

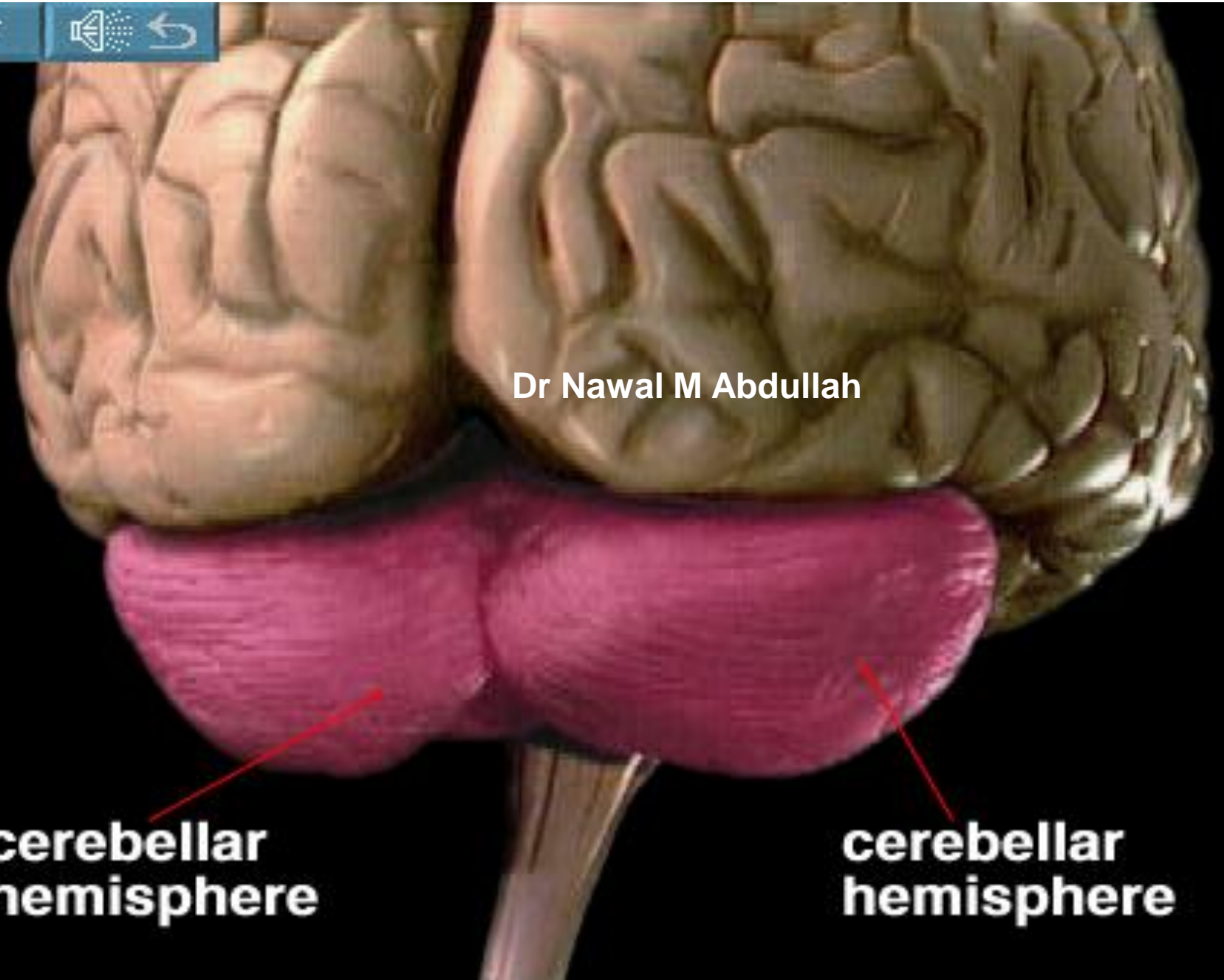
TEXT



Dr Nawal M Abdullah

**cerebellar  
hemisphere**

**cerebellar  
hemisphere**



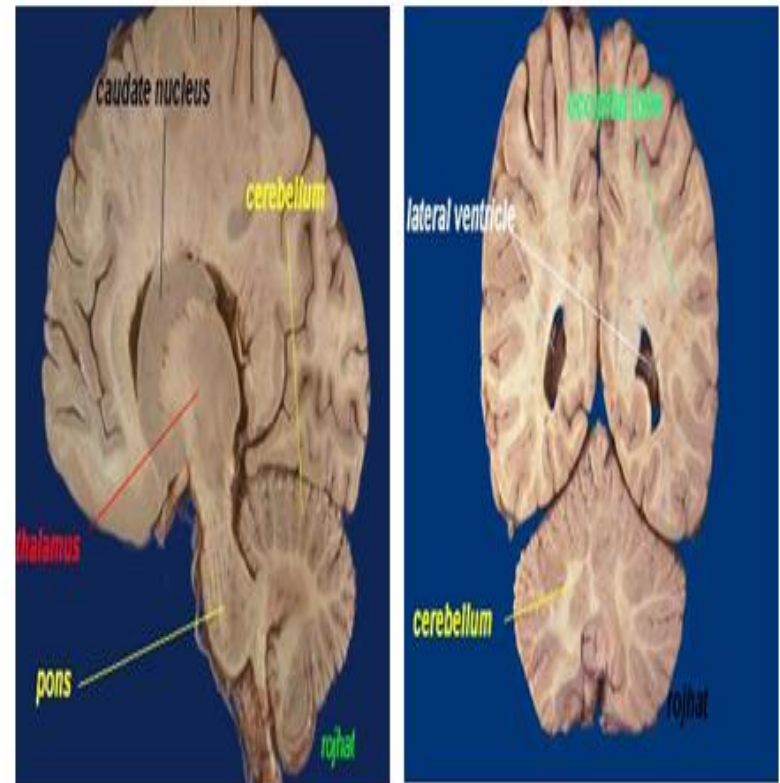
# cerebellum

Latin word= small brain

**Def:-**

- \* **largest part of hindbrain in posterior cranial fossa behind pons and medulla**
- \* **infra tentorial structure that coordinates voluntary movement of the body .**
- \* **It joins to the brain stem by 3 peduncles**
- \* **Weight: 150 gm in adult male.**
- \* **It forms 1/8 part of cerebrum in adults**
- \* **It forms 1/20 part of cerebrum in infants**

Sections /brain



# Cerebellar peduncles

## \*Middle :

largest ,most lateral

Formed by fibers arise in opposite half of ventral part of **pons** passes to. **cerebellum**

## \*Inferior:

Form on posterolateral surface of **medulla oblongata** to the **vermis**.

Contain afferent and efferent fibers

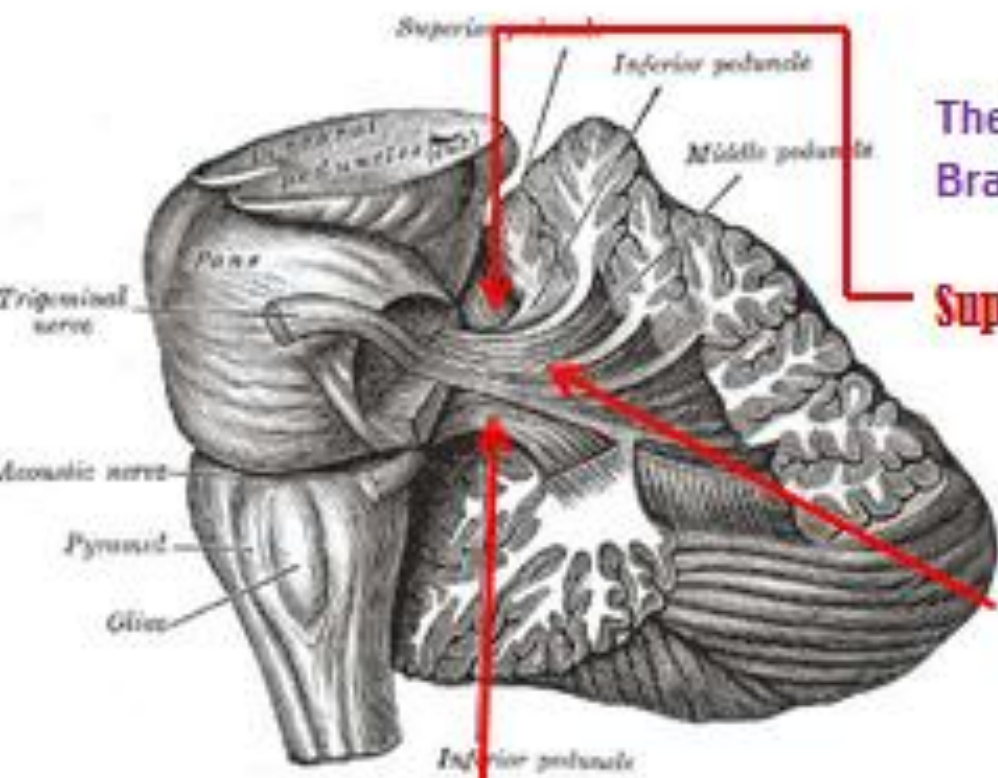
## **Superior:**

- Principle efferent pathway from **cerebellum** mainly arise from **dentate** nucleus ,ascend to form lateral wall of 4<sup>th</sup> ventricle.

- then enters tegmentum of **midbrain**

- then decussate and majority ascend superiorly to the **thalamus** and to

**red n**, .



The cerebellum is connected to Brain stem by three peduncles

**Superior cerebellar peduncle**

Midbrain

**Middle cerebellar peduncle**

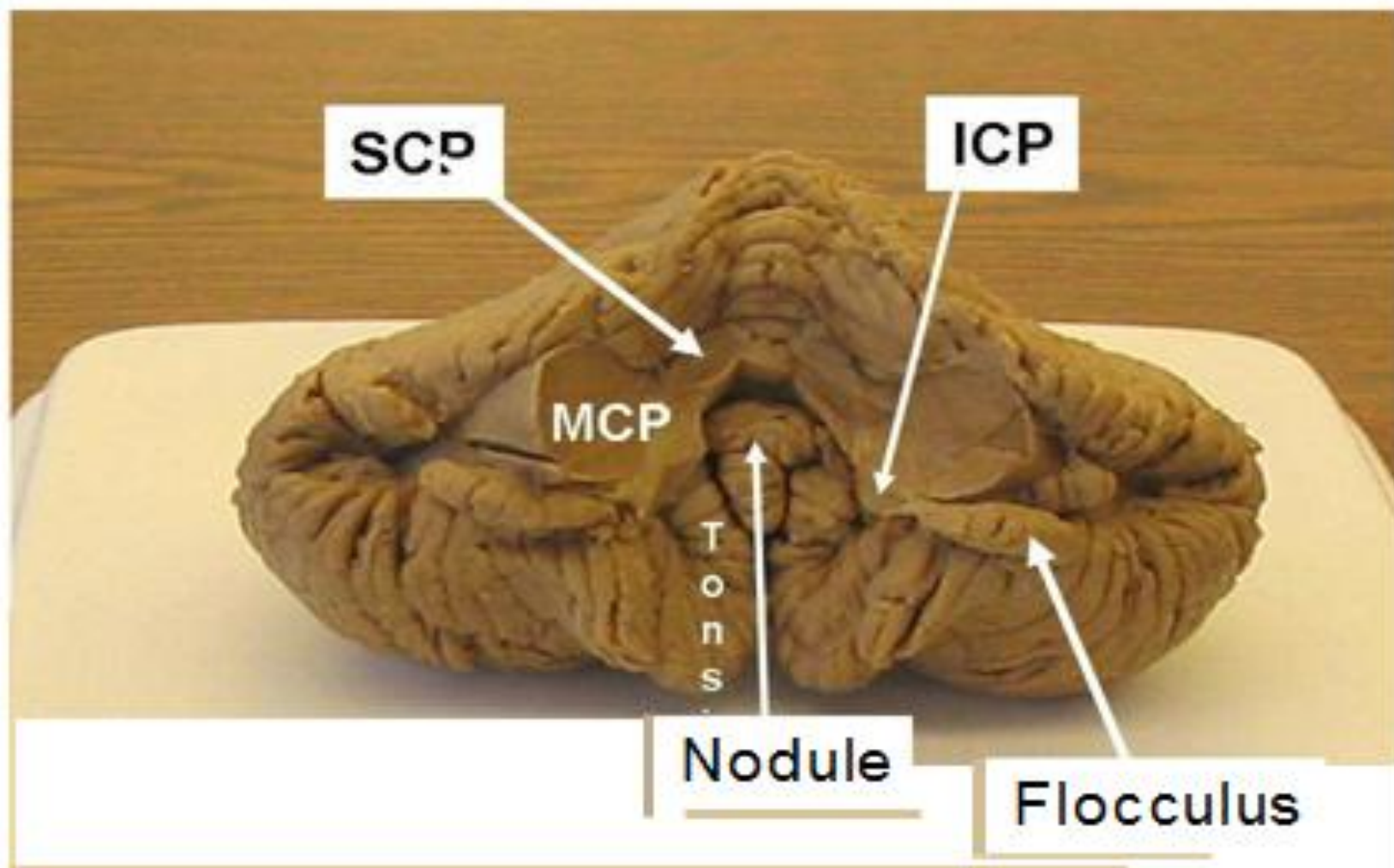
Pons

**Inferior cerebellar peduncle**

Medulla oblongata



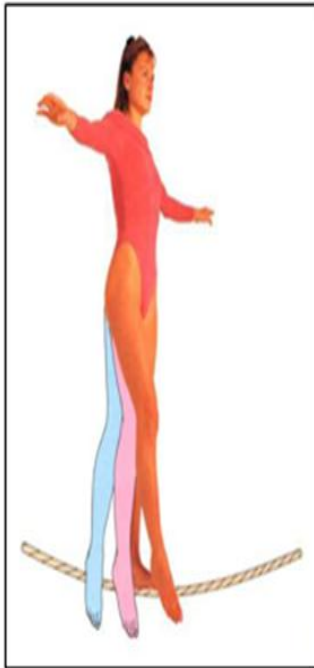
## *Peduncles of the cerebellum*



# Function:

- it is not sensory niether motor organ
- to coordinate by synergistic action all reflexes and voluntary muscular activity
- So movements are smooth balanced and accurate
- graduate and harmonized muscle tone and maintains normal body
- It control posture and equilibrium
- .It permits voluntary movements to take place with precision and economy of effort .

# Functions :



Balance



*Motor skills*



## External features:

- it is **avoid** in shape and constricted in its median part,
- It consist of
- **3 parts**
- **2 cerebellar hemispheres** joined by median **vermis**
- **2 surfaces**
- Superior- convex
- Inferior - notched
- **2 notches**
- **anterior** cerebellar notch
- wide and shallow and it lodges pons and medulla.



## **Posterior cerebellar notch**

Narrow and deep, it lodges falx cerebelli

### **2 borders:**

Anterolateral

Posterior

### **3 lobes**

**Anterior lobe**

**Middle = posterior**

**Flocculonodular lobe = smallest**

## **Fissures of cerebellum**

- divided into:

**Fissure prima** : = primary fissure

cuts across the superior surface and separates anterior and posterior lobes

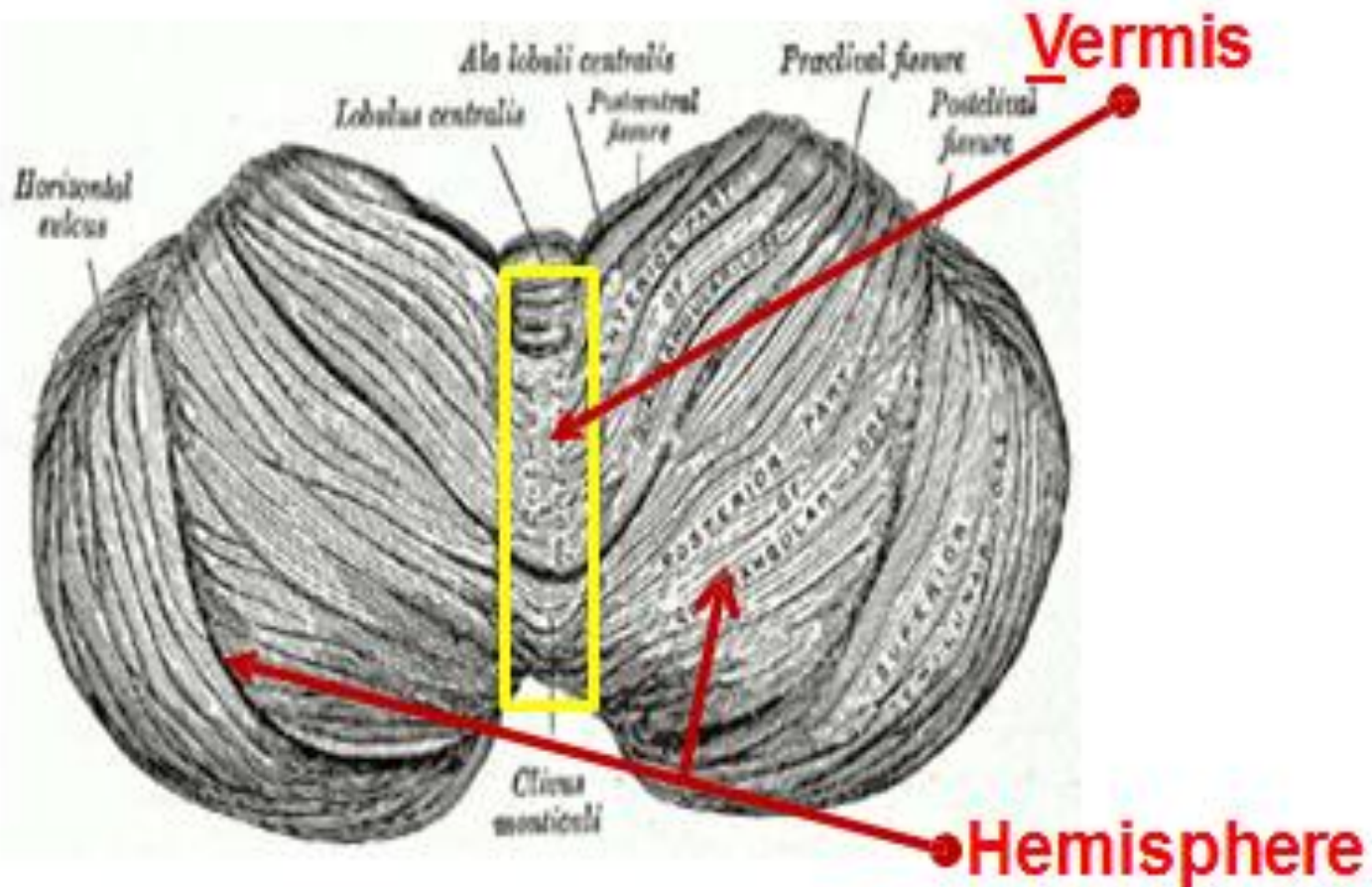
**Horizontal fissure:**

- extends from one middle cerebellar peduncle to the other and lies close to the junction of the superior and inferior surface of the cerebellum
- runs through posterior lobe.

**Postero-lateral fissure**

lies on the antero-inferior surface of the cerebellum and separates the nodules and flocculus from the remainder of the cerebellum.

# Parts of the cerebellum



# structure

## Grey matter

### Cerebellar cortex •

Molecular layer

Purkinje cell layer •

Granular layer •

## White matter

### Medulla:

Deep cerebellar nuclei

Fastigial n

Globas n

Dentate n

Emboliform n

# Grey matter of cerebellum:

- it consist of cerebellar - cortex and 4 nuclei

## Cerebellar cortex:

- \*\* Cortex is folded by many **parallel transverse fissures** into **Folia**
- \*\* Section appeare : a cut surface with branched appearance called **arbor vitae**.

## Cortex is divided into:

### 1. **Molecular layer = external layer**

Consist of **satellite** and inner **basket cells**.

**2. Purkinji cell layer , middle**

**3. Granular layer, internal**

## **Intracerebellar Nuclei**

4 **grey masses** are embedded in the white matter of the cerebellum on each side of the midline .

from lateral to medial

**1. Dentate nucleus**

largest , like crumpled bag with opening face medially ,  
most lateral

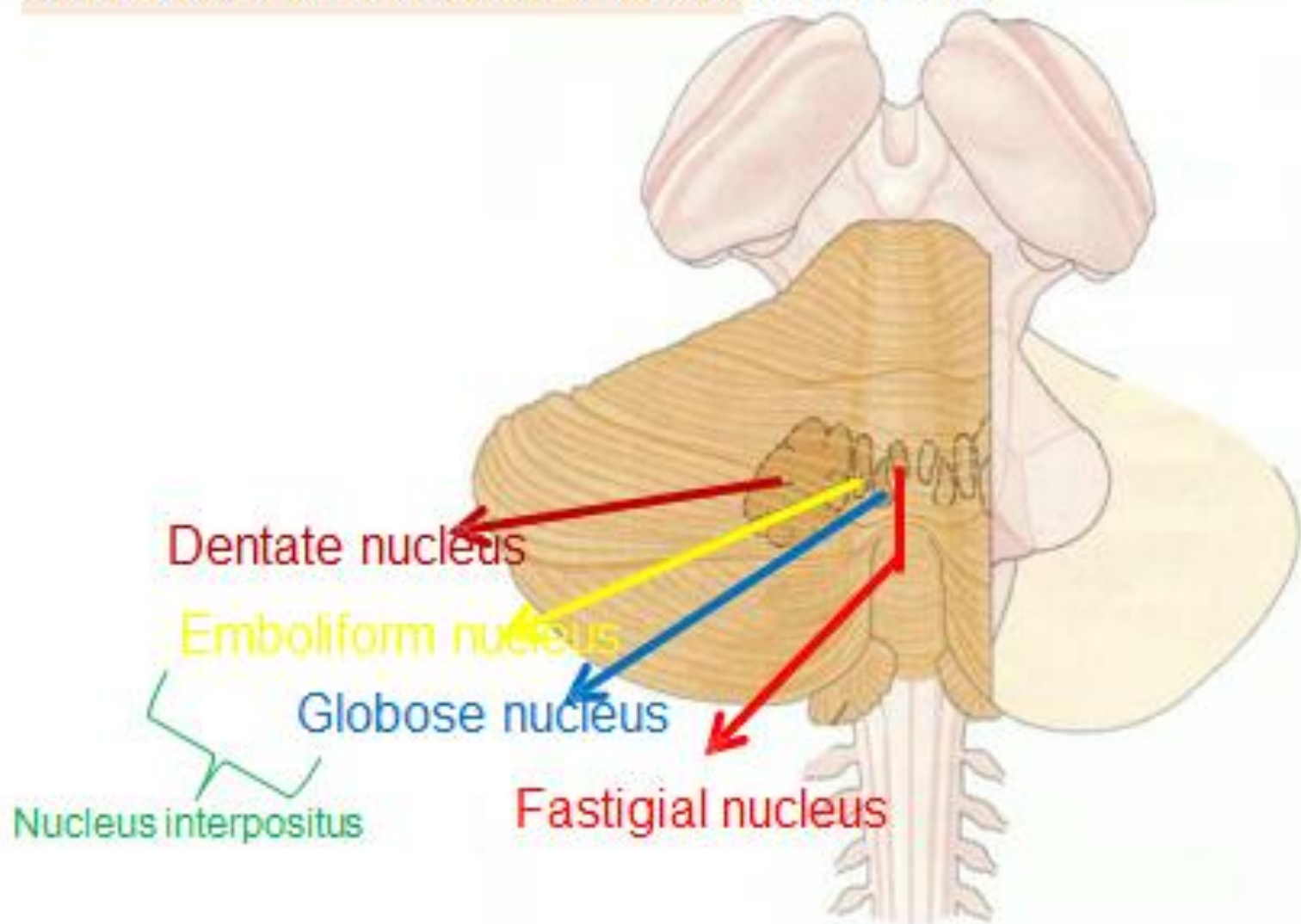
**2. Emboliform**      oval

**3. Globose nucleus**

**1. Fastigial nucleus**      near vermis, most medial

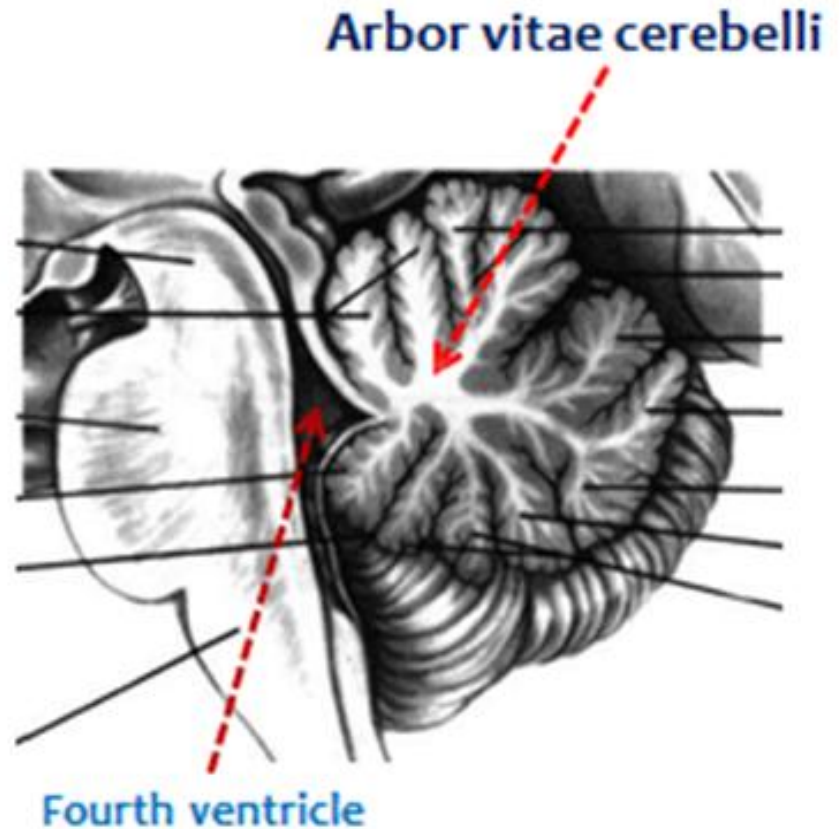


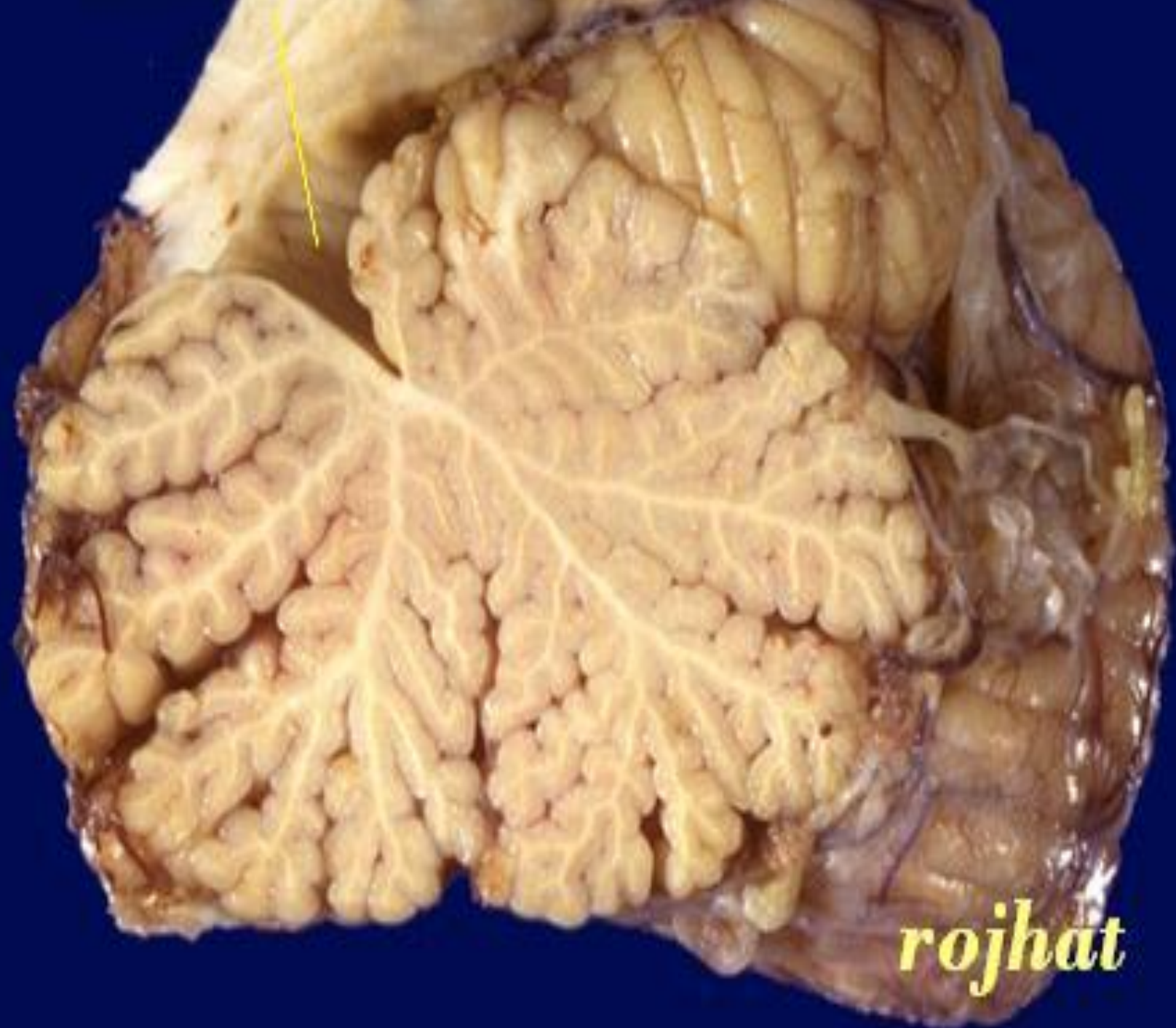
## DEEP NUCLEUSES OF CEREBELLUM



## Arbor vitae

- In latin "*tree of life*" it is the white matter of the white matter of cerebellum.
- It is so called because of the tree like appearance.
- It brings sensory and motor sensation to and from cerebellum.





*rojhat*

# White matter of cerebellum

3 groups of fibers

## 1. Intrinsic fibers .

( do not leave cerebellum and connect up different regions of the organ ).

## 2. Afferent fibers .

form greater part of white matter and proceed to cerebellar cortex

### A. cerebellar afferent fibers from cerebral cortex

1. cortico ponto cerebellar pathway
2. cerebro-olivo cerebellar pathway
3. cerebro-reticulo cerebellar pathway

### B. Cerebellar afferent fibers from spinal cord

1. anterior spino cerebellar tract  
muscle joint information

### **3. Efferent fibers.**

- fibers synapse with nuclei then leaving cerebellum through sup-cerebellar peduncle.

**Globose emboliform rubral pathway**

**Dento thalamic pathway**

**Fastigial vestibular pathway**

**Fastigial reticular pathway.**

# White matter of the cerebellum

➤ Consists of three types of nerve fibres in the white matter

## A. Axons of purkinje cells

The only axons to leave cerebellar cortex to end in deep cerebellar nuclei specially dentate nucleus.

## B. Mossy fibres

They end in the granular layer.

## C. Climbing fibres

They end in the molecular layer



## **Divisions of cerebellum:**

By 3 different ways:

1. **Anatomically:**
2. into central median vermis and 2 cerebellar hemispheres
3. by **fissures** into lobes and lobules
4. **functionally** by 3 different part

## **Anatomical division :**

### **Cerebellar hemispheres**

#### **Vermis** of cerebellum:

it is a narrow and median

##### **a. Superior vermis**

is median ridge on sup- surface

##### **b. Inferior vermis**

bulges into a deep median hollow on the antero inferior surface of the cerebellum ( deep groove= **vallecula**)

\*\*\*\*Vermis is separated from hemisphere by deep furrows but each part is continuous with a part of the hemisphere thus the nodule is continuous with the flocculus forming the **flocculonodular lobe**

## **Lobes and lobules of cerebellum:**

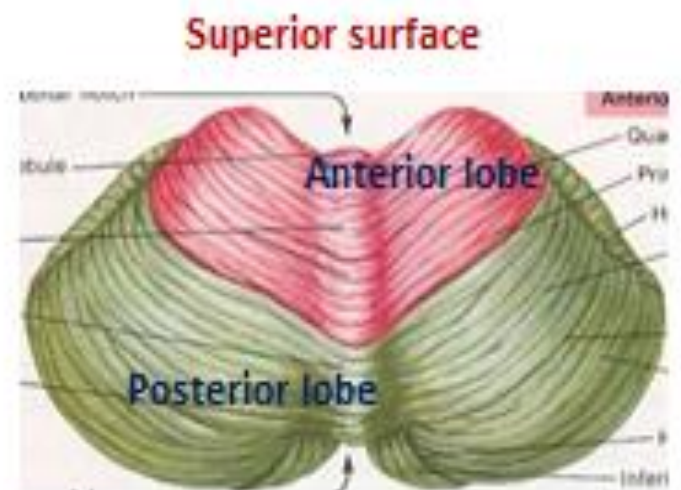
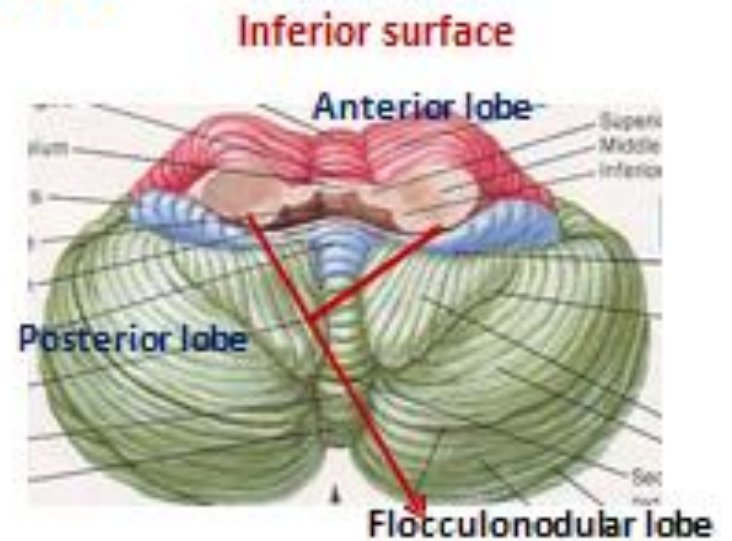
by transverse fissures which cut vermis transversely and extend laterally into the hemisphere .

# LOBES OF CEREBELLUM

## □ Divisions of lobes

### Anatomical

- Flocculonodular lobe
- Anterior lobe
- Posterior lobe



## Functional division of cerebellum

### 1. **Vestibular part** = **Archi-cerebellum** = cerebellum of equilibrium

- \*\* formed of flocculonodular lobe  
( 2 flocculi + nodular lobe)
- \*\* receives fibers from internal ear
  - a. 3 semicircular canals
  - b. utricle
  - c. saccule

## 2. **Spinal part = paleo-cerebellum** **= cerebellum of proprioception**

\*\* formed of **vermis** of ant- lobe + **uvula**+ **pyramid**.

\*\* recieves fibers from muscles and associated structures from :

- a. Muscle spindles
- b. Tendon spindles
- c. Pacinian corpusles

by **spino-cerebellar** tract



3. **Cerebral part = neocerebellum =**  
**cerebellum of cerebral cortex**

\*\* largest part of cerebellum

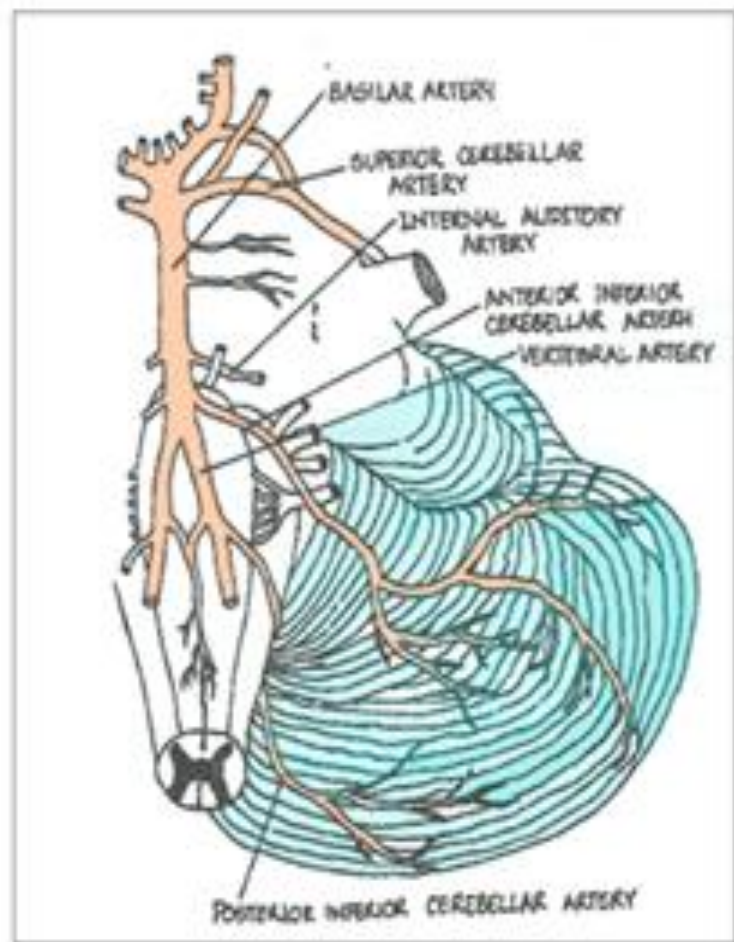
\*\* formed of 2 **cerebellar hemispheres** + middle part of  
**vermis**

\*\* receives impulses from **pontine** nuclei

\*\* receive impulses from **cerebral cortex**

# Blood supply

- Posterior inferior cerebellar artery
- Anterior inferior cerebellar artery
- Branch of basilar artery
- Superior cerebellar artery



## Cerebellar dysfunction:

Unability to do movements smoothly and accurately

Cerebellar ataxia = asynergia

Hypotonia

Gait disturbance

Intension tremor

Pendular knee jerk

Nystagmus

dysarthria