Embryology II

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Department of Neuroscience
University of Minnesota

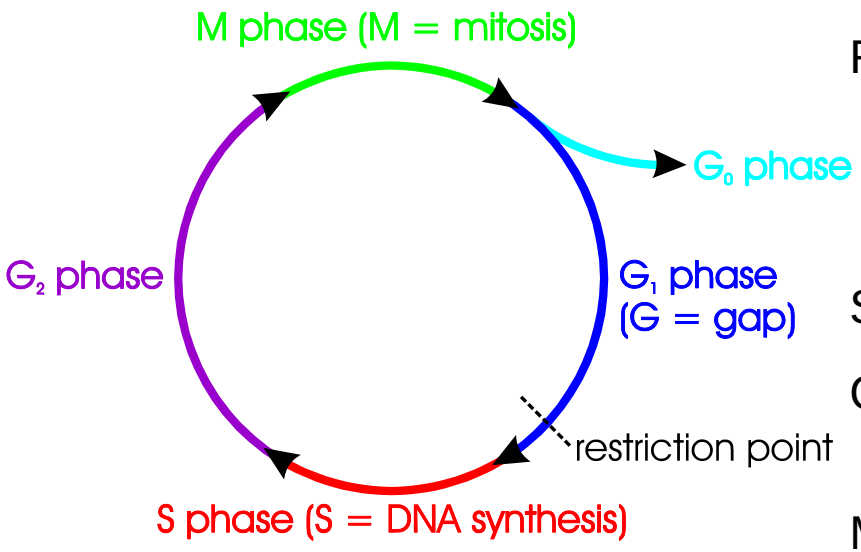
Coffee Hour

Monday (Sept 17) 9:00-9:55am

Surdyk’s Café in Northrop Auditorium

Stop by for a minute or an hour!

Review of the Cell Cycle
(steps involved in cell division)



G_1 period during which proteins that initiate or block division are expressed

Restriction point - a condition during which a cell is destined to progress through mitosis regardless of any changes in the environment of the cell

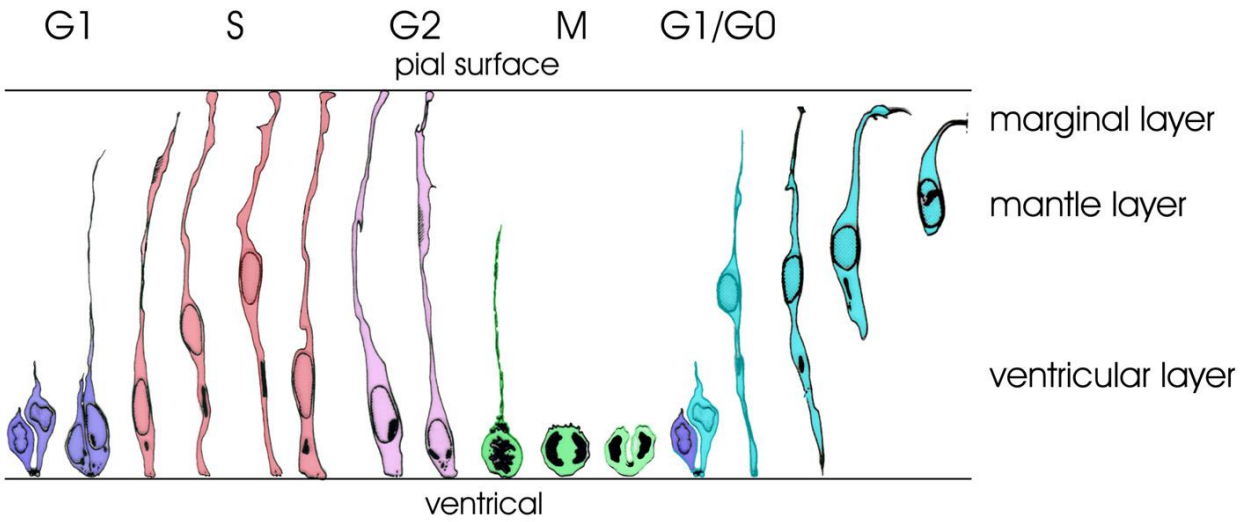
S period during which DNA is replicated

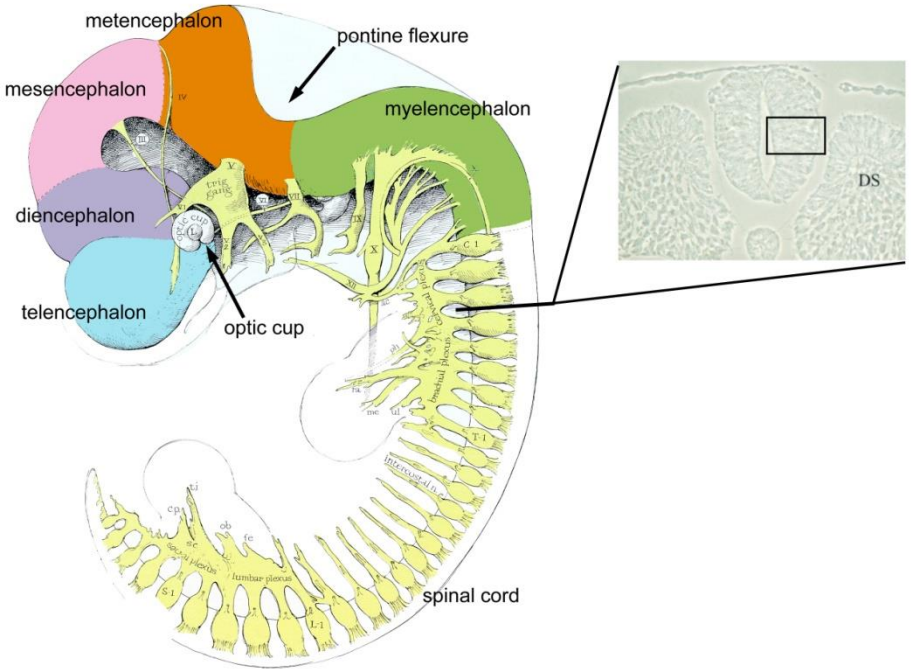
G_2 period during which proteins needed for mitosis are expressed

M period during which cell divides into two; steps are: prophase, metaphase, anaphase, telophase and cytokinesis

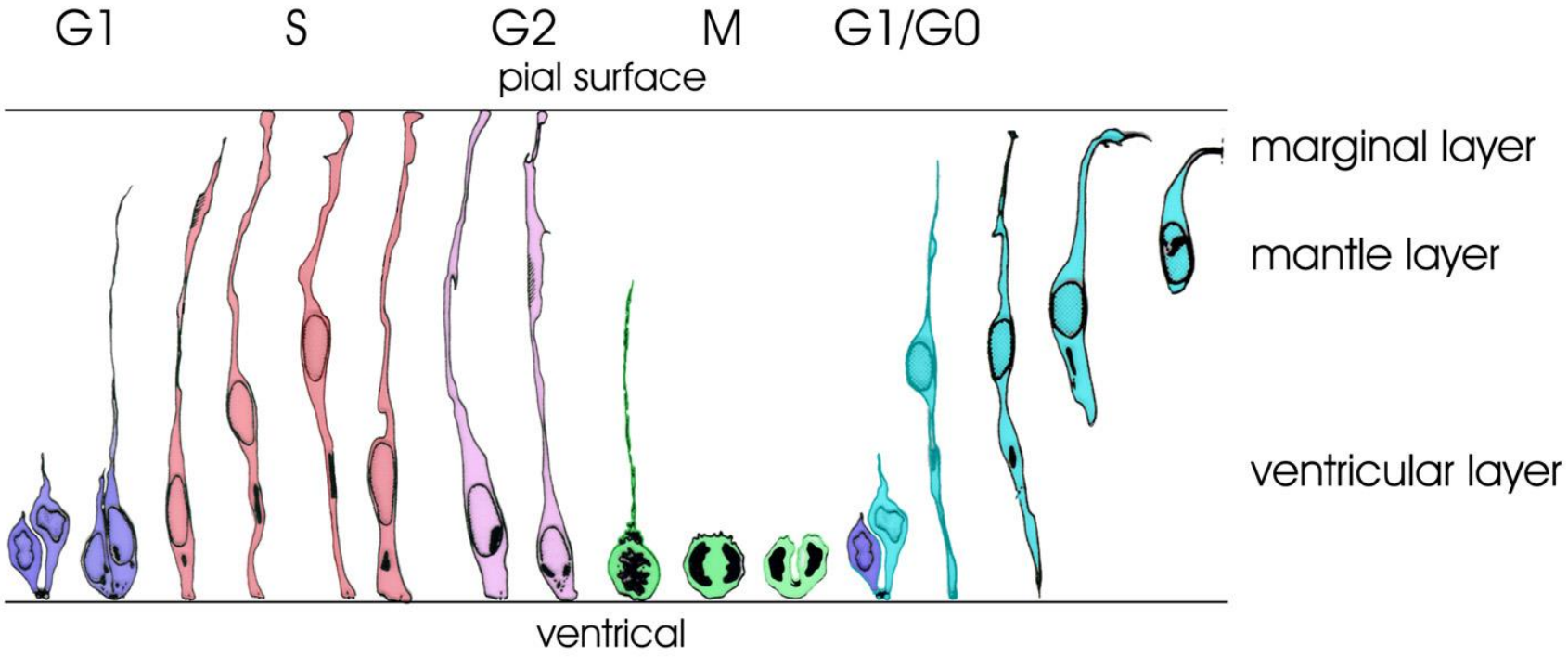
G_0 permanent arrest in G_1; period during which neurons differentiate and function

Initially, all cells of the neural tube undergo cell division.





As development progresses, some cells cease to divide and begin to differentiate. This forms three layers.



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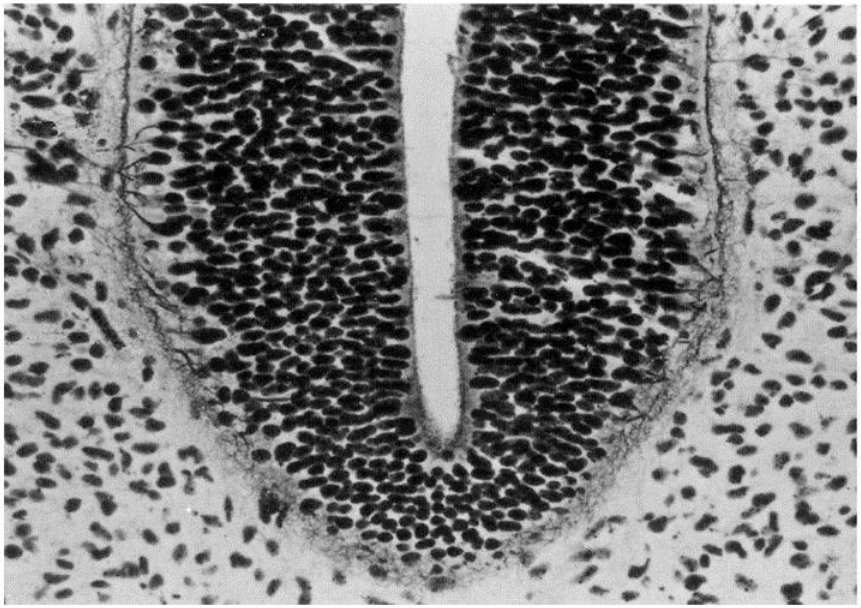
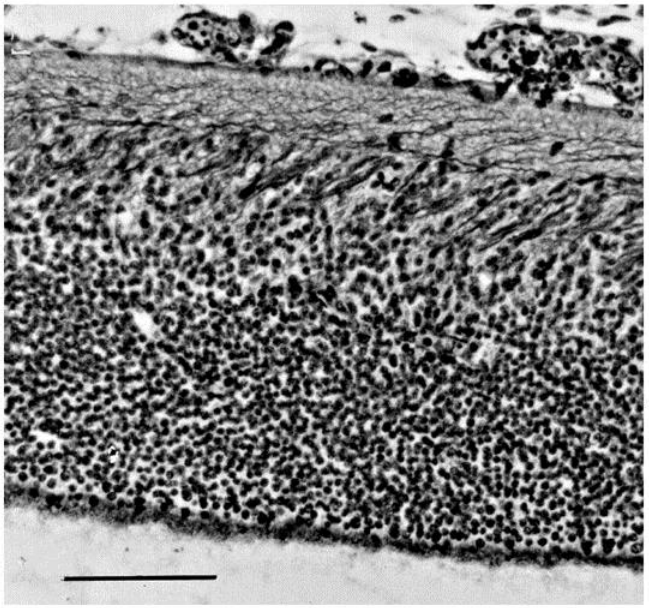
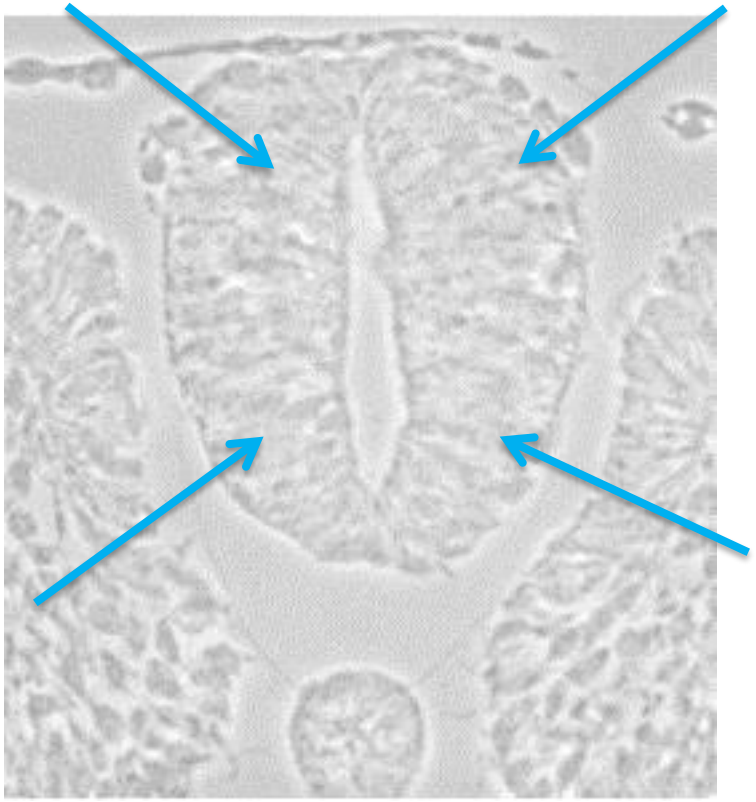


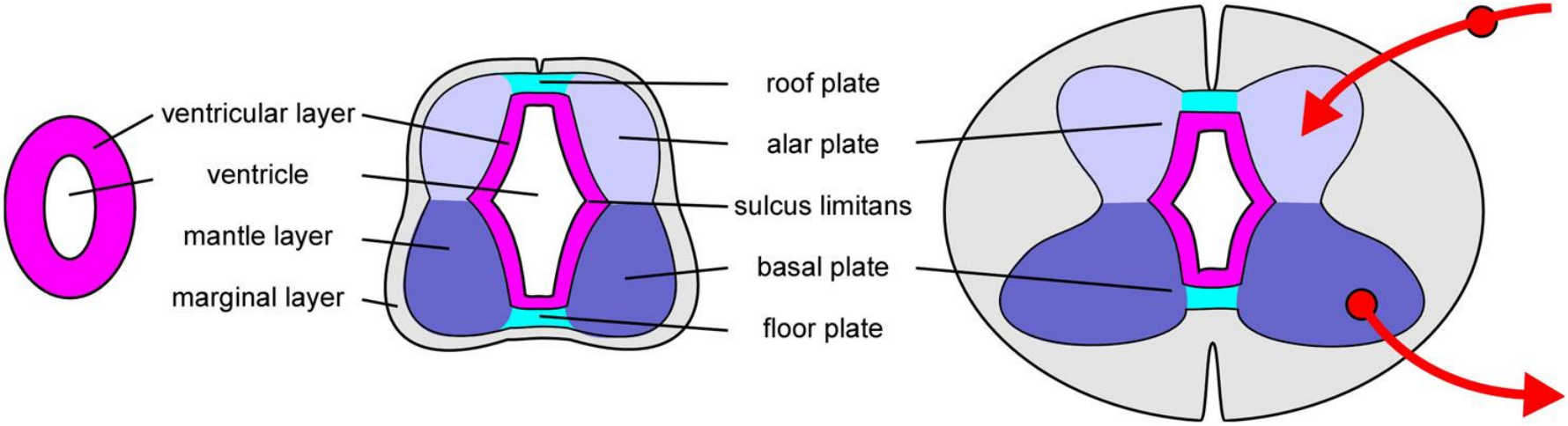


Cell division is not uniform around the neural tube.

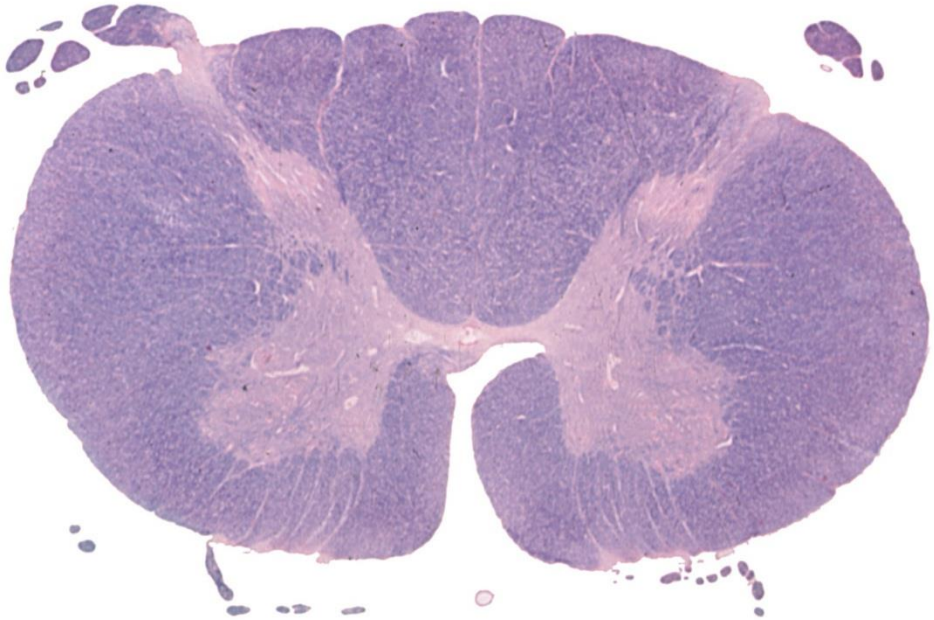


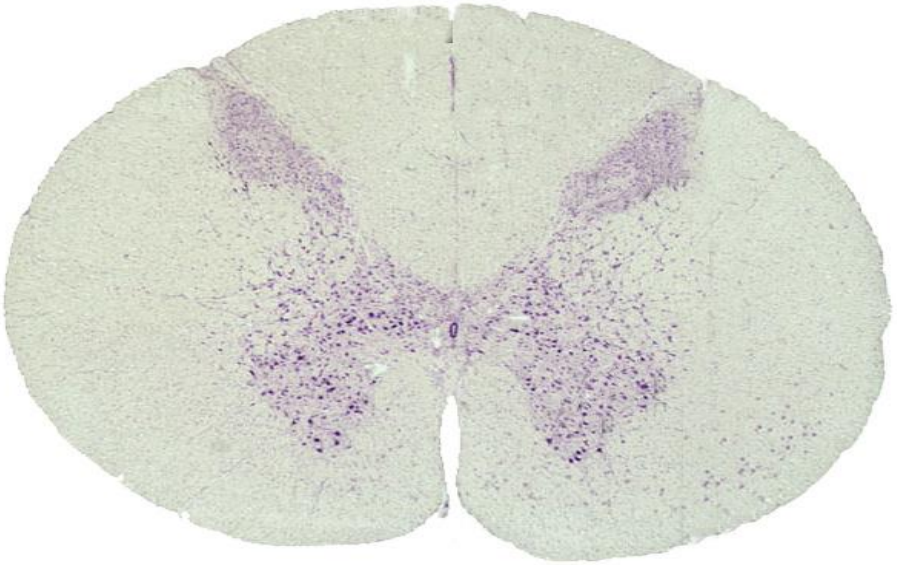
Arrows indicate areas of more cell division.

Uneven cell division results in uneven accumulation of postmitotic cells around the circumference of the tube.

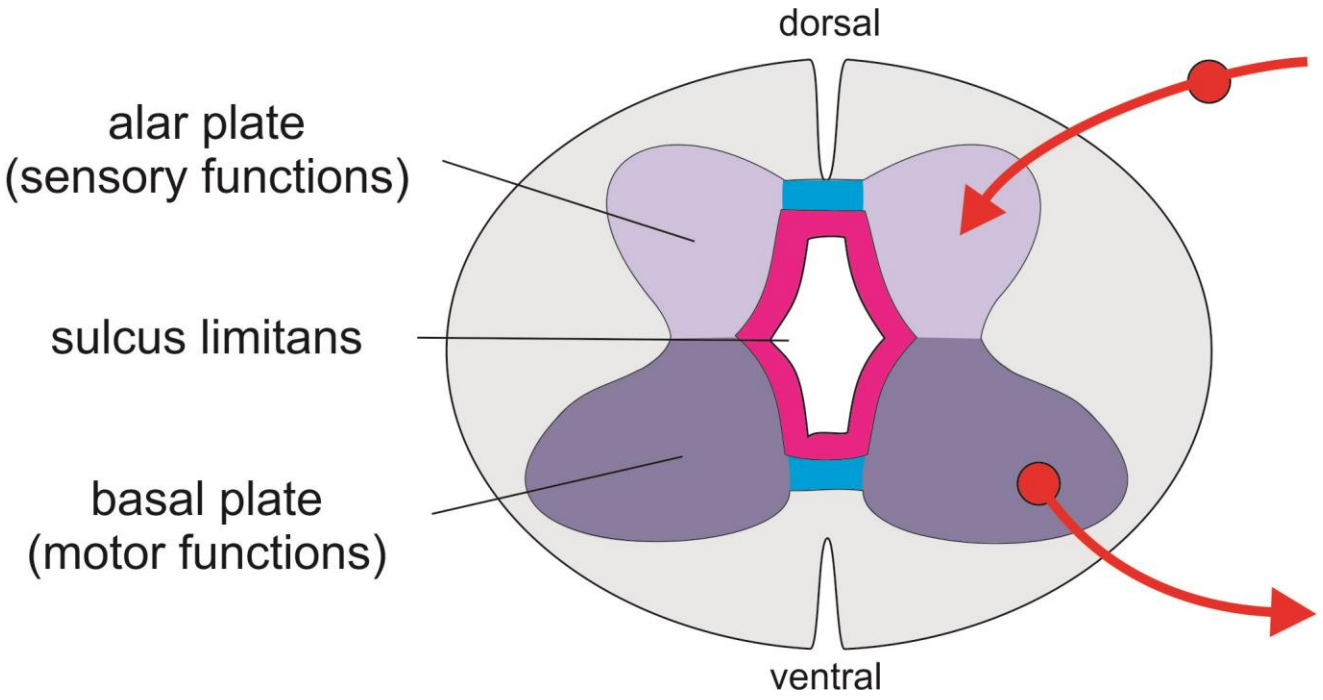


Adult Spinal Cord





Alar and basal plates represent functional domains.



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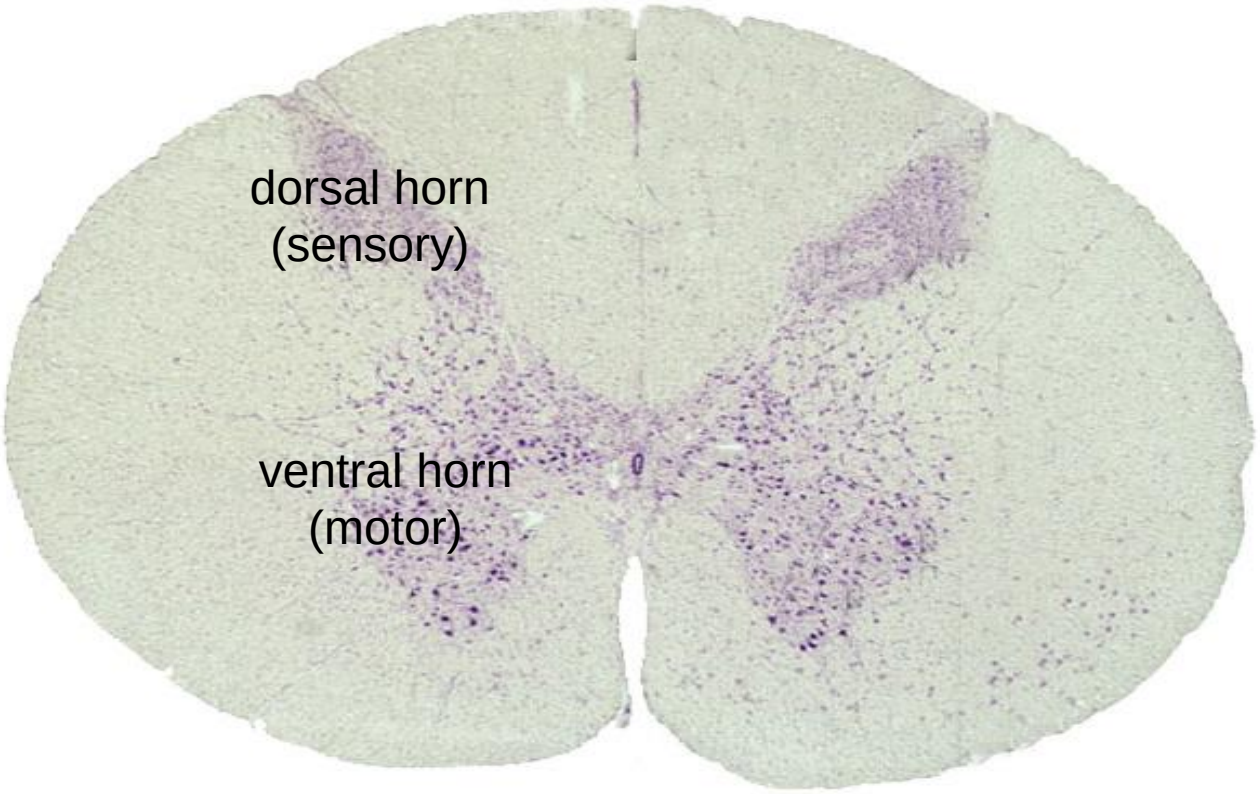
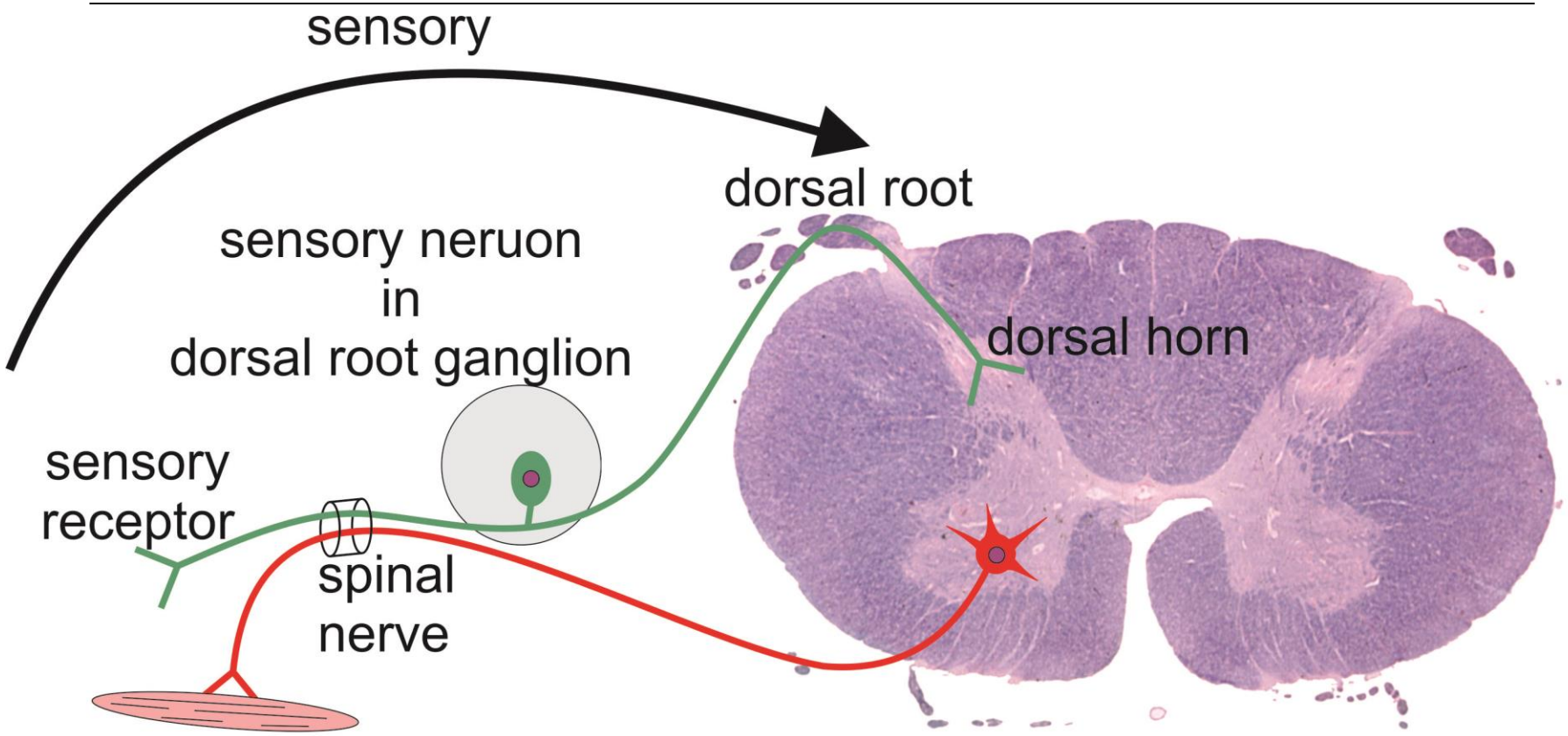
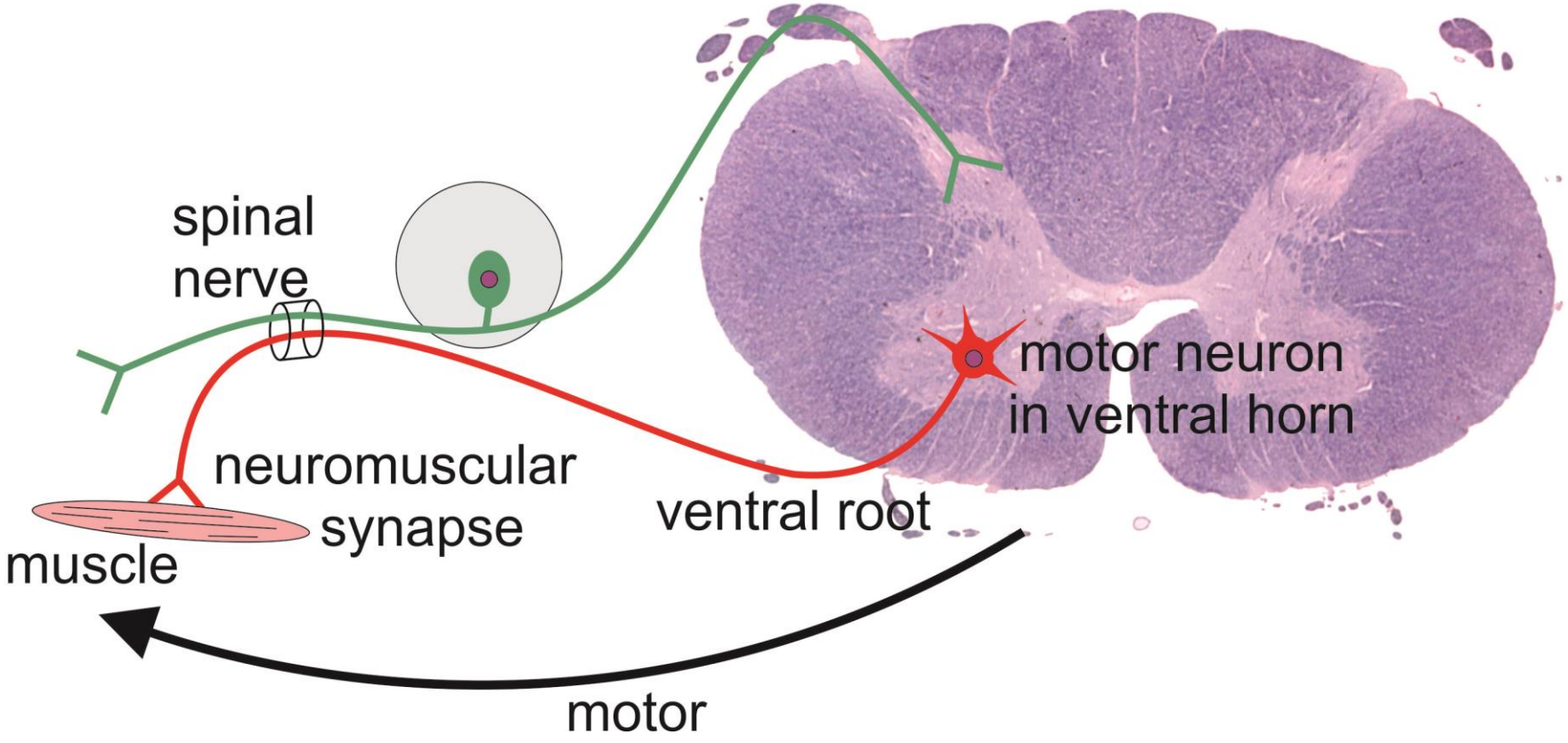


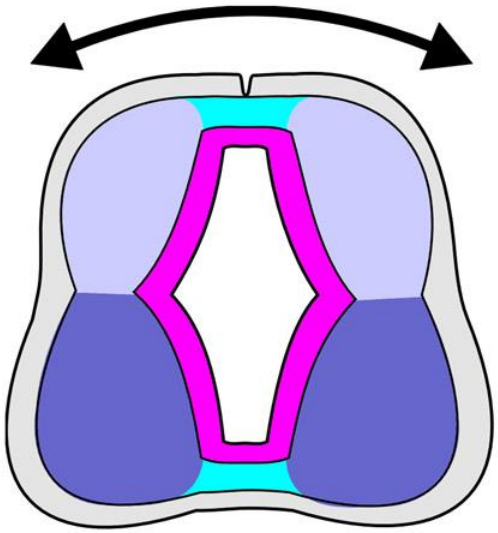
Sensory Input from the Body into the Spinal Cord

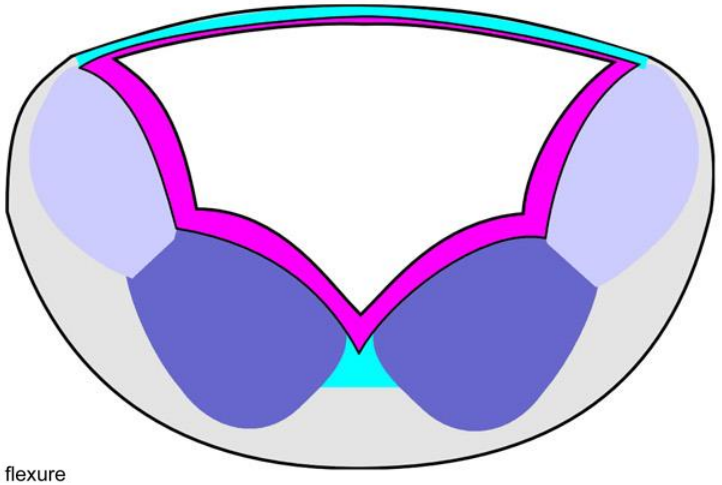


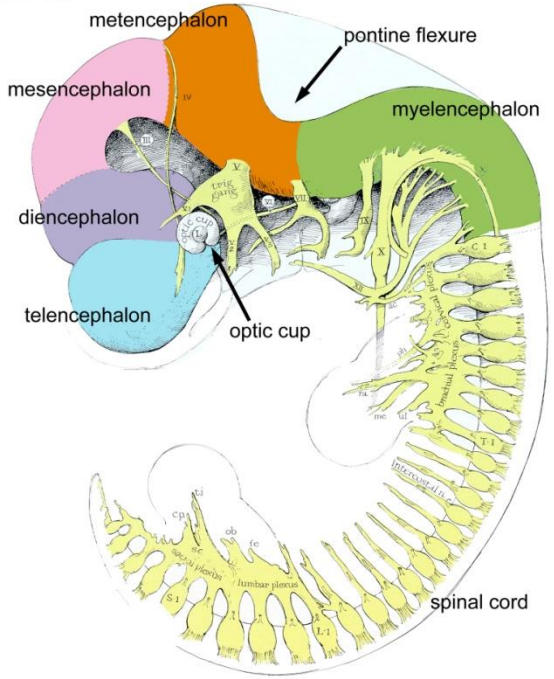
Motor Output from the Spinal Cord to the Body



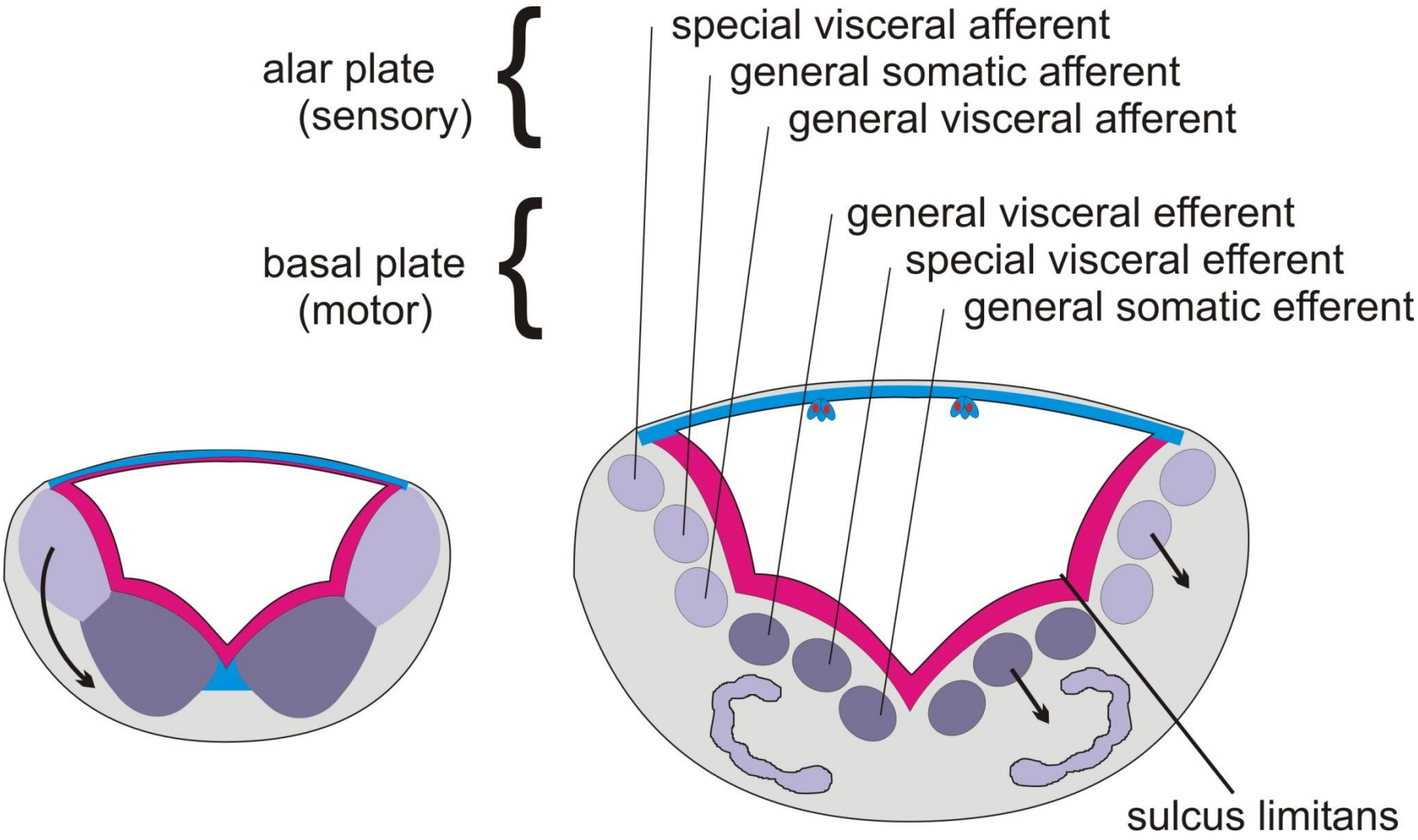
As the pontine flexure forms, the roof plate spreads forming the IV ventricle.



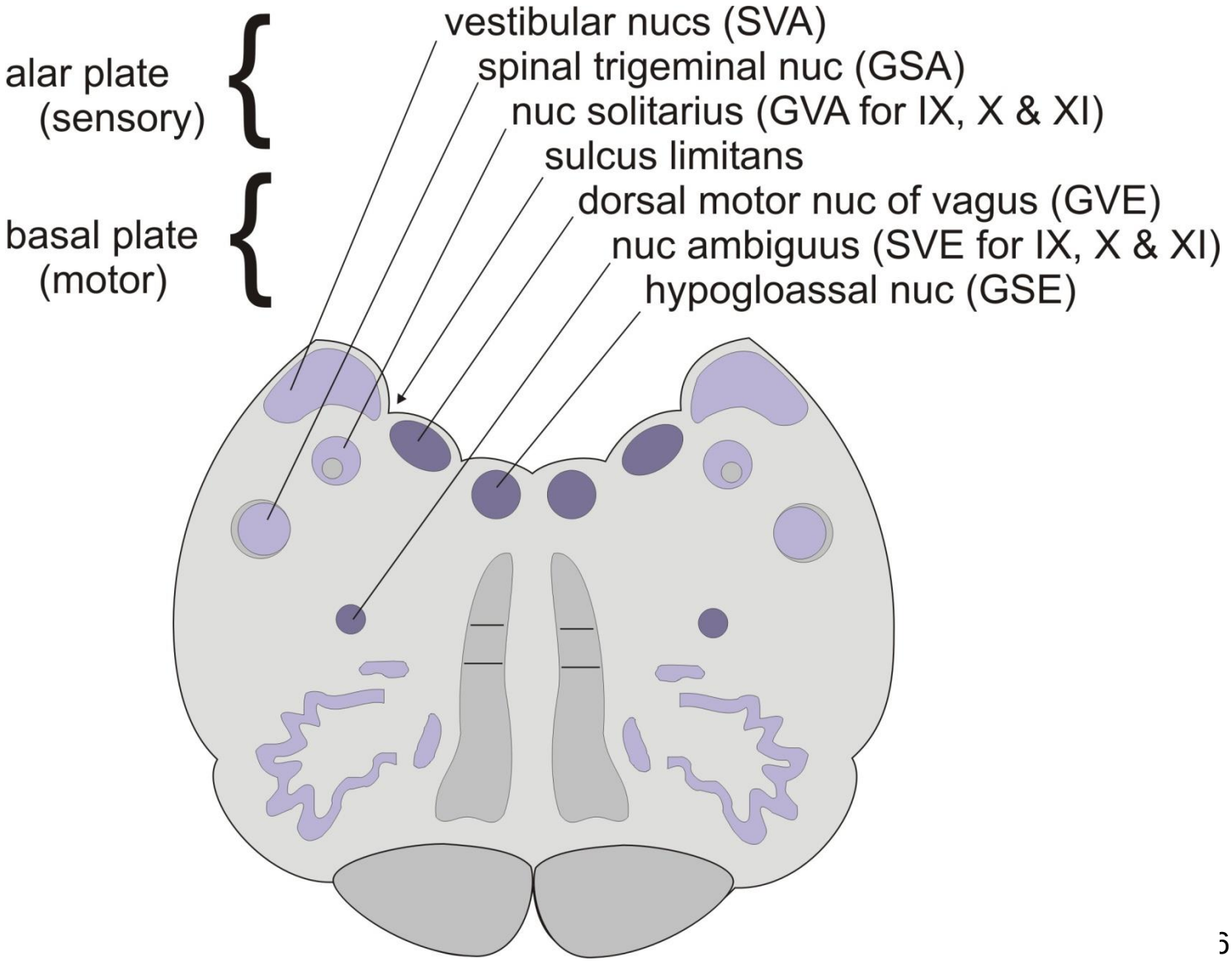




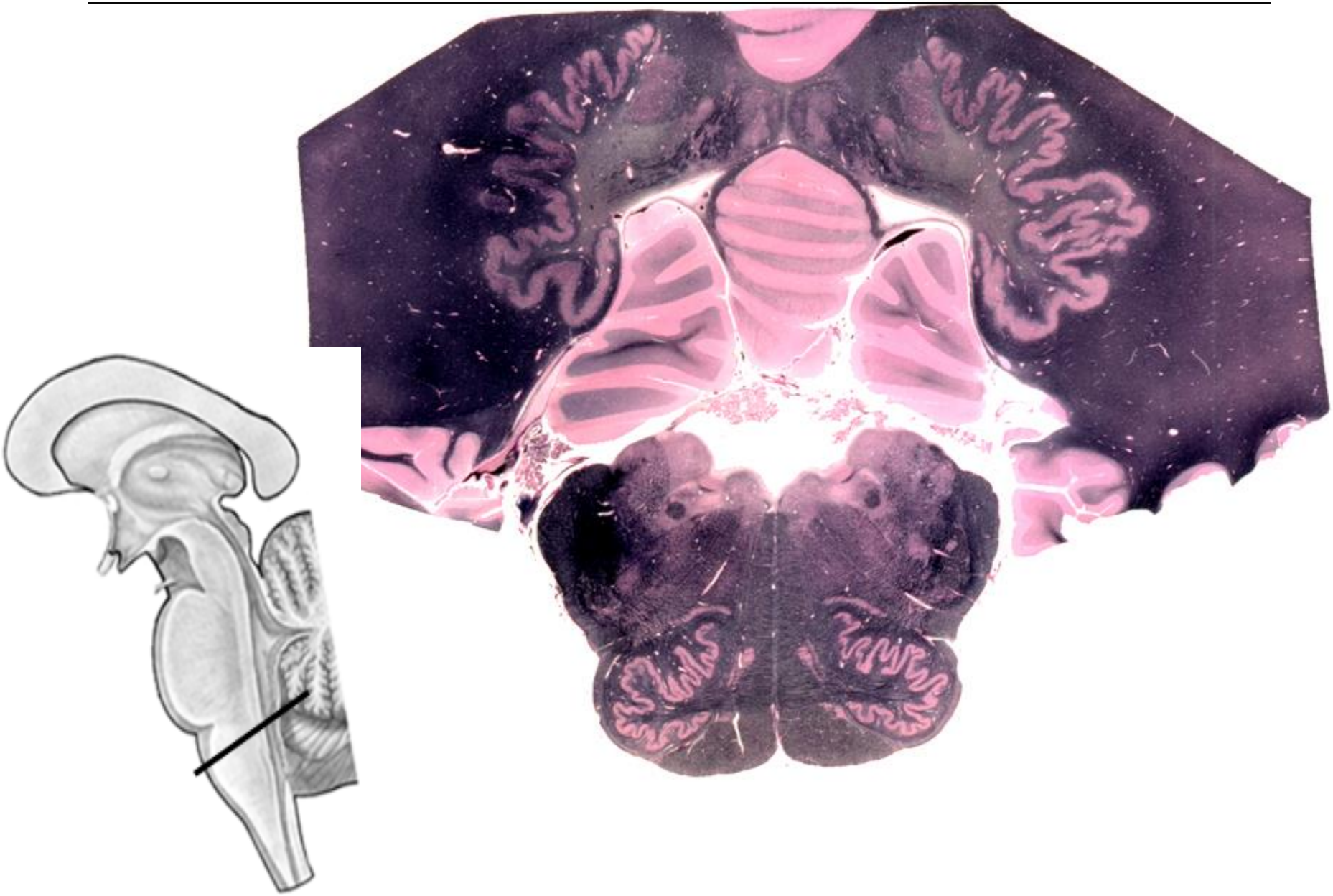
Alar and basal plates on both sides of the tube each subdivide into three distinct columns of cells with different functions.



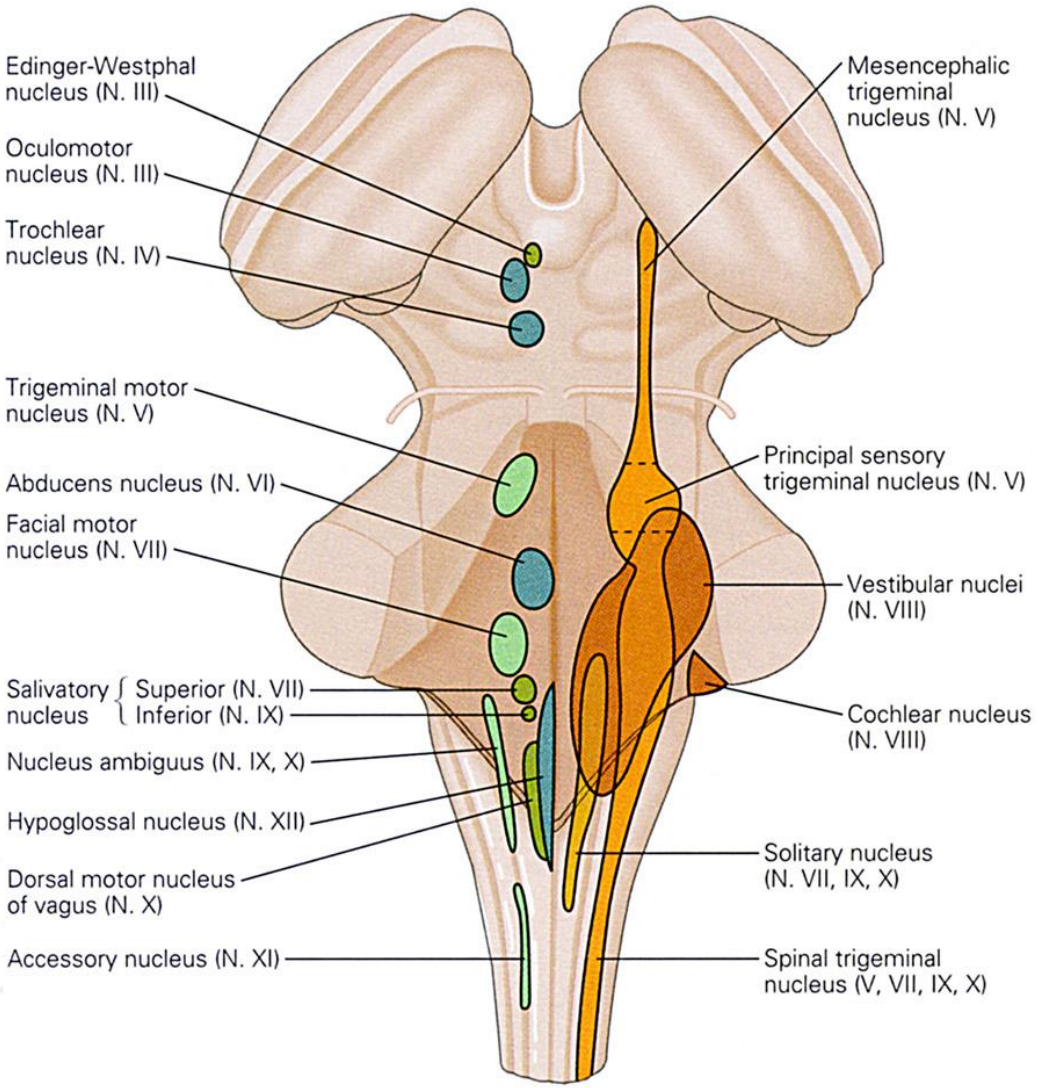
Each cranial nerve nucleus is derived from a single functional cell column.

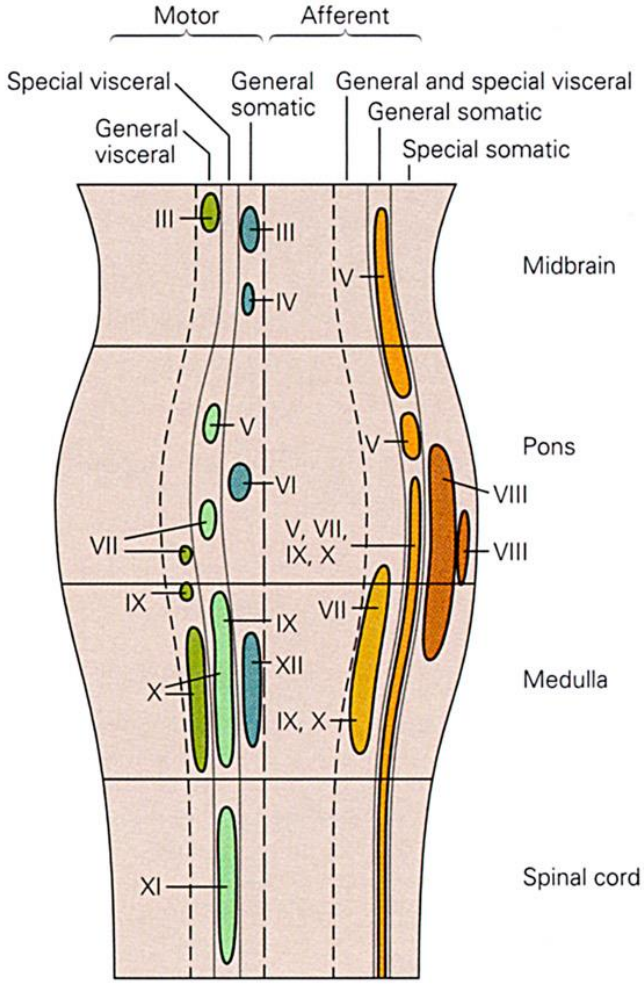


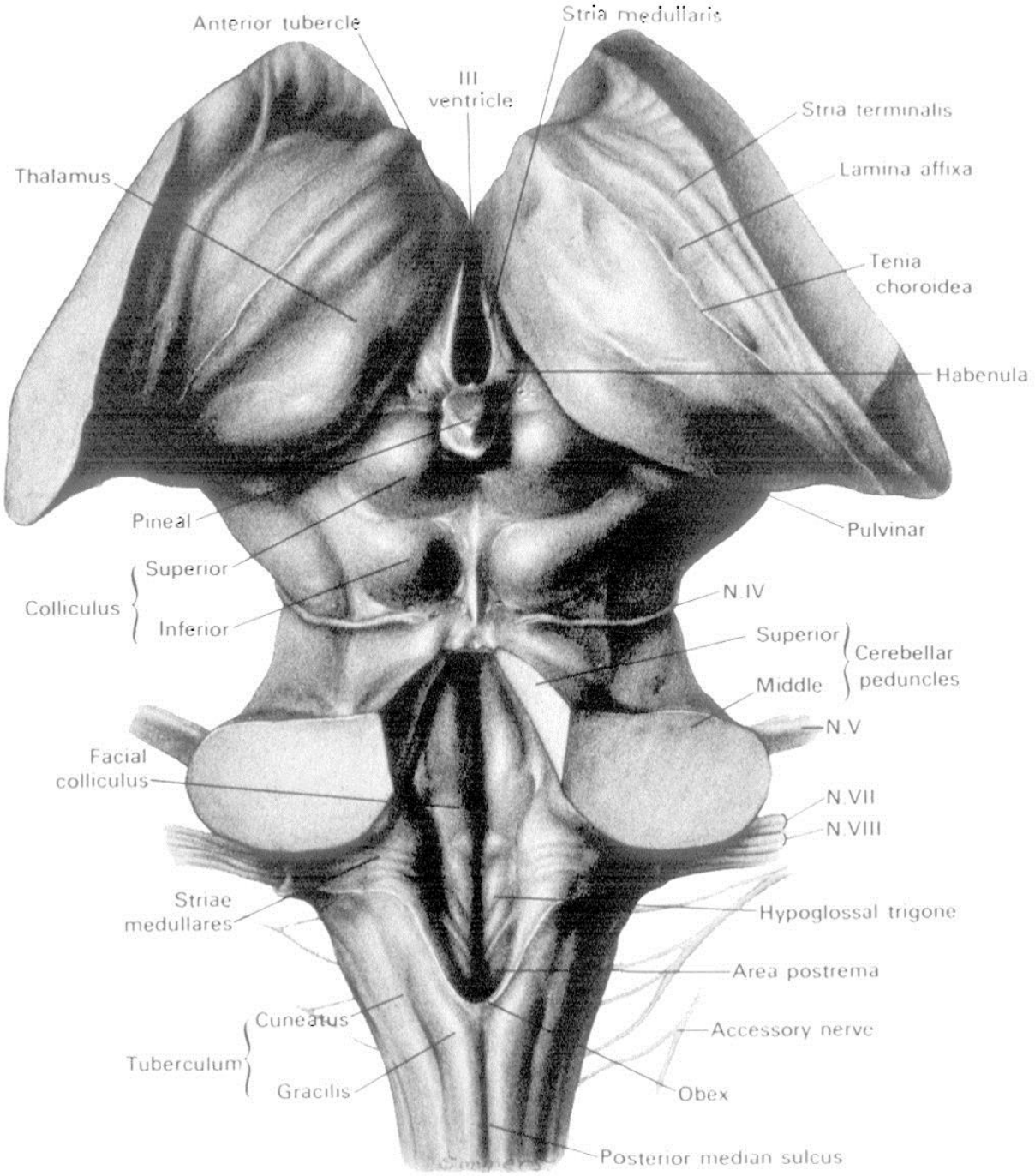
Adult (upper) Medulla



Along the length of the adult brainstem, nuclei are discontinuous columns of functionally related cells.

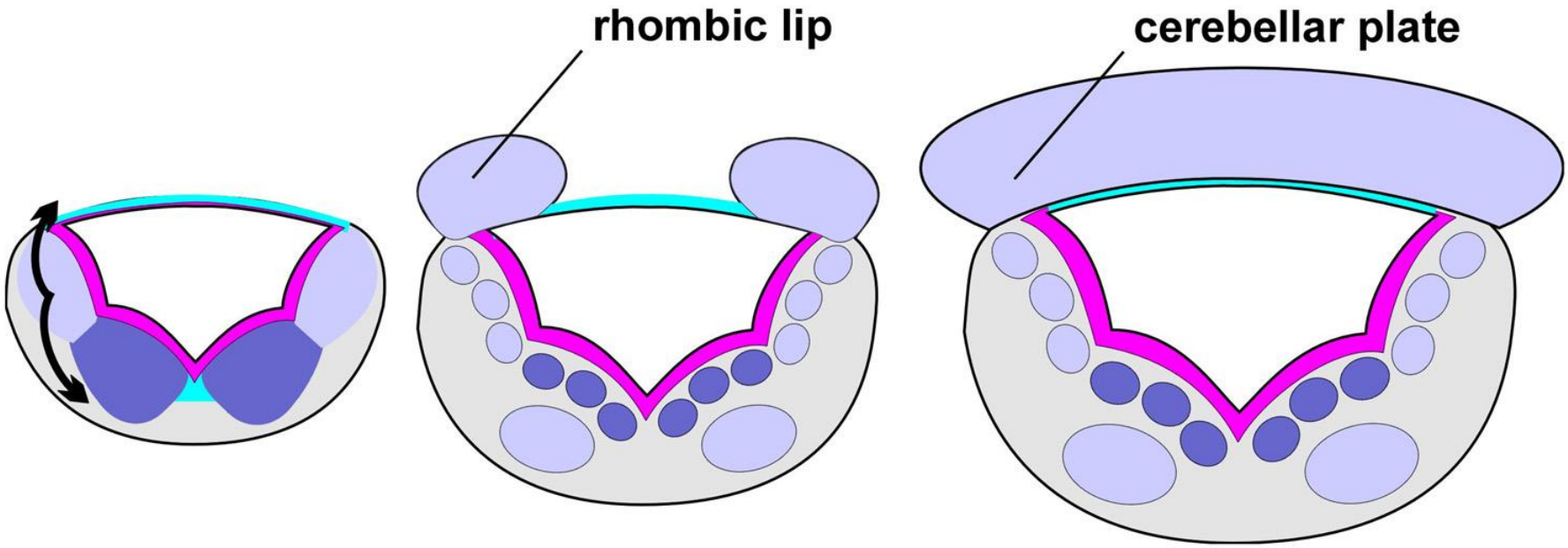




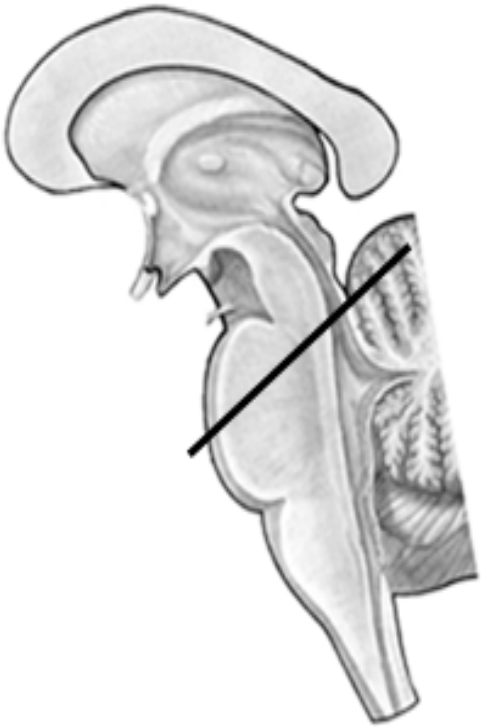

Anterior tubercle
Stria medullaris
III ventricle
Stria terminalis
Lamina affixa
Thalamus
Tenia choroidea
Habenula
Pineal
Pulvinar
Superior
Colliculus
Inferior
N.IV
Superior
Cerebellar peduncles
Middle
N.V
Facial colliculus
N.VII
N.VIII
Striae medullares
Hypoglossal trigone
Area postrema
Cuneatus
Tuberculum
Gracilis
Accessory nerve
Obex
Posterior median sulcus

Metencephalon (Pons and Cerebellum)

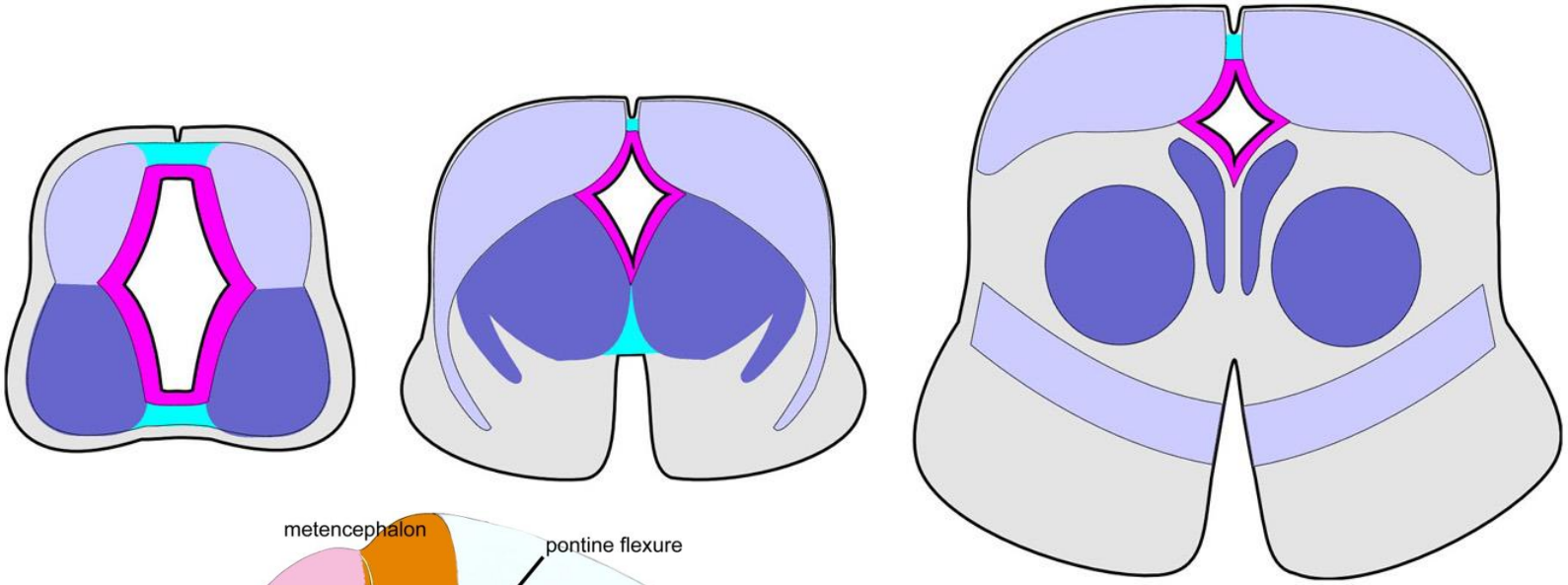
Some cells migrate from the alar and basal plates and undergo further cell division.

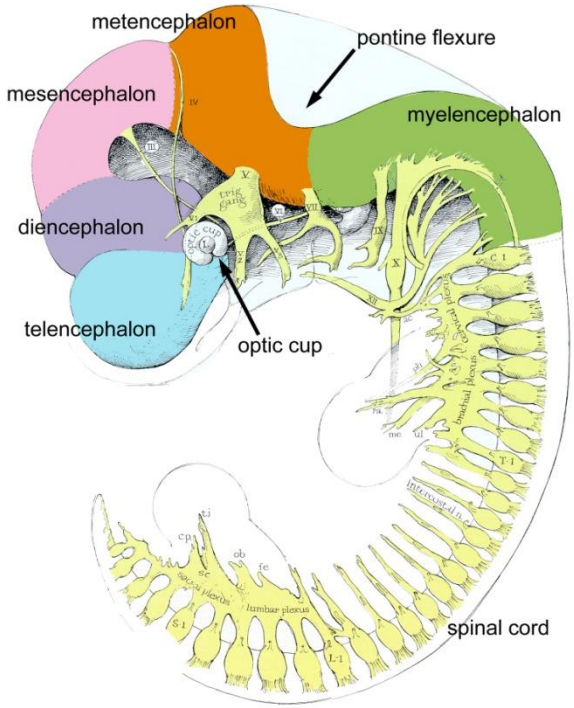


Adult Pons and Cerebellum



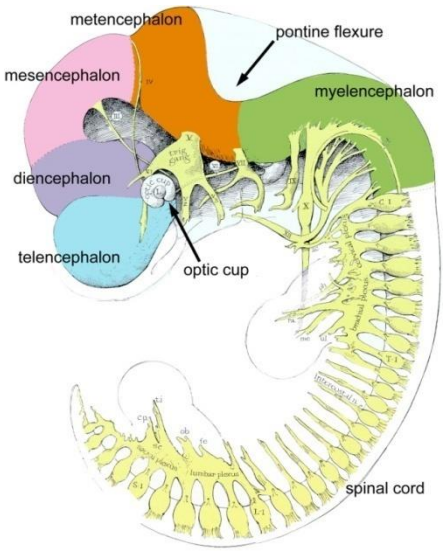
Mesencephalon

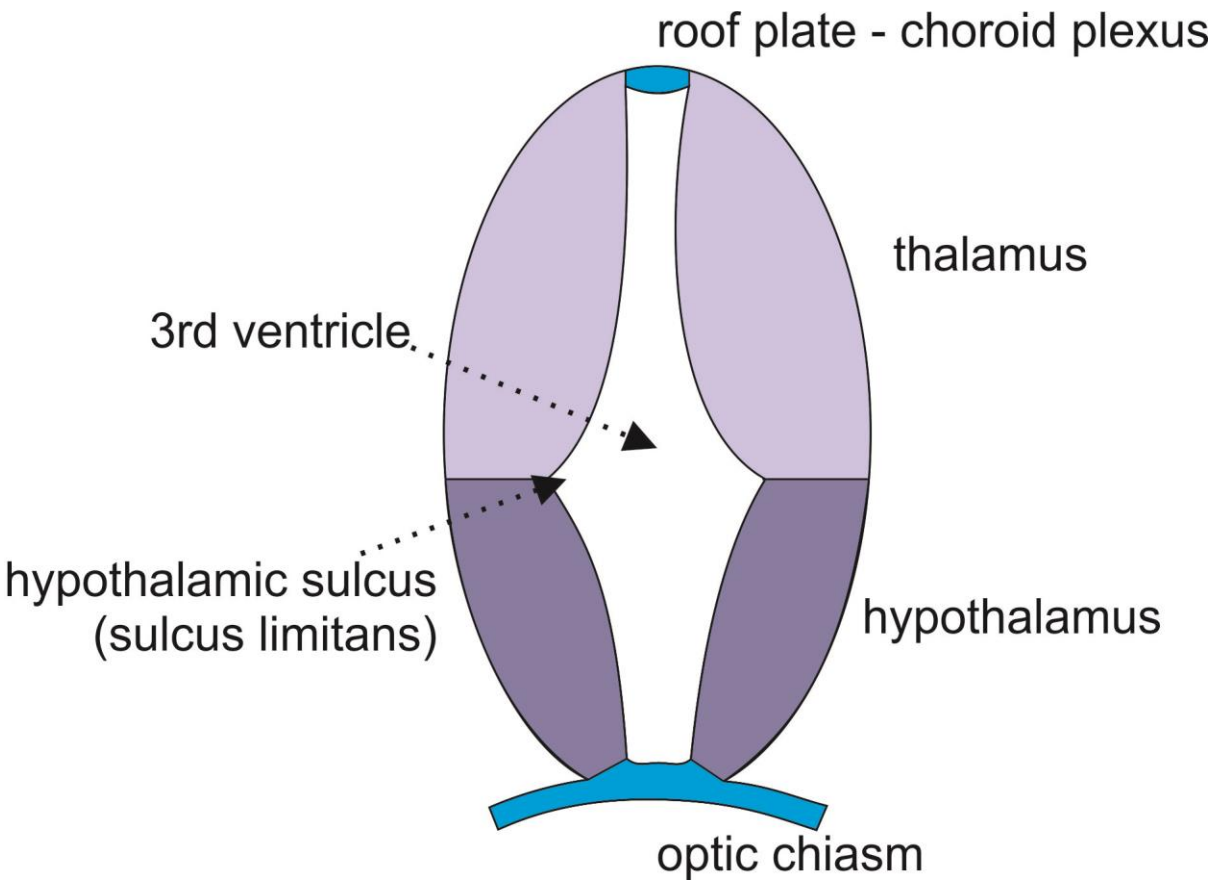




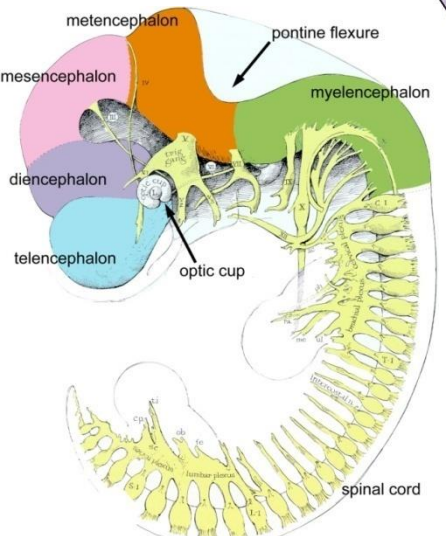
Adult Mesencephalon

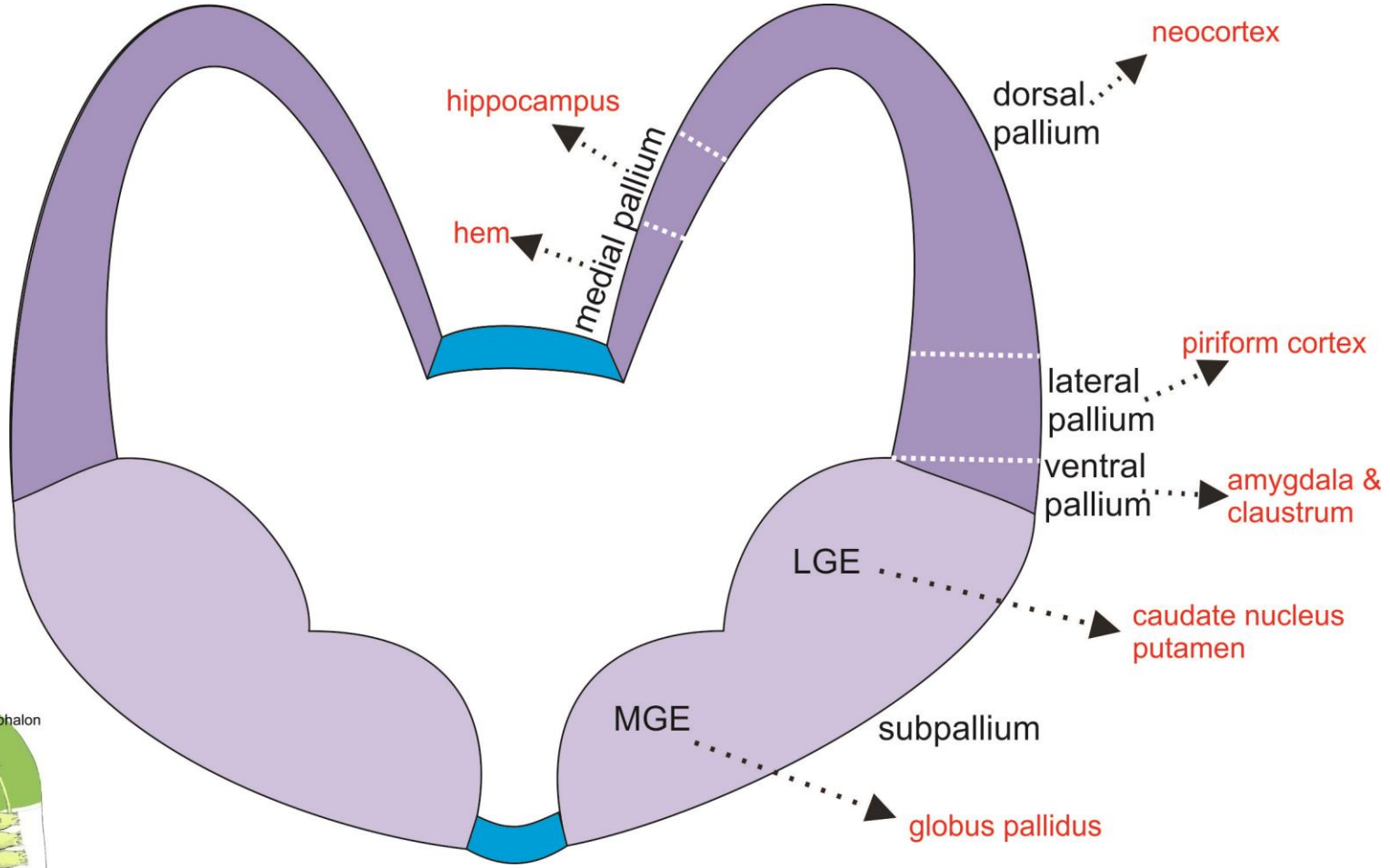
Diencephalon



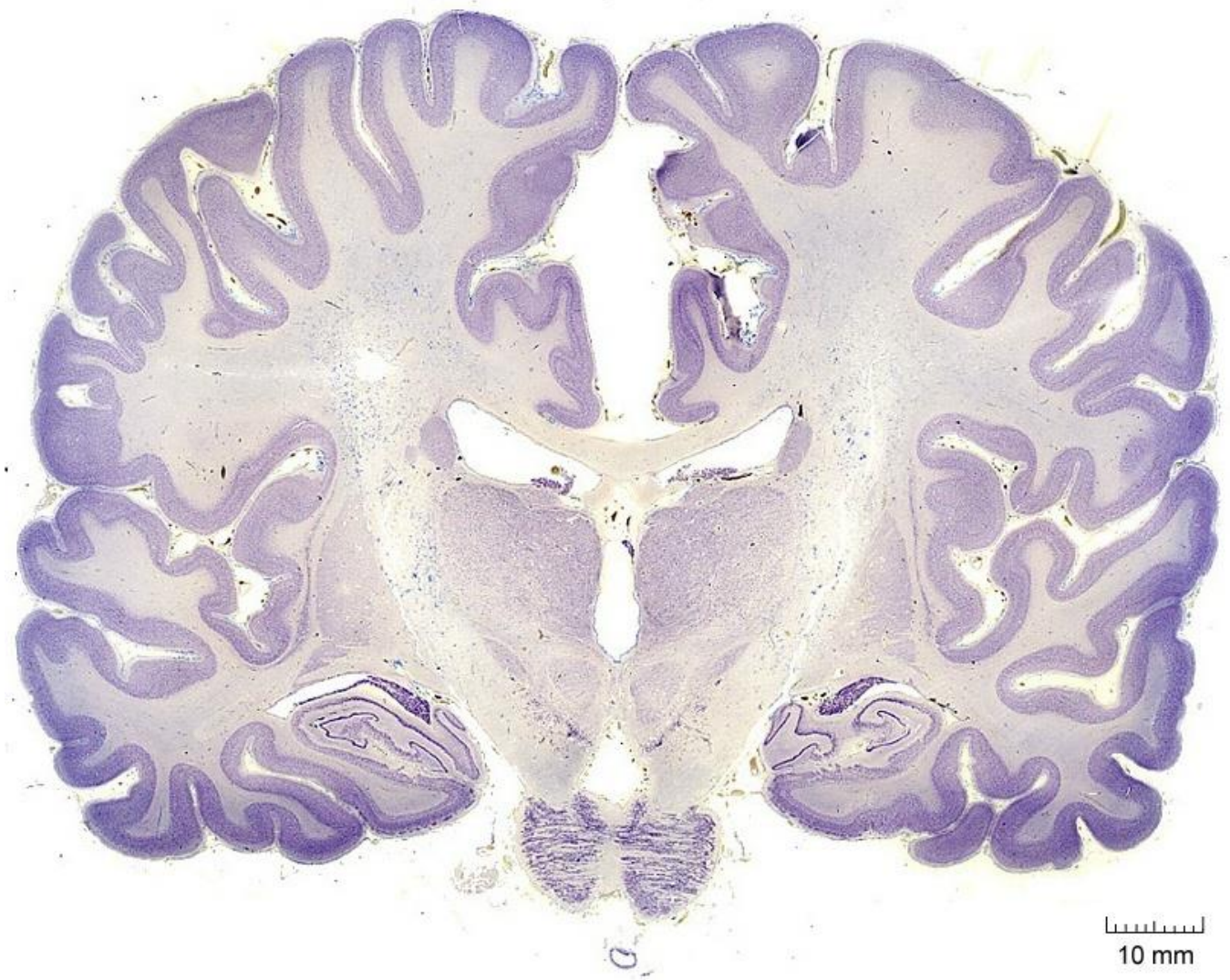


Telencephalon

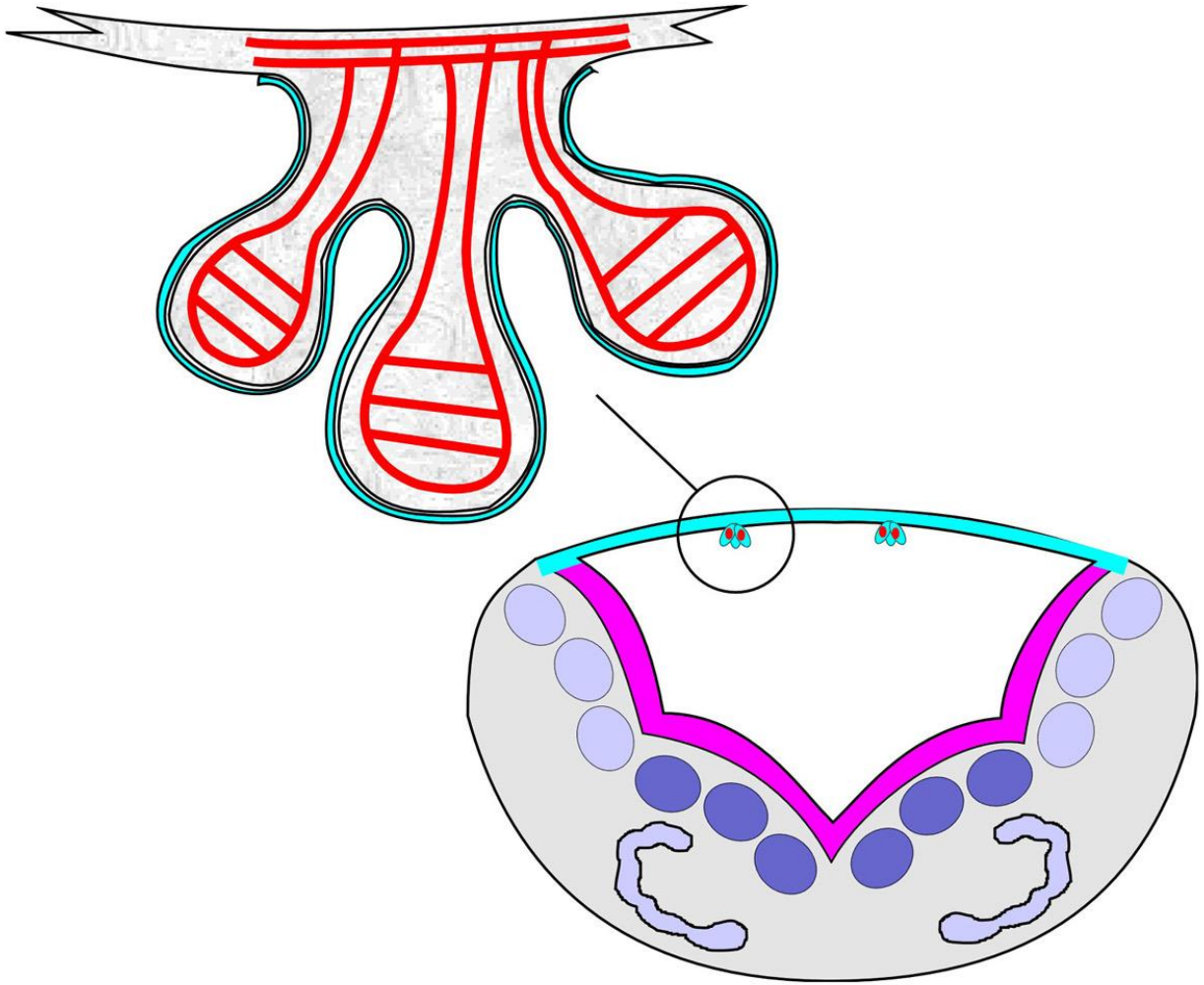




Adult Diencephalon & Telencephalon



Choriod plexus develops from invagination of roof plate and pia into the ventricle.



Summary of the Origin of Cell Types in the Nervous System

ectoderm			mesoderm
PNS		CNS	
Neural Placodes	Neural Crest	Neural Tube	
some sensory neurons	most sensory neurons	all neurons	microglia
	autonomic neurons	astrocytes	vasculature
	schwann cells	oligodendrocytes	
	satellite cells	ependymal cells	