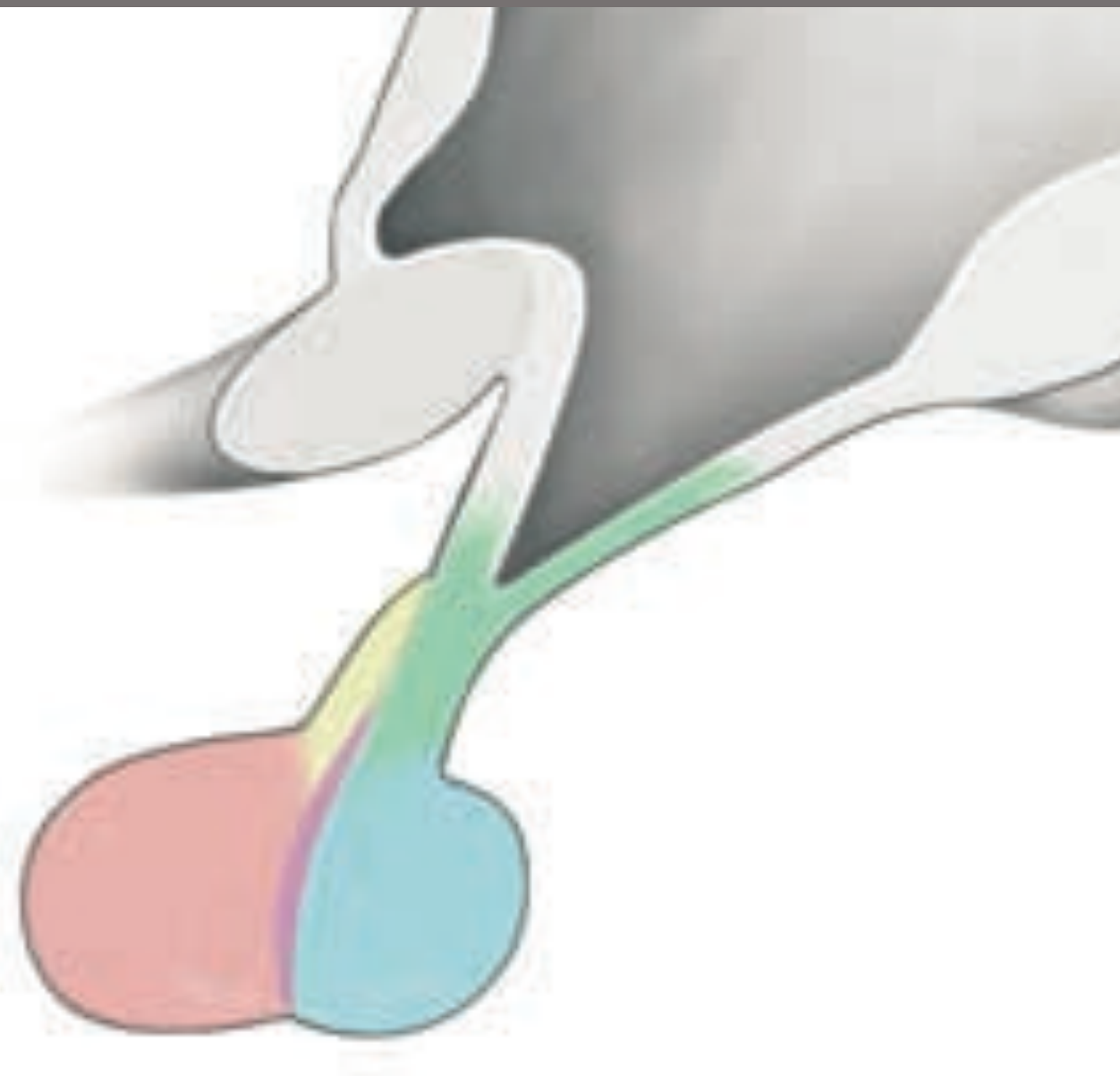
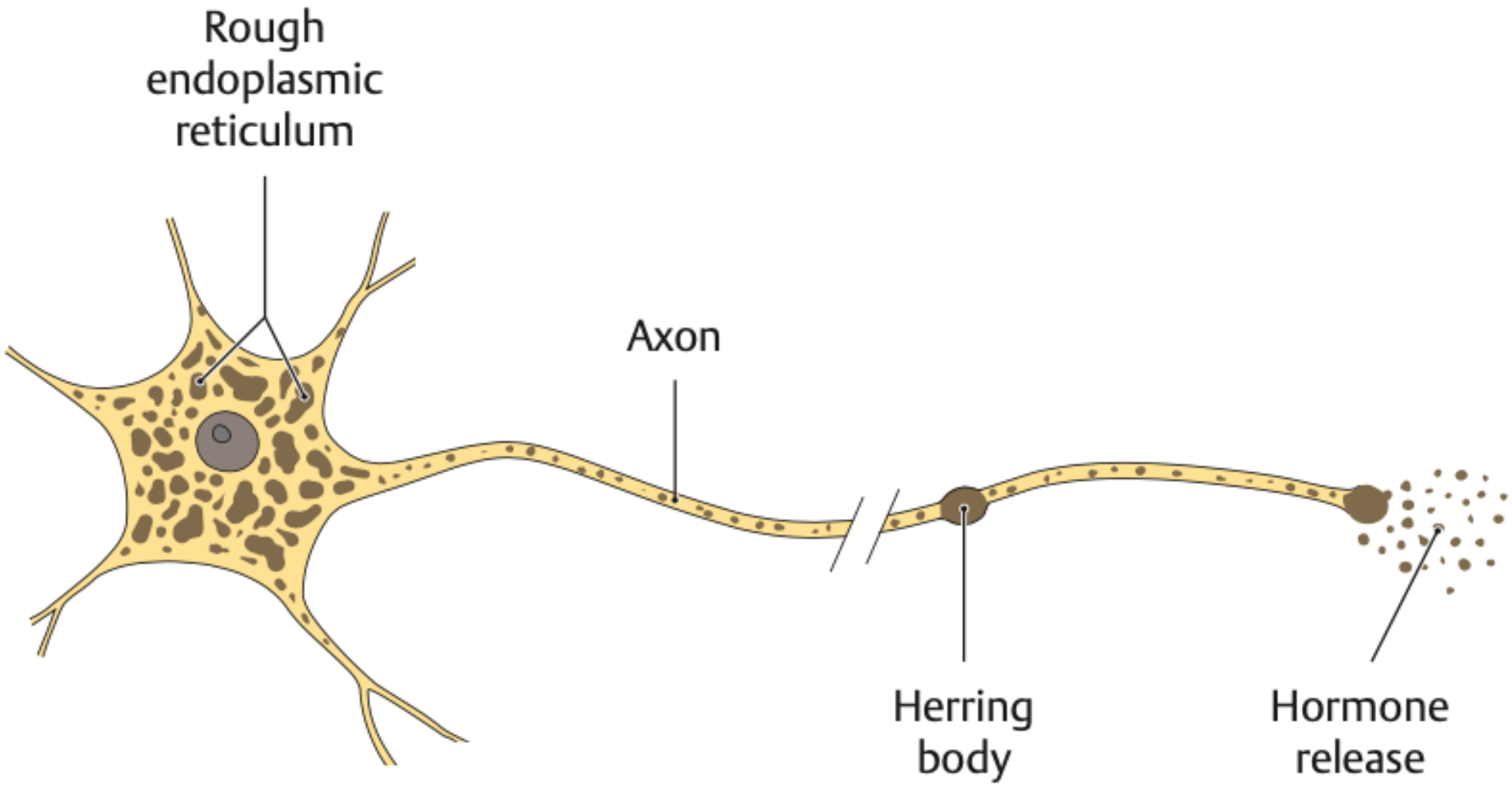
Hypophysis

- *Infundibulum*
- Neurohypophysis – lobus posterior
- Adenohypophysis – lobus anterior
- *Pars tuberalis*
- *Pars intermedia*
- Pars distalis





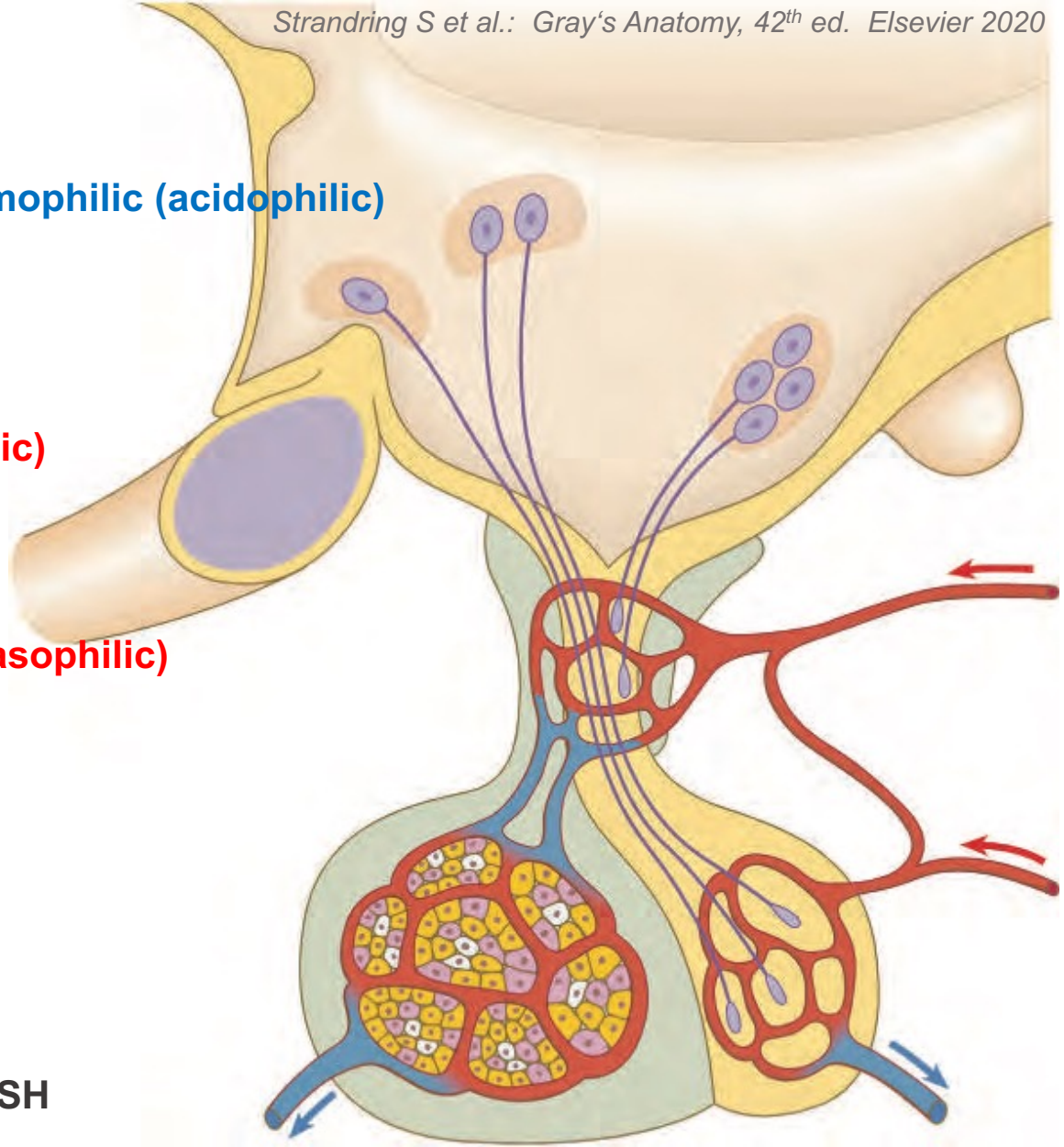
Hypophysis


Rough endoplasmic reticulum
Axon
Herring body
Hormone release

Adenohypophysis – anterior lobe

- Adenohypophysis
  - Neuropeptides
  - Somatotropine (STH) = growing hormone (GH) – chromophilic (acidophilic)
    - Tissue and organs growing
  - Prolaktine (PRL) – chromophilic (acidophilic)
    - Milk secretion
  - Glycoproteins
  - Adrenocortikotropine (ACTH) – chromophili (acidophilic)
    - Adrenal cortex
  - Thyreotropine (TSH) - chromophili (basophilic)
    - Thyroid gland
  - Folikulostimmulating hormone (FSH) - chromophili (basophilic)
    - Ovarial folicles – stimmulated production of hormones
    - Sertoli bb - spermatogenesis
  - Luteinizating hormone (LH) - chromophili (basophilic)
    - Secrerion of progesterone from corpus luteum
    - Leydig cells – secretion of testosterone

- Pars intermedia, chromophobic cells – lost granula
- Pars tuberalis – cslusters and funicles – basophilic LH a FSH



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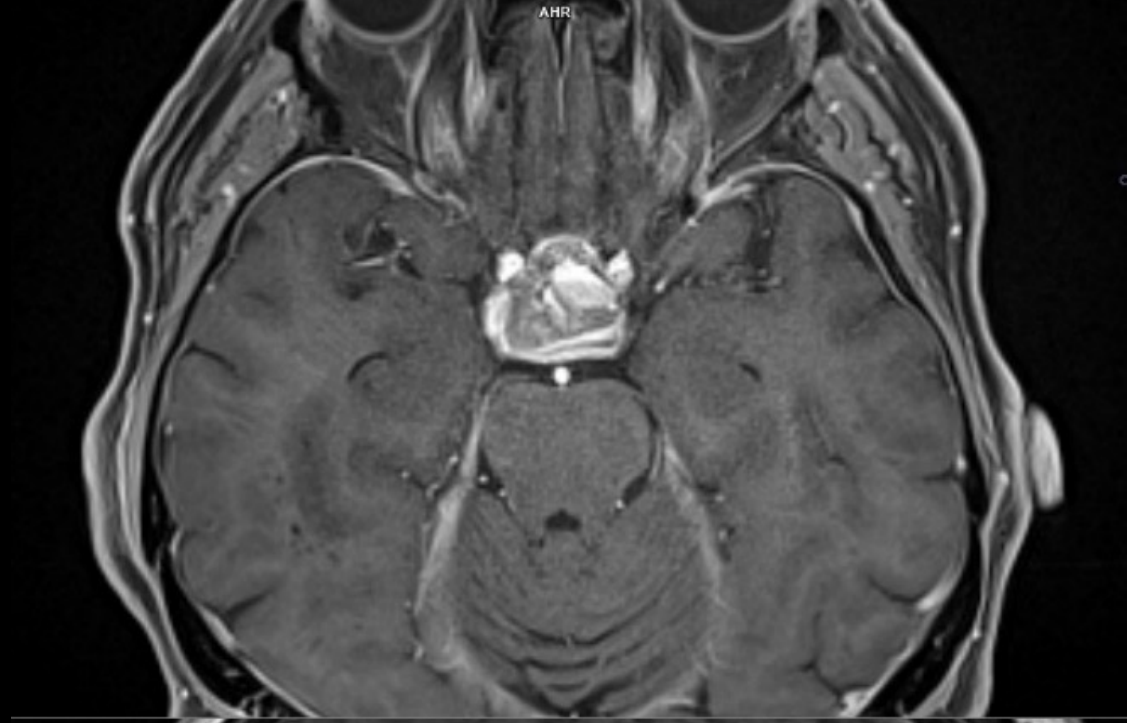
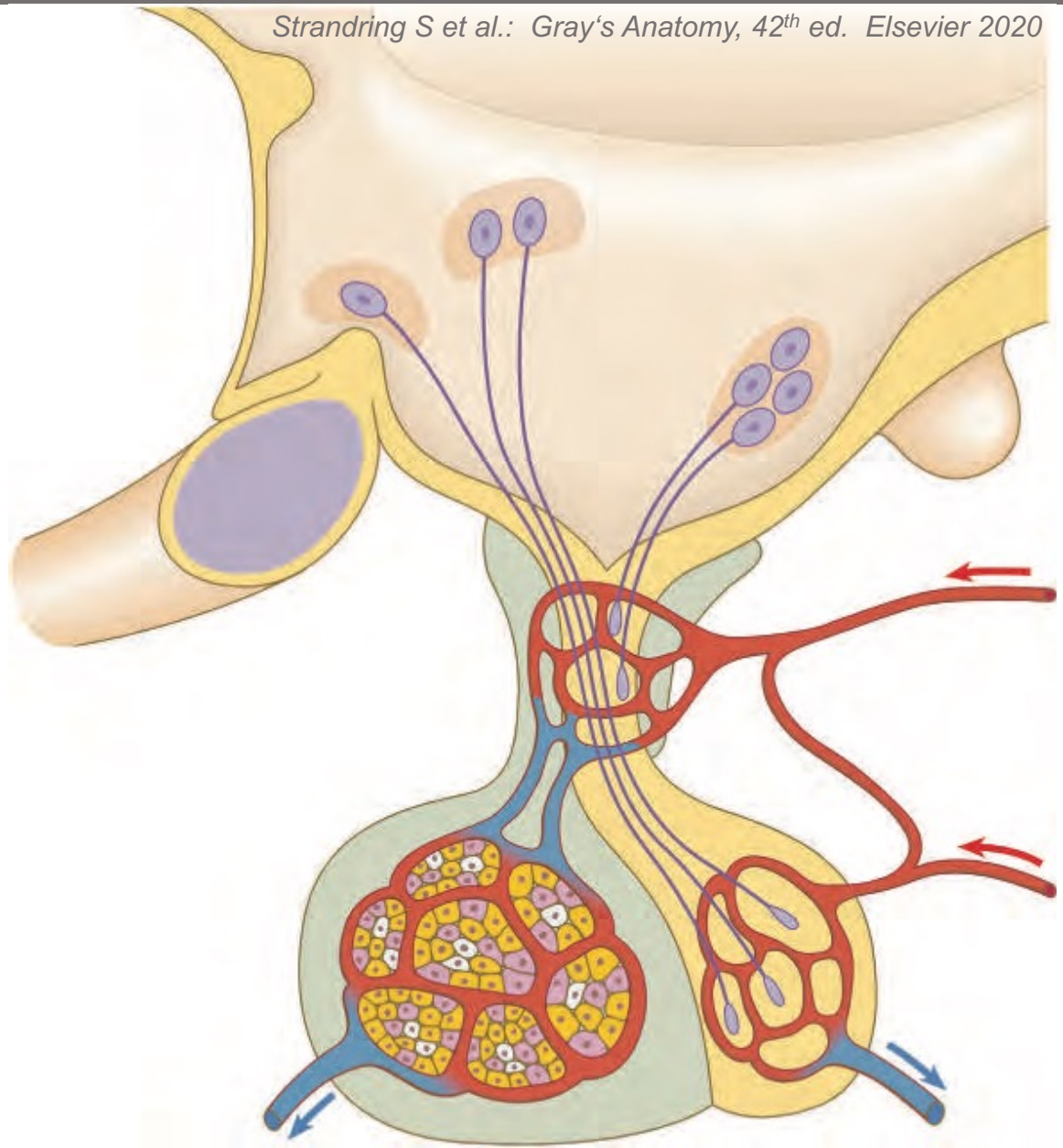

AHR


HLA

Neurohypophysis

- Processus of hypothalamus
- Lobus posterior – neurohypophysis
  - Processus of hypothalamus
  - Modified glial cells - pituicytes
  - Neural fibers
  - Transportation of peptidic hormones
  - Nc. supraopticus
  - Nc. paraventricularis
  - Vasopresine = antidiuretic hormone (ADH)
    - Water resorption in distal renal tubule
  - Oxytocine
    - Uteral contractions during deliverance
    - Milk ejection during breastfeeding



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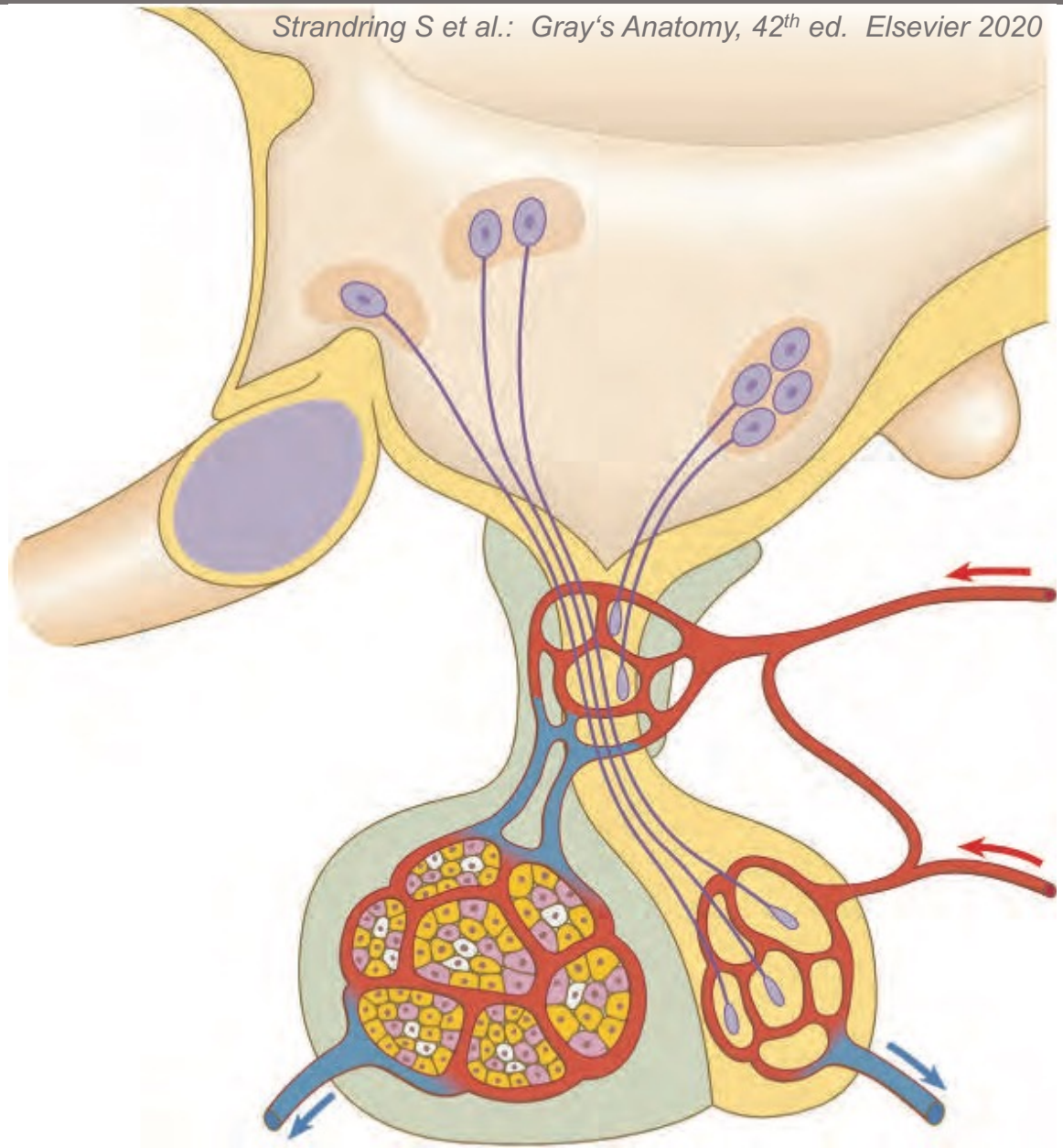
Vascular supply of the pituitary gland

- *A. carotis interna*
- **A. hypophysealis superior**
  - **trabecula**
- **A. hypophysealis inferior**

- **Plexus hypophysealis superior**
- ***Porta hypophysealis***
- **Plexus hypophysealis inferior**

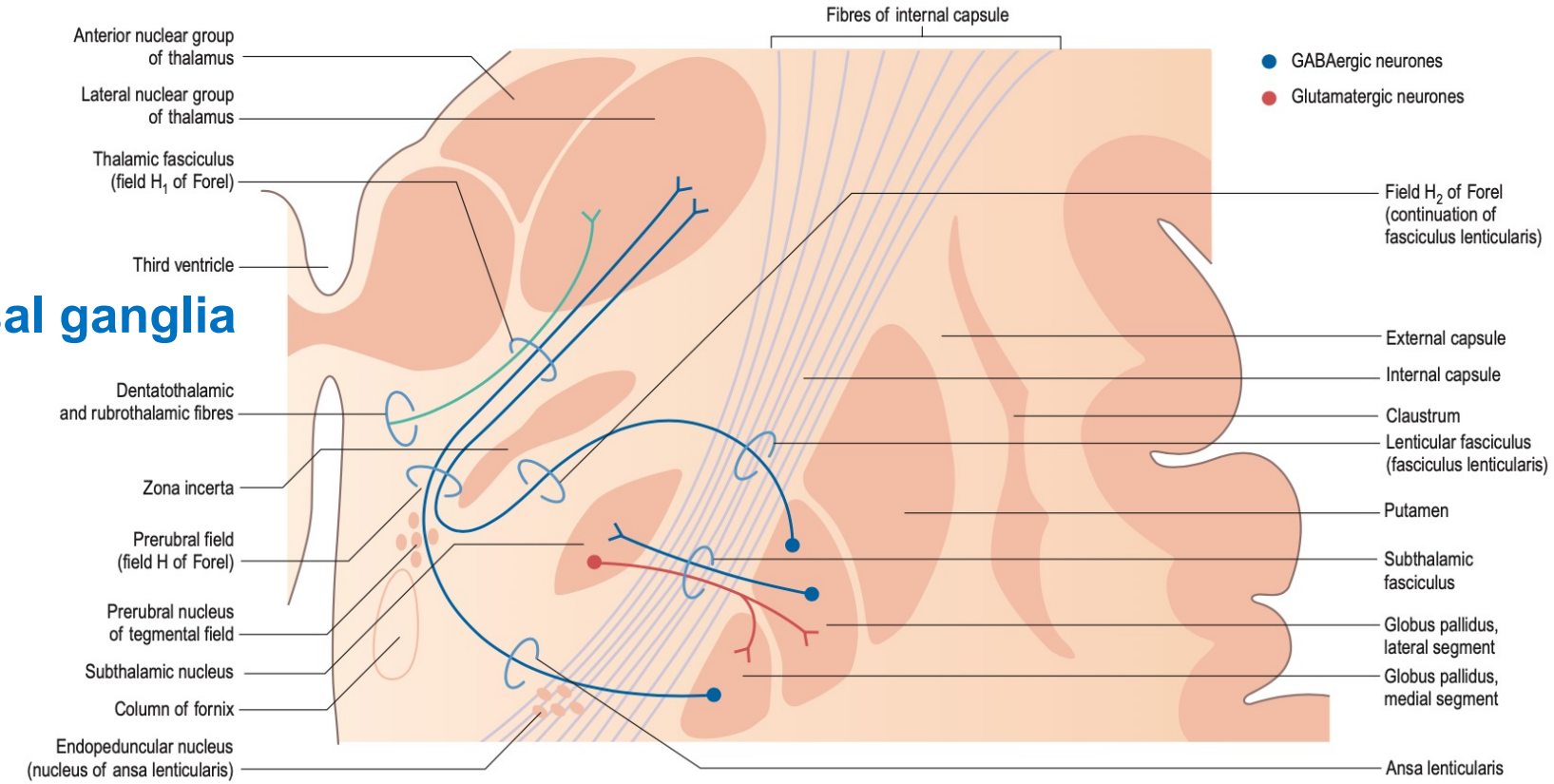
- **Plexus hypophysealis lobi posterioris**

- **Hypophysela veins**
- **Dural sinuses**



Subthalamus

- injury
  - Hemibalismus
    - Contralateral extremity
  - Chorea and athetosis
- A part f indirect pathway of basal ganglia
  - Ventral to thalamus
  - Lateral to hypothalamus
- Nucleus subthalamicus (Luysi)
  - splitted (fasciculus lenticularis)
  - From dorsal zona incerta
- Projection neurones
- Afferent connection
  - Pallidum externum – fasciculus subthalamicus – GABA
  - Motor, premotor, motor supplementary area – glutamate
  - Intralaminary thalamic ncc. - noradrenalin
  - Substantia nigra – pars compacta – dopamine
  - Raphela ncc. RF – serotonine
  - Nc. pedunculopontinus - acetylcholine



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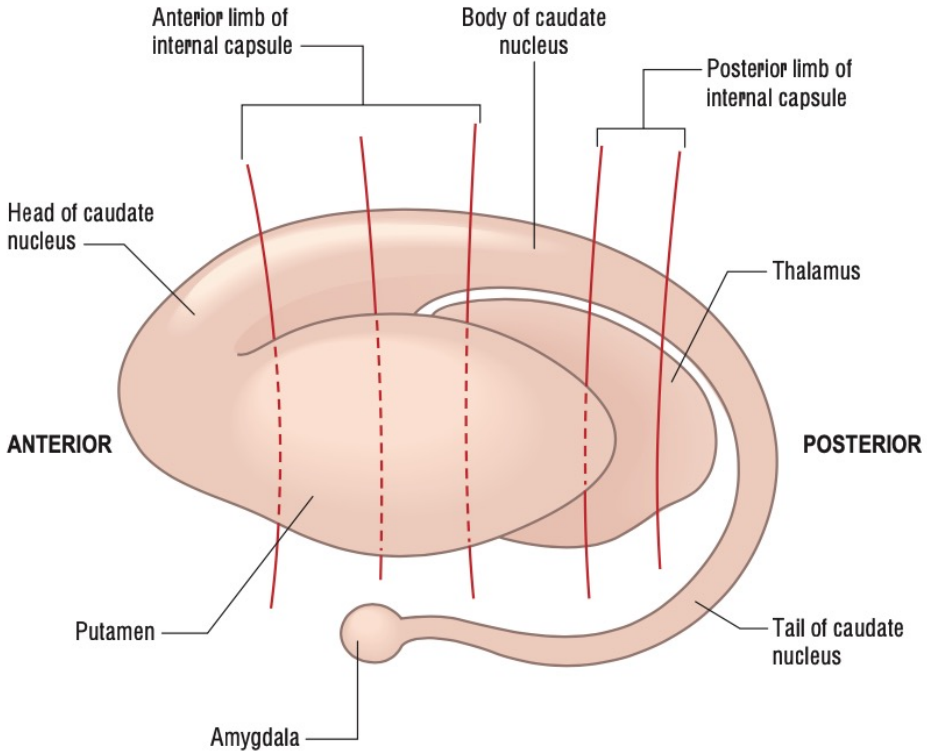
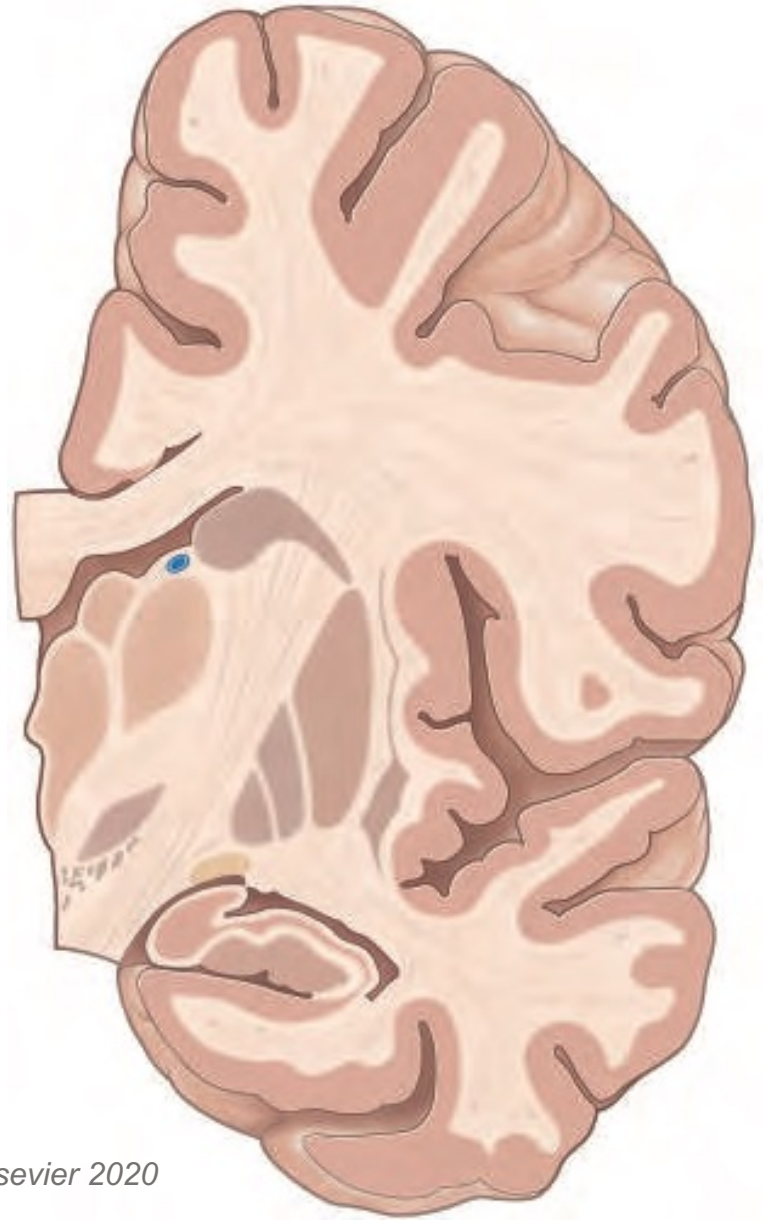
Basal ganglia

- Sucortical nuclei
- Corpus striatum
  - Nucleus caudatus
  - Putamen
  - Globus pallidus
- Claustrum
- Amygdaloid complex
- Associated centres
  - Diencephalon
  - Mezencephalon





- Neostriatum = striatum = nucleus caudatus + putamen
- Paleostriatum = globus pallidus = pallidum

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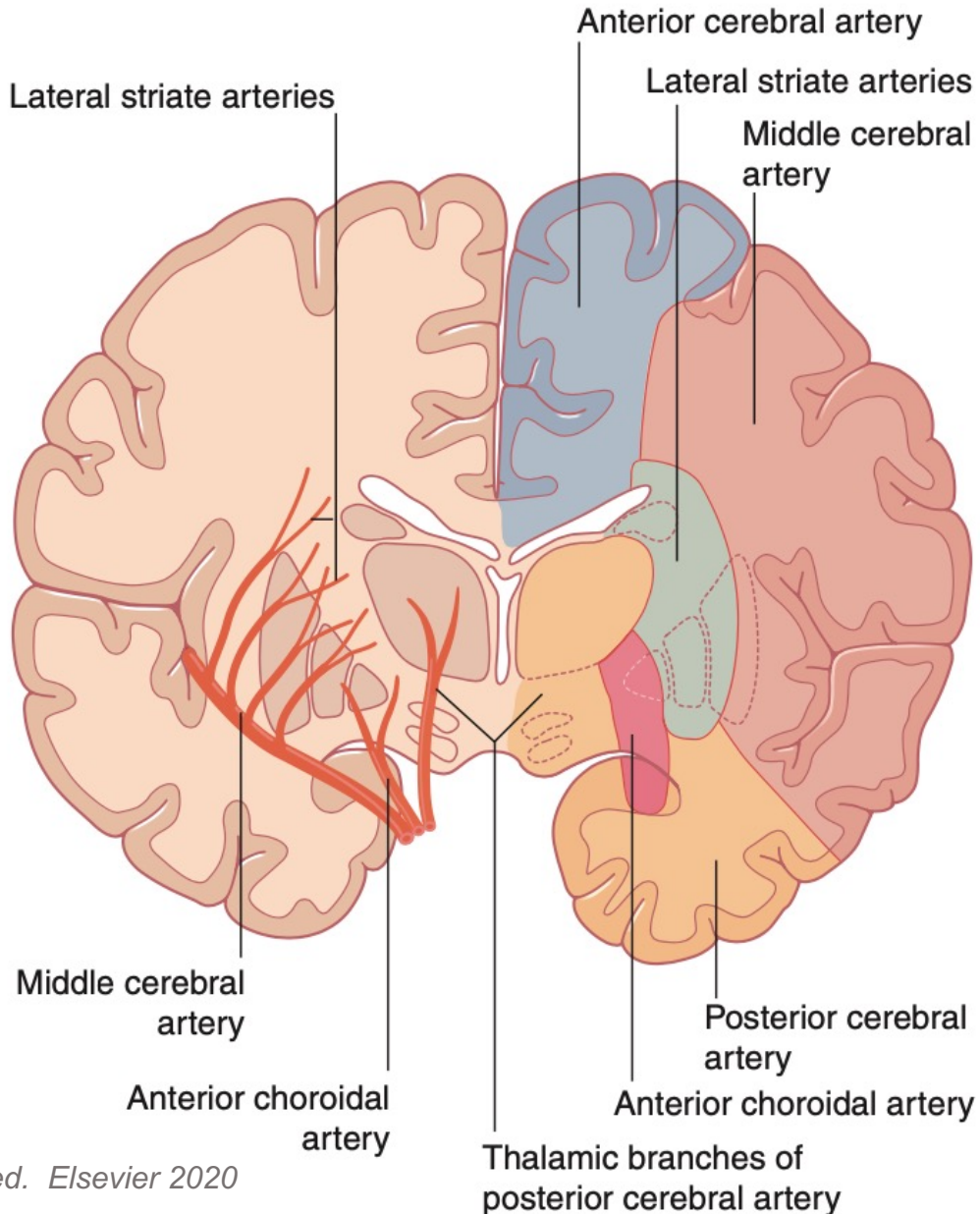
Basal ganglia and thalamus - arterial supply

- A. cerebri media
- Aa. centrales anteriores

- A. chorioidea anterior

- A. cerebri posterior
- Aa. centrales posteriores



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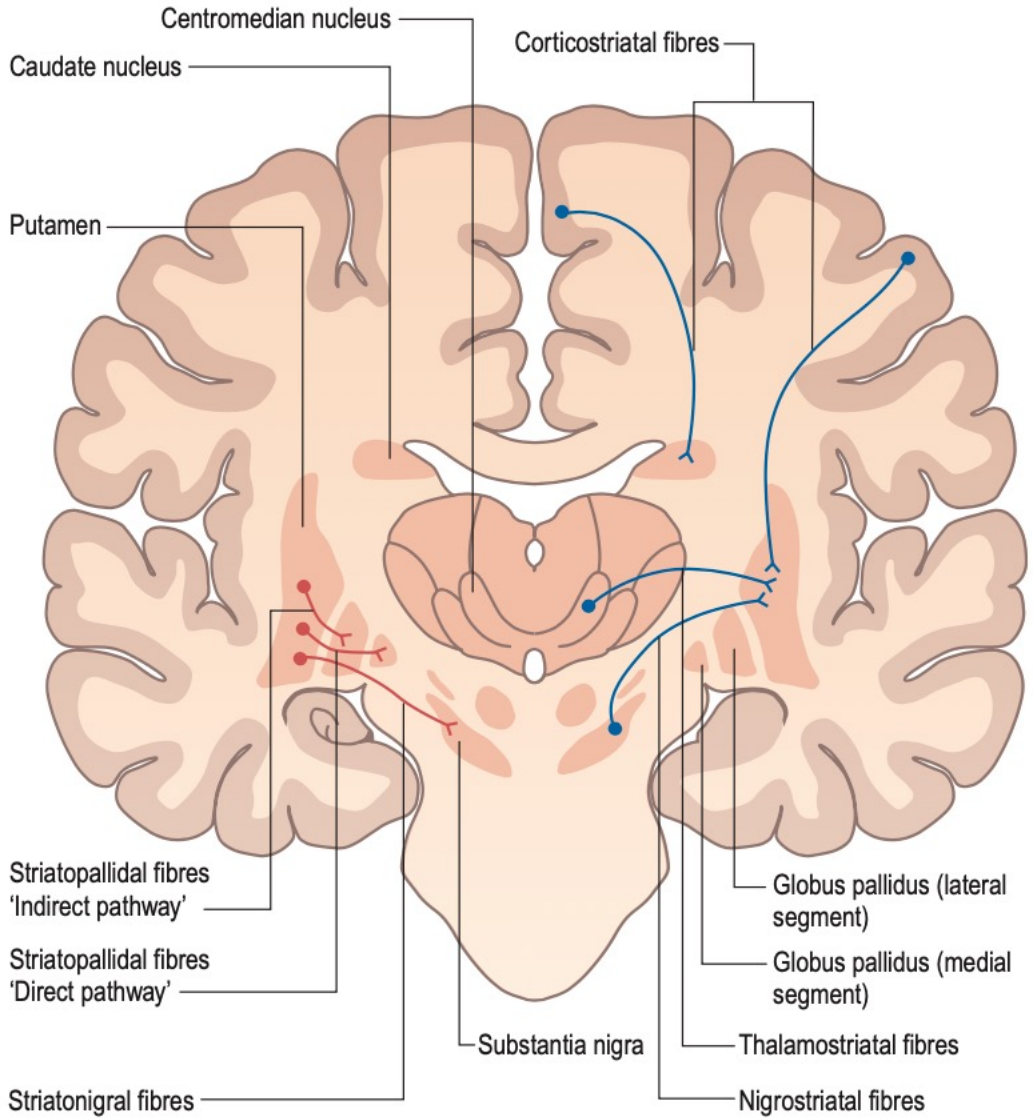
Striatum

- High cellular density
- Bugh vascular density
- GABA
- Enkefalines
  - D2 receptors of dopamine
- Substance P (dynorphin)
  - D1 receptors of dopamine
- Somatostatine
- Acetylcholine
- **Afferent connections**
  - Cortex
  - Thalamus
  - Substantia nigra
- **Efferent connections**
  - Globus pallidus – medial – „direct pathway“
  - Globus pallidus – lateral - “indirect pathway“
  - Nc. subthalamicus



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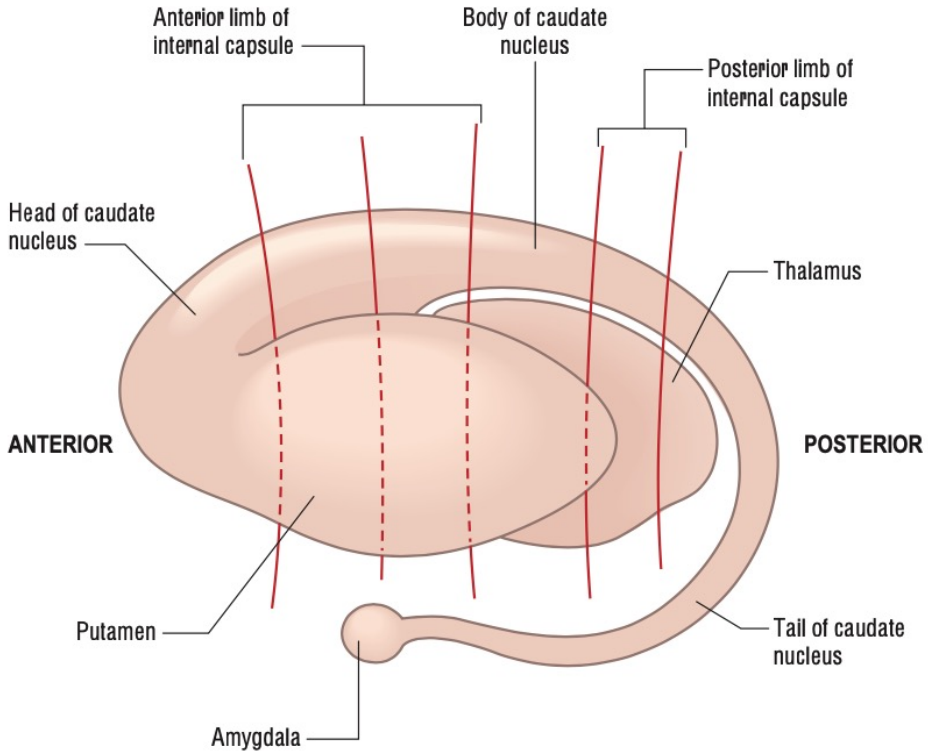
Striatum

- Corticostriatal connection
- Ipsilateral neocortex
- Orbitofrontal – caput nc. caudati pars inferior
- Dorsolateral frontal – caput nc. caudati
- Parietal – corpus nc. caudati
- Temporal and okcipital – cauda nc. caudati
- Somatosenzoric and motoric – putamen
  - Lower part – lateral
  - Upper part – medial
- Contralateral projection – cauda nc. caudati + inferior putamen



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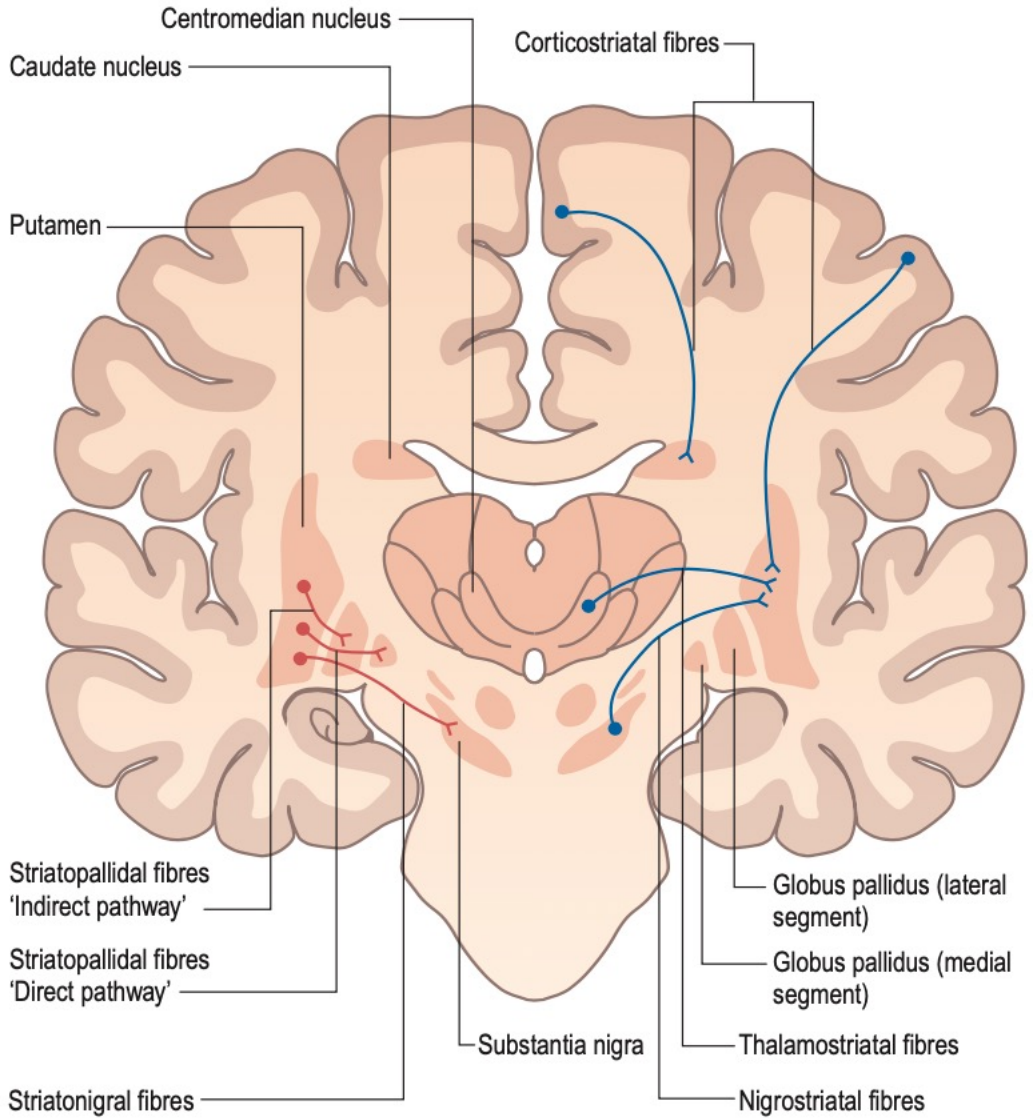
Striatum

- **Anibergic connections**
- **Dopamine**
  - *Substantia nigra pars compacta*
  - *Rubrostriatal connection*
- **Serotonine**
  - *Reticular formation, nuclei of raphe*
- **Noradrenaline-norepinephrine**
  - *Locus coeruleus*
- ***Connections of striatum***
- *Ventral striatum*
  - *Limbic cortex including allocortex*
  - *Nc. accumbens + tuber olfactorium*
  - *In the front of commisura anterior – addiction to cocaine, amphetamine*
  - *Decreases re-uptake of dopamine*
- *dorsal striatum*
  - *Motor cortex, prefrontal cortex kortex, gyrus cinguli*
  - *Intralaminar thalamic nuclei*



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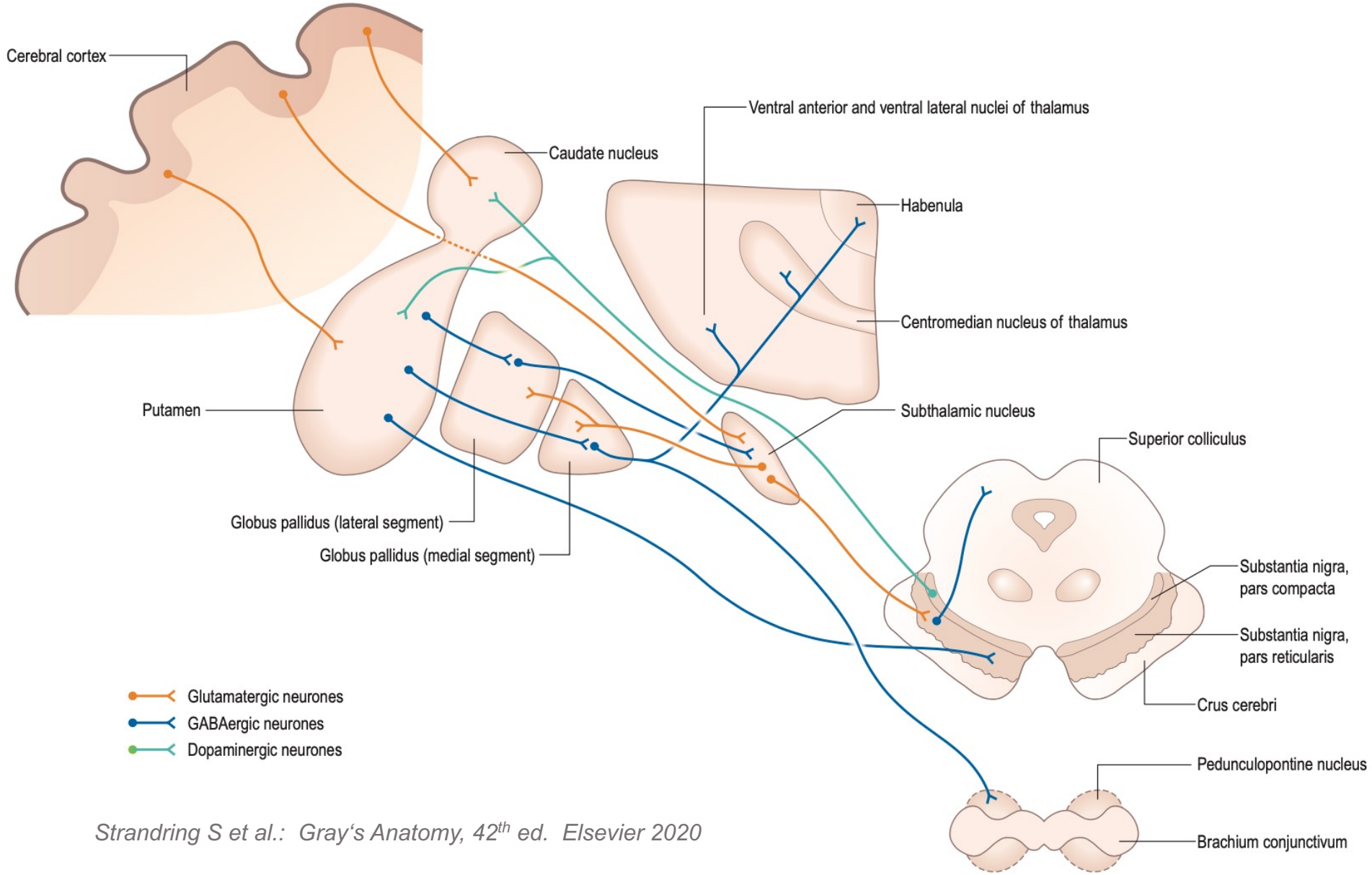
Connections of striatum



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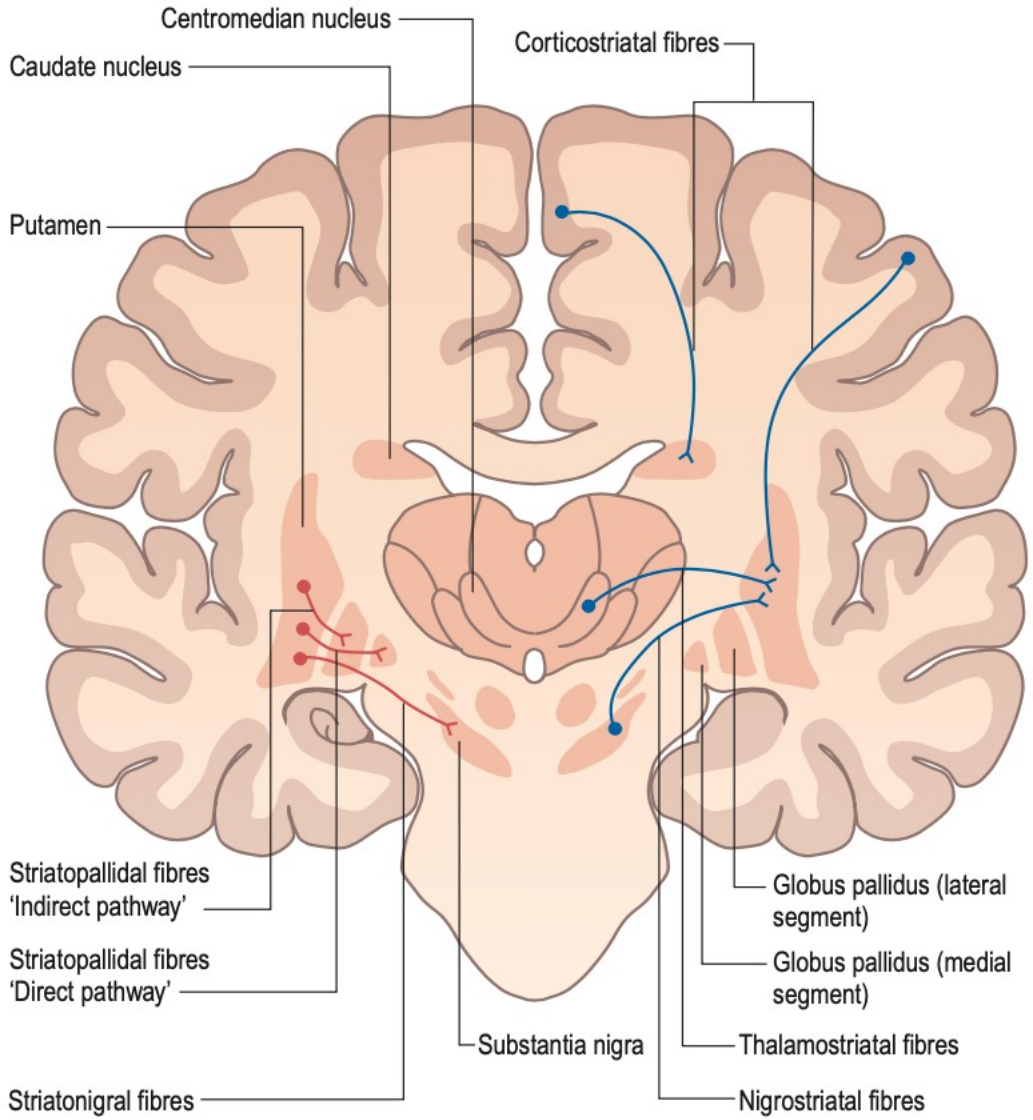
Globus pallidus = pallidum

- Paleostriatum = pallidum
  - 5% of cells in comparison to striatum
  - Striatopallidal connections
- Direct pathway
  - striatum
  - Globus pallidus pars medialis
    - (pallidum internum)
  - Substantia nigra pars reticulata
  - GABA (D1 receptor), dynorphin, substance P
- Indirect pathway
  - striatum - nc. subthalamicus
  - Globus pallidus pars lateralis
    - (pallidum externum)
  - Substantia nigra pars reticulata
  - GABA (D2 receptor), enkefalin
- Hyper-direct pathway
  - Frontal lobe
  - Nc. subthalamicus



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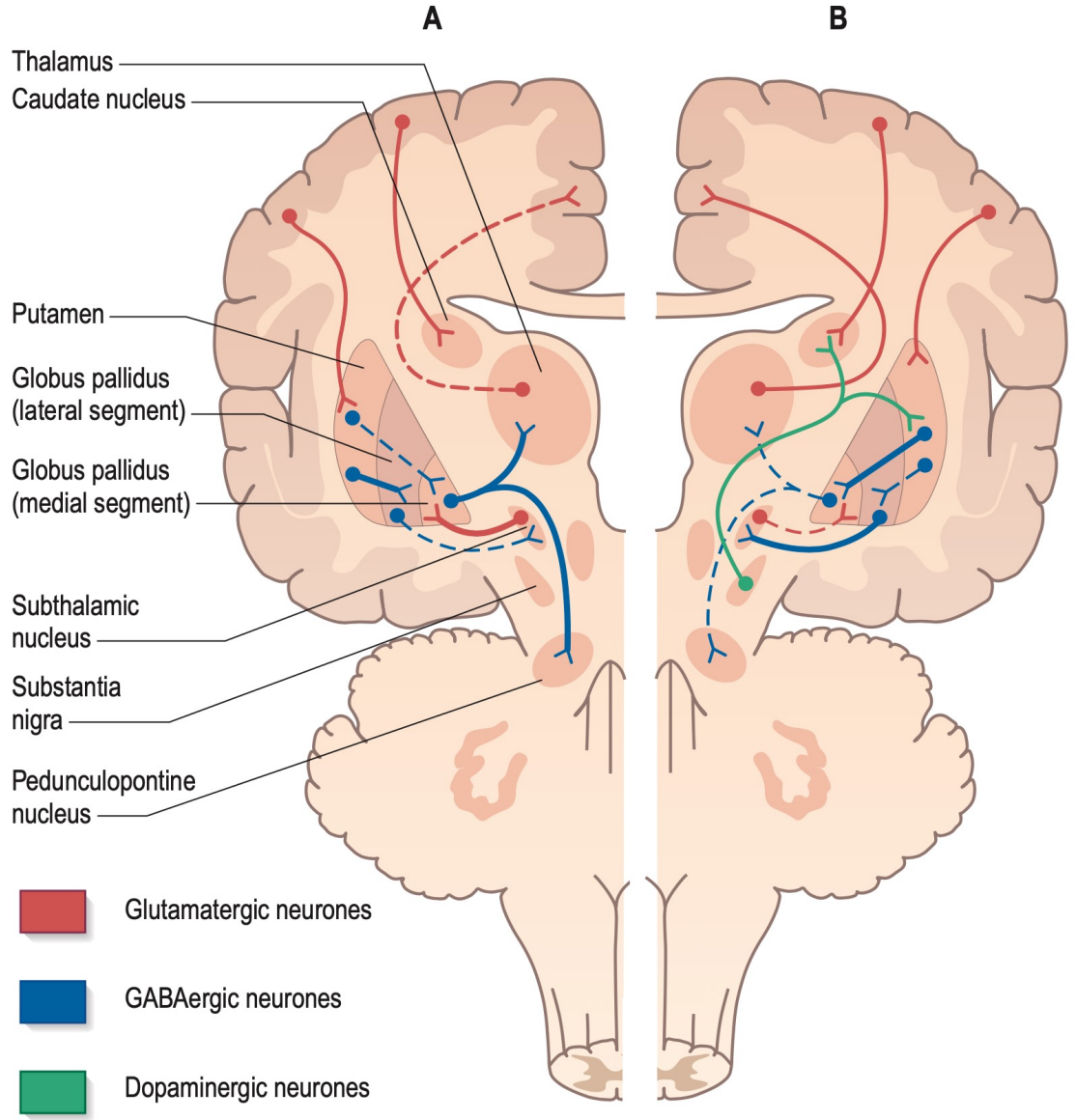
Basal ganglia

- Function disorders
- Inability to initiate and execute the motion
- Morbus Parkinson
- Inability to prevent involuntary motions
- Chorea major (Morbus Huntington)
- Distorder of the sight fixation
- Progressive supranuclear palsy (PSP)



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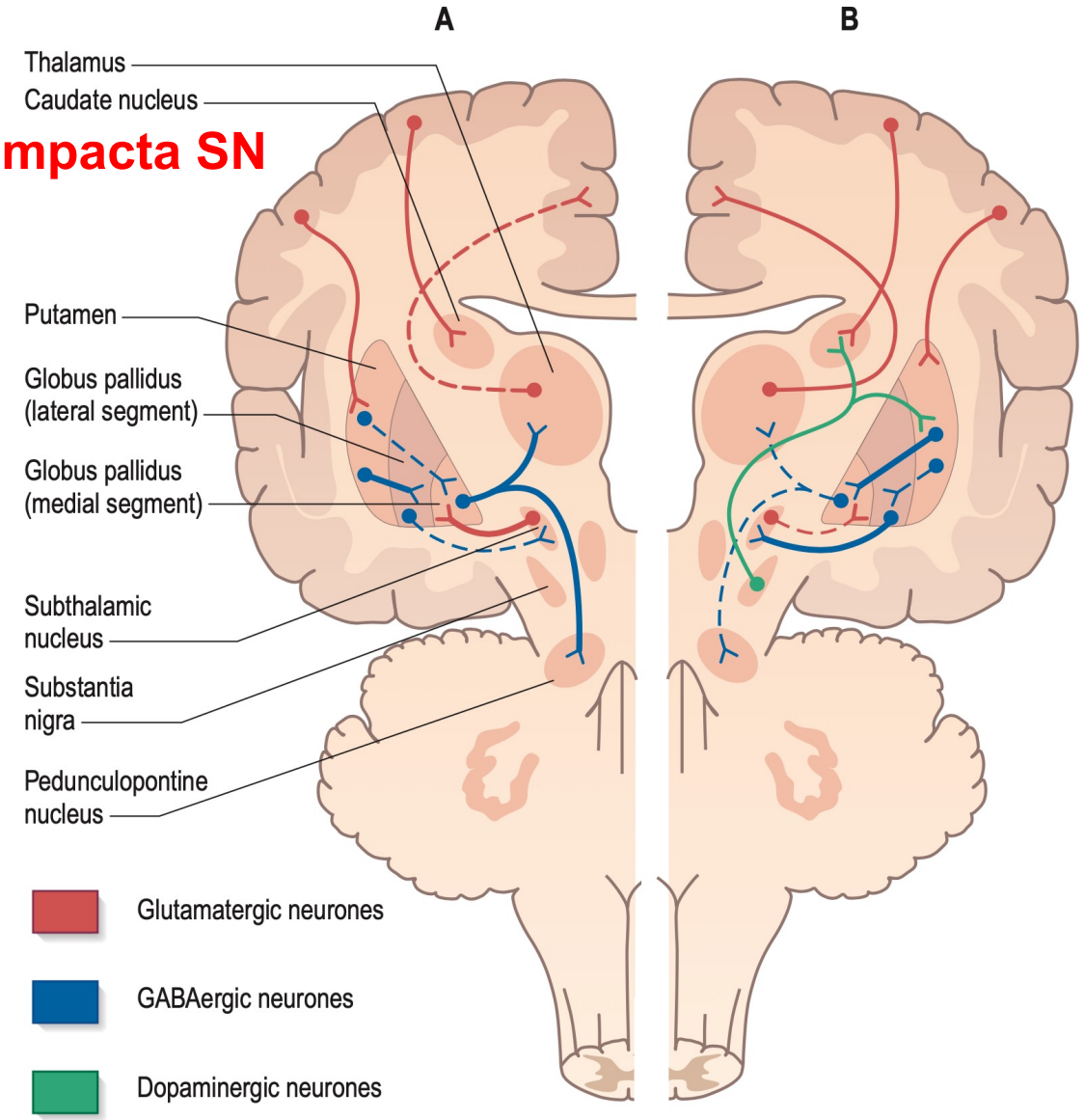
Bazal ganglia

- **Parkinson disease**
- **Degeneration of dopaminergic neurons in pars compacta SN**
- **Decreased concetration of dopamine in striatum**
- **Receptors preserved**
- *Decreased density of receptors*
  - *striatonigral degeneration*
- **Increased aktivity of the indirect pathway**
- **Decreased aktivity of the direct pathway**
- **Decreased inhibition of nc. subthalamicus**
- **Increased aktivity of thalamic motor nuclei**
- **Increased cortical activity**
- **Hypertonus**
- **Dyskinesia**



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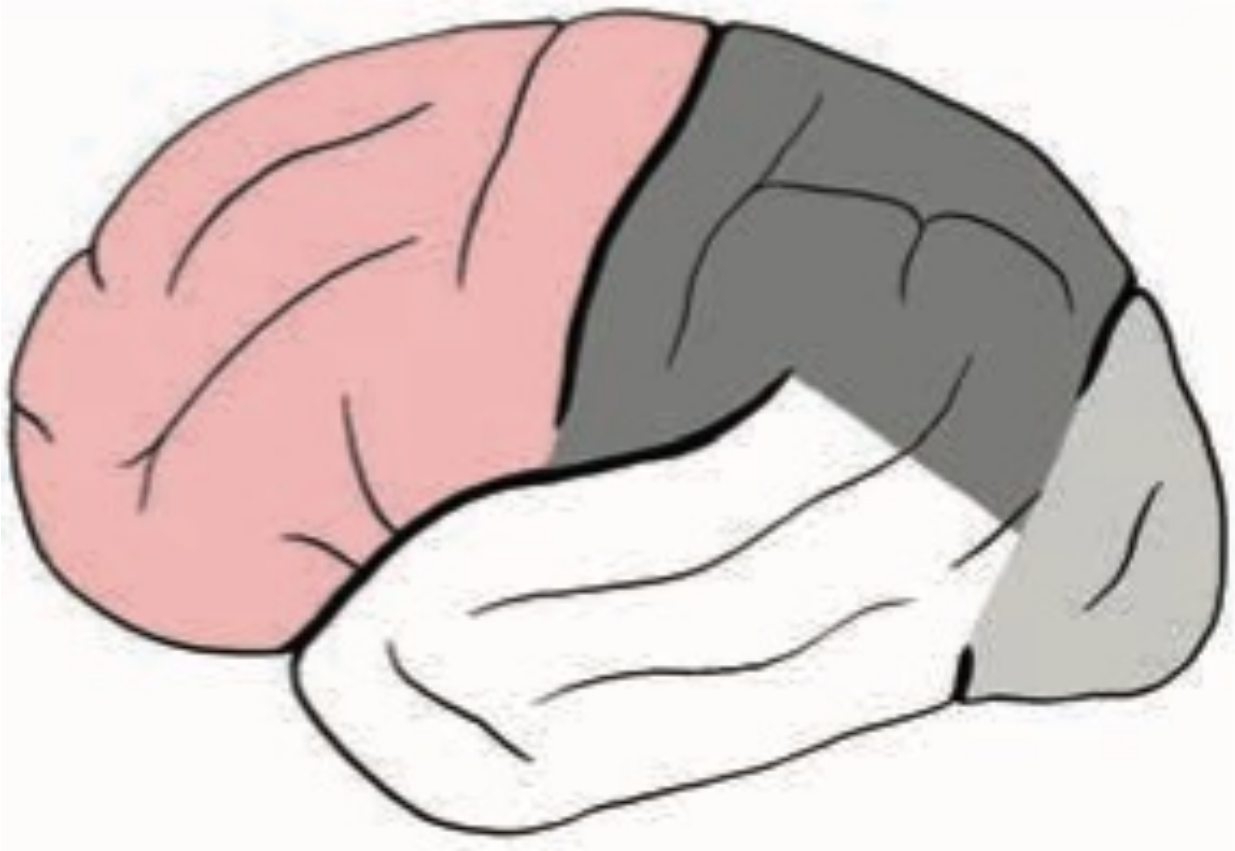
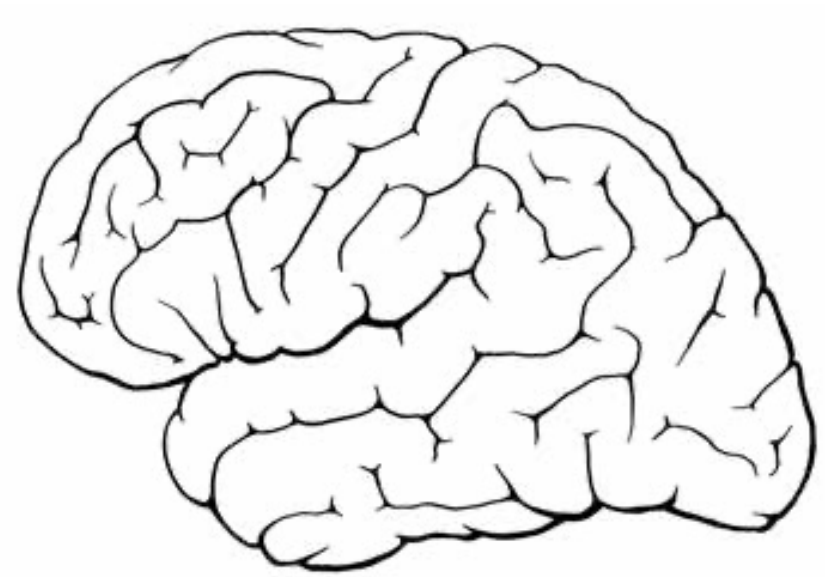
Lobi, sulci, gyri

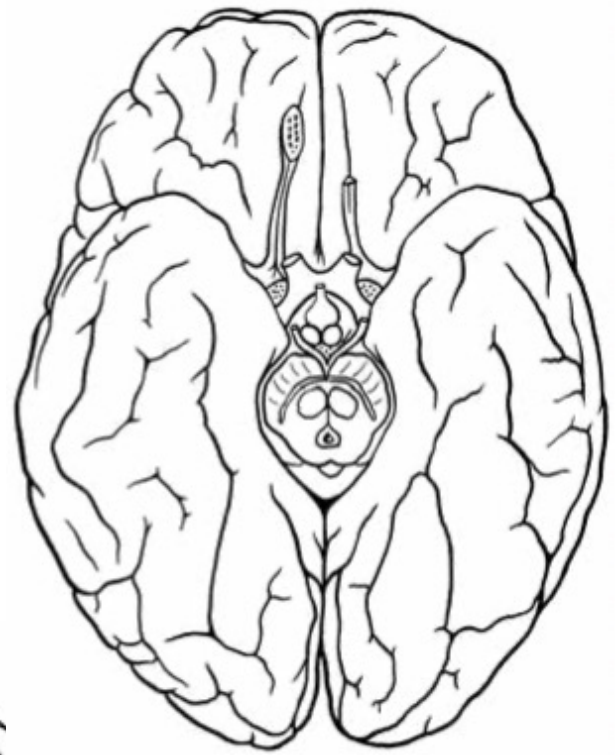
- **Lobus - lobi**
  - **Divided by**
- **Sulci**
- ***Sulcus centralis (Rolandi)***
- *Lobus frontalis / lobus parietalis*
- ***Sulcus lateralis (Sylvii)***
- *Lobus temporalis / lobus temporalis + parietalis*
- ***Sulcus parietooccipitalis***
- *Lobus parietalis – lobus occipitalis*
- ***Incissura praeoccipitalis***
- *Lobus temporalis / lobus occipitalis*

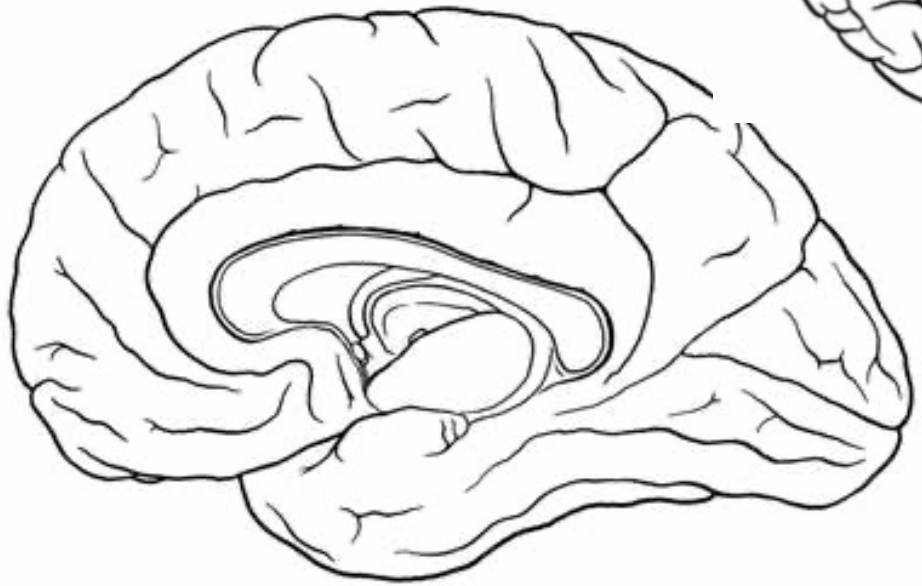


Cortex cerebri

- **Allocortex**
  - **Paleopallium = paleocortex (1%)**
  - **Olfactory region**
  - **Archipallium = archicortex (3,5%)**
  - **Three layers**
- **Isocortex**
  - **neocortex = neopallium (95,5%)**
  - **Six layers with differnt participation**
- **Mesocortex**
  - **Reduction of some layers**
  - **Between allocortex and isocortex**
  - **Peripaleocortex**
  - *insula*
  - **Periachicortex**
  - *Entorhinal area – medial uncus gyri hippocampalis*
  - *Praesubiculum - medial surface gyrus parahippocampalis*

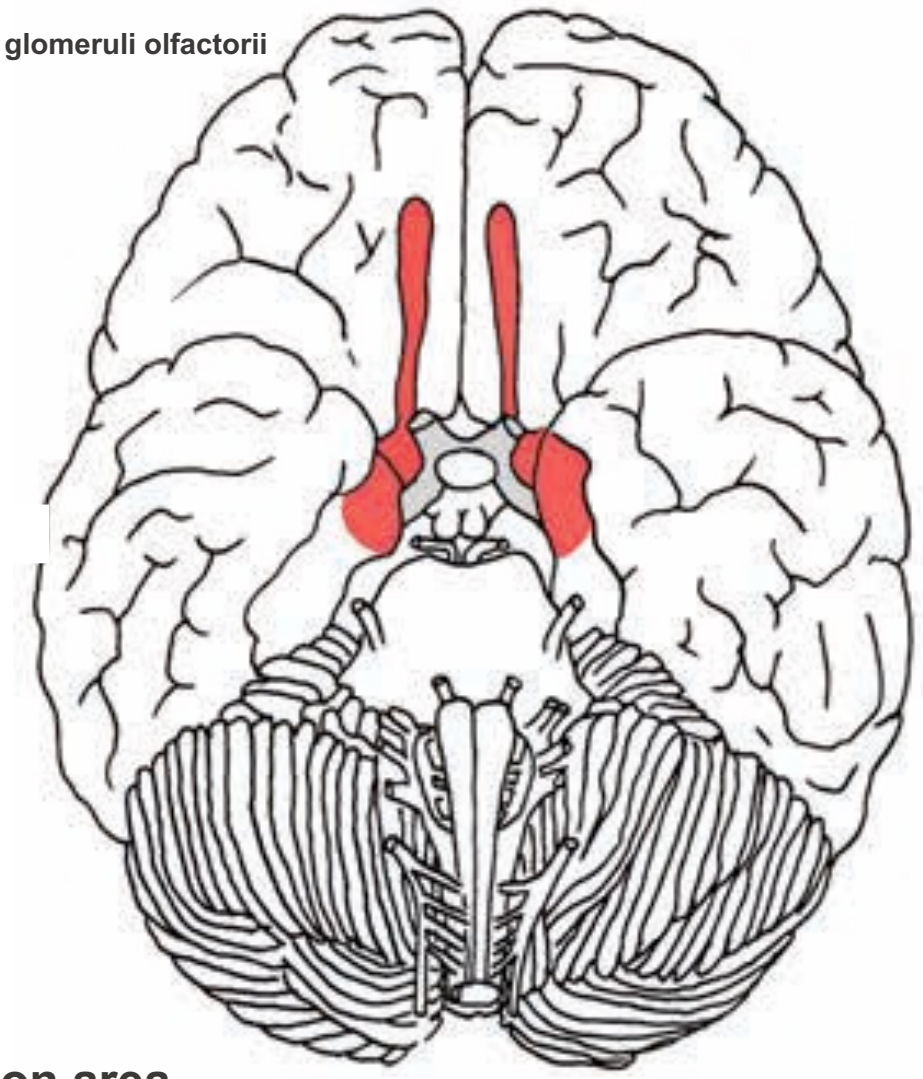






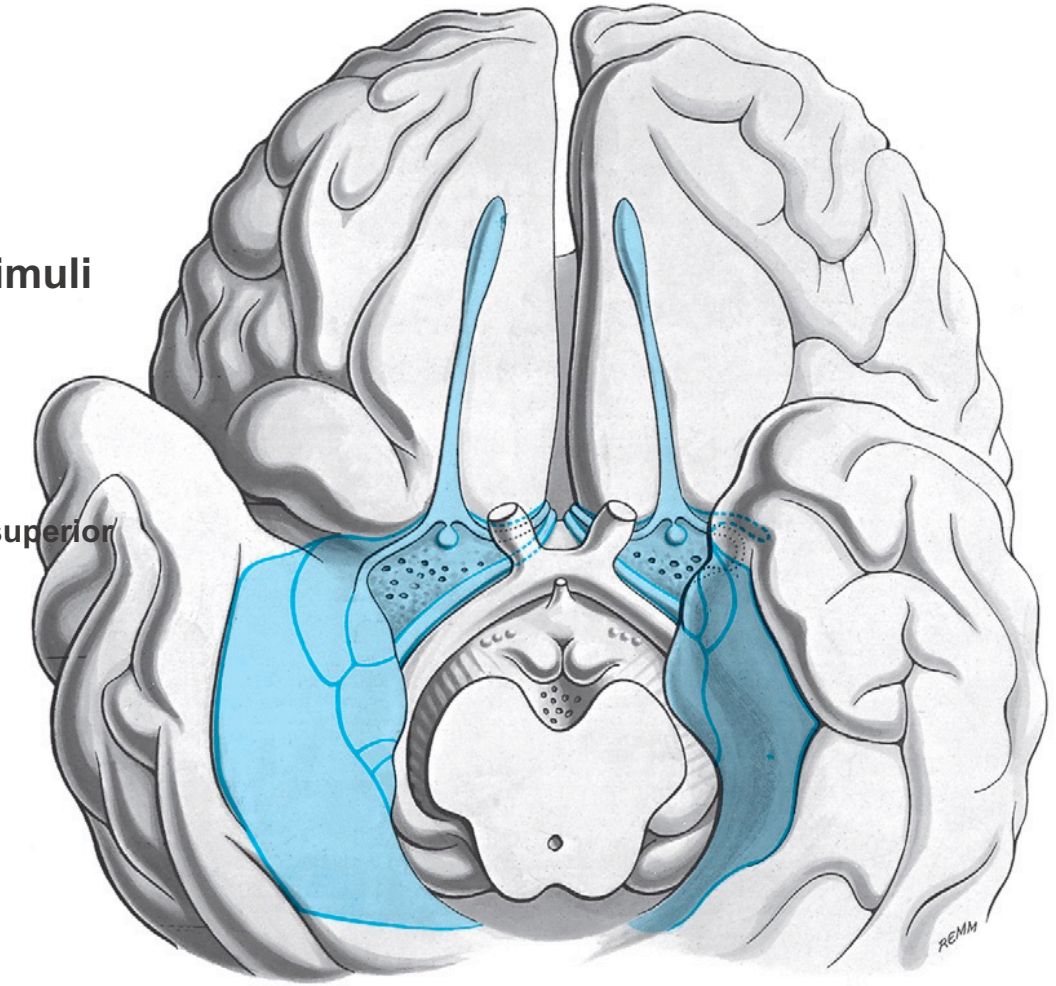
Olfactory brain - rhinencephalon

- Bulbus olfactorius
  - Synaptic complex of special sensoric cells and mitral cells in olf. bulbs- glomeruli olfactorii
  - Endings of olfactory region fibers and from septum verum
- Tractus olfactorius
  - Substantia perforata anterior
- stria olfactoria lateralis
  - Leads to uncus gyri hippocampalis
  - To primary olfactory region
- stria olfactoria medialis
- Rhinencefalon – only where olfactory pathway
  - twoneuronal
  - Sensoric cells . Nasal mucosa
  - Mitral cells – bulbus olfactorius
- Olfactory cortical area
- Paleocortex - all
  - frontal – lateral from stria olfactoria lateralis
  - Temporal upper surface odf – uncus gyri hippocampalis
- Anterior part of entorhinal region
- Medial and cortical nukleus of amygdala
- Primary olfactory area only bulbus
- rest of rhinencefalon – a som signs of association area



Olfactory brain - rhinencephalon

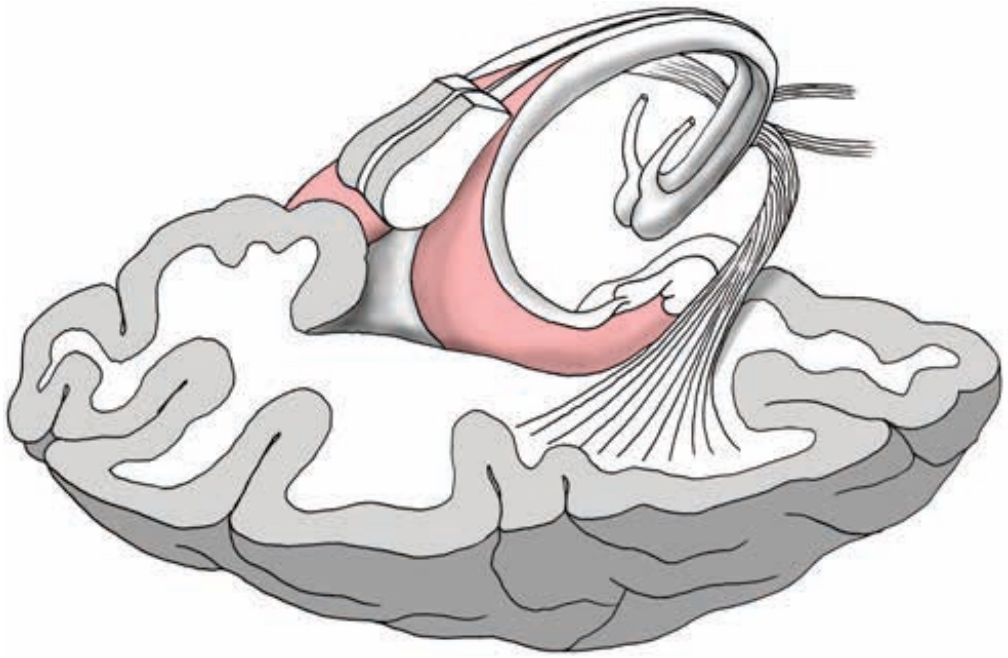
- Afferent connections
  - Axons of mitaral cells in bulbus olfactorius
- Efferent connections
- cortical – entorhinal area
  - To hippocampal formation – archicortex of limbic cortex
  - Anterior part of olfactory cortex activated by the positive stimuli
- subcortical
  - Amygdala – activated by negative stimuli
  - Thalamus – nc. mediodorsalis
    - Orbitofrontal cortex – association cortex in insuly and gyrus temporalis superior
    - Emmltions and behaviour
  - Hypothalamus – area hypothalamica lateralis
    - Vegetative and brainsem functions
- Association connection
  - With rest of paleokortex
- Commisural connections
  - Left/right connection of paleocortex
  - Crossed projection to olfactory bulb

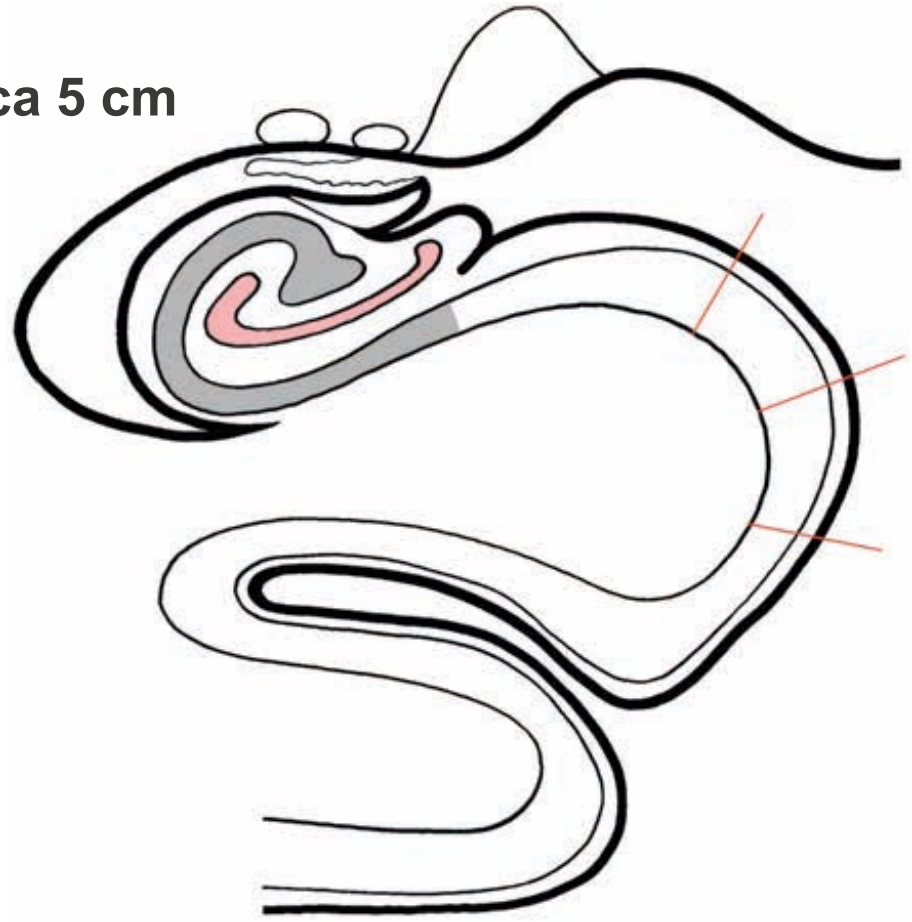


Archaecortex

- In fissura chorioidea at the base of temporal horn of lateral ventricle
- Three layers
- Three bands of grey matter – hippocampal formation

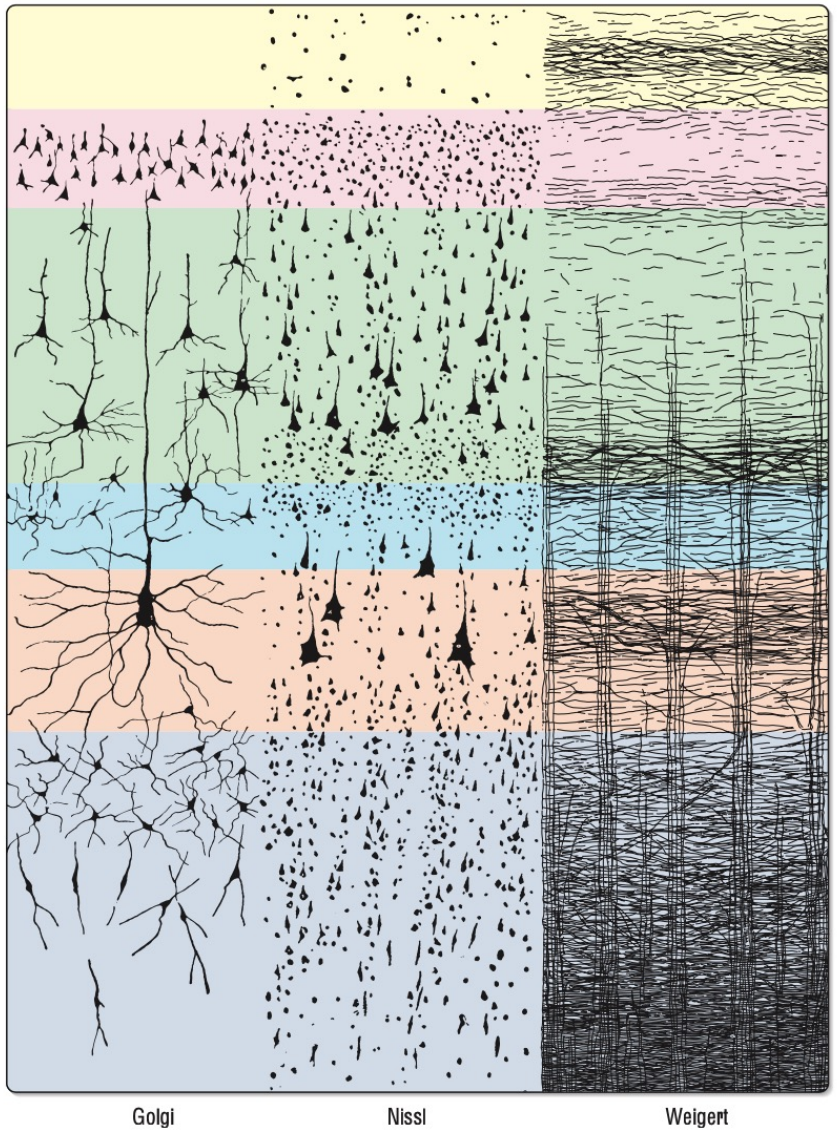
- **Subiculum – uper surface of parahippocampal gyrus**
- **Hippocampus – bank facing into lateral ventrikle – cca 5 cm**
- **Gyrus dentatus – medial to hippocampus**





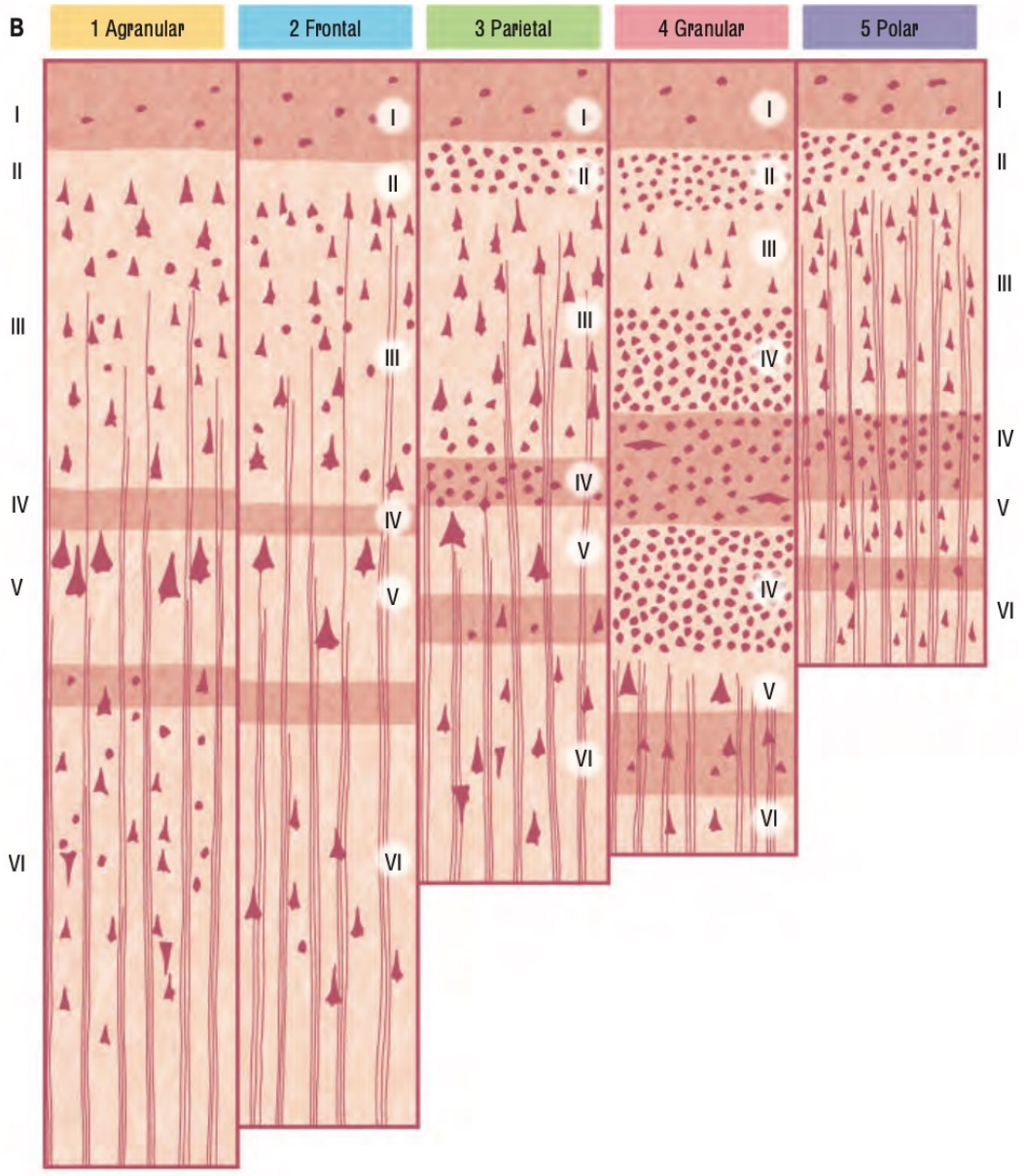
Isocortex

- I. lamina molecularis
  - Horizontal neurons, apical dendrites of pyramidal cells
  - Minimla number of neurons, reach of neurglia and fibers
  - Superficial part. Reach of astrocytes – membrana limitans gliae superficialis
  - Covered by basal membrane and on it lies pia mater
- II. lamina granularis externa
  - Stellar neurons and small pyramidal cells
  - Paralel fibers - association
- III. lamina pyramidalis externa
  - smaller pyramidal cells – apical dendrites to lamina I. , than horizontal dendrites
  - Stellar and Martinotti cells - commisural functions
- IV. lamina granularis interna
  - overwwlming stellar neurones
  - Endings of thalmaic fibers
  - Minimla in motorcortex, extended in sensoric
  - Layer of myelinized fibers in horizontal orientation – stria Baillargeri externa
- V. lamina pyramidalis interna (ganglionaris)
  - Large pyramidal cells – 100um – Betz pyramids – axons lead to subcortical centers
  - Apical dendrites reach I. lamina
  - The deep part contains stria Baillargeri interna
- V. lamina multiformis
  - Fusiform, Matinotti, stellar neurons

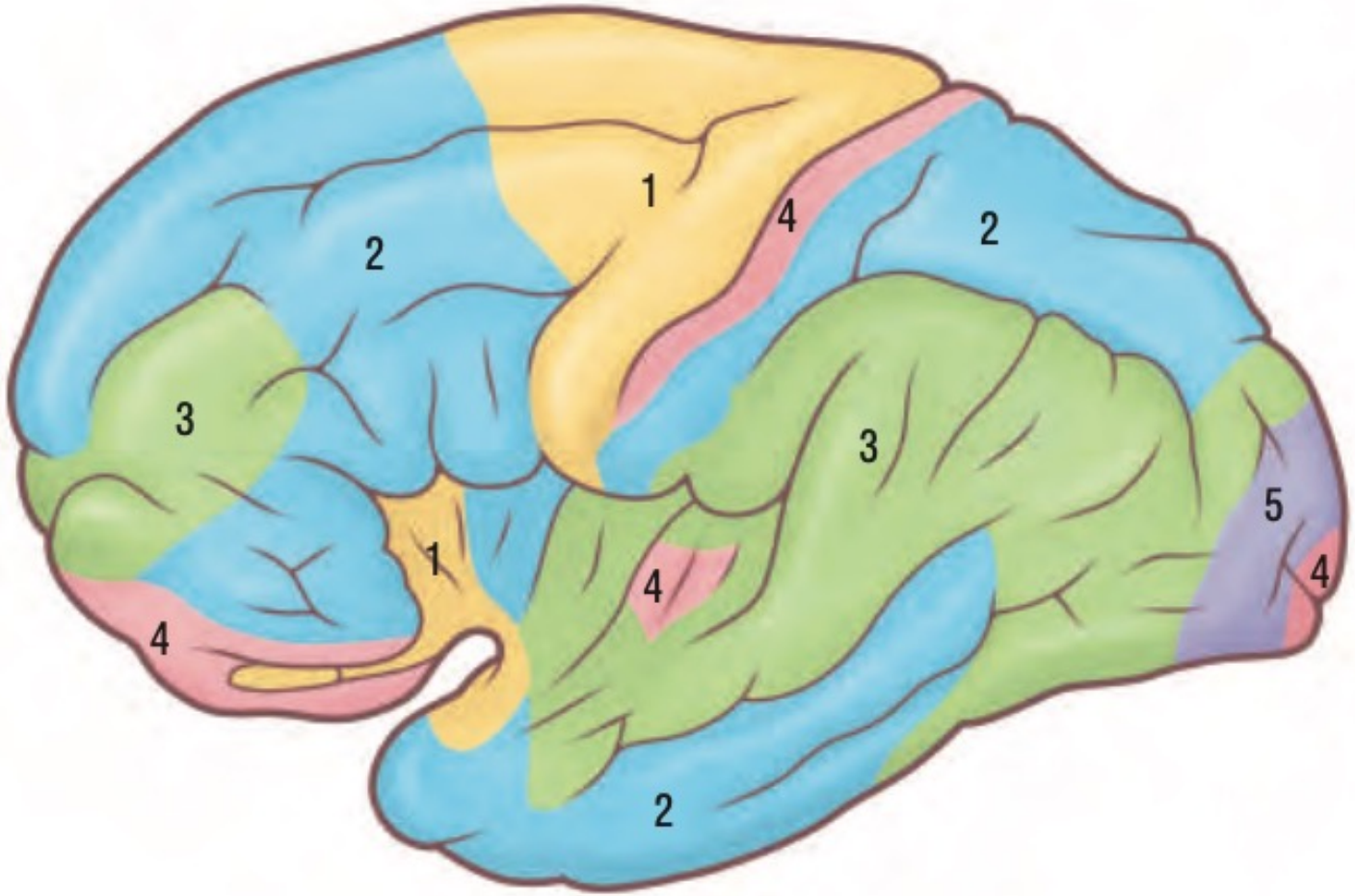


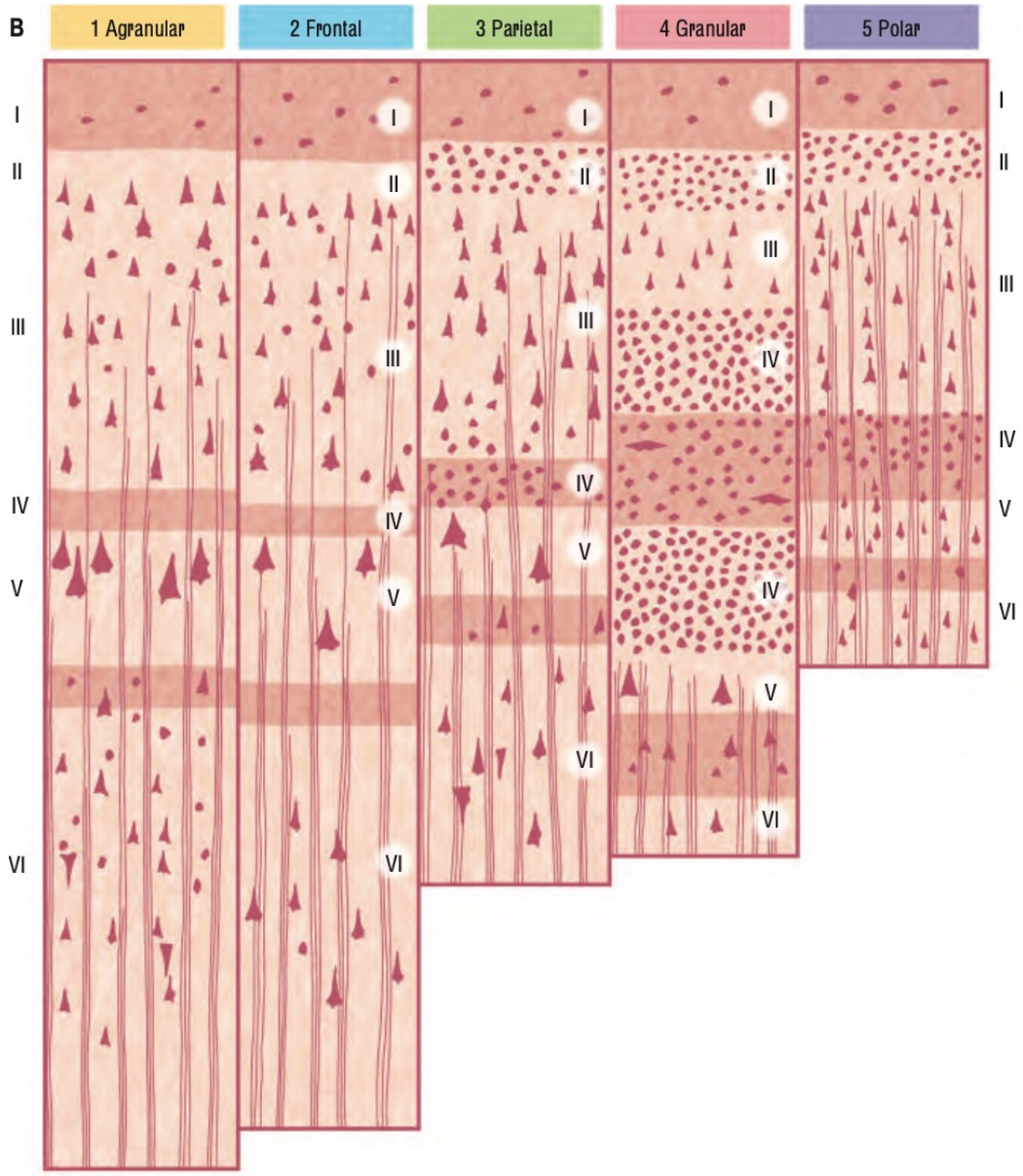
Cytoarchitectonic - differences

- **Homotypical cortex**
  - *Al layers distinguished well*
- **Heterotypical cortex**
  - *Some layers are suppressed, other oversized*
- **Agranular cortex**
  - *Motor cortex*
  - *Dominating layers III. + V.*
  - *Dominated by pyramidal cells*
  - *Important reduction of stellar cells*
- **Granular cortex**
  - *sensoric*
  - *Dodominating layers II. + IV.*
  - *Mainly stellar neurons*

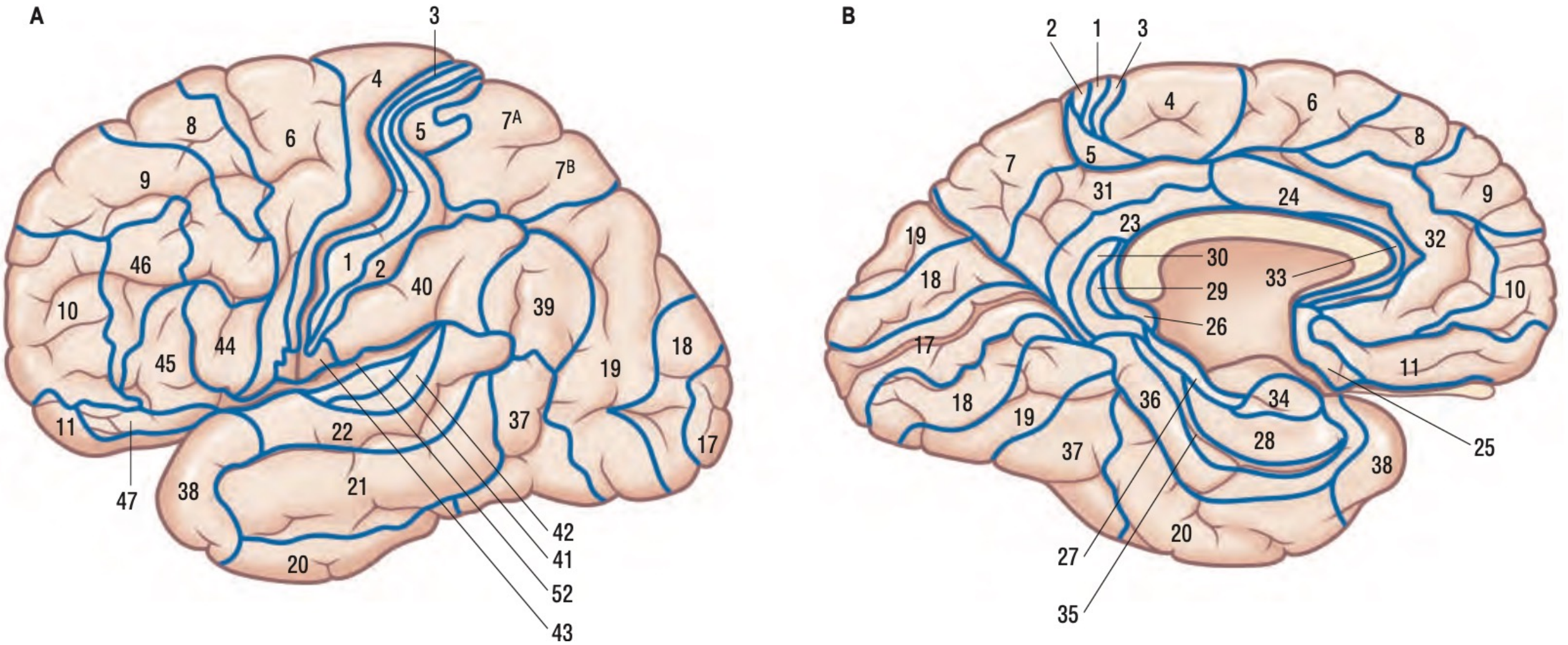


Cytoarchitectonic



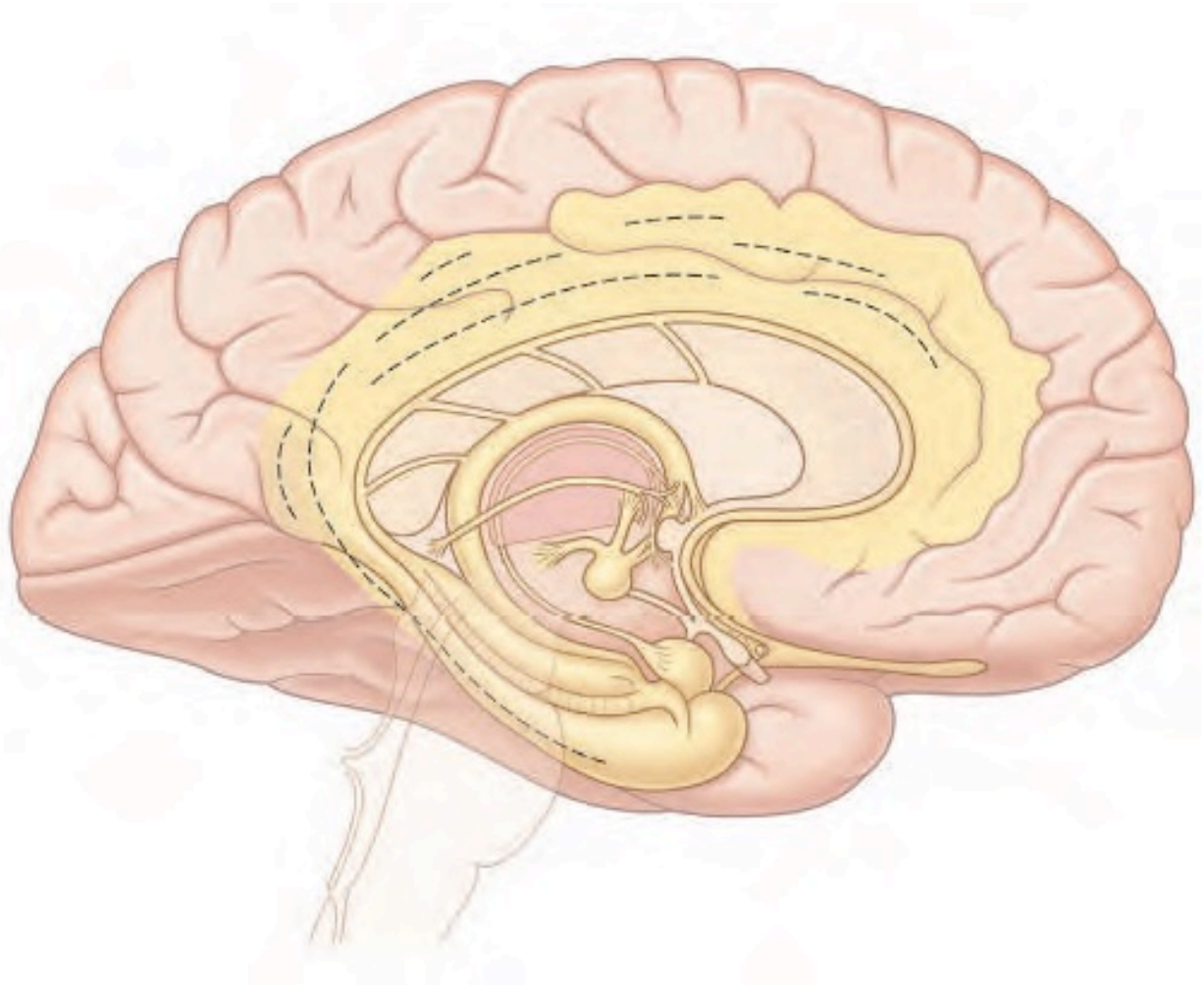


Brodman areas



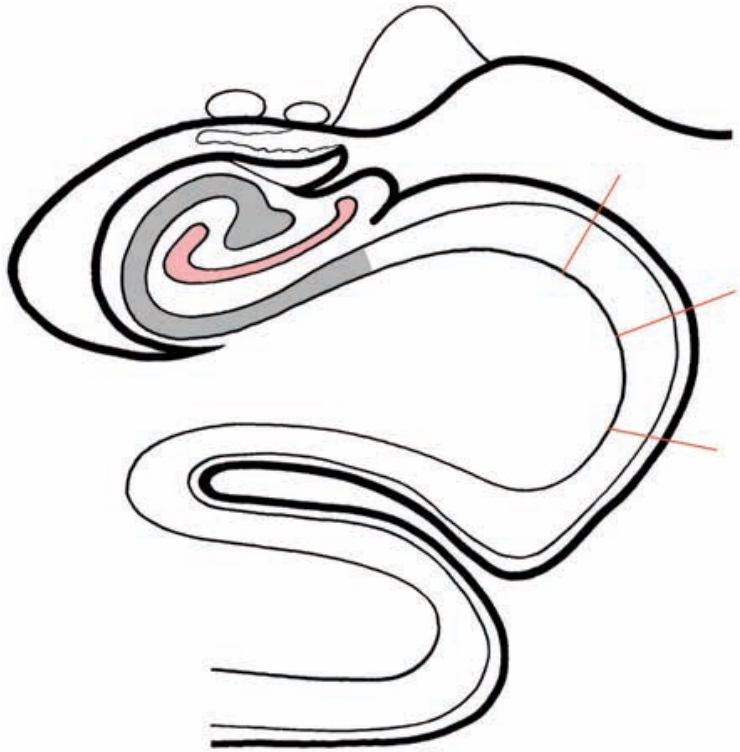
Lobus limbicus

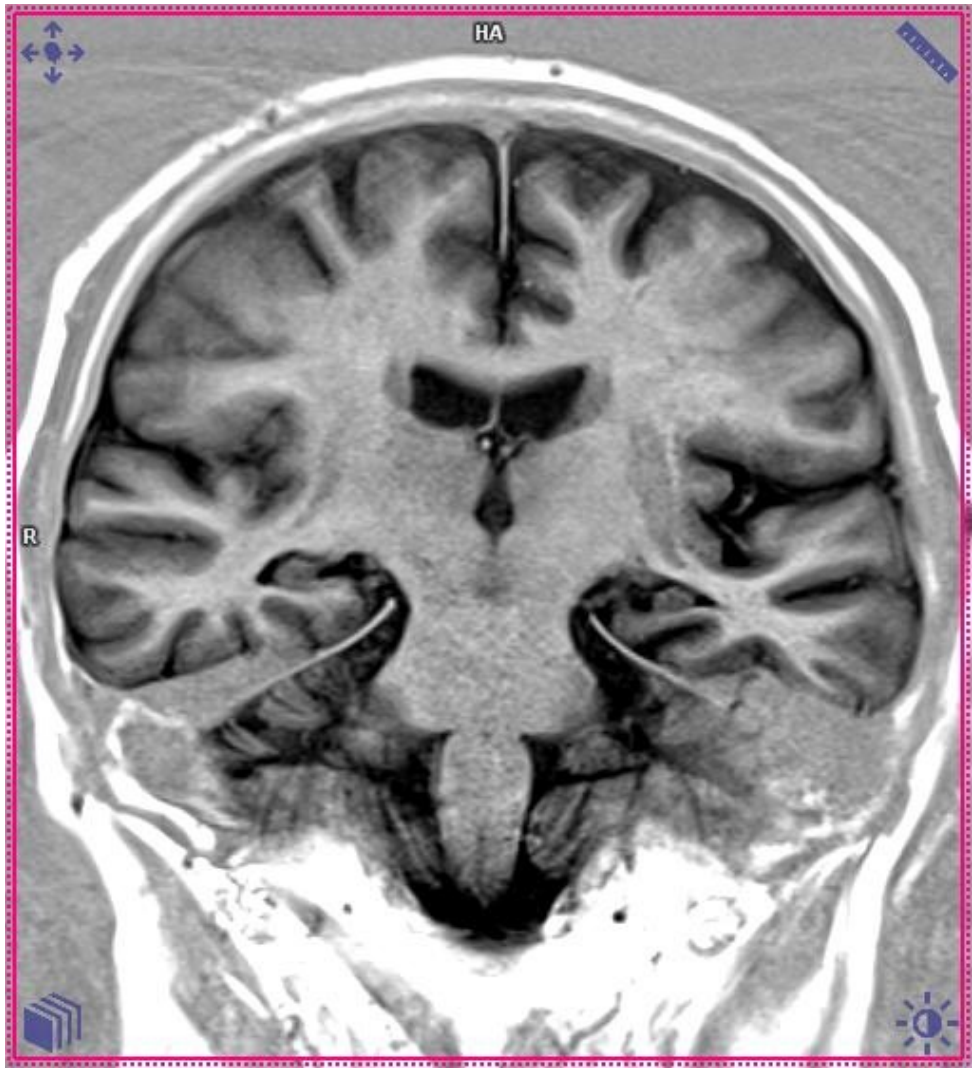
- Gyrus cinguli
- Gyrus parahipocampalis
- Uncus gyri parahipocampalis
- Sulcus hipocampi – oddělení od dienecefala
- Subiculum – horní část g. parahipocampalis
- Gyrus dentatus
- Taenia Giacomini
- Fimbria hipocampi – initiation of fornix
- Tela chorioidea ventriculi lateralis
- To lateral ventrikle bulges hipocampus
- anteriorly pes hipocampi



Subiculum

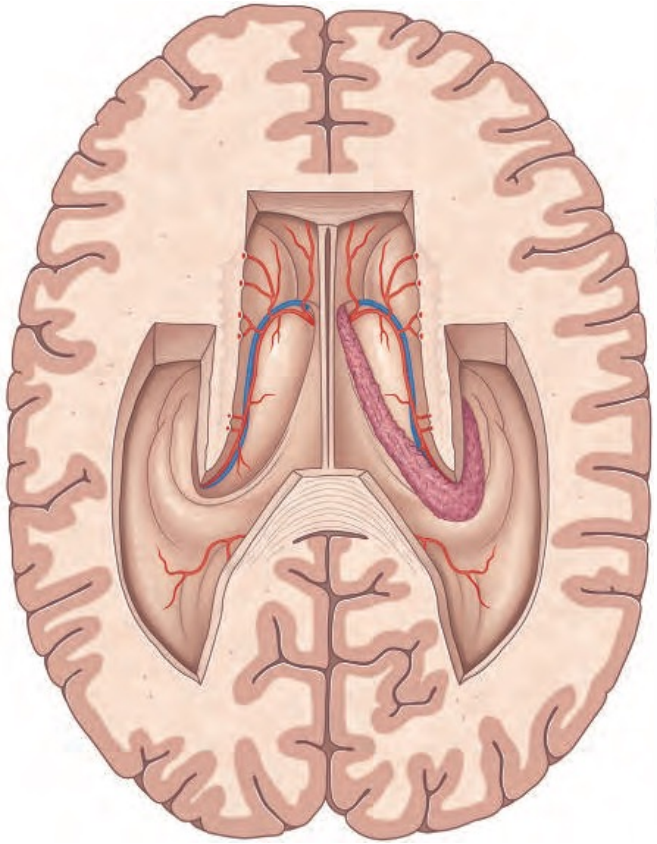
- Upper surface of gyrus hippocampi (parahippocampalis)
- Laterally continues to hipocampus
- Layers
- Surface - stratum moleculare
- Superficial pyramidal layer
- Deeper pyramidallayer
- Neghboring to mesocortex
  - Entorhinal area
  - Praesubiculum

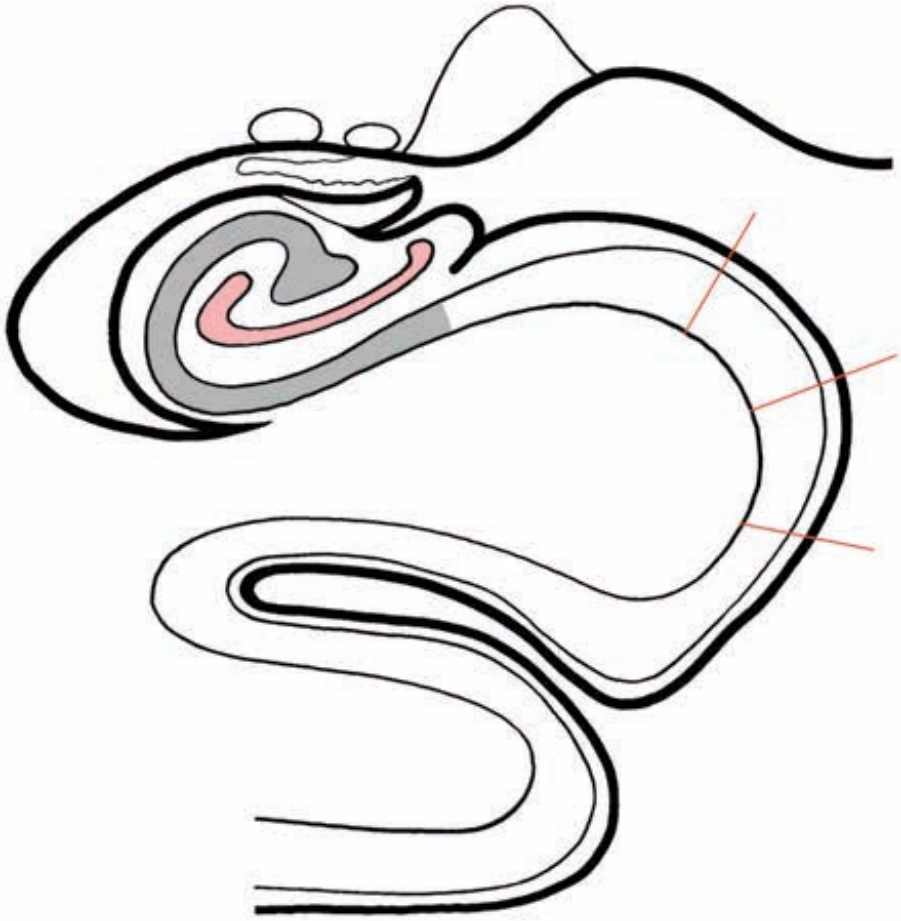




Hippocampus

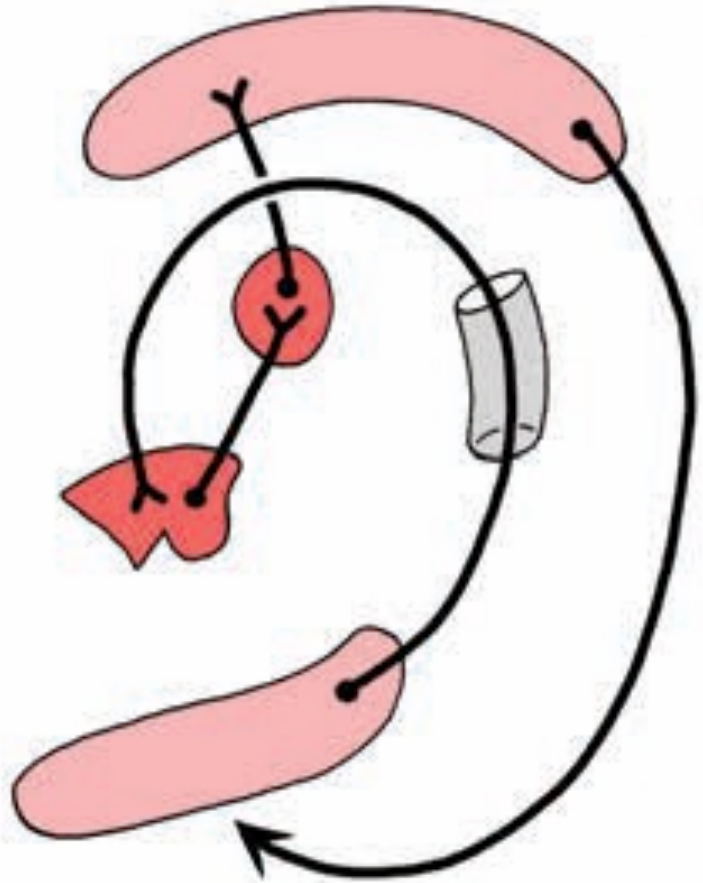
- Hippocampus (cornu Ammonis)
- Anteriorly widens to pes hippocampi (foot)
- Upper ridge – fimbria fornicis – continues like fornix
- surface of hippocampus – ependyma
- Subependymal layer - alveus
  - Fibers converging to fimbria
- Foru fields of hippocampus
- CA1-4
- layers
  - Stratum oriens
    - Small number of neurons
  - Stratum pyramidale
    - Pyramidal projection neurons
  - Stratum radiatum
    - Small number of interneurons





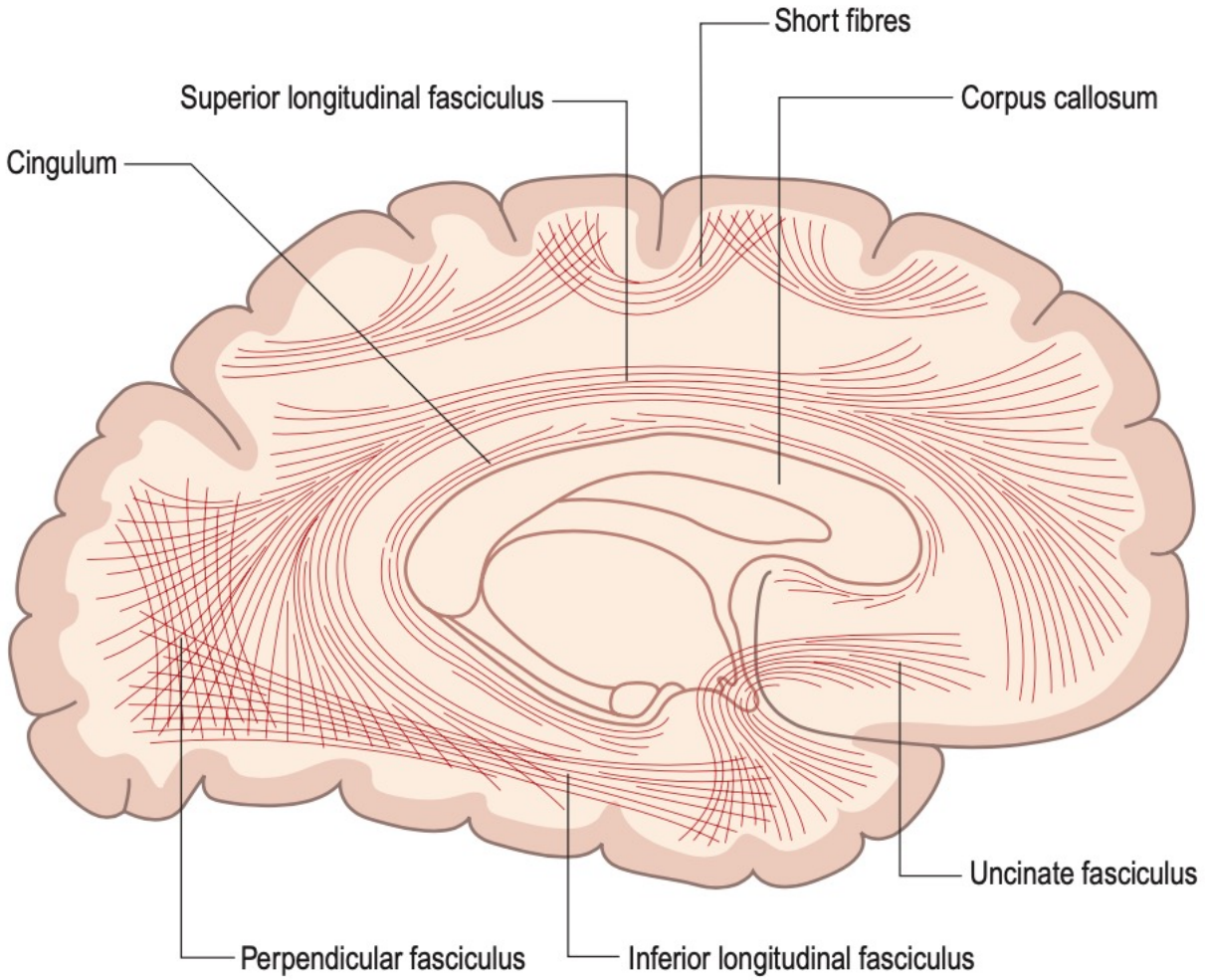
Papez circle

- Hipocampal formation
- Fornix
- Hypothalamus – corpora mamilaria
- Tractus mamilothalamicus
- Nuclei anteriores thalami
- Thalamocortical projection
- Gyrus cinguli
- Cingulum (association fibers)
- Gyrus parahippocampalis
- Entorhinal area
- Hippocampal formation



Substantia alba – - white matter

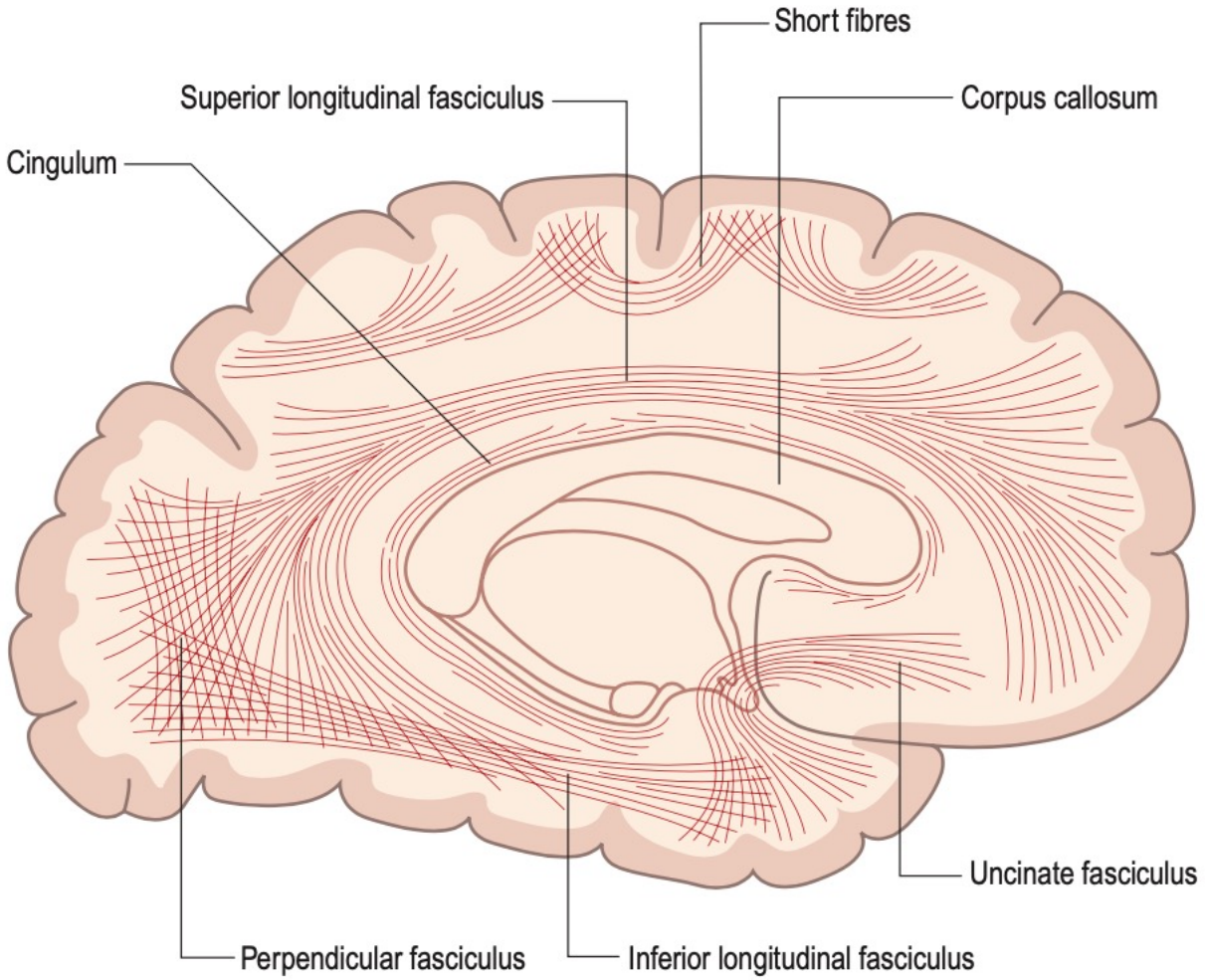
- Almost nerve fibers
- Axones
- White matter organization
- Related to communication
- Association fibers
- Comissural fibers
- Projection fibers
- Bound to – fasciculi



- Imaging of the white matter
- Magnetic resonance imaging
- Diffusion imaging – 3D tractography
-

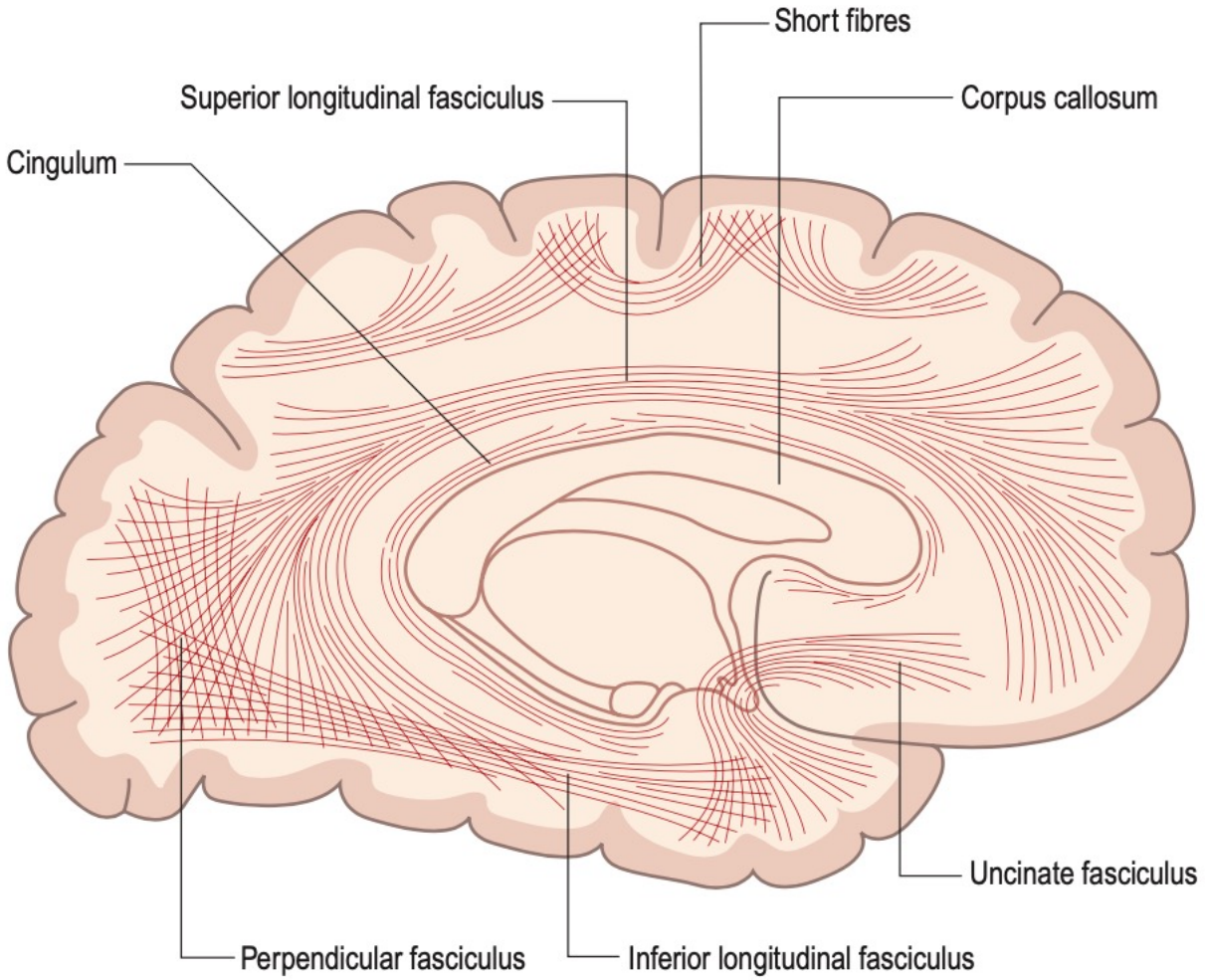
Cingulum

- inside
- gyrus cinguli
- gyrus parahippocampalis
  - Different length of fibers
  - The longestgyrus temporalis anterior
  - To orbitofrontal cortex
  - Gets fibes
  - *Anterior thalamic nuclei*
  - *Upper frontal gyrus*
  - *Paracentral lobulus*
  - *precuneus*
  - ends
  - Entorhinal cortex
  - presubiculum



Temporoparietal fibre intersection area

- Crossing of milions of fibers
- Deep inside below
- Gyrus angularis
- Posterior part
- Supramarginal gyrus
- Upper, medial and inferior temporal gyrus

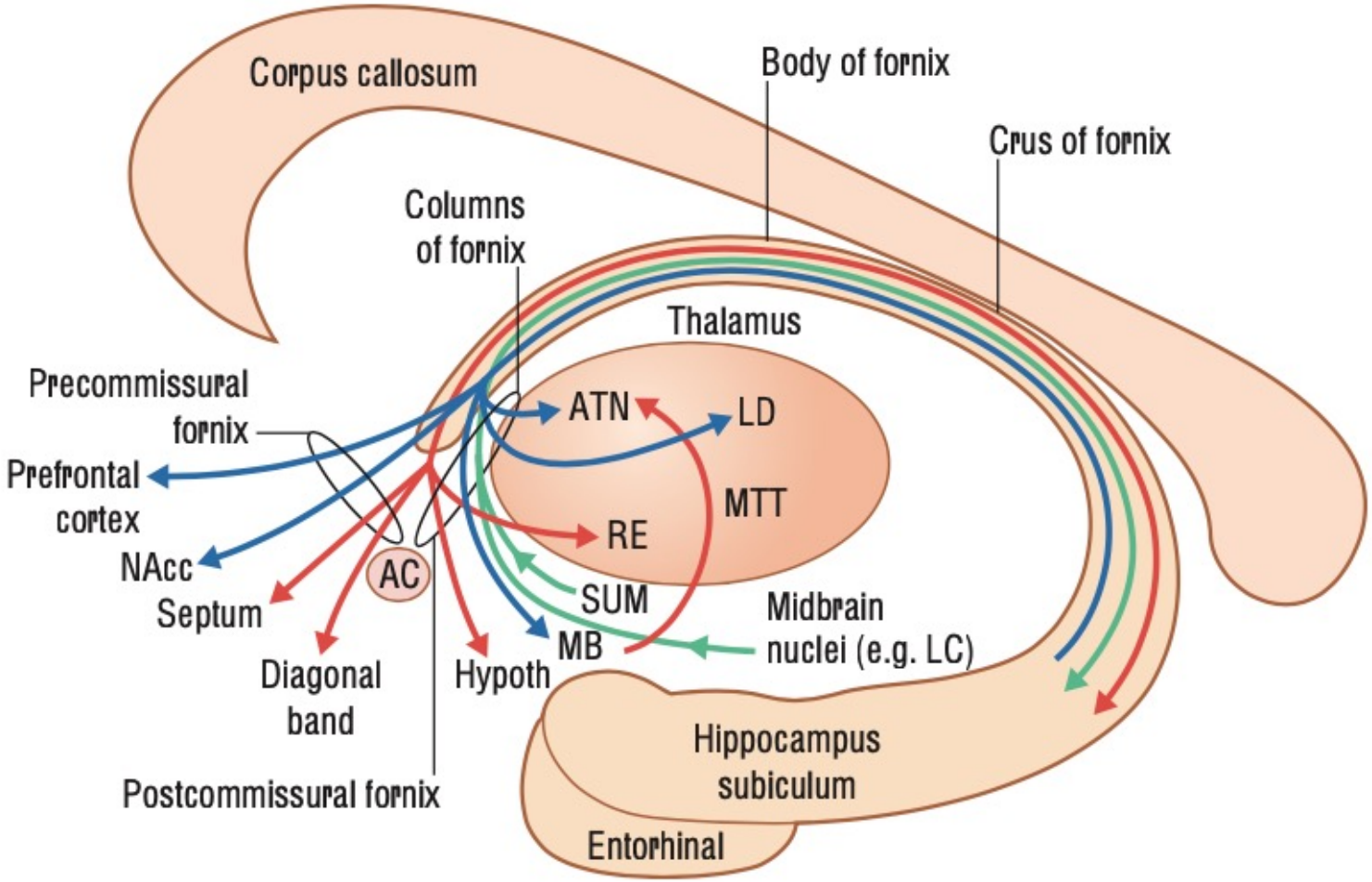


Fornix

- Connection of
- Nuclei thalami anteriores
- Corpora mamilaria
- Ventrální striatum
- Prefronální kortex

- Reciprocity of connection
  - septum verum
  - nucleus reuniens
  - rapheální jádra retikulární formace
  - locus coeruleus

- Shear injuries



Commisural fibers

- **Corpus callosum**
  - The largest
- **Commisura anterior**
- **Commisura hippocampalis**
  - Commisura fornicis
  - between crura fornicics
- **Commisura posterior**
  - below
- **Commisura habenularum**
  - connects epithalamus

Corpus callosum

- 150 – 200 millions of fibers
- Contralateral anatomical related structures
- Function-related connections
- **Rostrum**
- **Genu**
- **Truncus**
- **Splenium**
  -
- ***Radiation into the semioval centre***
  - *from truncus crossing corona radiata*
- ***Forceps minor – from genu***
- ***Forceps major – from splenium***

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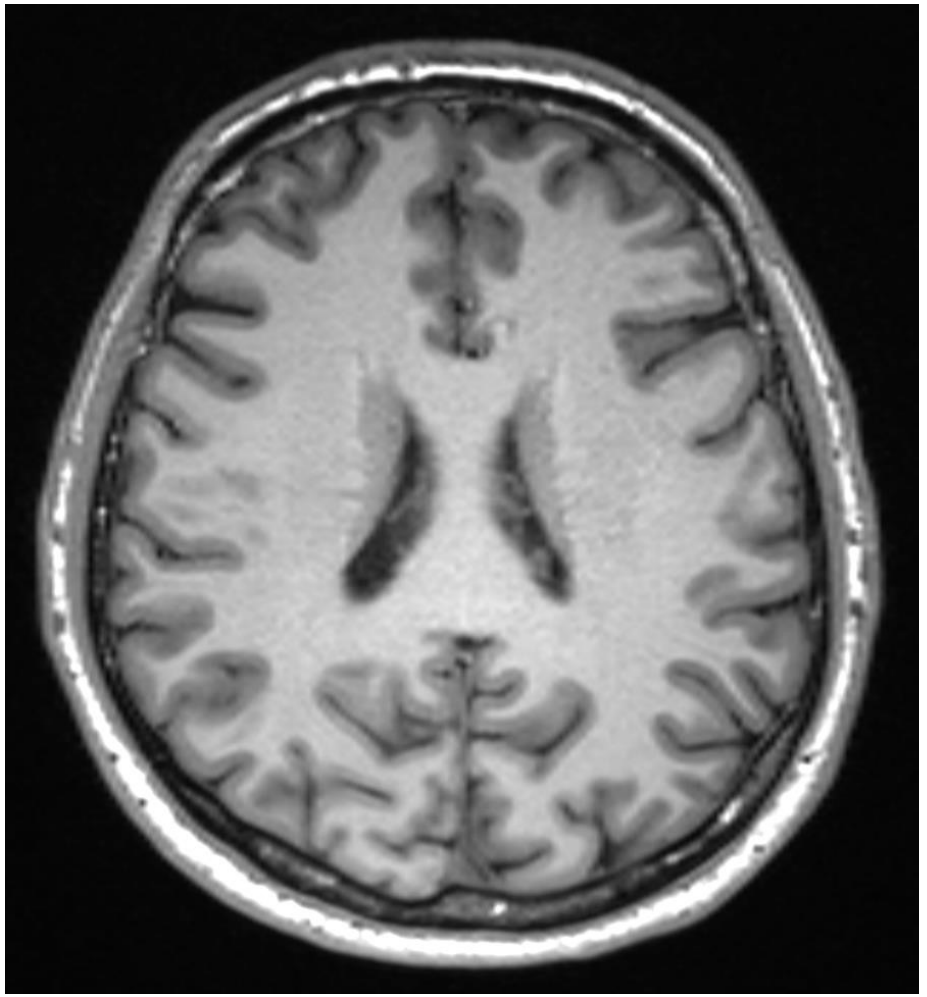


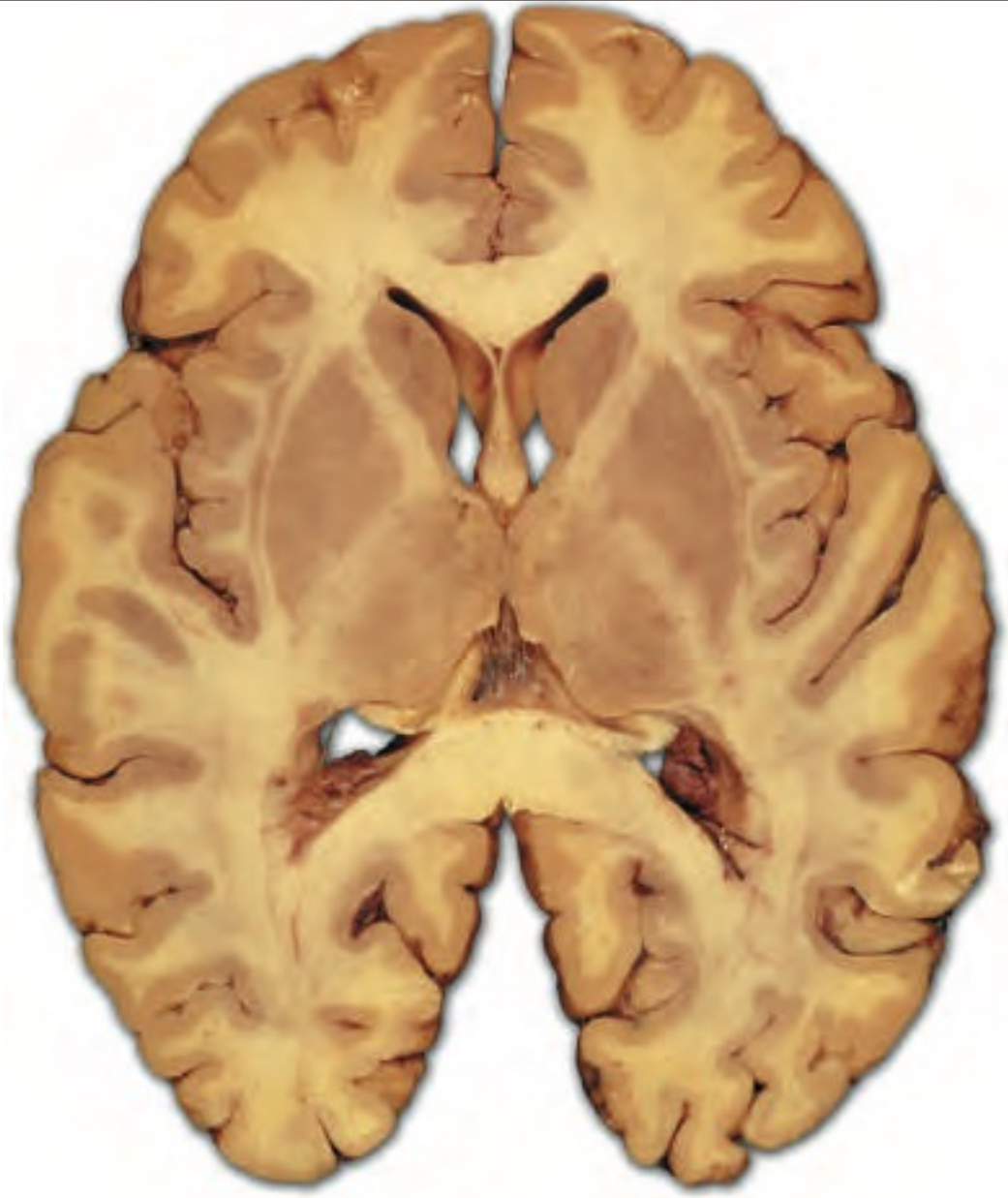
Commisura anterior

- *Connects olfactory cortex*
- *Parahippokampal cortex*
- *Amygdaloid complexes*
- *Nucleus accumbens*

- **4 mm in diameter**
- **3,5 milions of myelinized fibers**
- **supraoptic recessus of III. ventricle**
- **In the front of columnae fornicis**
- **Posterolateral bundle**
- **Anterior part**

Projection fibers

- **Capsula interna**
  - **Genu**
  - **Anterior arm** putamen and caput nuclei caudati
  - **Posterior arm** – putamen and thalamus
  - **Retrolenticular part** – dorsálně za putaminem
  - **Sublenticular part** – below putamen
- **Radiatio capsulae internae**



Capsula interna