

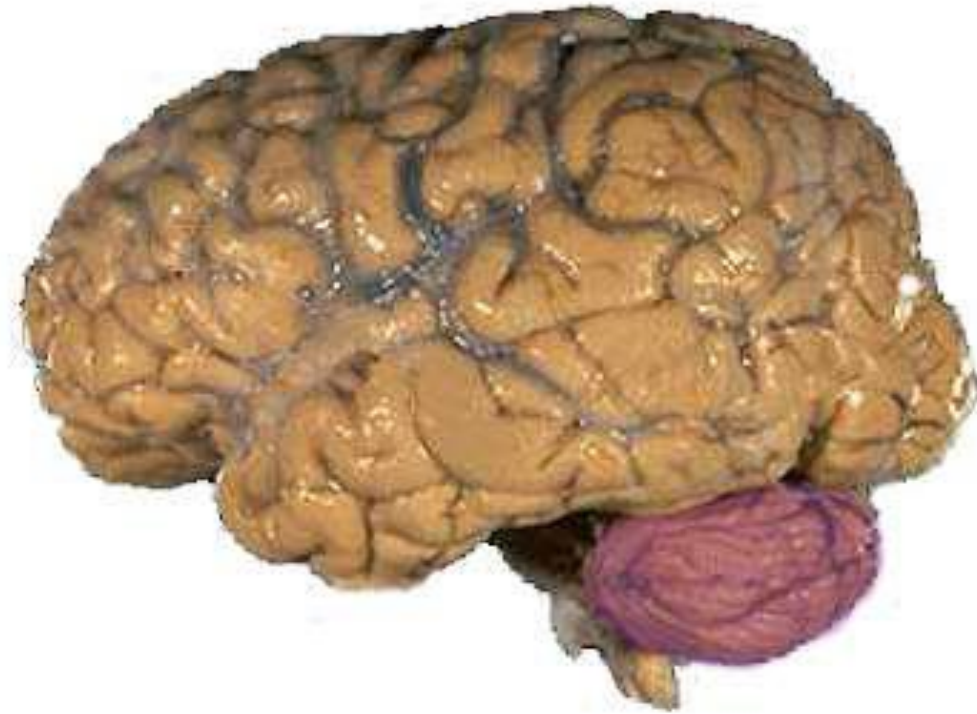
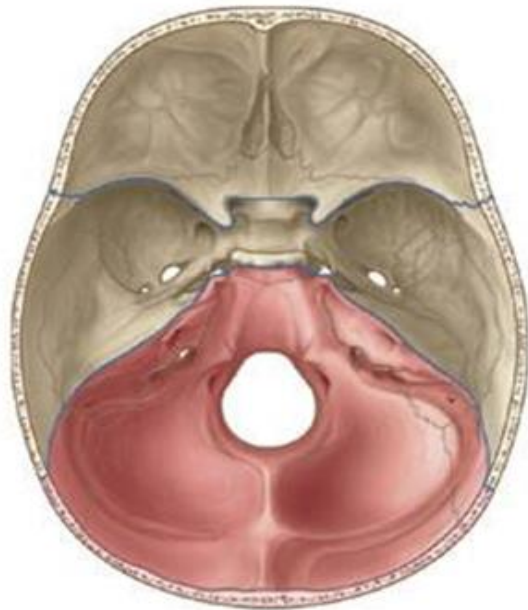
Cerebellum

Dr Ashraf Sadek *PhD, MD, MRCPCH*

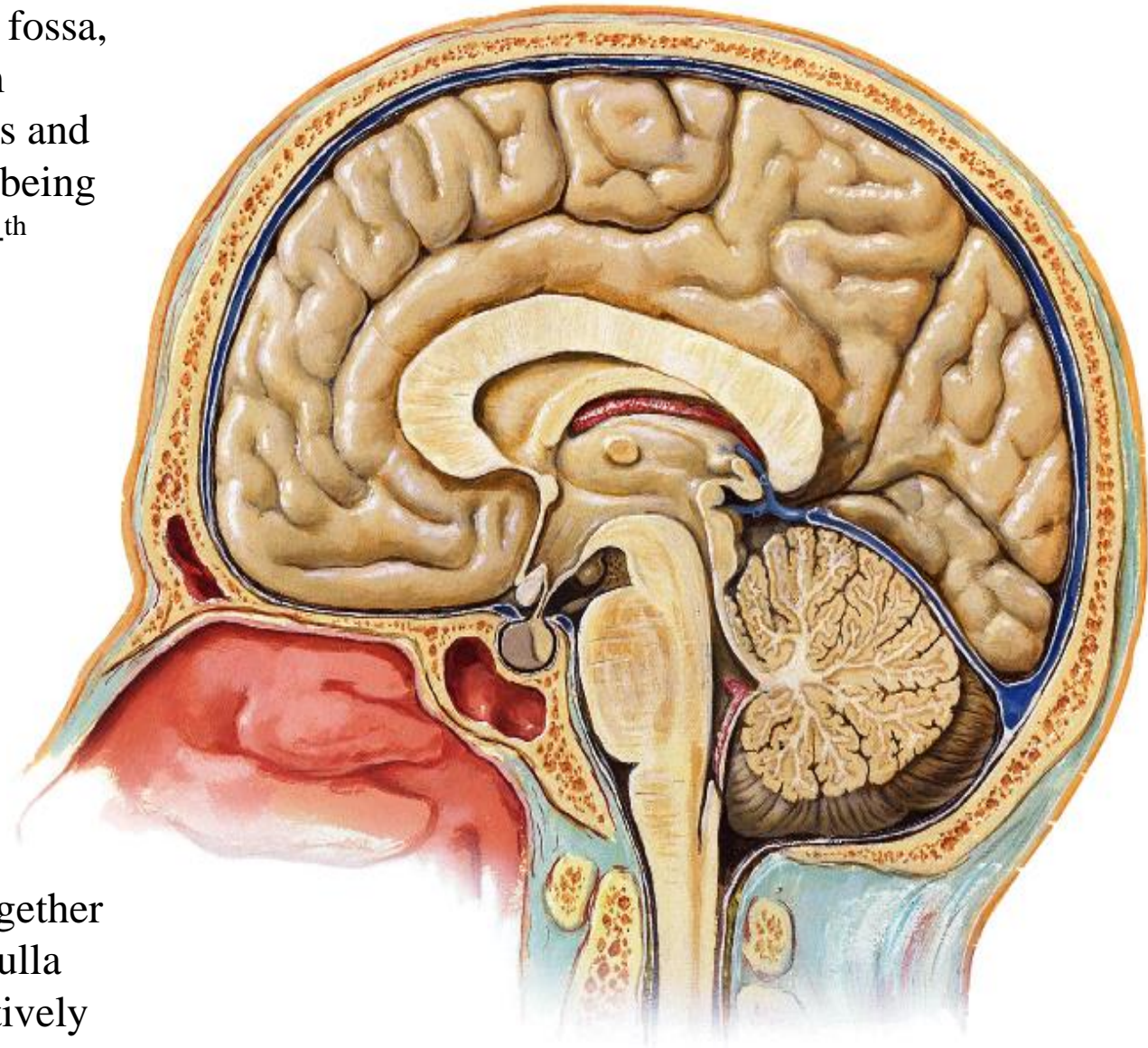
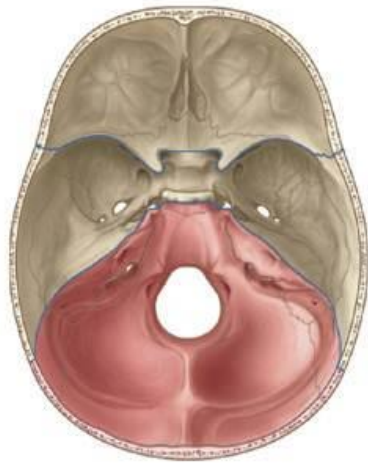
Assistant Professor of anatomy and embryology

site:

➤ The term cerebellum is from “latin meaning” the little brain. It is a part of the hindbrain situated in the posterior cranial fossa.



It lies in posterior cranial fossa, under cover of tentorium cerebelli, and behind pons and open medulla oblongata, being separated from them by 4th ventricle.



[N.B.] Cerebellum together with pons and medulla oblongata are collectively called the “**Hindbrain**”.

Function of cerebellum

- ✓ *Maintenance of Equilibrium, balance, posture, eye movement*
- ✓ *Adjustment of Muscle Tone*
- ✓ *Motor Learning – Motor Skills*
- ✓ *Cognitive Function*

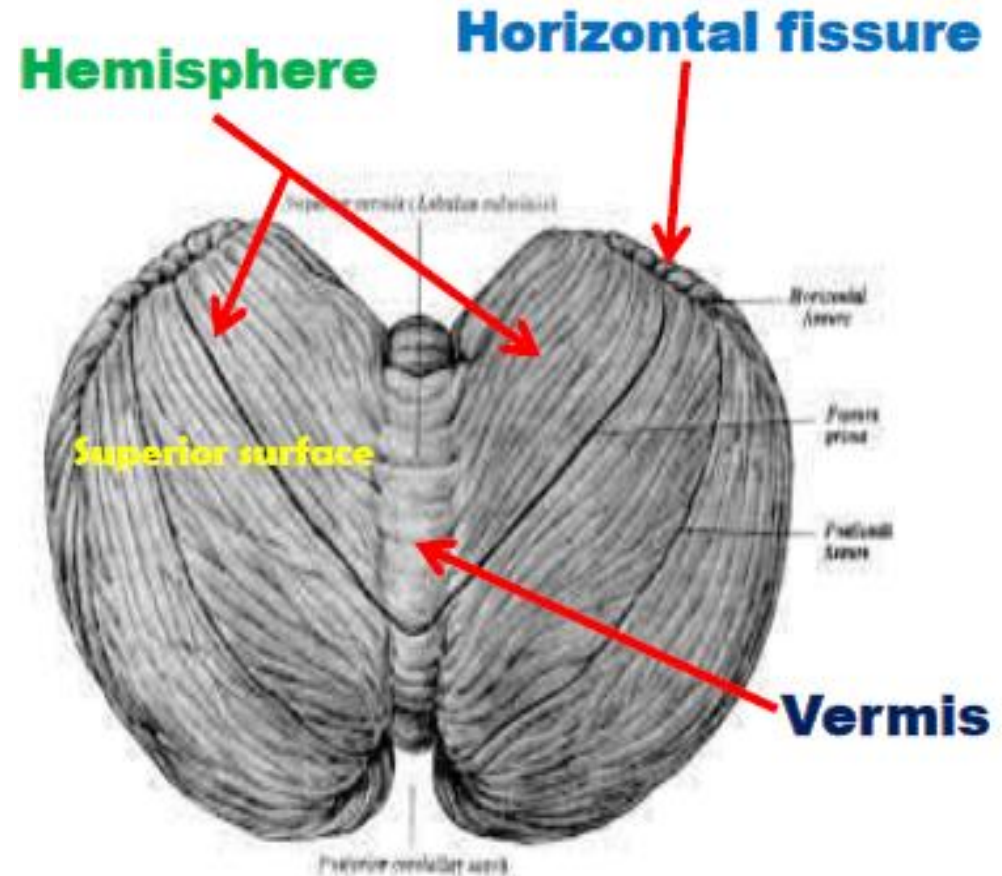
Parts of the cerebellum

- **Two large lateral cerebellar hemispheres**

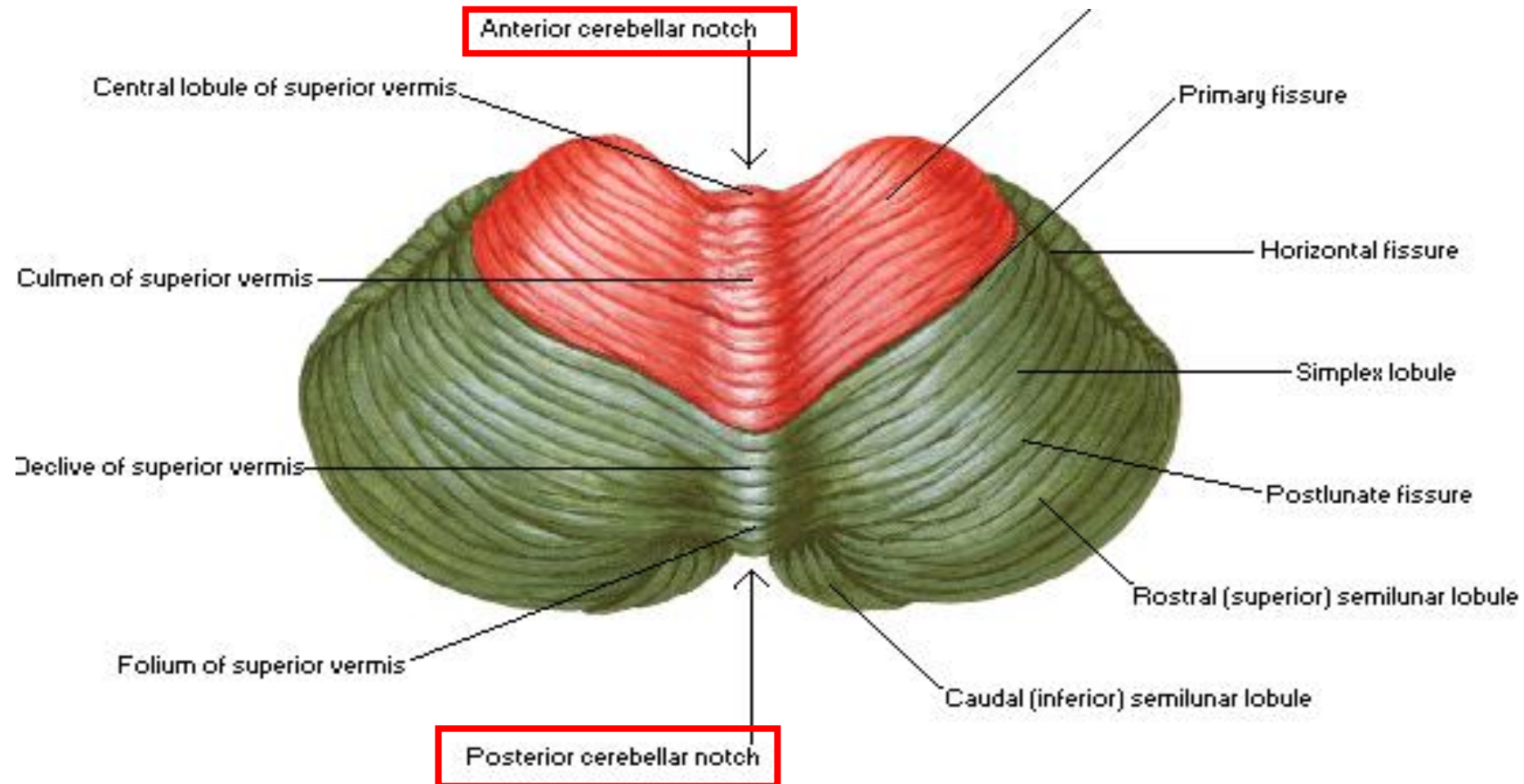
formed of many gyri called folia separated by deep fissures (sulci).

- **Vermis**

narrow median part joining the two cerebellar hemispheres. It is divided into superior and inferior vermis.



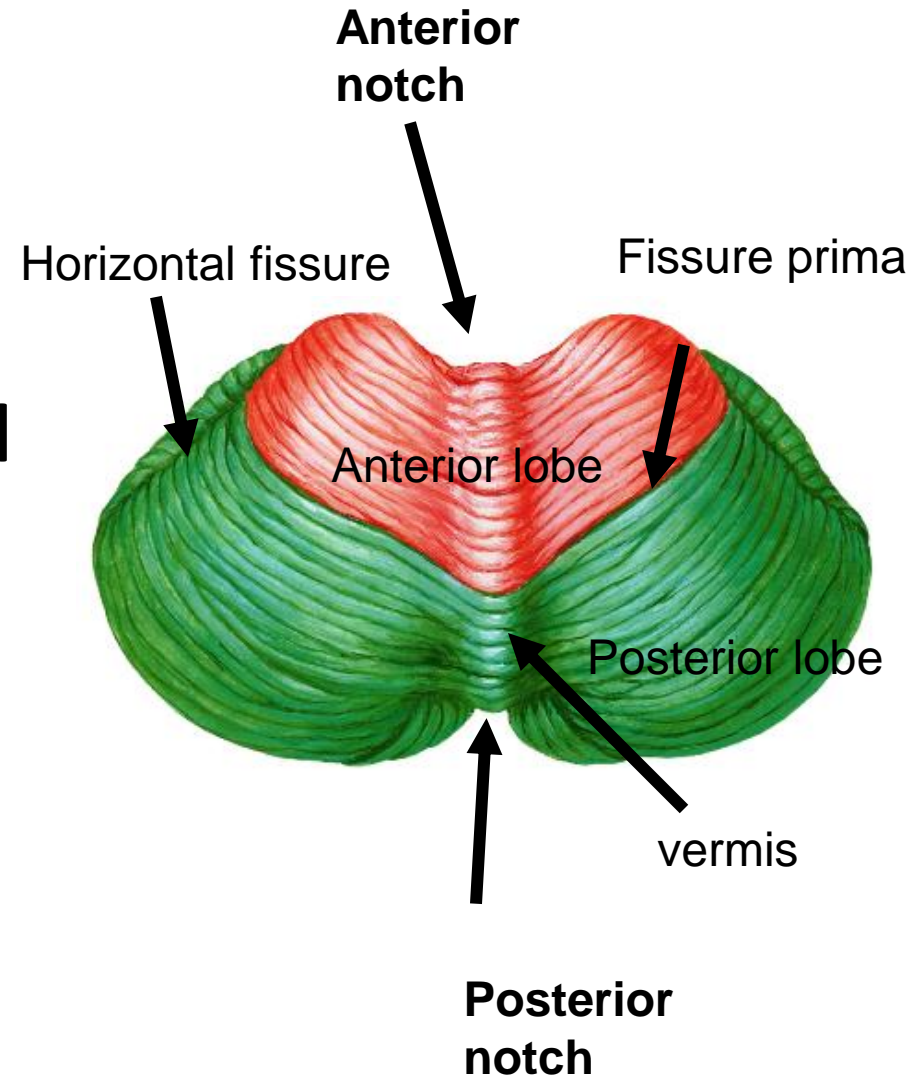
- **anterior notch:** related to back of brain stem.
- **posterior notch:** receives falx cerebelli.
- **Two surfaces :** superior & inferior.



Surfaces of Cerebellum

Superior surface:

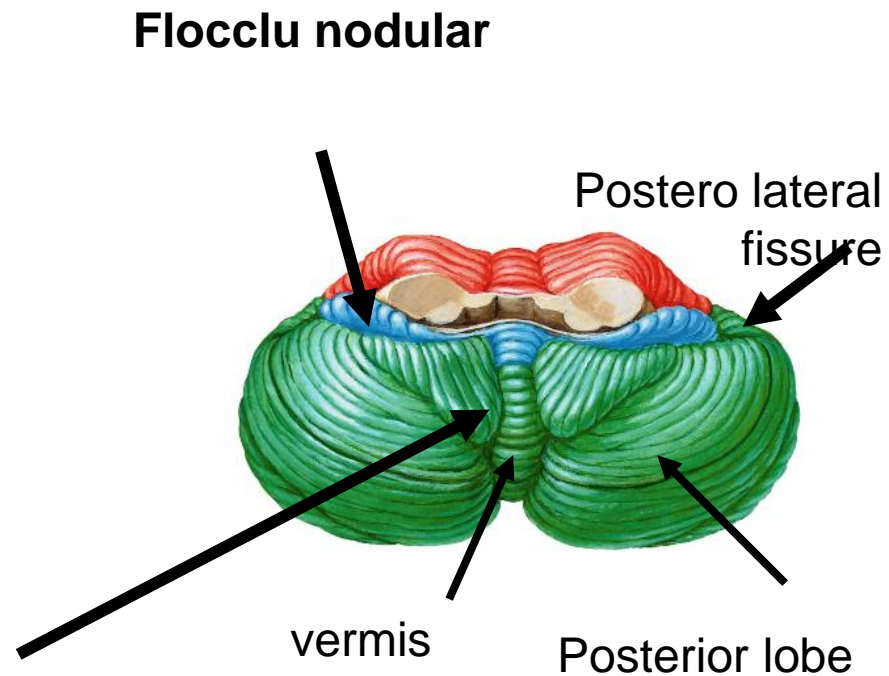
- it shows superior surface of vermis (raised) & cerebellar hemisphere
- It has a deep fissure **V shaped** called fissure prima that separates anterior lobe from posterior lobe



Surfaces of cerebellum

Inferior surface:

- It includes inferior surface of vermis which lies in a deep groove called vallecula
- Posterolateral fissure separates the posterior lobe from flocculonodular lobe.
- The most inferior part of the cerebellum is the cerebellar tonsil

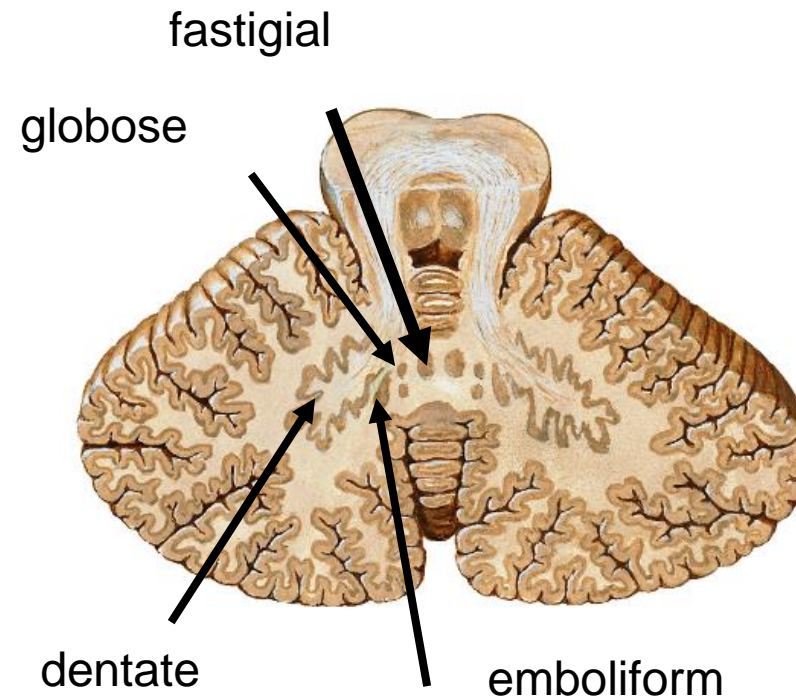


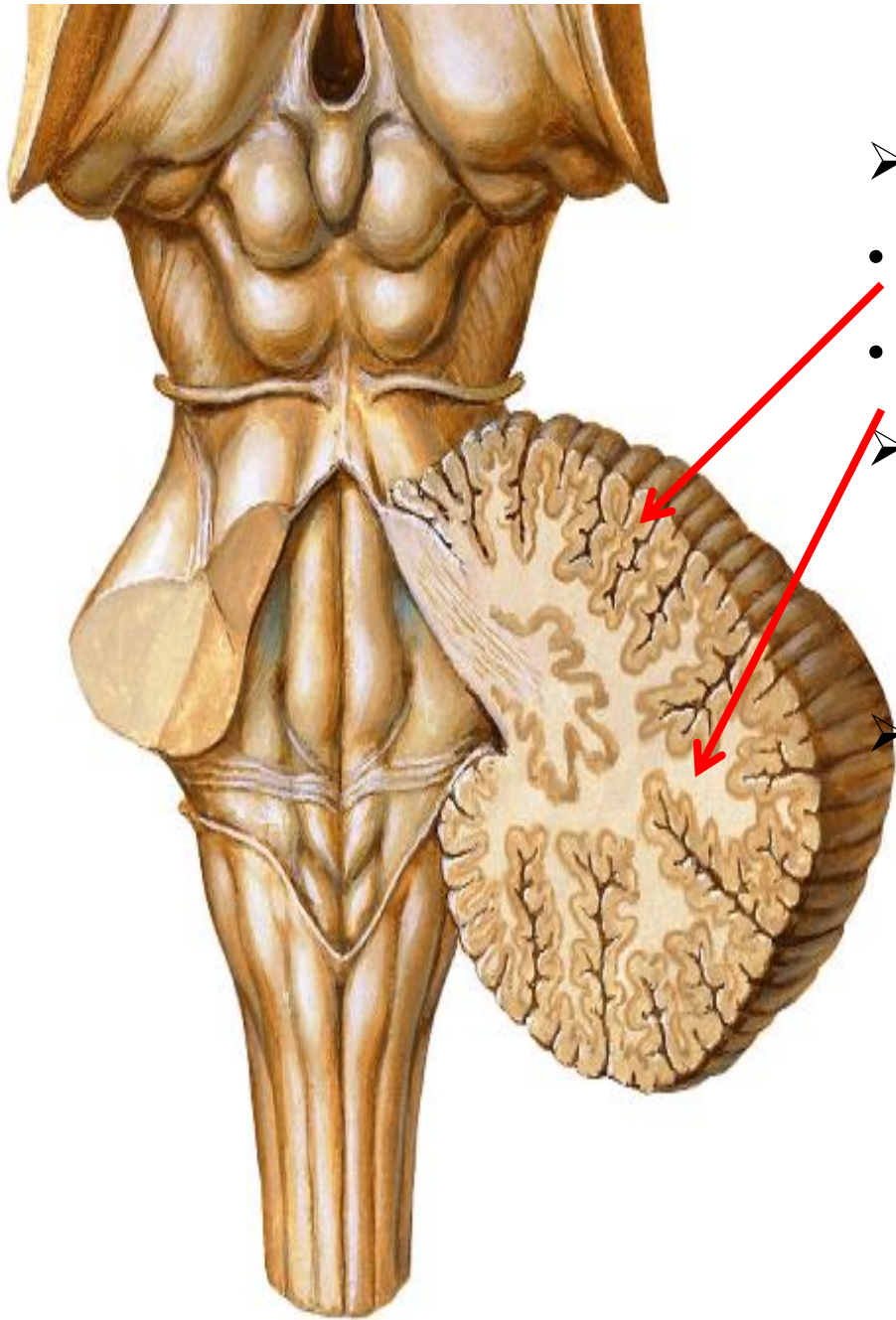
Cerebellar Nuclei

Masses of gray matter scattered in the white matter of the cerebellum

1. Dentate
2. Emboliform
3. Globose
4. Fastigial

From lateral to medial



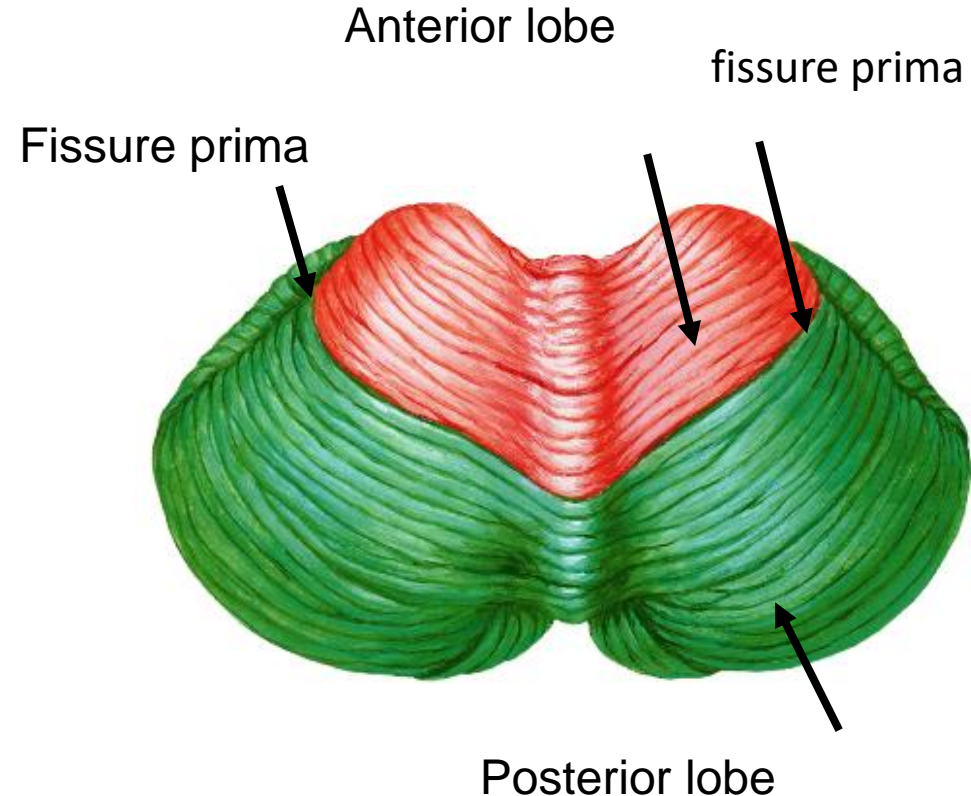
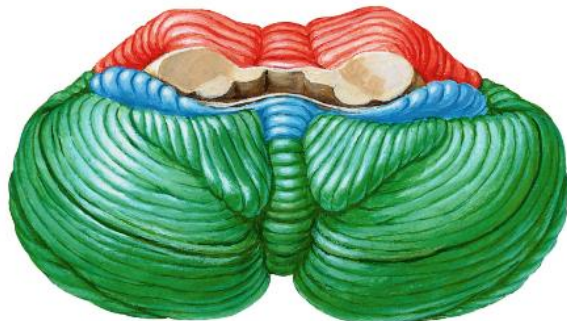


- Cerebellum consists of
 - outerlayer of grey matter (*cortex*)
 - inner layer of white matter (*medulla*)
- The medullary core is composed of incoming and outgoing fibres projecting to and from the cerebellar cortex.
- Medullary core also contain four cerebellar nuclei

Anatomical lobes(3)

- **Anterior lobe:**
anterior to fissure prima
- **Posterior lobe:** posterior to fissure prima
- **Flocculonodular lobe:**
separated from posterior lobe by posterolateral fissure

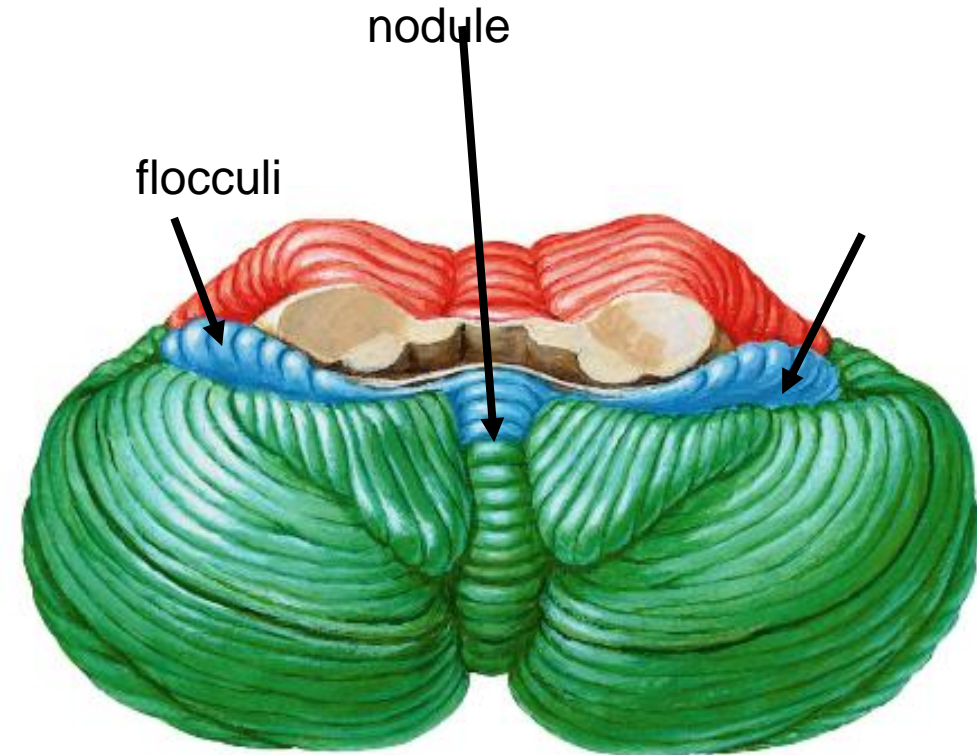
Flocculo
nodular
lobe:



Functional Lobes of Cerebellum (3)

Archicerebellum:

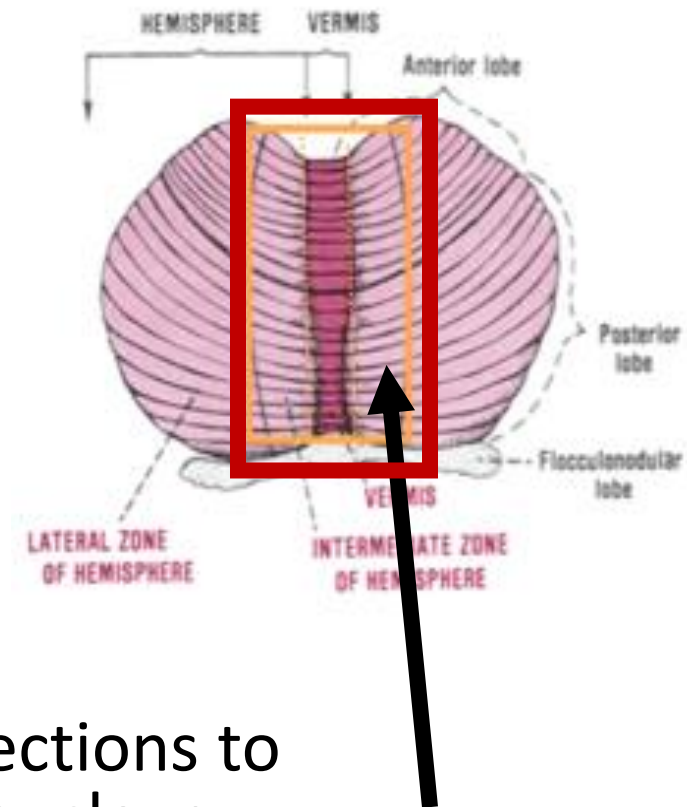
- Its connections are vestibular
- Concerned with equilibrium
- Formed of 2 flocculi & nodule (part of vermis)
- **Fastigial nucleus** (medially): linked functionally with archicerebellum.



Lobes of Cerebellum

Paleocerebellum

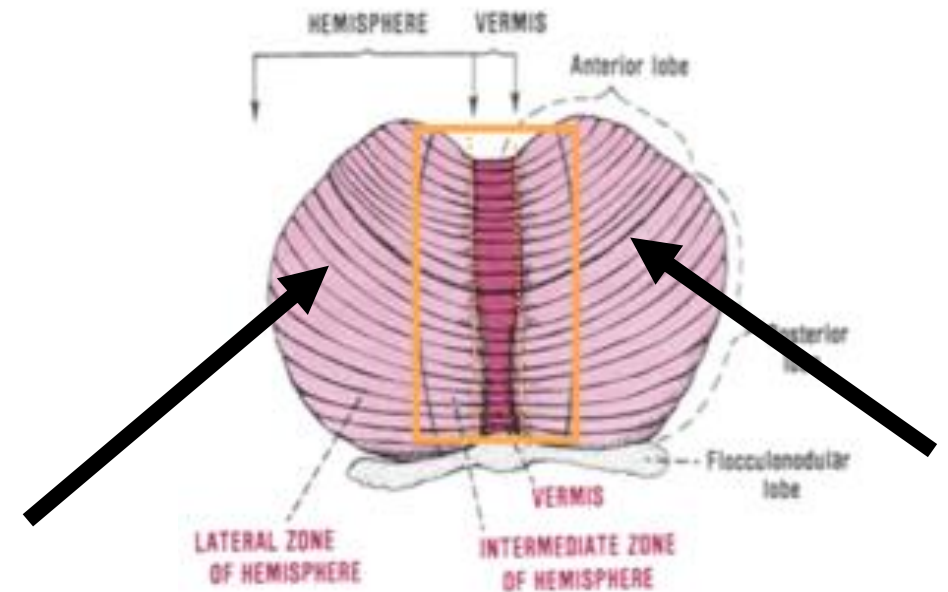
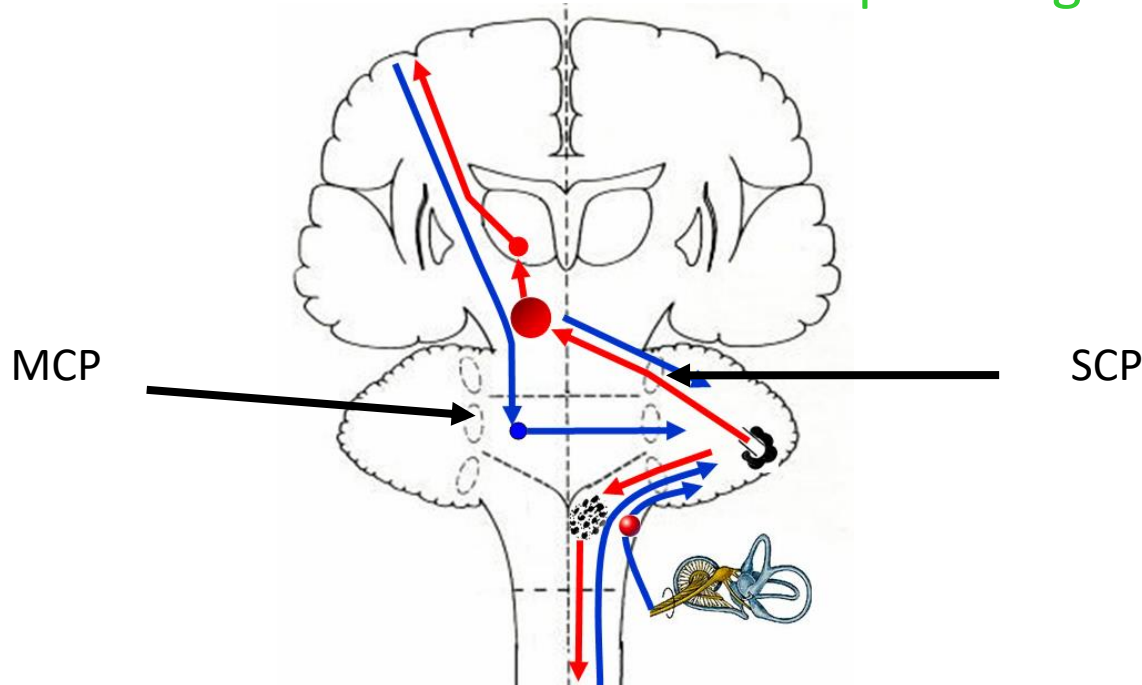
- Connections are spinal (Spino cerebellar)
- Controls muscle tone, posture & coordinate movements
- Formed of 3 parts
 - 1- **Vermal**: includes whole vermis, it has connections to the trunk muscles of both sides via fastigial nucleus
 - 2- **Two paravermal of cerebellar hemisphere** : are connected to distal limb muscles of the same side via globose & emboliform nucleus

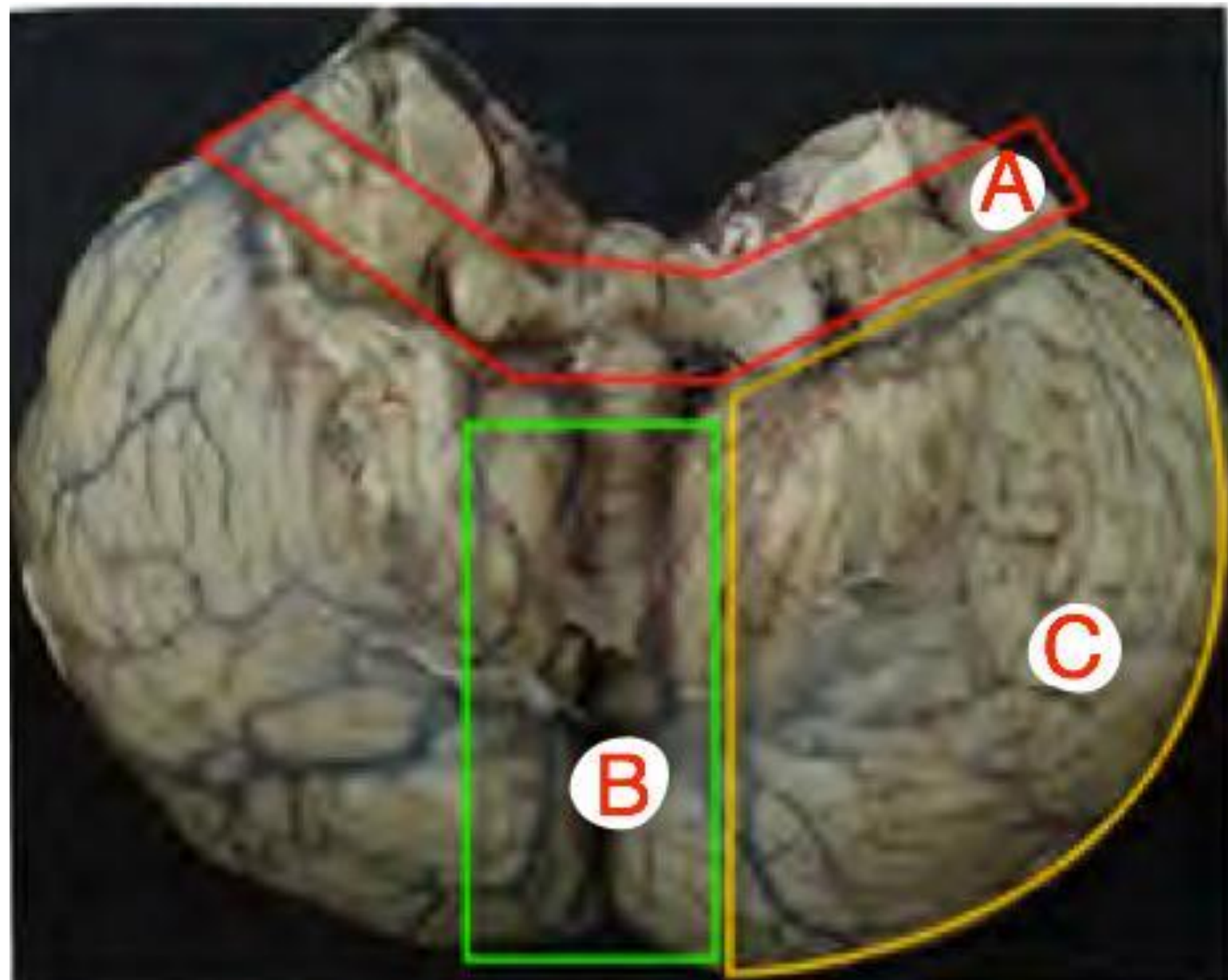


Lobes of Cerebellum

Neocerebellum:

- its connections are cortico- ponto – cerebellar
- Projects to the contra lateral cerebral hemisphere via dentate nucleus
- Formed of most of lateral parts of cerebellar hemisphere
- it interacts with motor cortex in planning & programming of movement





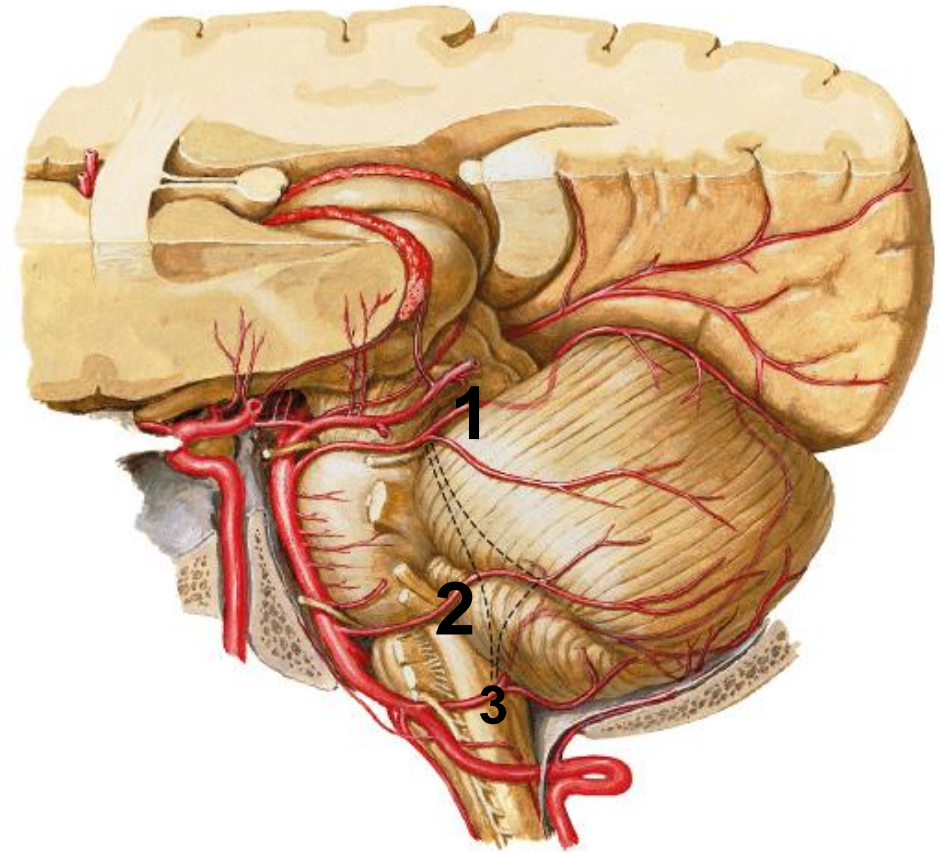
Functional Areas of Cerebellar Cortex

- **Vermis** : influences movement of neck, shoulders, thorax , abdomen
- **Lateral to vermis or intermediate zone**: controls muscles of distal parts of limbs hand and feet
- **Lateral zone** : is concerned with planning of movements of whole body and conscious assessment of movement errors

- **Dentate nucleus** (laterally): linked functionally with neocerebellum.
- **Fastigial nucleus** (medially): linked functionally with archicerebellum.
- **Nucleus interpositus** (emboliform and globose nuclei) in between : linked functionally with paravermal zone of spinocerebellum.

Blood Supply of Cerebellum

1. Superior cerebellar(of basilar)
2. Anterior inferior cerebellar(basilar)
3. Posterior inferior cerebellar(vertebral)



Arterial supply

Superior cerebellar artery: arises from basilar artery and supplies superior surface

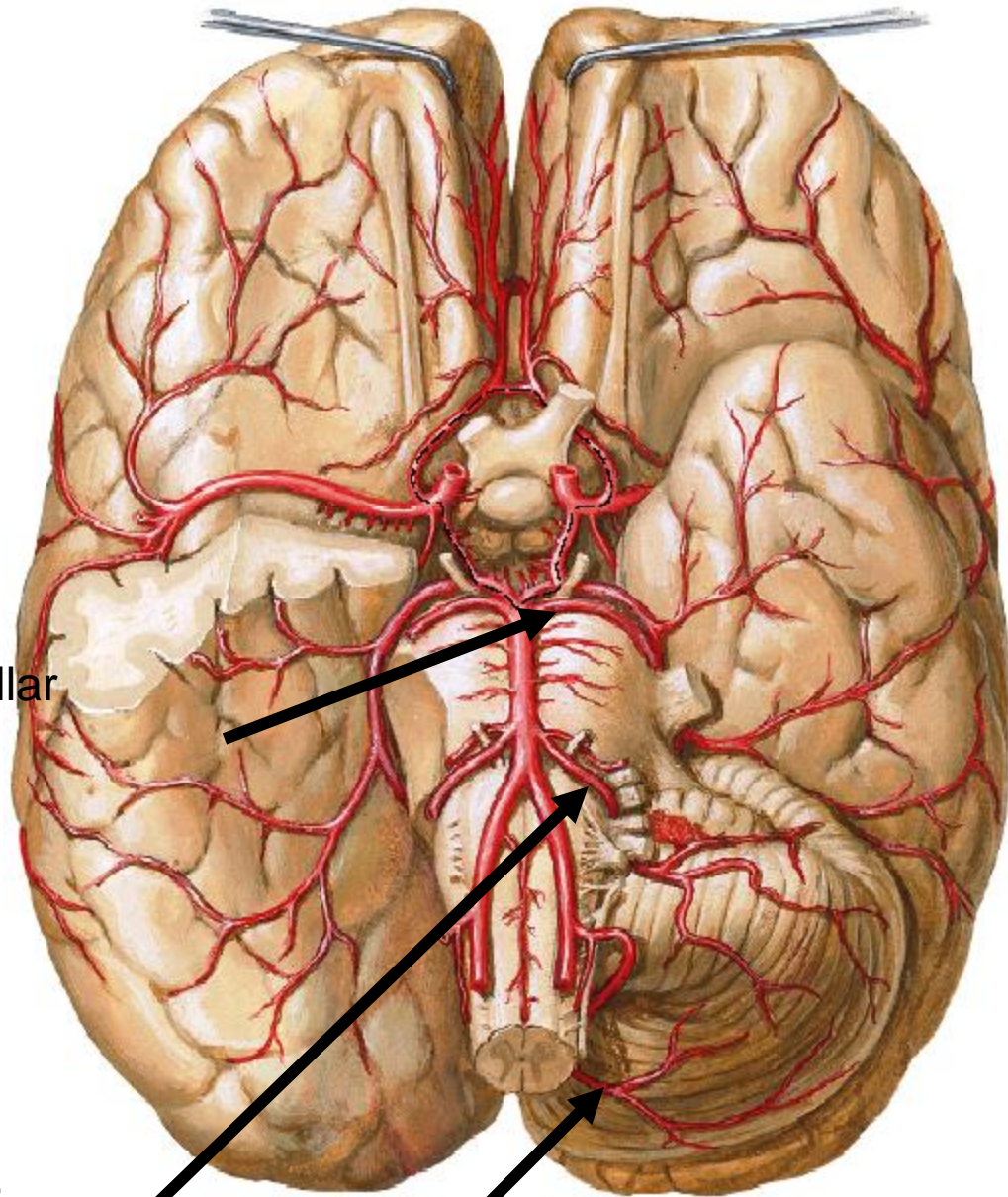
Anterior inferior cerebellar artery : arises from lower part of basilar artery and supplies small anterior part of the inferior surface

Posterior inferior cerebellar artery: arises from vertebral artery and supplies large posterior part of inferior surface

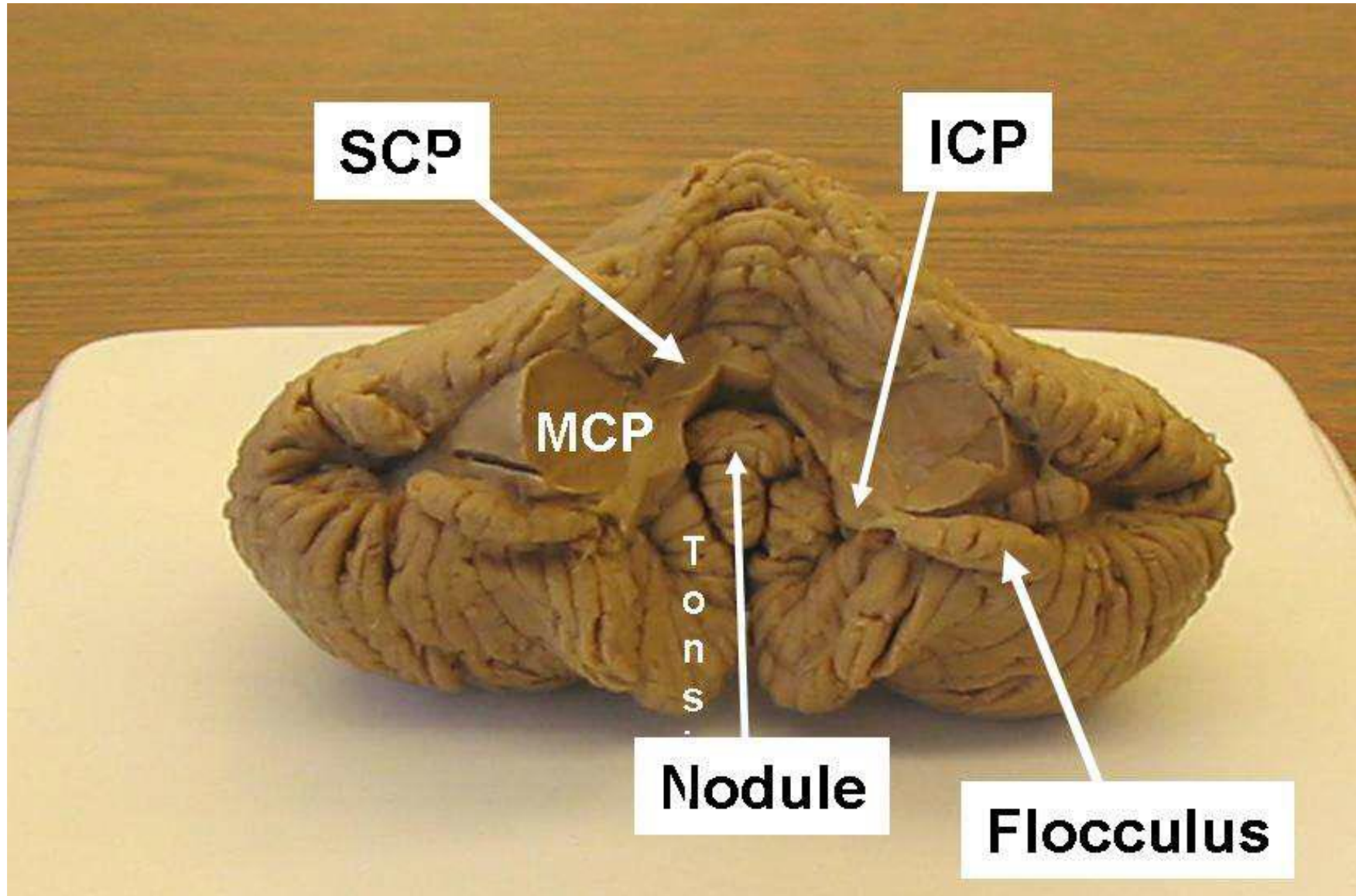
Superior cerebellar

Anterior inferior cerebellar

Posterior inferior cerebellar



The cerebellum is connected to Brain stem by three peduncles **SCP**, **MCP** and **ICP**



Cerebellar Peduncles(3)

3 pairs of peduncles that connect cerebellum with brain stem

1- Inferior cerebellar peduncle connects cerebellum to medulla (mostly afferents)

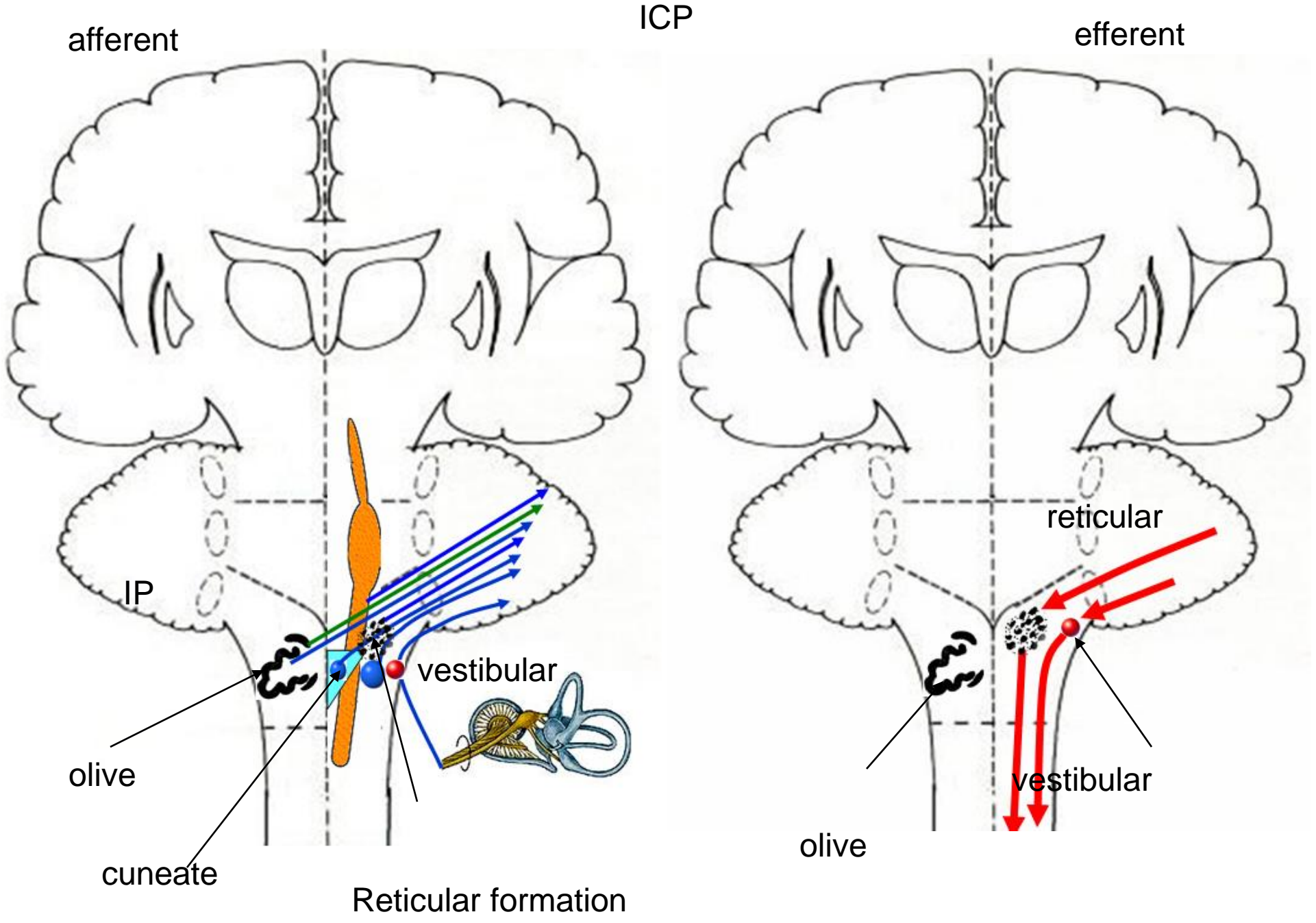
Afferent fibers

1. Posterior spino cerebellar: from ipsilateral Clarke's
2. Dorsal external arcuate fibers or Cuneocerebellar from accessory cuneate
3. Ventral external arcuate: from arcuate nucleus
4. Olivo cerebellar: from inferior olivary nucleus(climbing fibers)
5. Para olivo cerebellar: from dorsal & medial accessory olivary nuclei
6. Vestibulo cerebellar: from vestibular nerve & nuclei end on flocculonodular lobe
7. Reticulo cerebellar

Inferior Peduncle

Efferent fibers:

- Cerebello vestibular: from flocculonodular lobe to vestibular nuclei
- Cerebello olivary: to inferior olive
- Cerebello reticular

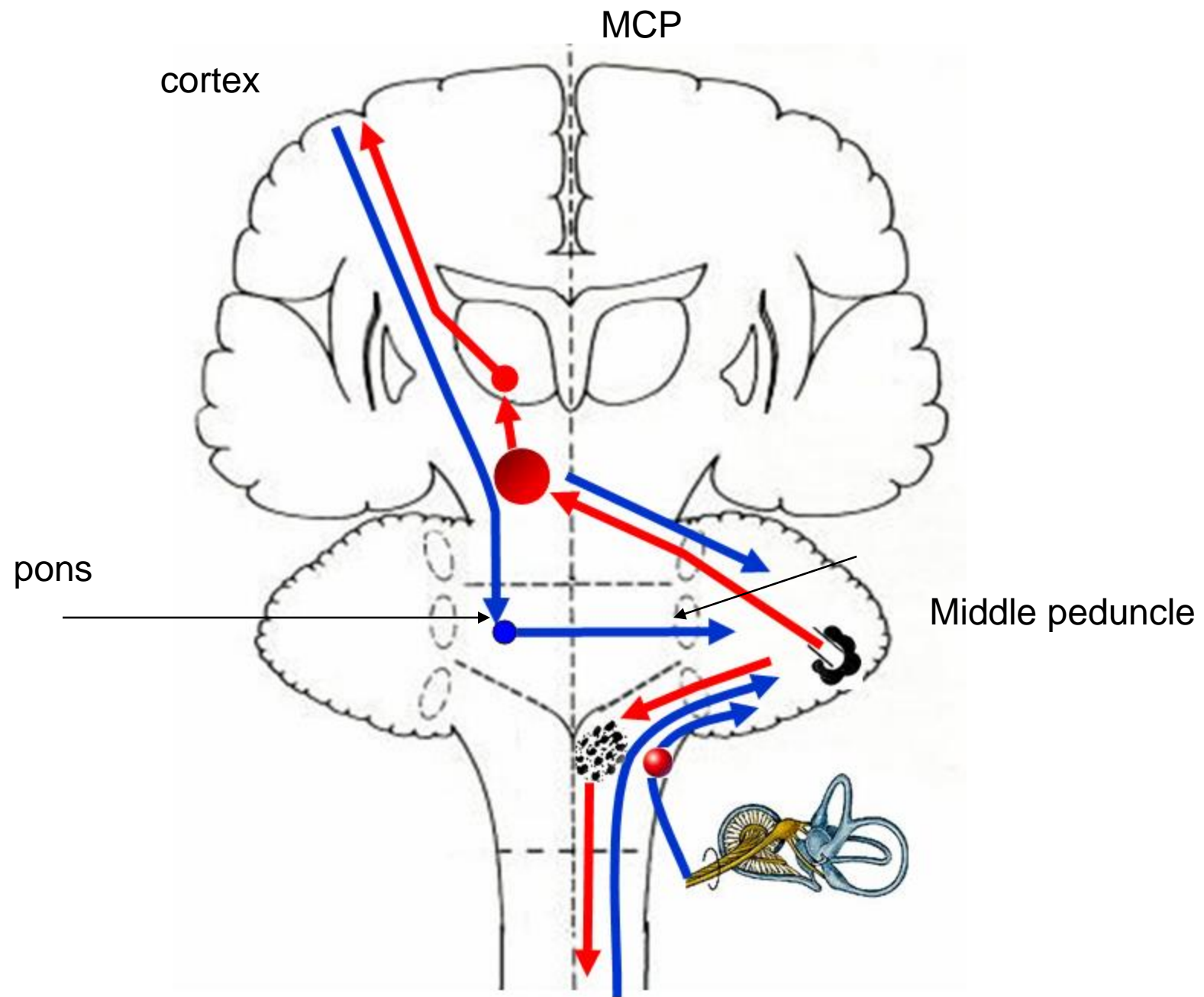


Middle Cerebellar Peduncle

Largest peduncle connects cerebellum to pons

Contains cortico- ponto cerebellar fibers

- Fibers arise from frontal, parietal, temporal & occipital lobes
- Descend in internal capsule then through the crus cerebri of the midbrain lateral 1/5 for Medial 1/5.....
- Terminate on pontine nuclei
- Pontine nuclei form transverse pontine fibers which cross mid line and enter cerebellum as middle cerebellar peduncle



Superior Cerebellar Peduncles

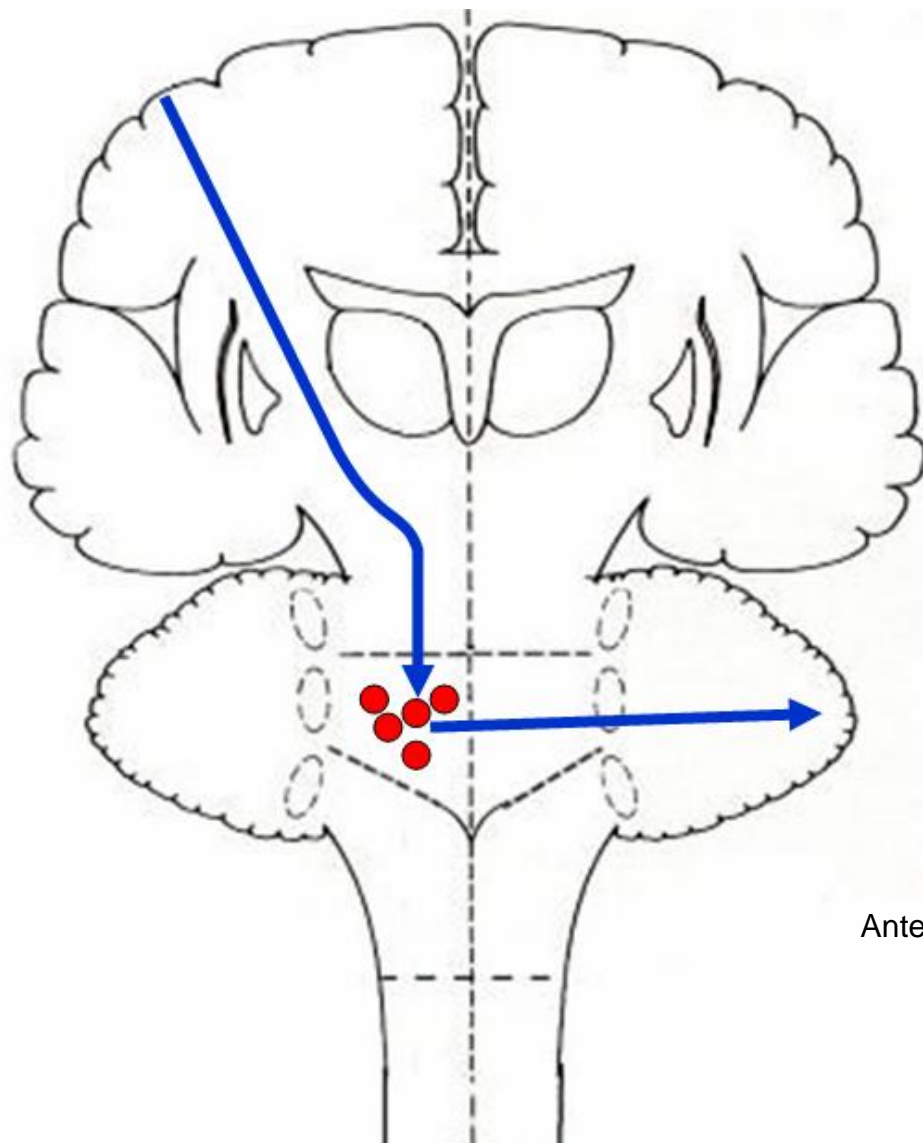
Connects cerebellum to mid brain

Afferents fibers

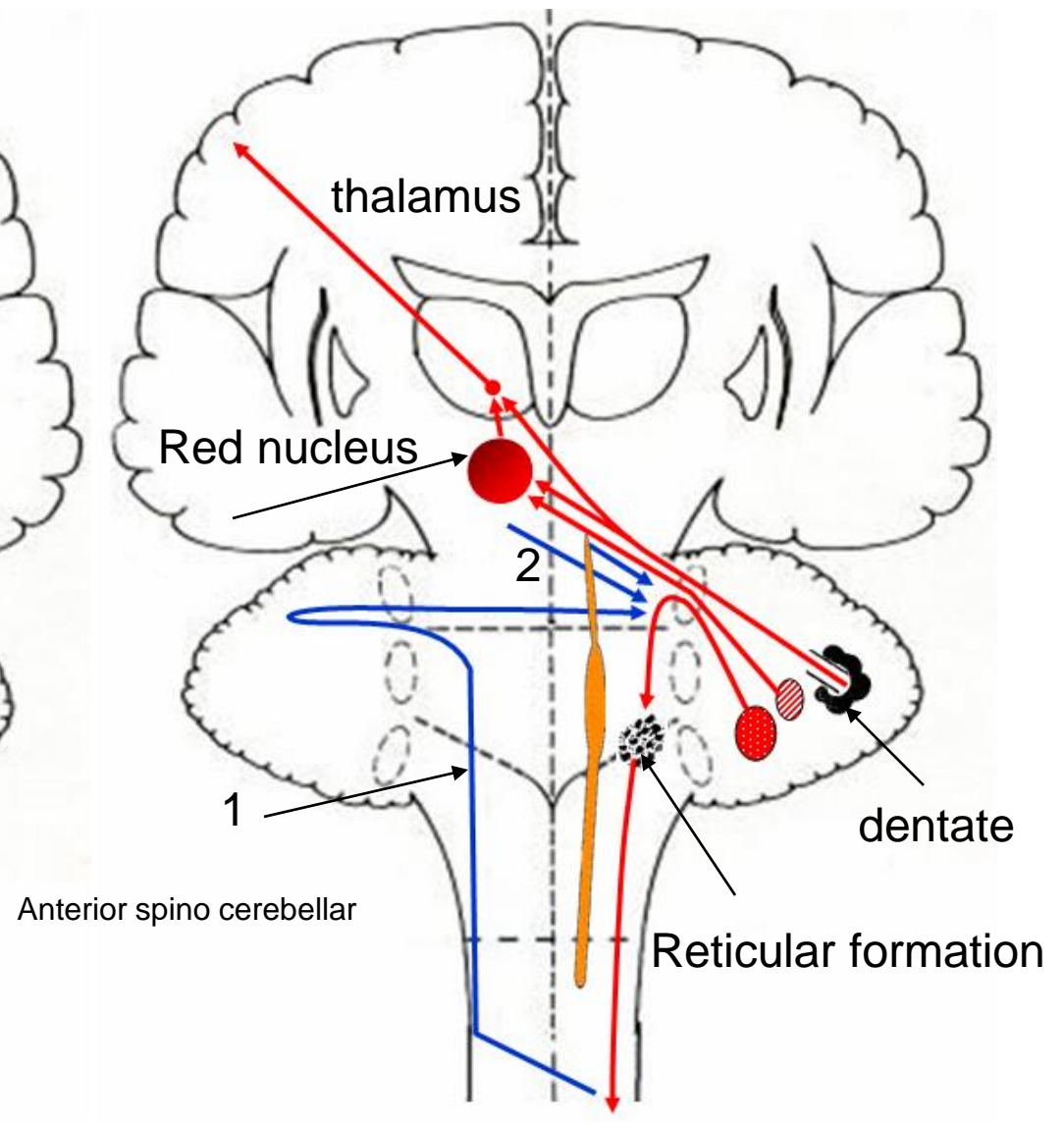
1. Anterior spino cerebellar
2. Tectocerebellar from superior colliculus

Efferent fibers

1. Fastigio reticular
2. Cerebello rubral: from globose & emboliform to red nucleus
3. Dentate thalamic to VLN of thalamus and dentate rubro thalamic to same nucleus of thalamus VLN but via red nucleus then to the cortex



MCP



SCP

Applied Anatomy

Lesion presents with signs and symptoms on the same side

- Hypotonia
- Disturbance in gait
- Cerebellar ataxia which present with (incoordination of the voluntary movement in absence of motor weakness). The range, rate, force and direction of movement are affected in cerebellar lesions.

1- nystagmus: horizontal oscillation in both eyes.

2- staccato speech : interrupted explosive speech.

3- intention tremors: (Shaking of fingers when attempting to do a movement)

4- dysmetria :(Ask patient to point to tip of nose by finger, he either past points it or misses it).

5- dysdiadokokinesia (Patient is unable to do rapid alternating movements as Pronation/ Supination)

THANK YOU

A 3D rendered scene featuring the words "THANK YOU" in large, colorful, block letters. Each letter is held by a small, white, cartoonish character with a spherical head and thin limbs. The characters are arranged in a line on a reflective white surface. The letters are colored as follows: 'T' is red, 'H' is orange, 'A' is yellow, 'N' is light green, 'K' is yellow, 'Y' is light green, 'O' is bright green, and 'U' is dark green. The characters are holding the letters from behind, making them appear to be supporting them. The background is a plain, light-colored wall.