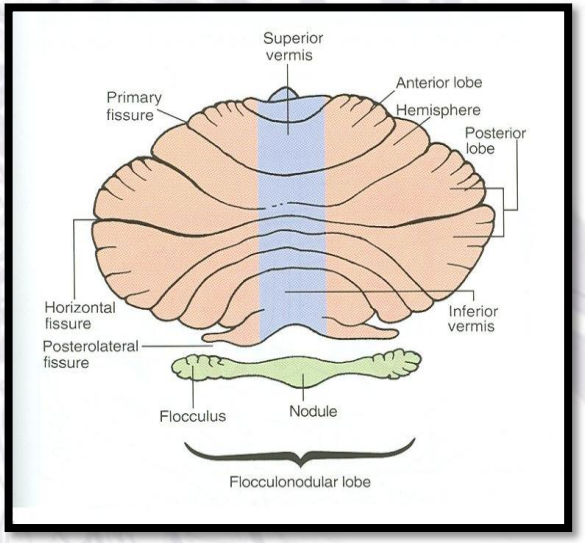
THE CEREBELLUM

Done by: Mohammed Bin Askar
Revised by: Anjod AlMuhareb

OBJECTIVES

At the end of the lecture, students should:

- ❑Describe the external features of the cerebellum (lobes, fissures).
- ❑Describe briefly the internal structure of the cerebellum.
- ❑List the name of cerebellar nuclei.
- ❑Relate the anatomical to the functional subdivisions of the cerebellum.
- ❑Describe the important connections of each subdivision.
- ❑Describe briefly the main effects in case of lesion of the cerebellum.



Abbreviations :

ICP :- INFERIOR CEREBELLAR PDUNCLE

MCP :- MIDDLE CEREBLLAR PDUNCLE

SCP :- SUPERIOR CEREBELLAR PDUNCLE

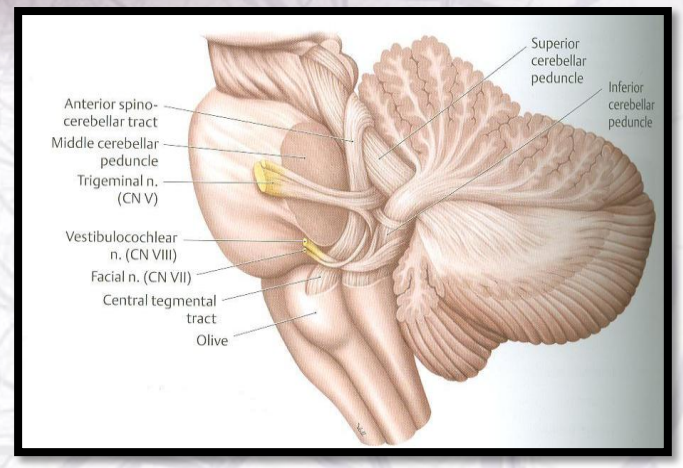
THE CEREBELLUM

❑ORIGIN:

from hindbrain, separated from pons and medulla by fourth ventricle.

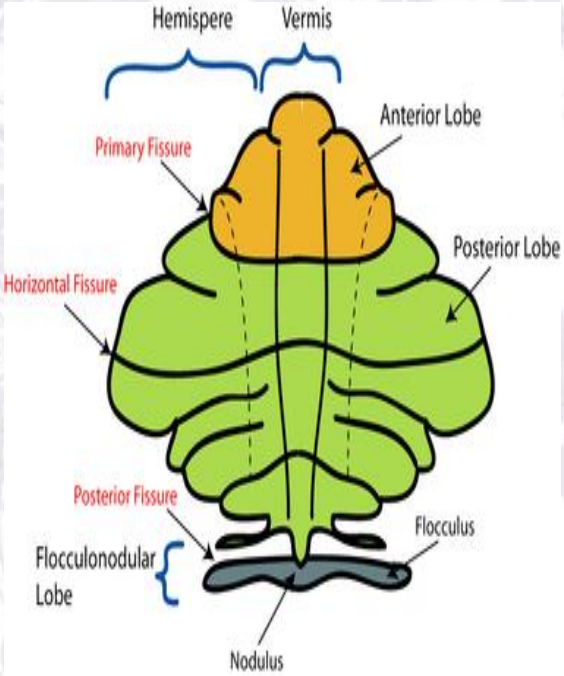
❑CONNECTION TO BRAIN STEM:

by inferior, middle and superior cerebellar peduncles.

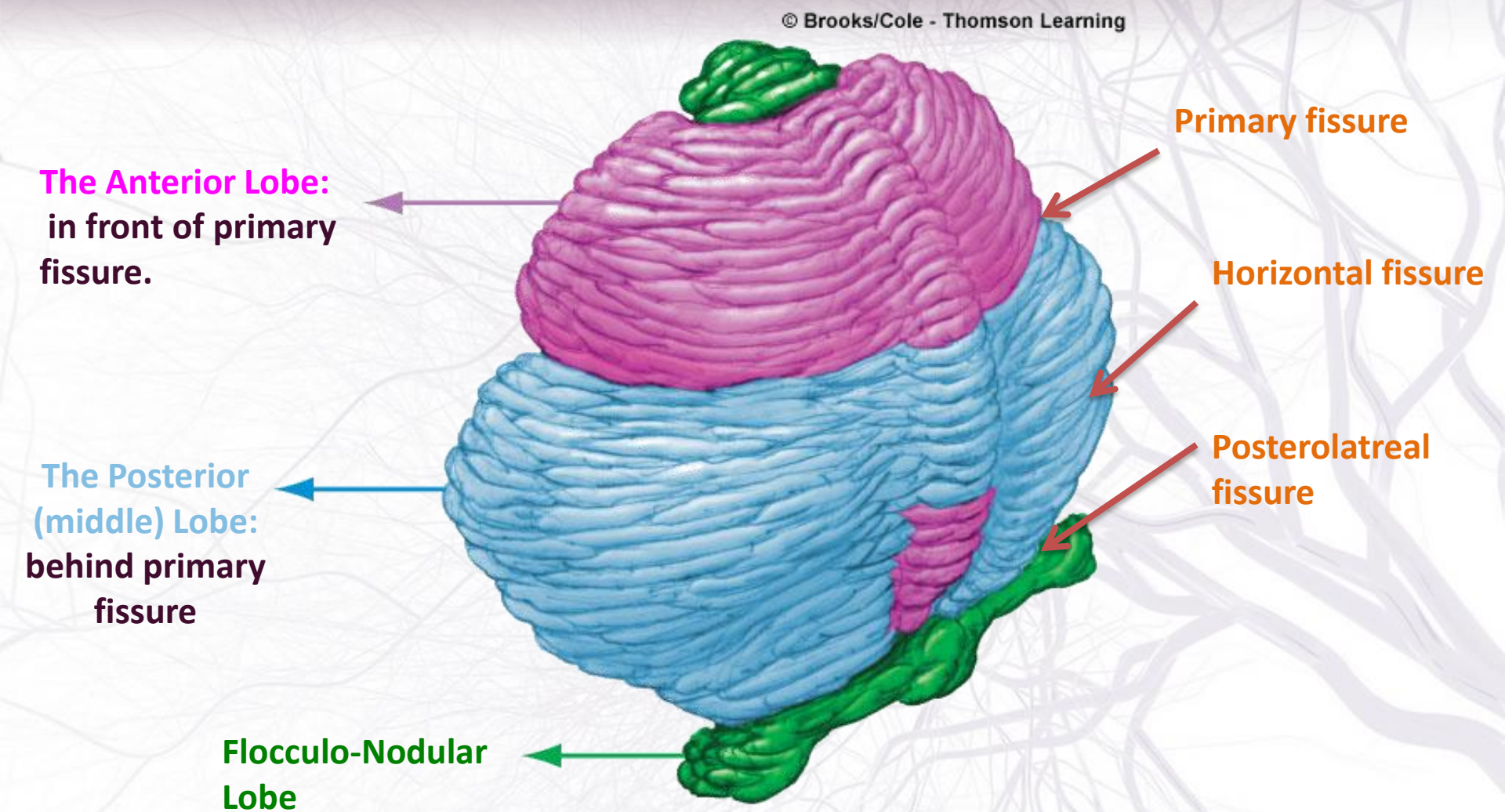


- **It consists of two cerebellar hemispheres joined in midline by the vermis.**

- **It's surface is highly convoluted forming folia separated by fissures.**



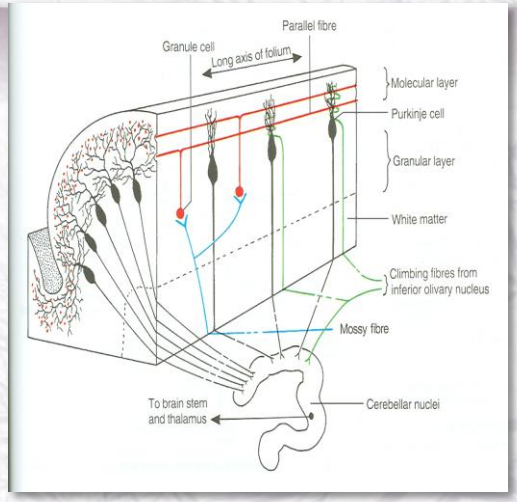
ANATOMICAL SUBDIVISION

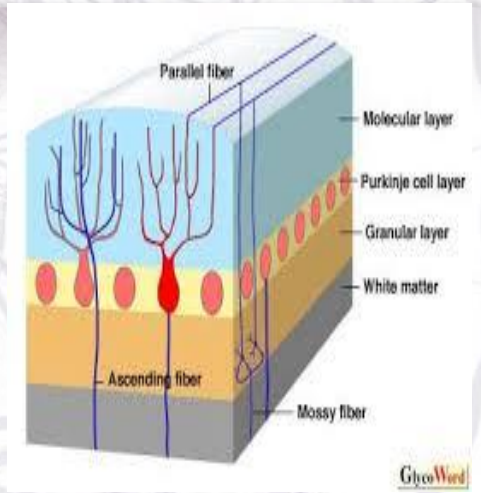


CEREBELLAR CORTEX

The cerebellar cortex (outer grey matter) Divided into 3 layer :-

1. Outer **molecular layer.**
2. Intermediate **Purkinje cell layer.**
3. Inner **granular layer.**

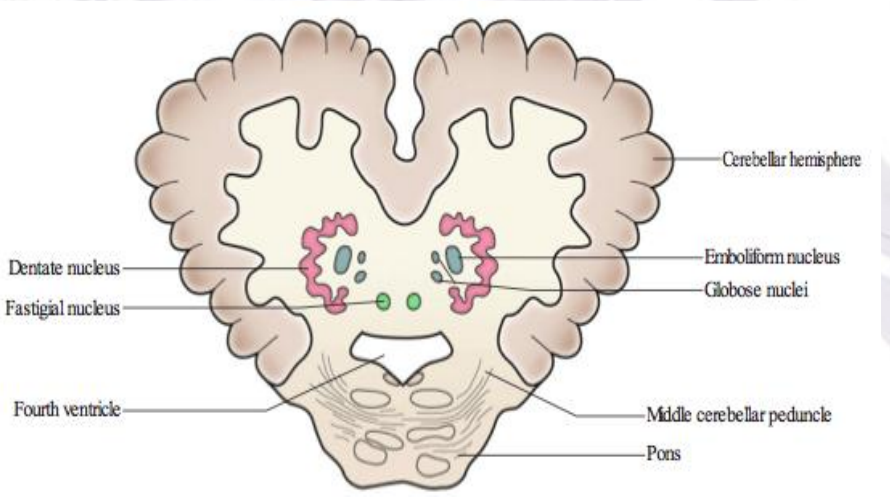




Deeply in the white matter there are 4 nuclei From medial to lateral :-

Festigeal nucleus .
Globose nucleus.
Emboliform nucleus.
Dentate nucleus.

****The largest nucleus & see by naked eye is the Dentate .**
The smallest nucleus is the festigeal .
Bothe the Globose and Emboliform nuclei called interpositus nucleus



CEREBELLAR MEDULLA

Inner white matter

AFFERENT FIBRES

that relay in the cerebellum :-

1/ Climbing fibers: from inferior olivary nucleus relay **DIRECTLY** to Purkinge cells .

2/ Mossy fibers: rest of fibers :

- From vestibular nuclei .
- From spinal cord .
- From pons .

They relay to granule cells which in turn relay **INDIRECTLY** to Purkinge cells .

EFFERENT FIBRES:

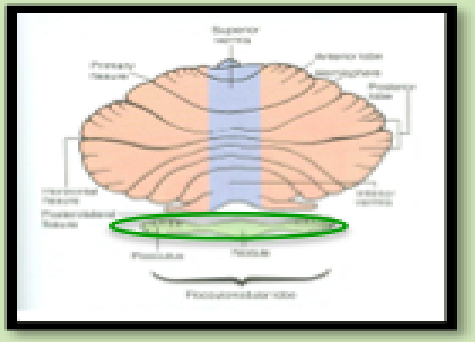
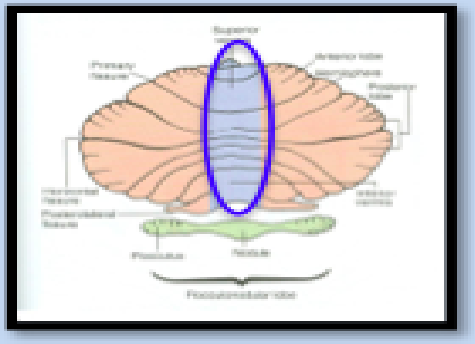
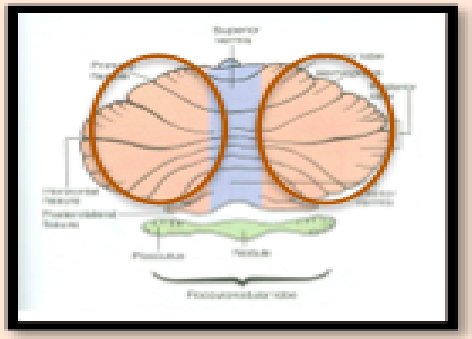
- Most of efferent fibres are axons of **deep cerebellar nuclei** .

- Main efferents go to :-
  1. Vestibular nuclei
  2. Red nucleus
  3. Ventral lateral nucleus of thalamus

Axons of **Purkinge cells** are the only axons to **leavet he cortex to medulla**

- The great majority of axons do not leave cerebellum and end in deep cerebellar nuclei.
- Some of axons leave cerebellum as Efferent fibres .

FUNCTIONAL SUBDIVISIONS OF THE CEREBELLUM

	ARCHICEREBELLUM	PALEOCEREBELLUM	NEOCEREBELLUM
	Vestibular Part	Spinal Part	Cerebral Part
Cerebellar lobe	Flocculonodular lobe	Vermis & Paravermis	Rest of Cerebellum.
Nuclei related	Fastigial	globose & emboliform	Dentate
Afferents	Vestibular nuclei (Vestibulocerebellar fibres),(through ICP)	spinal cord (dorsal & ventral spinocerebellar tracts through ICP & SCP, respectively)	Pons (Pontocerebellar fibres) (through MCP)
Efferents	Vestibular nuclei (through ICP)	red nucleus (through SCP)	Red nucleus but mostly to Ventral Lateral Nucleus of Thalamus (through SCP) then to motor cortex
Function	controls body Balance	influences posture & muscle tone	coordination of voluntary movements
Via	(vestibulospinal & reticulospinal tracts)	(Rubrospinal tract).	(descending corticospinal & corticobulbar tracts).
			

ARCHICEREBELLUM

Purkinge cells of flocculonodular lobe

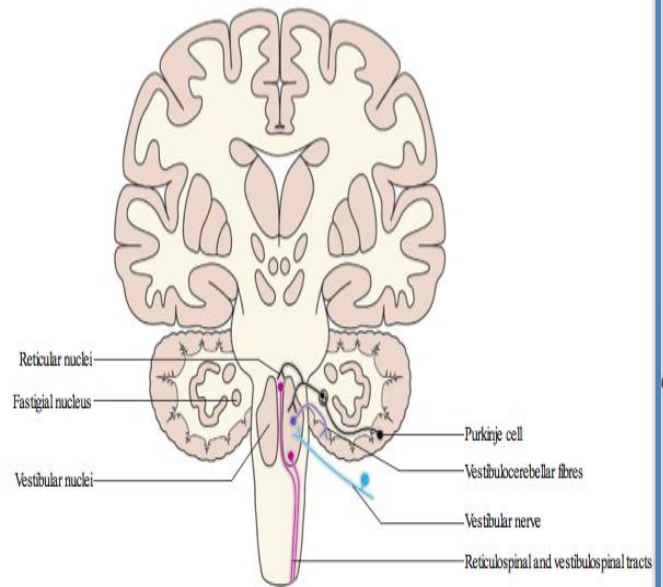
BALANCE

Fastigeal nucleus

ICP

ICP

Vestibular nuclei



PALEOCEREBELLUM

Purkinge cells of vermis & paravermis

ICP

SCP

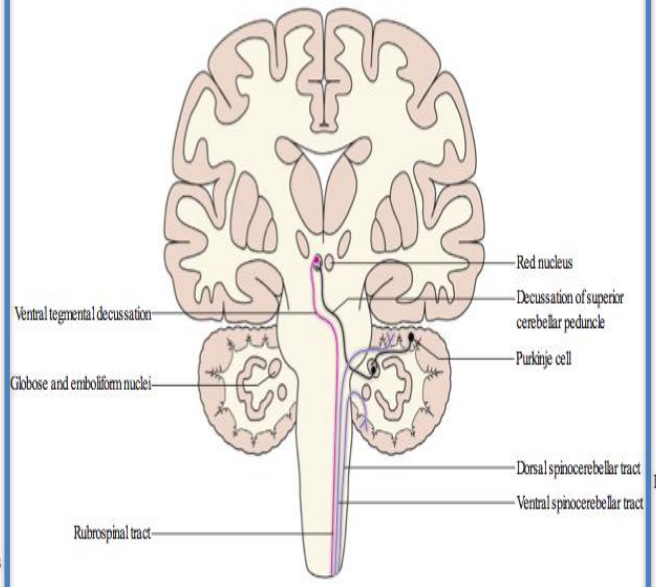
POSTURE & MUSCLE TONE

Globose & emboliform nuclei

SCP

Spinal cord

Red nucleus



NEOCEREBELLUM

Purkinge cells of rest of cerebellum

MCP

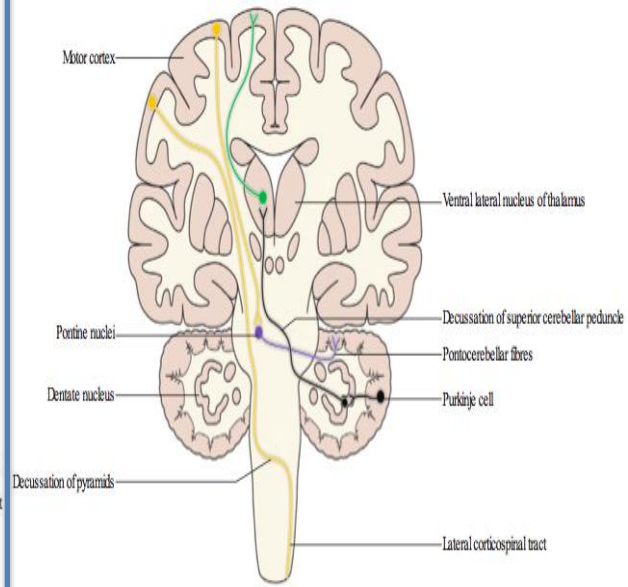
Dentate nucleus

Red nucleus & Ventral lateral nucleus of thalamus

Pons

COORDINATION OF VOLUNTARY MOVEMENTS

Motor cortex



CEREBELLAR LESIONS

- **MIDLINE LESION :-** Loss of postural control .
- **UNILATERAL LESION :-** "**Cerebellar ataxia**" causes ***ipsilateral*** :-

1. **Incoordination of arm :-** intention tremor (**on performing voluntary movements**).
2. **Incoordination of leg :-** Unsteady gait .
3. **Incoordination of eye movements :-** Nystagmus .
4. **Slowness of speech :-** Dysarthria .

*Charcot's Triad : Nystagmus , Dysarthria and intention tremor

MCQ

1. Which one of the following nucleus is related to NEOCEREBELLUM?	**2. To which part of the CNS the flocculonodular lobe send its efferent fibers?**
A. Fastigeal nucleus B. Dentate nucleus C. Globose nucleus	A. Red nucleus B. Pons C. Vestibular nuclei
3.Which one of the following cerebellar cortex layers is the INNER MOST?	**4.Which one of the following functions related to PALEOCEREBELLUM**
A. Molecular layer B. Purkinje cell layer C. Granular layer	A. controls balance B. influences posture & muscle tone C. coordination of voluntary movements
5. Which one of the following nuclei lie medially?	**6. Which one of the following cerebellar parts related to ARCHICEREBELLUM**
A. Fastigeal nucleus B. Dentate nucleus C. Globose nucleus	A. flocculonodular lobe B. vermis & paravermis C. rest of cerebellum

GOOD LUCK

CEREBELLUM

1.B 2.C 3.C 4.B 5.A 6.A