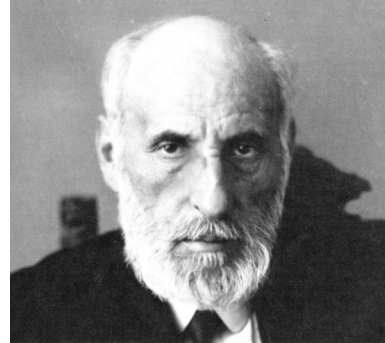


Emilio Golgi



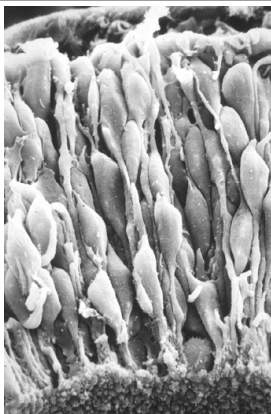
Santiago Ramon y Cajal



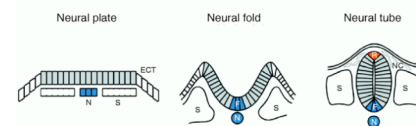
How to build a nervous system.

1. Cellular commitment to neural lineage.
2. Cell proliferation of neuroblasts and glioblasts.
3. Cellular migration.
4. Differentiation – neurons, astroglia (radial glia), oligodendroglia (myelination).
5. axonal outgrowth and synapse formation.
6. Cell death = apoptosis.

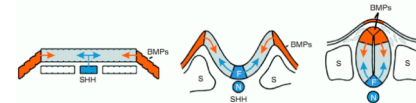
Cell Proliferation



A Developmental stages



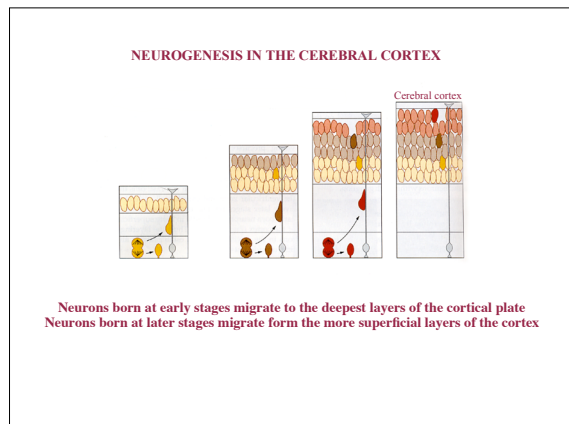
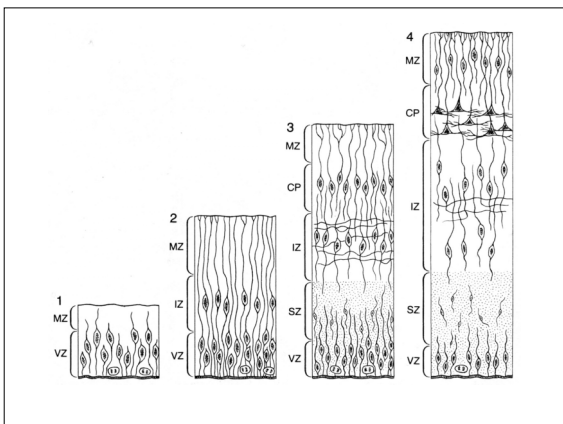
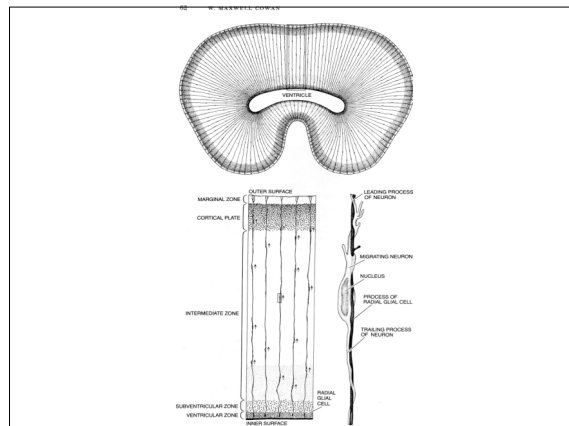
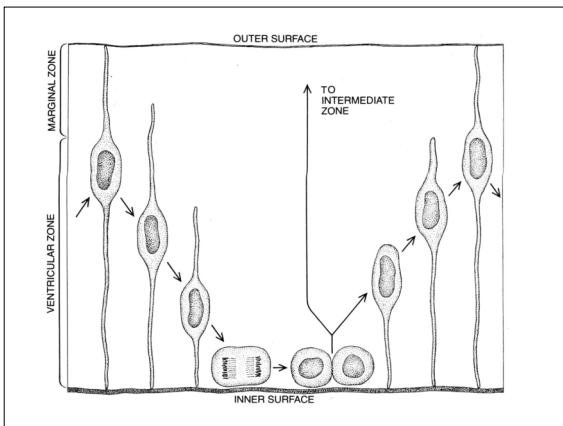
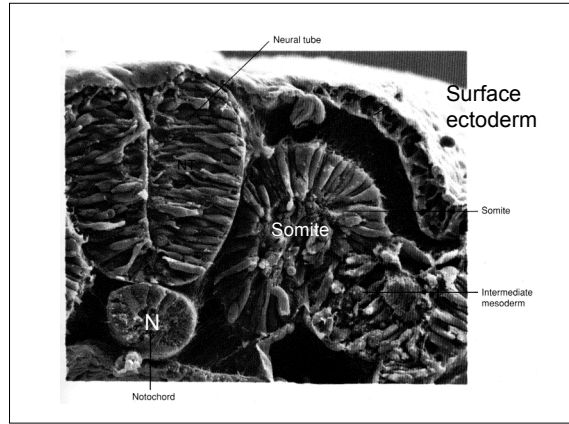
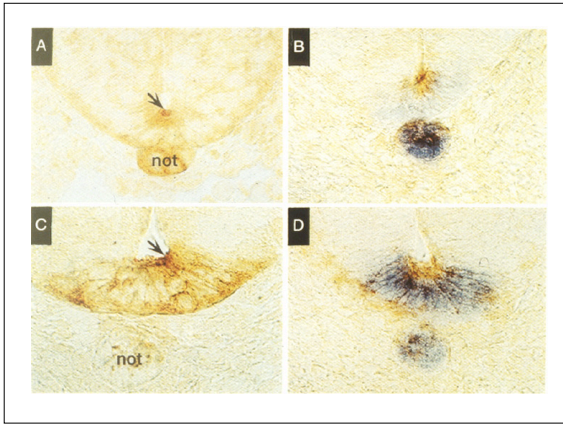
B Inductive signals

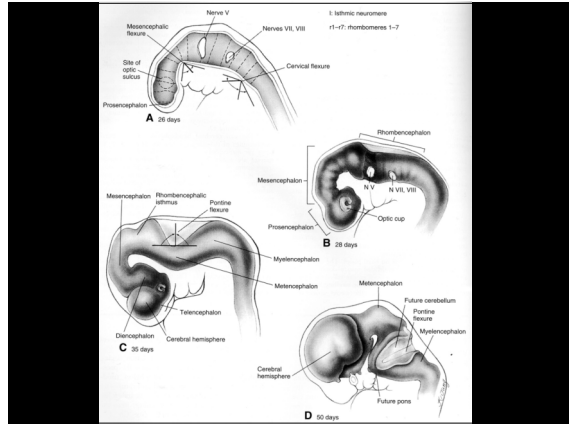
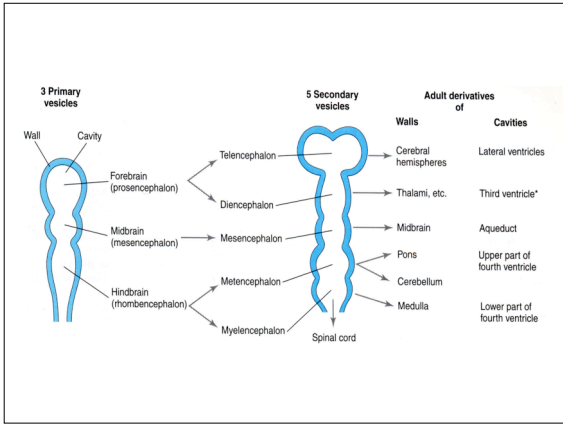


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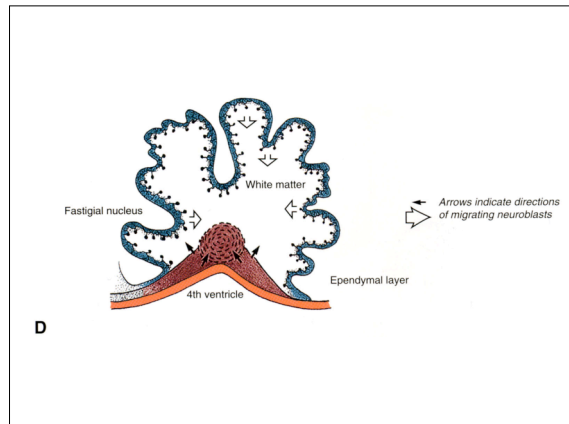
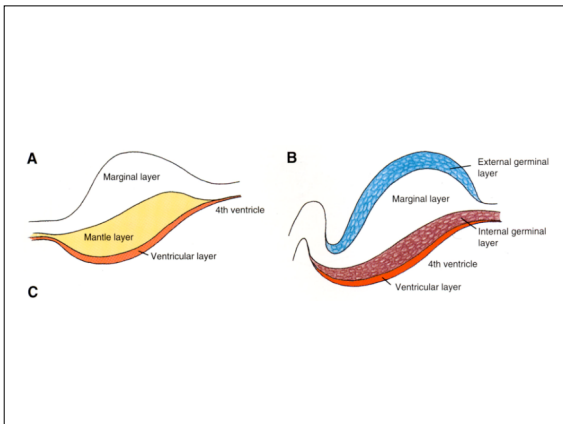
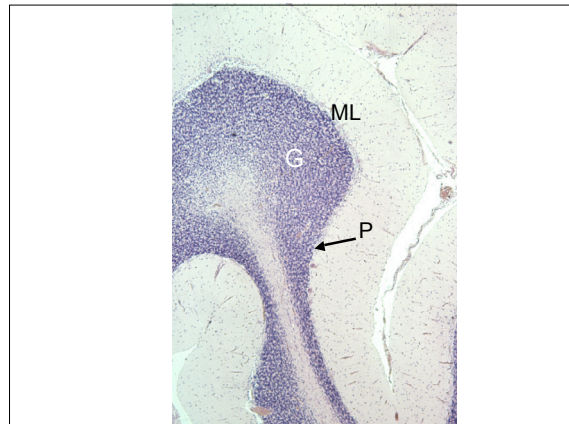
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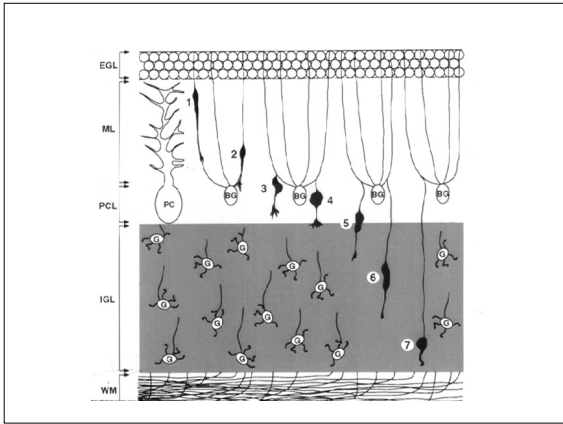






Cerebellum is generated by two regions of mitotic cells





Organization of rhombencephalon

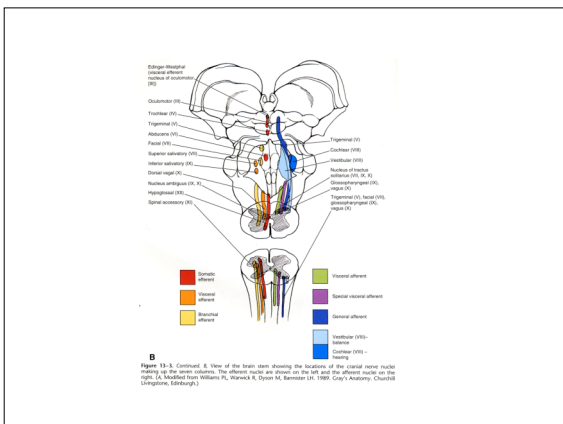
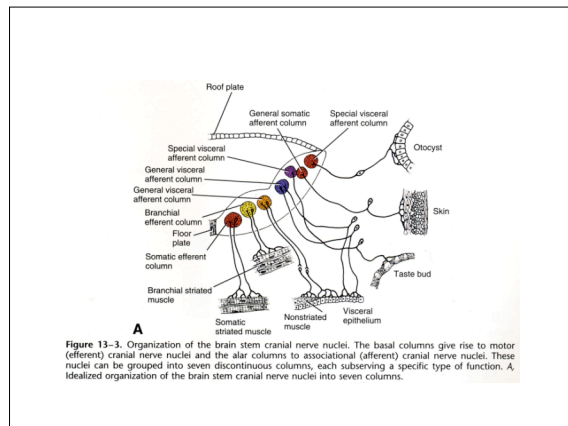
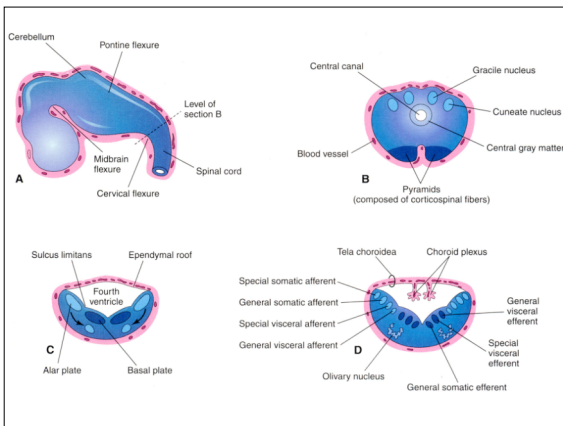


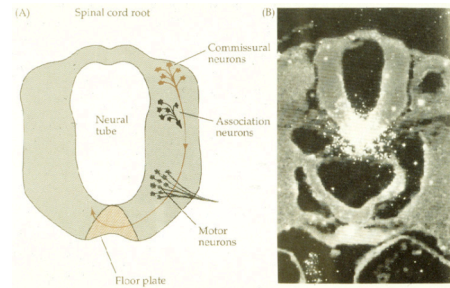
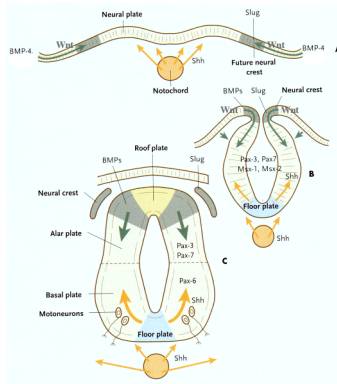
Table 13-1
Location of the Cranial Nerve Nuclei

BRAIN REGION	ASSOCIATED CRANIAL NERVES
Telencephalon	Olfactory (I)
Diencephalon	Optic (II)
Mesencephalon	Oculomotor (III)
Metencephalon	Trochlear (IV) (Arises in the metencephalon but is later displaced into the mesencephalon)
	Trigeminal (V) (The trigeminal sensory nuclei arise in the metencephalon and myelencephalon but are later displaced partly into the mesencephalon. The trigeminal motor nucleus arises in the metencephalon and remains there.)
	Abducens (VI)
	Facial (VII)
	Vestibulocochlear (VIII)
Myelencephalon	Glossopharyngeal (IX)
	Vagus (X)
	Accessory (XI)
	Hypoglossal (XII)

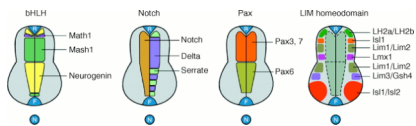
**Table 13-2
Origins of the Neurons in the Cranial Nerve Ganglia**

CRANIAL NERVE	GANGLION AND TYPE	ORIGIN OF NEURONS
Olfactory (I)	Olfactory epithelium (primary neurons of the olfactory pathway) (special afferent)	Nasal placode
Oculomotor (III)	Ciliary ganglion (visceral efferent)	Neural crest of the caudal diencephalon and cranial mesencephalon
Trigeminal (V)	Trigeminal ganglion (general afferent)	Neural crest of the caudal diencephalon and cranial mesencephalon; trigeminal placode
Facial (VII)	Superior ganglion of nerve VII (general and special afferent)	Rhombencephalic neural crest; 1st epibranchial placode
	Inferior (geniculate) ganglion of nerve VII (general and special afferent)	1st epibranchial placode
	Sphenopalatine ganglion (visceral efferent)	Rhombencephalic neural crest
	Submandibular ganglion (visceral efferent)	Rhombencephalic neural crest
Vestibulocochlear (VIII)	Acoustic (cochlear) ganglion (special afferent)	Otic placode
	Vestibular ganglion (special afferent)	Otic placode plus some contribution from neural crest
Glossopharyngeal (IX)	Superior ganglion (general and special afferent)	Rhombencephalic neural crest
	Inferior (petrosal) ganglion (general and special afferent)	2nd epibranchial placodes
Vagus (X)	Otic ganglion (visceral efferent)	Rhombencephalic neural crest
	Superior ganglion (general afferent)	Rhombencephalic neural crest
	Inferior (nodose) ganglion (general and special afferent)	3rd and 4th epibranchial placodes
	Vagal parasympathetic (enteric) ganglia (visceral efferent)	Rhombencephalic neural crest

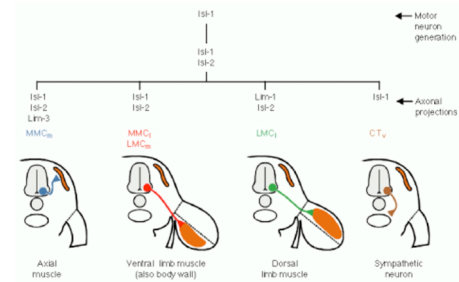
Neuronal differentiation:
Example – spinal cord.



No Caption Found



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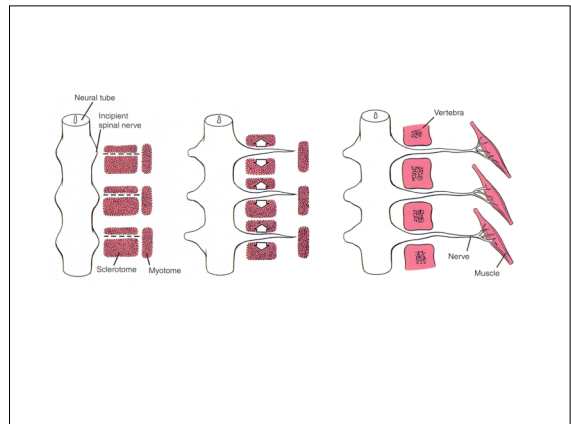
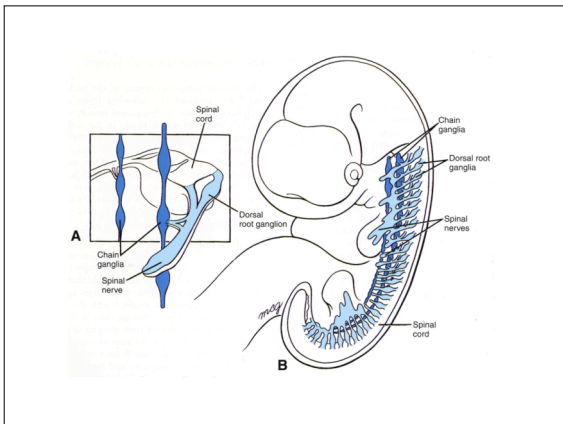
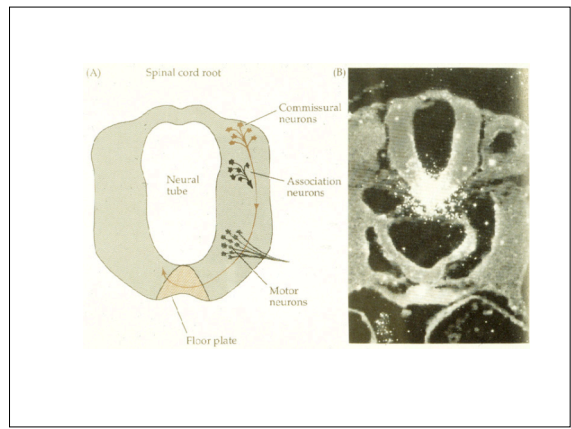
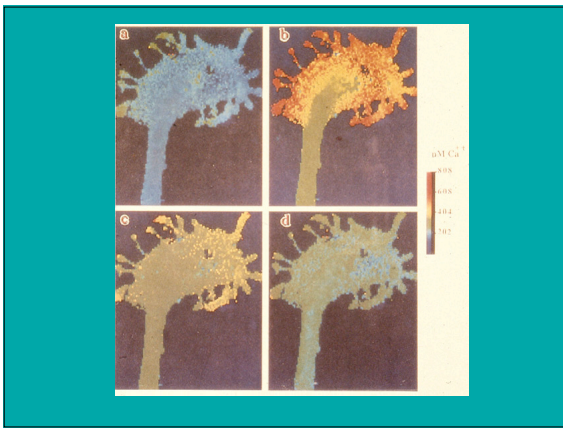
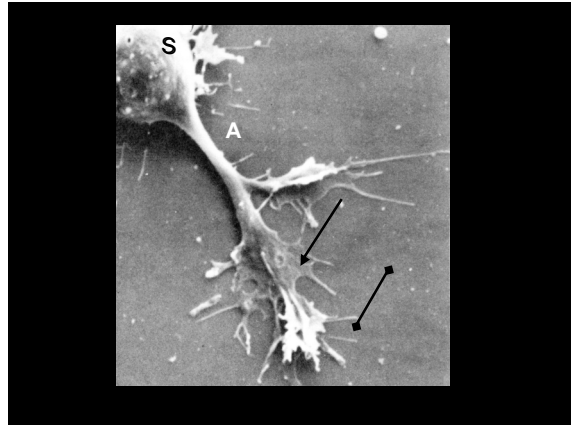
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Neuronal polarity & axonal outgrowth



Neuronal death

Programmed cell death by apoptosis

