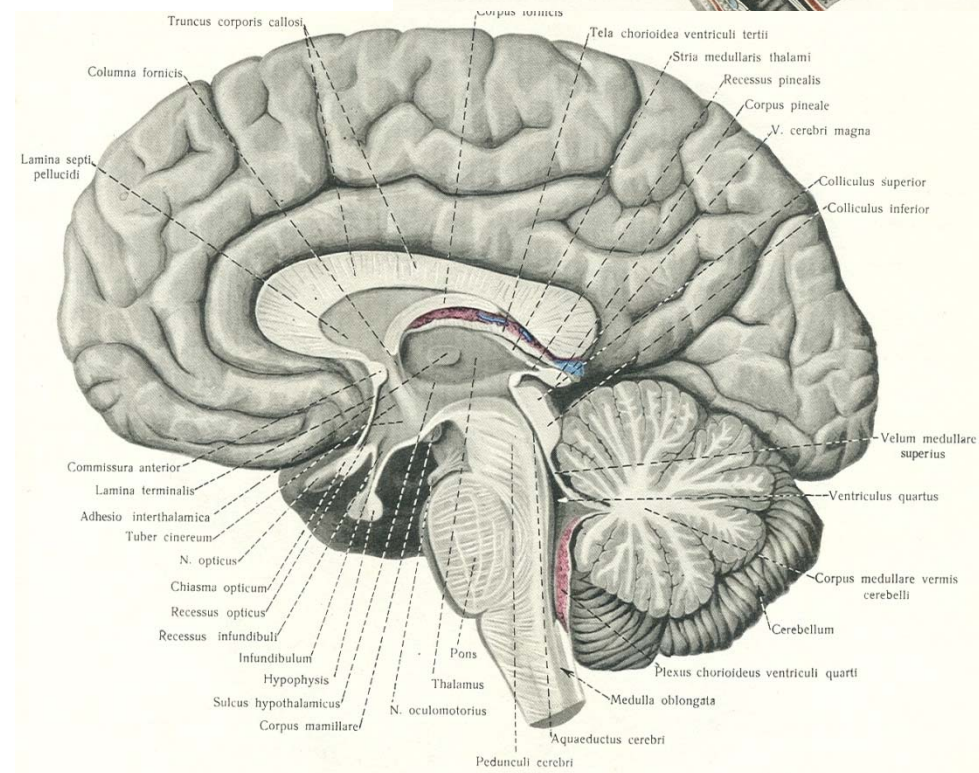
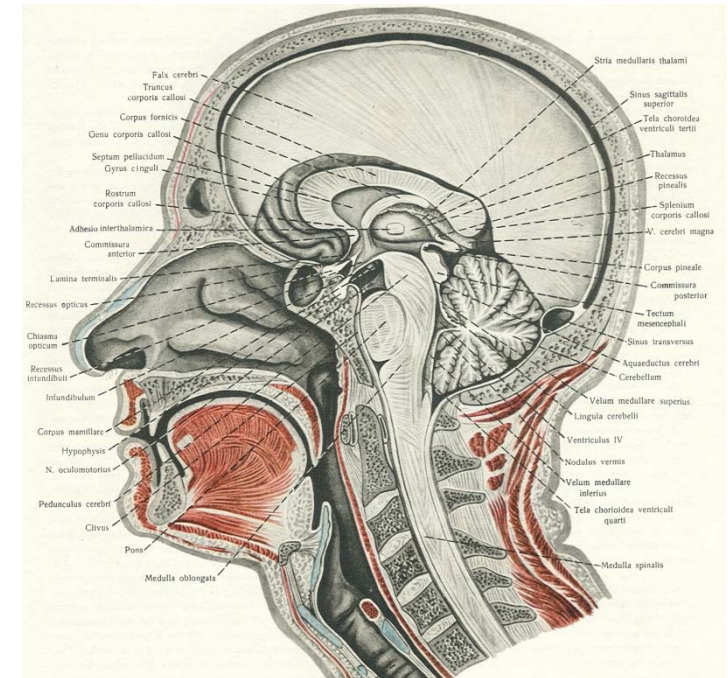


Cerebellum (Small brain)

- Posterior part of hind brain
- In adult it weighs around 150 gm
- Situated in posterior cranial fossa behind the pons & medulla separated from them by fourth ventricle
- From the cerebrum it is separated by tentorium cerebelli



Subdivisions

Cerebellum consist of a part lying near the midline called the vermis & two lateral hemisphere

- Two surfaces

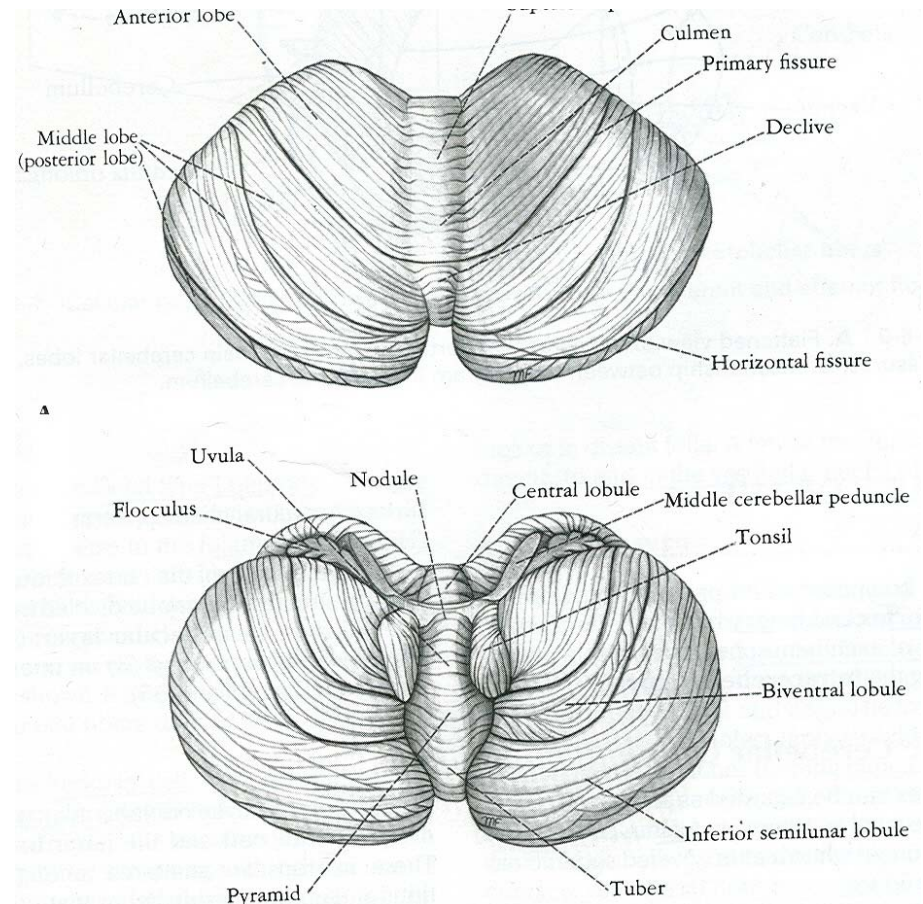
 - superior

 - inferior

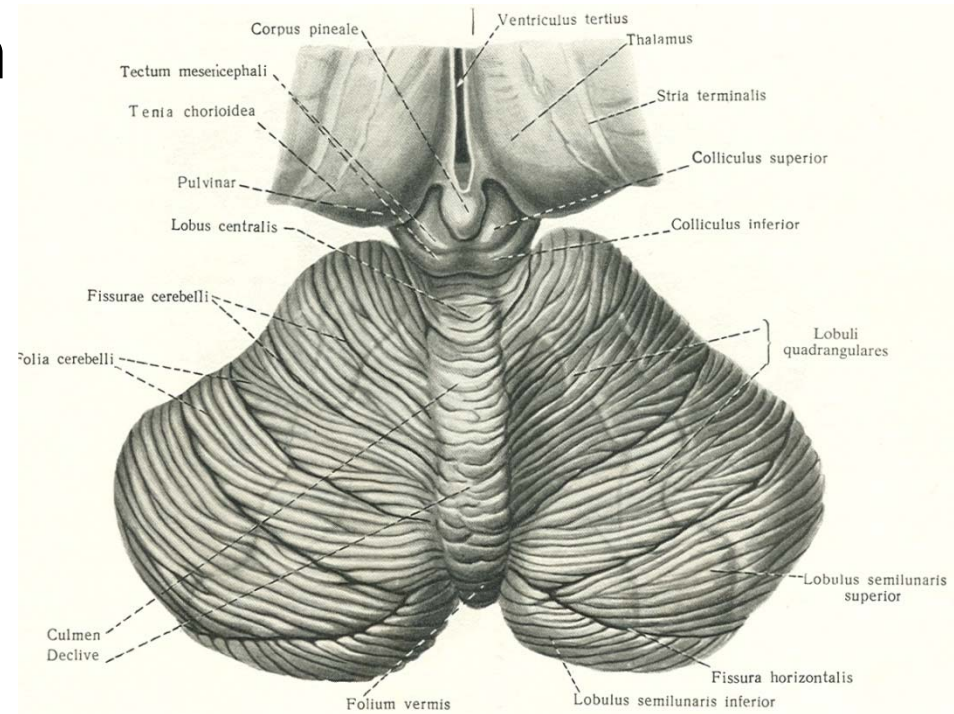
- On superior surface there is no distinction between vermis & hemisphere

- On inferior surface vermis lies in depth of vallecula

- Vermis is separated from corresponding hemisphere by paramedian surface



- Surface of cerebellum is marked by parallel running fissures
- They divide the surface into narrow **Folia**
- Section of the cerebellum cut at right angle to the folia axis has the appearance of tree so given the name of **Arbor vitae**

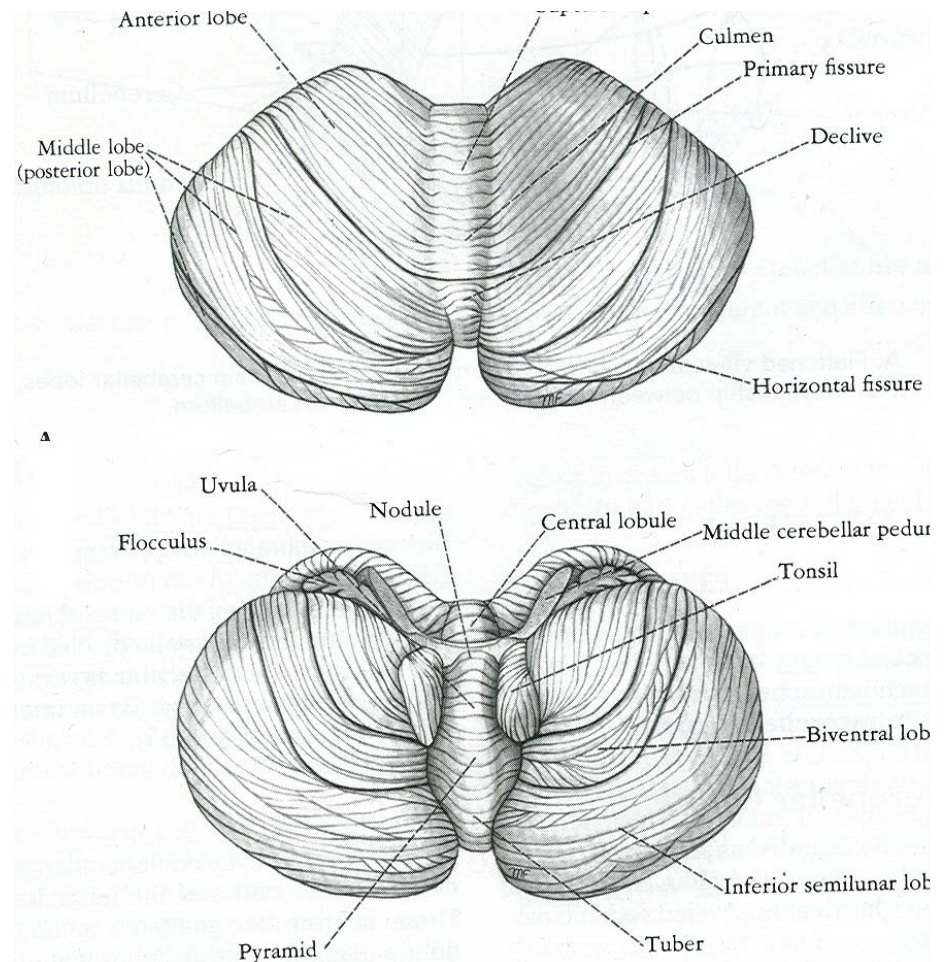


- Some of the fissures are deep. They divide the cerebellum into lobes which is constituted by smaller lobules

- Like cerebrum it also has a superficial layer of grey matter the cerebellar cortex
- Because numerous fissures are present the actual cerebellar cortex is much more than what is seen on surface
- Cerebellar notches

Anterior

Posterior



Fissures-

primary fissure

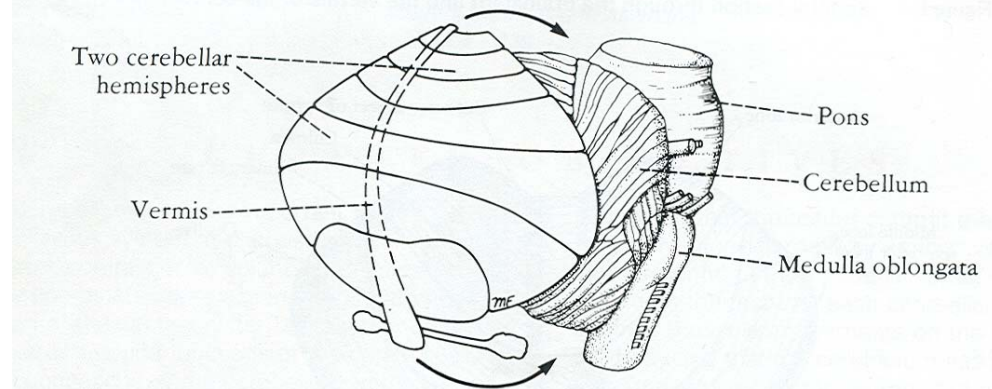
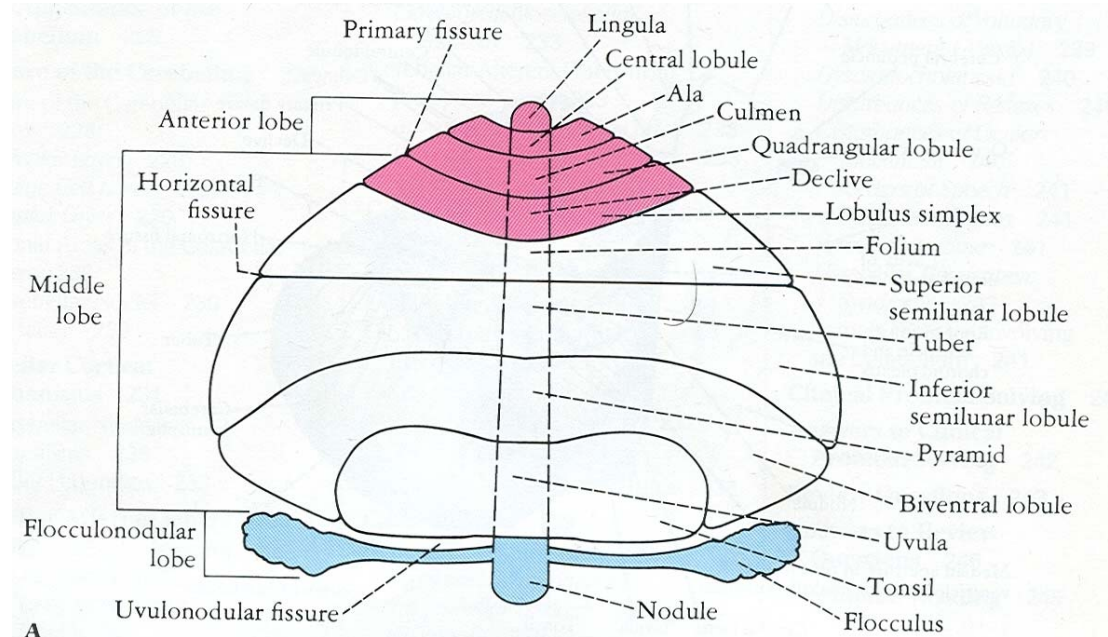
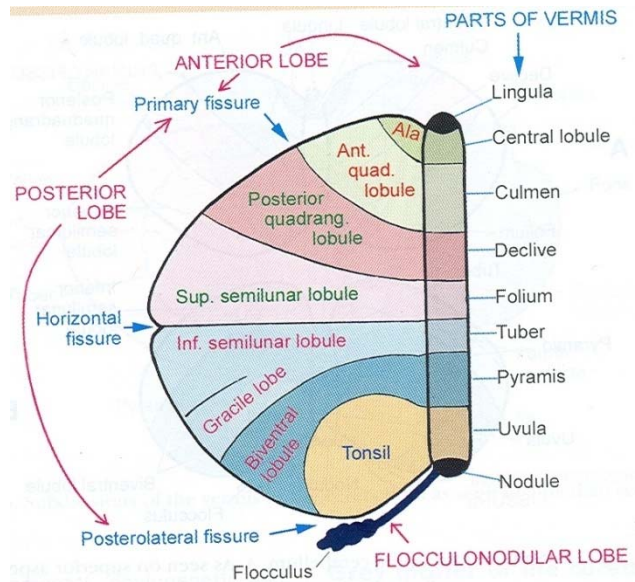
Horizontal fissure

posterolateral fissure

Lobes- anterior lobe

Middle lobe

Posterior lobe



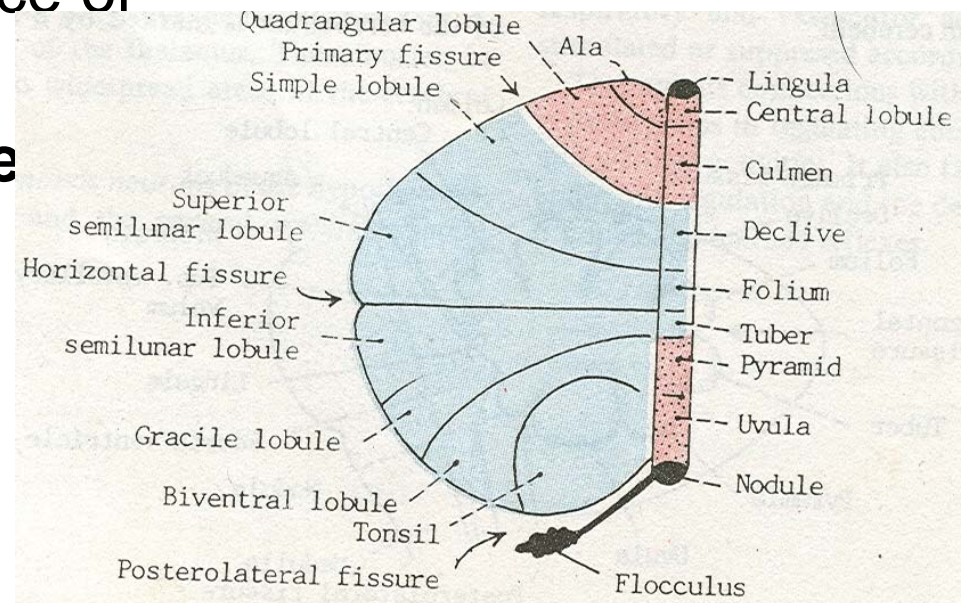
- Functional areas of cerebellar cortex
Vermis- Movement of the long axis of the body namely neck, shoulders, thorax, abdomen & hips
- Paravermal areas- control the muscles of distal part of the limbs especially the hands & feet
- Lateral zone is concerned with the planning of sequential movements of the entire body & is involved with the conscious assessment of movement errors

Morphological & functional divisions –

Archicerebellum- flocculonodular lobe & lingula Oldest part. Chiefly vestibular in connection. Controls the axial musculature & bilateral movement used for locomotion & maintenance of equilibrium

Paleocerebellum- Anterior lobe (-lingula)+ pyramid & uvula. Connections are spinocerebellar. Controls tone, posture, & crude movement of limbs.

Neocerebellum- Middle lobe-(pyramid & uvula). Corticocerebellar in connections. Concerned with regulation of fine movements

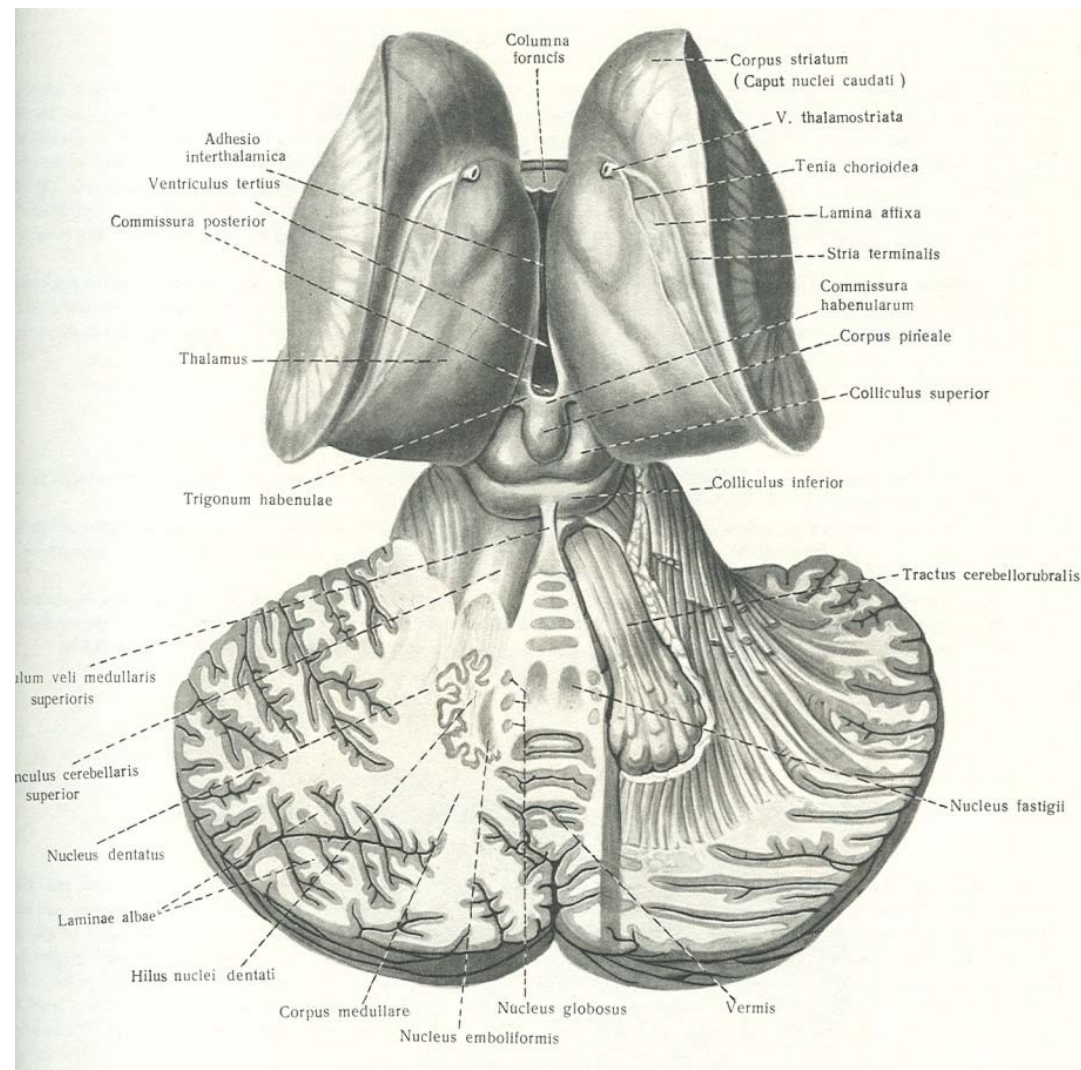


Grey matter of cerebellum Dentate nucleus (neocerebellar)

Emboliform nucleus (paleocerebellar)

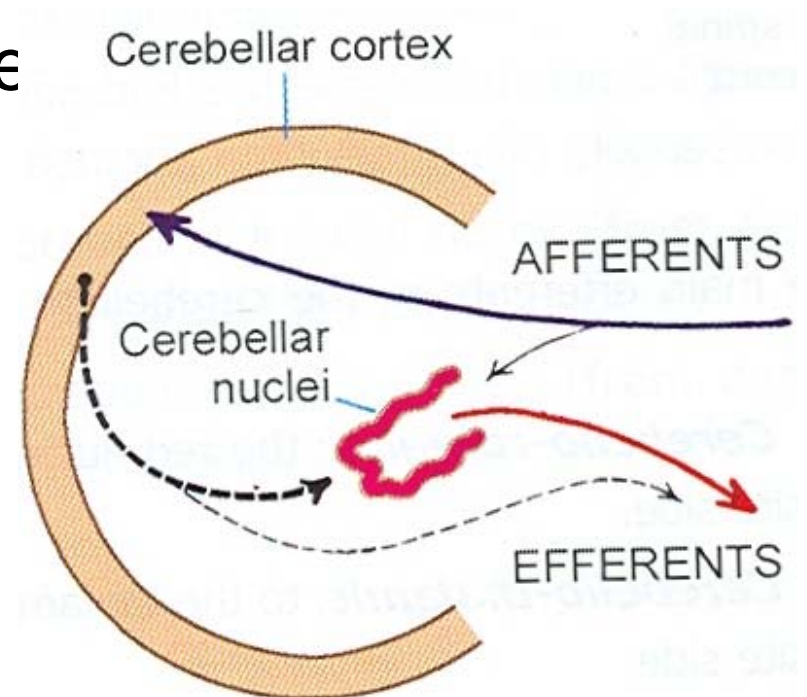
Globose nucleus (paleocerebellar)

Fastigial nucleus (archicerebellar)

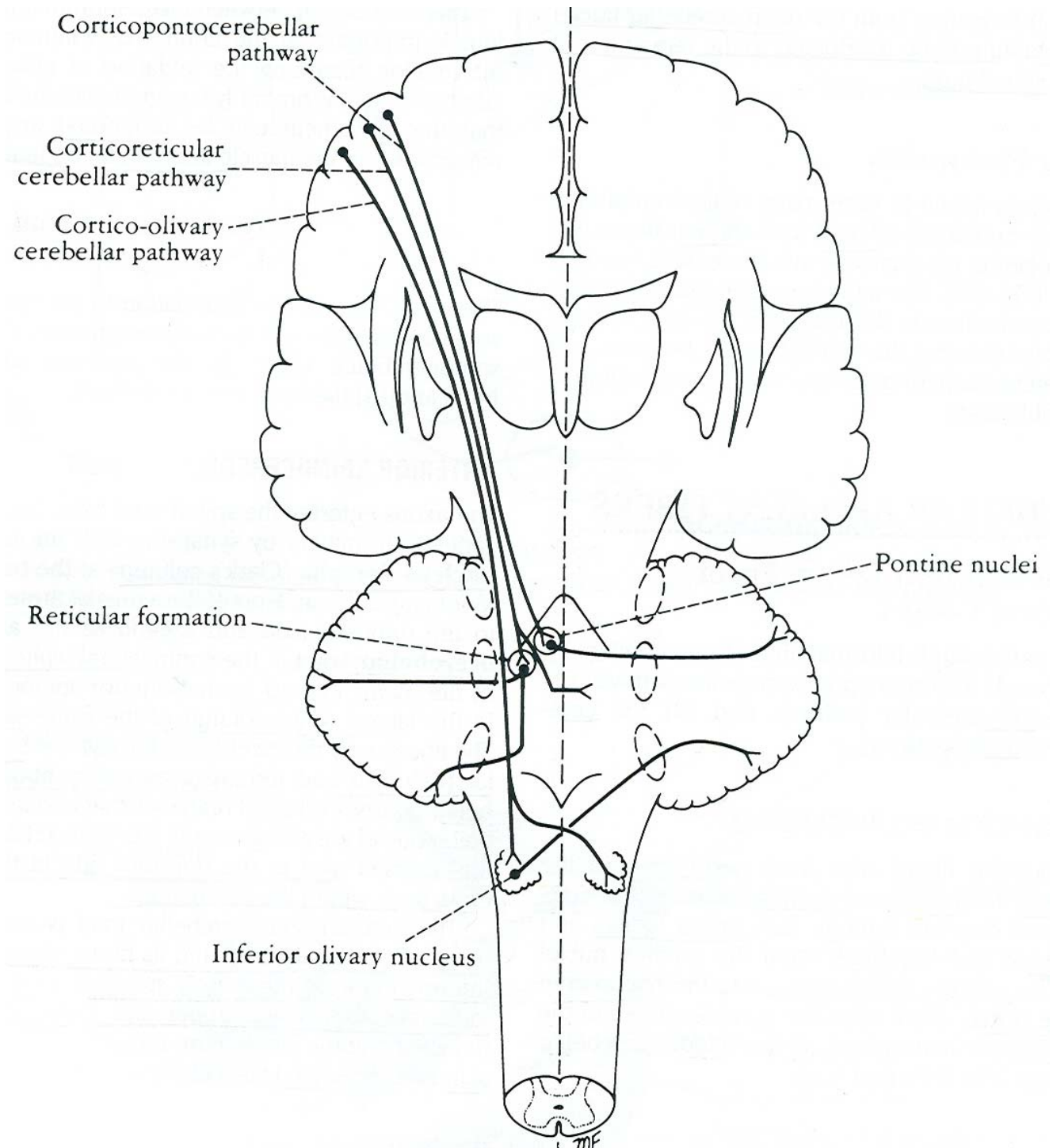


White matter of cerebellum-

- a. Consist of Afferent fibers entering the cerebellum
- b. Projection fibers from cerebellar cortex to the cerebellar nuclei
- c. Commissural fibers connecting the two cerebellar hemispheres
- d. Fibers from the cerebellar nuclei to centers outside the cerebellum



- Cerebellar afferent fibers from cerebellar cortex



- Cerebellar afferent fibers from the spinal cord & internal ear

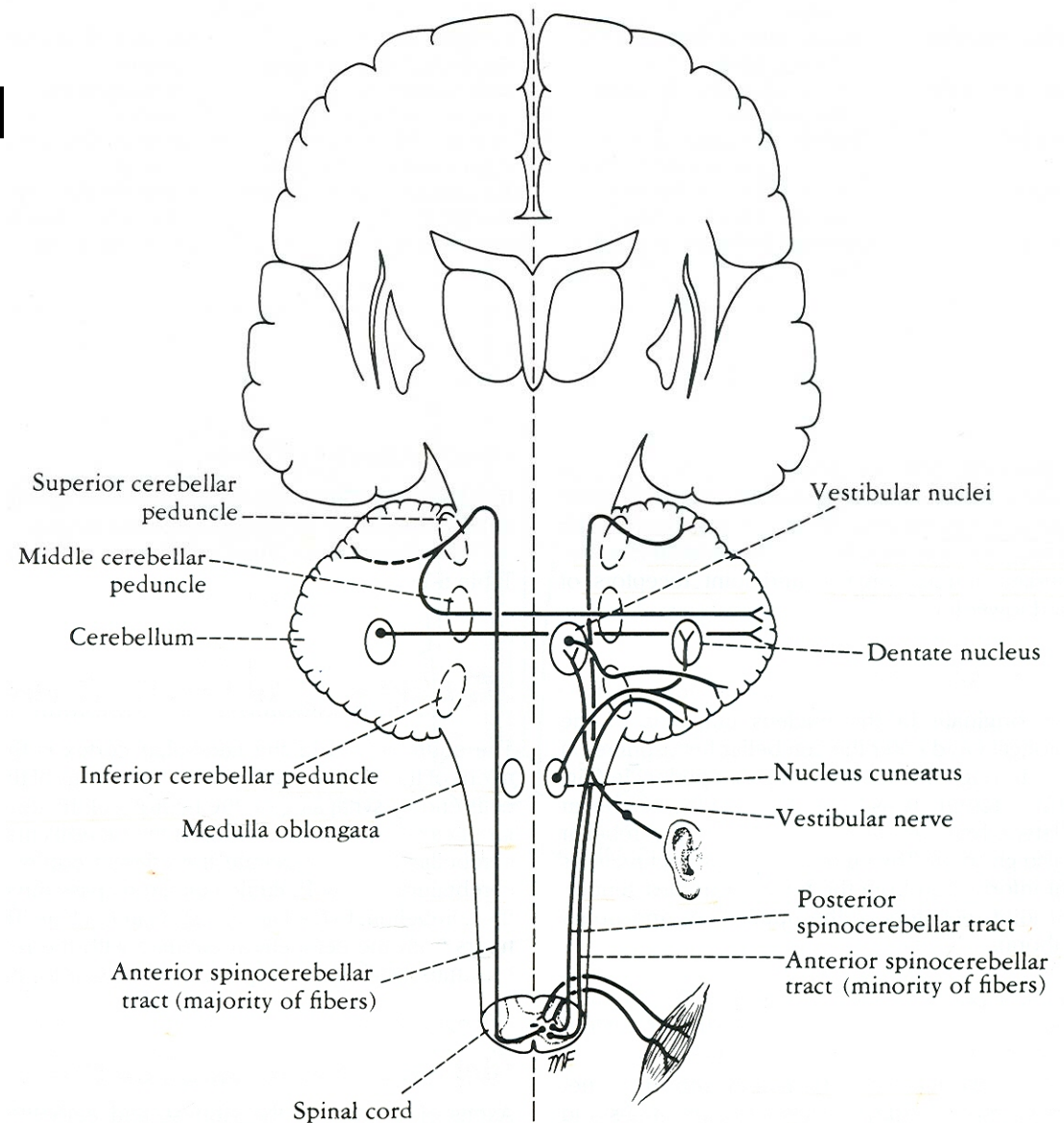
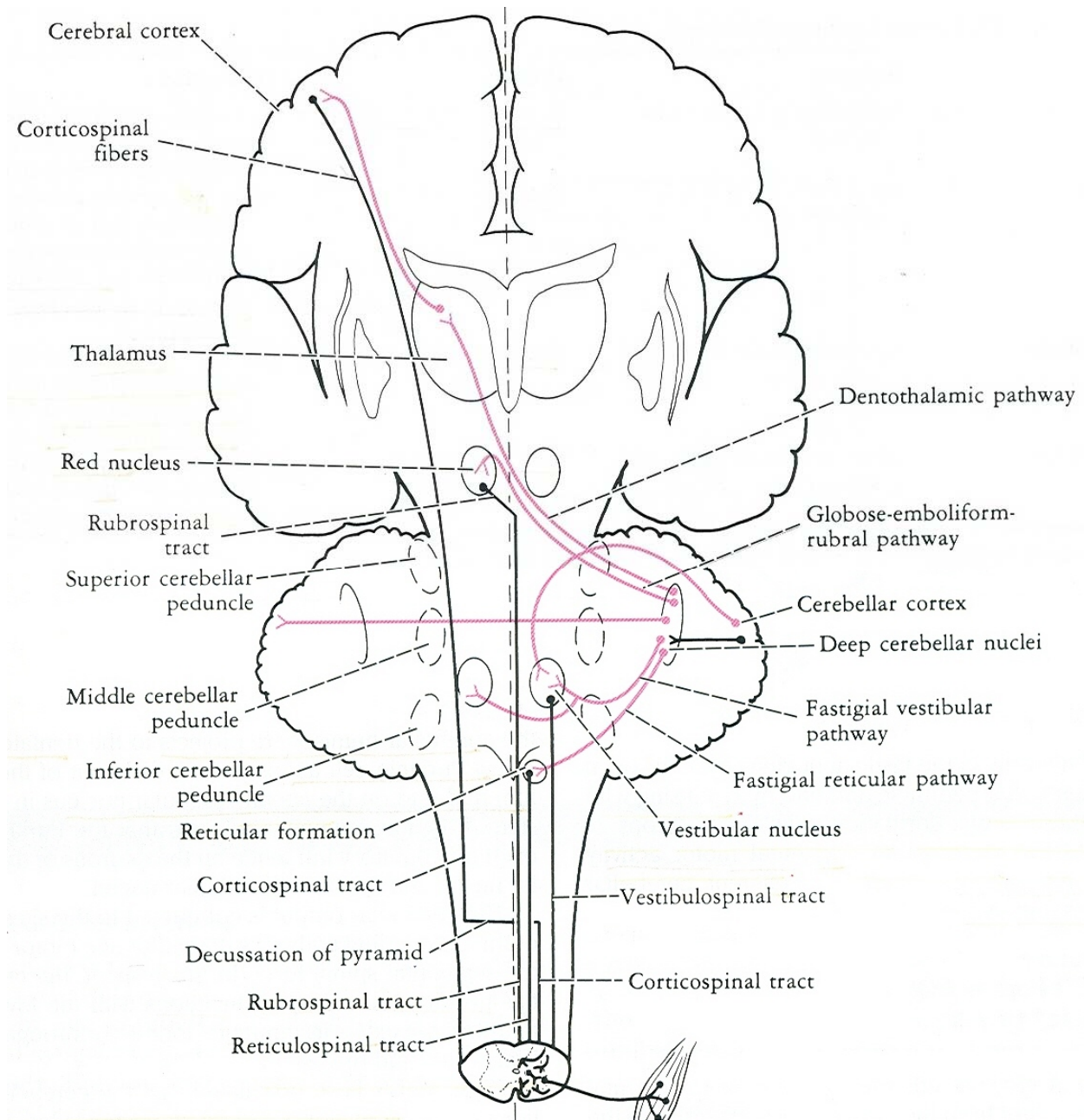
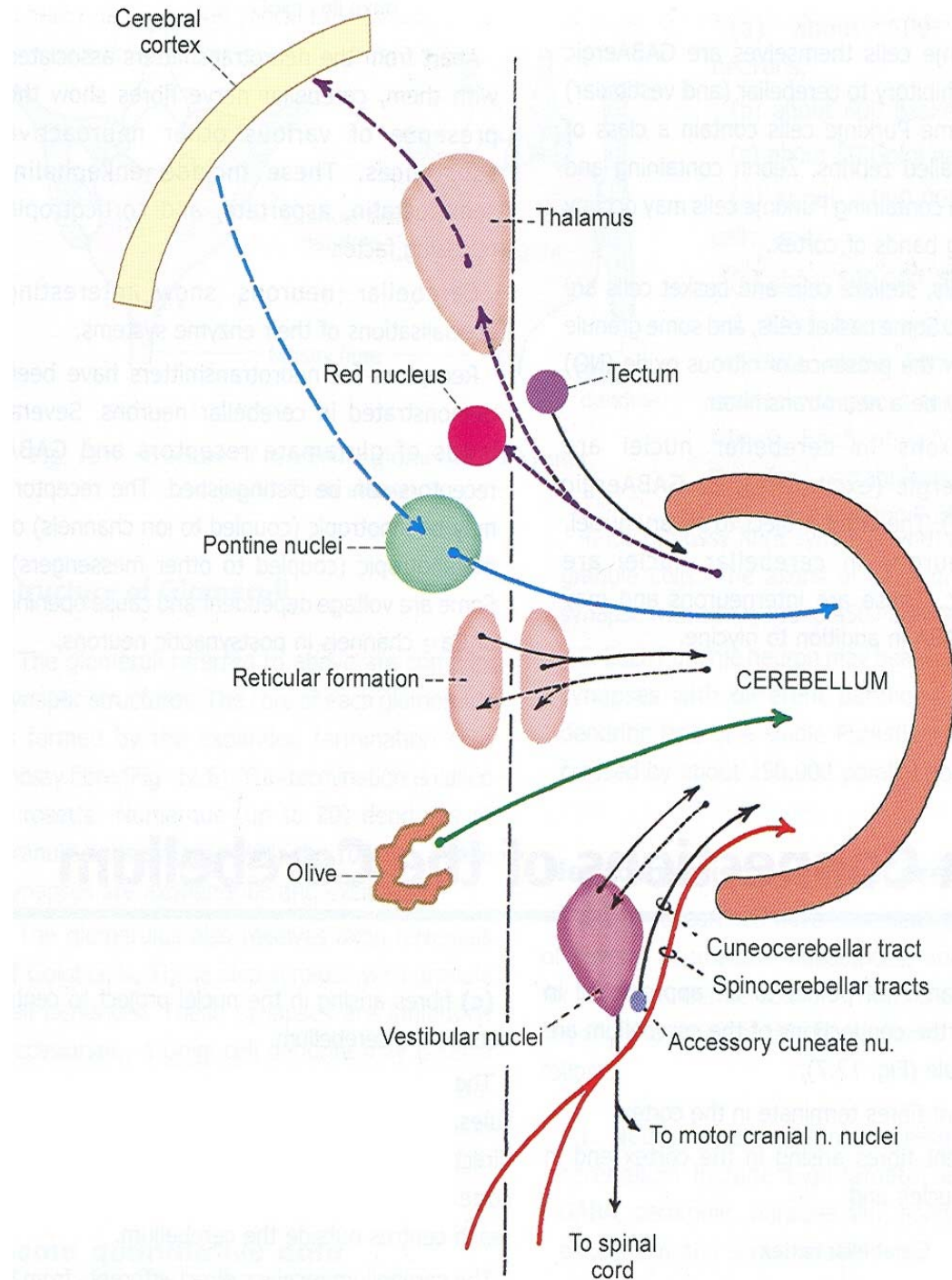


Figure 6-11 Cerebellar afferent fibers from the spinal cord and internal ear

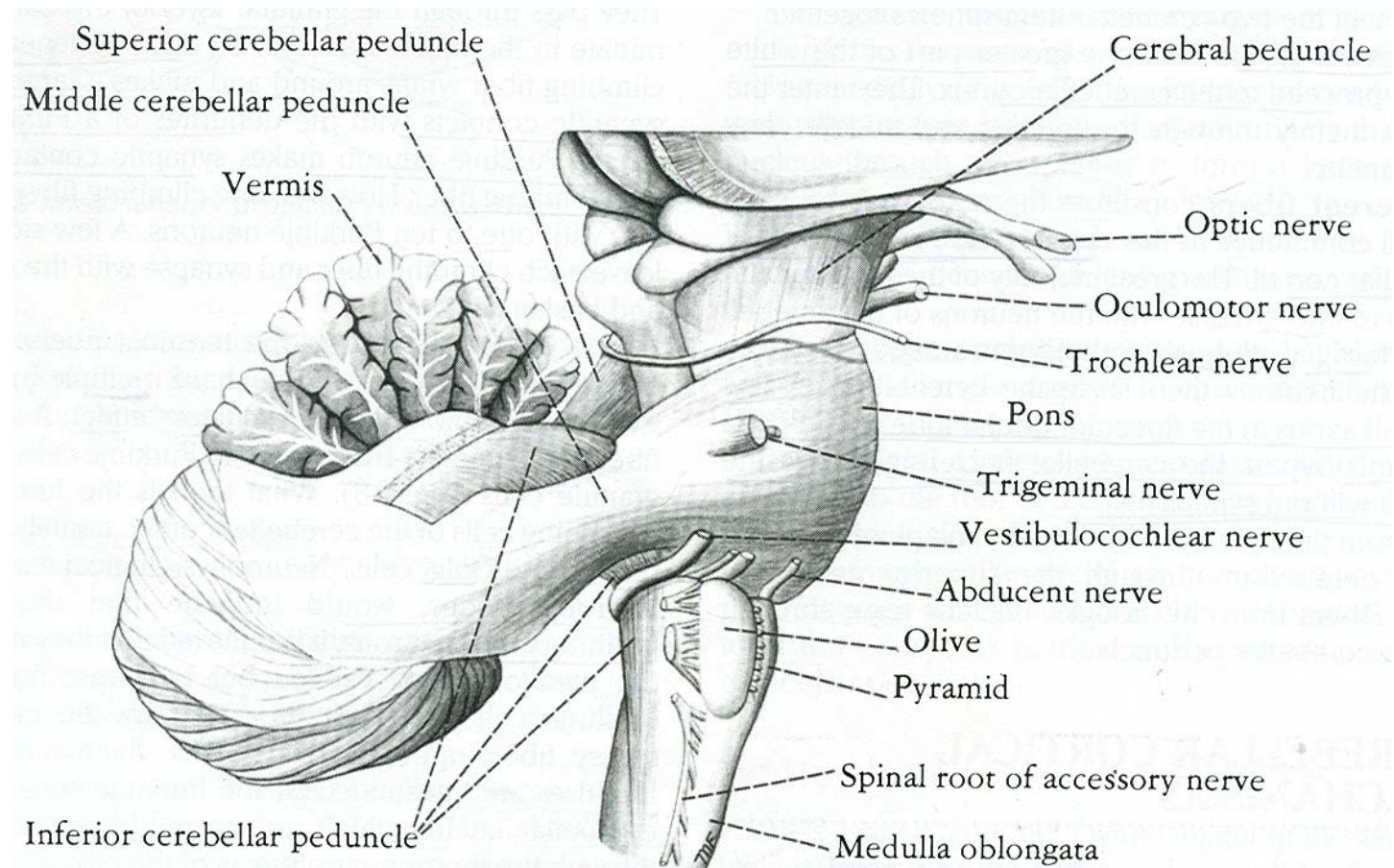
Cerebellar efferent fibers



Scheme to show main connections of the cerebellum



Cerebellar peduncle-Bundle of efferent & afferent fibers which are grouped together in three bundle on each side connecting cerebellum to medulla, pons & midbrain. Near the upper end of medulla inferior cerebellar peduncle lies between superior cer. Ped. (medial) & middle cer. Ped. (lateral)



Cerebellar peduncle-

Inferior cerebellar peduncle

Afferent fibers

Posterior spinocerebellar tract

Cuneocerebellar tract

Olivocerebellar tract

Parolivocerebellar tract

Reticulocerebellar tract

Vestibulocerebellar tract

Anterior external arcuate fibers from arcuate nuclei

Striae medullares

Trigeminocerebellar fibers

Efferent fibers

Cerebellovestibular

cerebelloolivary

cerebelloreticular

Middle cerebellar peduncle-

Pontocerebellar fibers

Superior cerebellar peduncle-

Afferent fibers-

ventral Spinocerebellar tract

Tectocerebellar tract

Rubrospinal tract

Trigemino-cerebellar

Hypothalamo-cerebellar

Coeruleo-cerebellar fibers
thalamus

Efferent fibers

Cerebellorubral fibers

Cerebellothalamic fibers (DEG)

Cerebelloreticular fibers(F)

Cerebelloolivary(DEG)

Cerebellonuclear (MLN)

Fibers to hypothalamus & sub

Fibers to hvpothalamus & subthalamus

Structure of cerebellar cortex-

Three layers

- a. Molecular layer
- b. Purkinje cell layer
- c. Granular layer

Neurons of the cerebellum

Purkinje cells

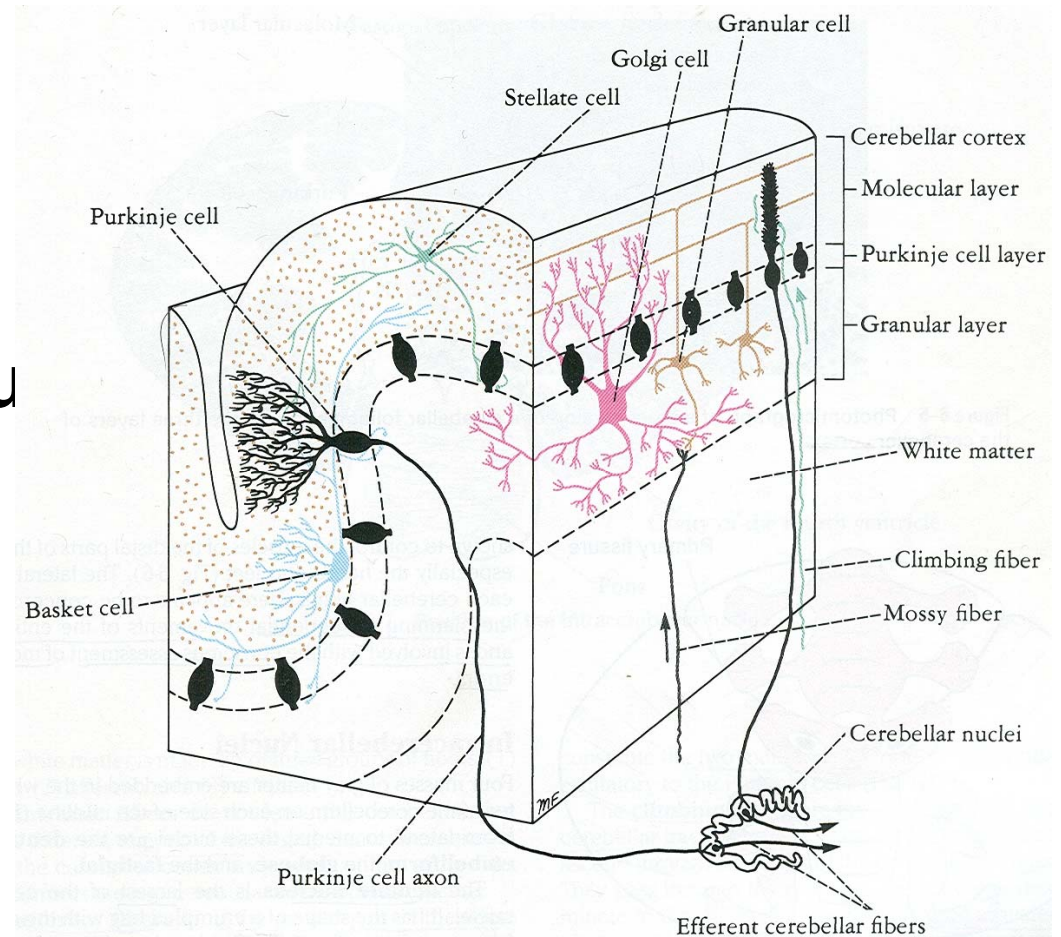
Granule cells

Outer stellate cells

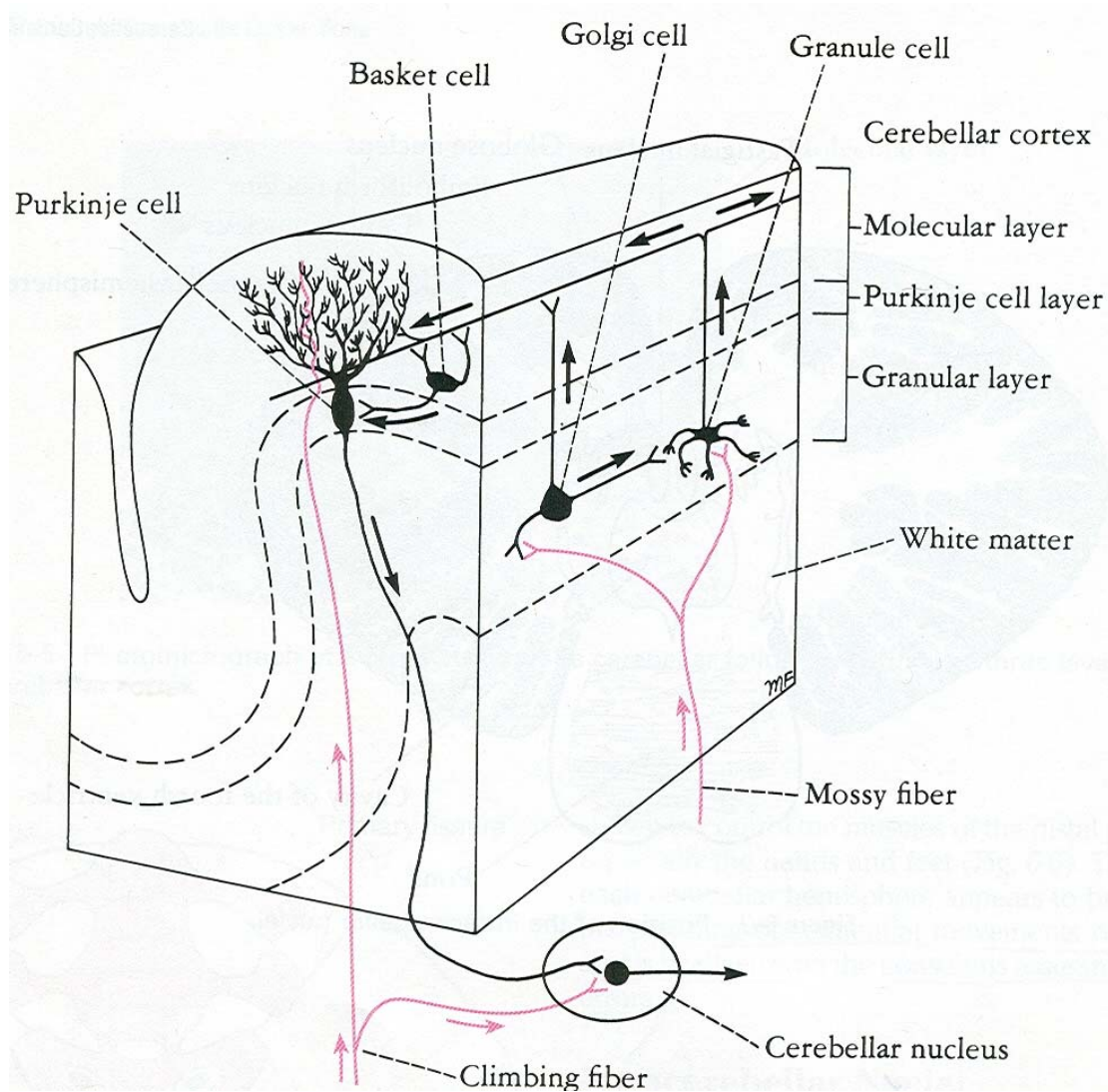
Basket cells

Golgi cells

Brush cells



Functional organisation of cerebellar cortex



Function of cerebellum- Coordinator of precise movement by continually comparing the output of motor area of cerebral cortex with the proprioceptive information received from the site of muscle action, it is able to bring about adjustment by influencing the activity of the lower motor neuron

It also sends back information to the motor cortex to inhibit the agonist muscle & stimulate the antagonist muscle thus limiting the extent of voluntary movement

- **Applied anatomy-** A lesion in cerebellar hemisphere gives rise to sign & symptom that are limited to **the same side (ipsilateral)** of the body
- **Sign & symptom- acute** lesion produce sudden severe symptom and signs, but patient can recover completely from large lesions In **chronic** lesions sign & symptom are much less severe
 - Hypotonia- the muscle loss resilience to palpation. Shaking produces excessive movement at terminal joint. It is due to loss of cerebellar influence on the stretch reflex.
 - Postural changes & alteration of gait- Head is often rotated & flexed & shoulder on the side of lesion is lower wide base stance often stiff legged to compensate for the loss of muscle tone. On walking person staggers towards the affected side

- **Ataxia-** Muscle contract weakly & irregularly. Tremor occur on doing the fine movement like buttoning clothes Muscle group do not work harmoniously so there is **decomposition of movement**. Past pointing occurs
- **Dysdiadochokinesia-** Inability to perform alternating movements regularly & rapidly
- **Disturbances of reflexes- Pendular knee jerk** because of loss of cerebellar influence on stretch reflex
- **Disturbance of ocular movement- Nystagmus** Ataxia of ocular muscles. Easily seen when eye is deviated to the horizontal direction

- **Disorders of speech-** Dysarthria, Ataxia of the muscles of the larynx. Articulation is jerky & the syllables are separated from one another & slurred. Speech is explosive.
- **Vermis syndrome-** Occurs in children. Medulloblastoma of vermis causes vestibular symptom. Muscle in coordination in axial region. Tendency to fall forward & backward