

# Cerebellum

## ★ Interneurons

① granule ② unipolar brush cells ← 1:1 to inhibitory GABA \*

cells	characteristics	Neuron	Dendrites	Axon
Stellate	Inhibitory Molecular layer	star-like shape	many radiating	
Basket	Inhibitory Molecular layer	multipolar	free branching containing smooth spines	highly branched in form of basket surrounding soma
Candelabrum	Inhibitory Purkinje cell layer	small elongated, vertically oriented	* one or two branched ascending vertically into Molecular layer covered with spines * several (3-5) short project into Granular cell layer covered with spines	
Granule	Excitatory Granular cell layer	numerous, very small, spherical - dense nuclei - scanty cytoplasm	(3-5) short dendrites end in Glomeruli (cerebellar islands)	abundant, parallel fibers pass into Molecular layer divides into 2 parts at right angle to planes of dendritic trees of Purkinje cells synapse with Golgi II, Basket, Stellate

cells	characteristics	Neuron	Dendrites	Axon
<p><b>Golgi</b></p> <p><b>(Type II)</b></p>	<p><u>Inhibitory</u></p> <p>Granular cell layer</p>	<p>large, Stellate</p> <p>scattered</p> <p>superficially</p>	<p>*enter Molecular layer, branch, synapse with parallel fibers &amp; dendrites <b>Purkinje cells</b></p> <p>*some branch in Granular cell layer</p>	<p>branch, share in formation of Glomeruli (Cerebellar islands)</p>
<p><b>Uni-polar</b></p> <p><b>Brush</b></p>	<p><u>Excitatory</u></p> <p>Granular cell layer</p> <p>* involving in orientation of head * dysfunction of balance &amp; motor coordination</p>	<p>round, oval, small</p>	<p>single, short end in brush like cluster filopodia <b>in Golgi II</b></p>	
<p><b>Lugaro</b></p>	<p><u>Inhibitory</u></p> <p>Granular cell layer</p>	<p>① Classical: spindle shaped, tapering at each end, thick dendrites contact with <b>Purkinje cells</b></p> <p>② Second type: deeper position, globular soma</p>	<p>synapse with <b>Golgi II</b>, <b>Basket</b>, <b>Stellate</b>.</p> <p>interconnected many neurons in <b>All layers</b></p>	

## ★ Projecting neuron

cells	characteristics	Neuron	Dendrites	Axon
Purkinje (Golgi) (Type I)	Purkinje cell layer *unique cell to cerebellum	single, row, large pyriform	project upward into Molecular layer branches to form dendritic tree, synapse with axon of granule cells & basket cells	pass through Granular cell layer, projecting to white matter, terminate in cerebellar nuclei

## \* Glomeruli (Cerebellar Islands)

- spaces - No cells - pale area (LM)
- has glial sheath formed from protoplasmic astrocytes
- first processing station for afferent fibers entering cerebellum

### ☆ glomeruli:

- small

- synapse between:

- ① terminals of mossy fibers forming rosette located laterally (excitatory)
- ② dendrites of Granular cells (excitatory)
- ③ axons of Golgi cells (type II) (inhibitory)

Layer	Molecular	Purkinje	Granular
characteristics	<ul style="list-style-type: none"> <li>* most superficial</li> <li>* directly below Pia mater</li> </ul>		<ul style="list-style-type: none"> <li>* deepest</li> <li>* rest on white matter</li> <li>* extremely cellular</li> </ul>
Contains	<p>Neuron:</p> <ol style="list-style-type: none"> <li>Stellate cells</li> <li>Basket cells</li> <li>Neuroglia cells</li> </ol> <p>Dendrites:</p> <p>dendrites of Purkinje cells</p> <p>Axon:</p> <p>axons of Granular cells</p>	<p>Neuron:</p> <ol style="list-style-type: none"> <li>Purkinje cells</li> <li>Candelabrum cells</li> </ol>	<p>Neuron:</p> <ol style="list-style-type: none"> <li>Granule cells</li> <li>Golgi cells (type II)</li> <li>Unipolar Brush cells</li> <li>Lugaro cells</li> <li>Neuroglia</li> </ol> <p>other:</p> <p>Glomeruli (cerebellar islands)</p>

### White

#### Afferent fibers:

- climbing fiber (olivo-cerebellar)
- mossy fiber
  - from → All CNS
  - except → inferior olives
- multi-layered fiber

#### Efferent fibers:

- axon of Purkinje cells → vestibular nuclei
- Dentate nuclei → thalamus
- Emboliform & Globose nuclei
  - to → red nucleus & inferior olive
  - by → Superior Cerebellar peduncle
- Fastigi nuclei
  - to → vestibular nuclei & RF
  - by → Inferior Cerebellar peduncle