

END OF SEM NEURAL MASTER ANATOMY

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LUMBAR & SACRAL PLEXUS

LUMBAR PLEXUS (Ventral Rami of L1-4)

*Located between Ant. & Post. bellies of Psoas Major

*Merges w/ Sacral Plexus thru **Lumbosacral Trunk**

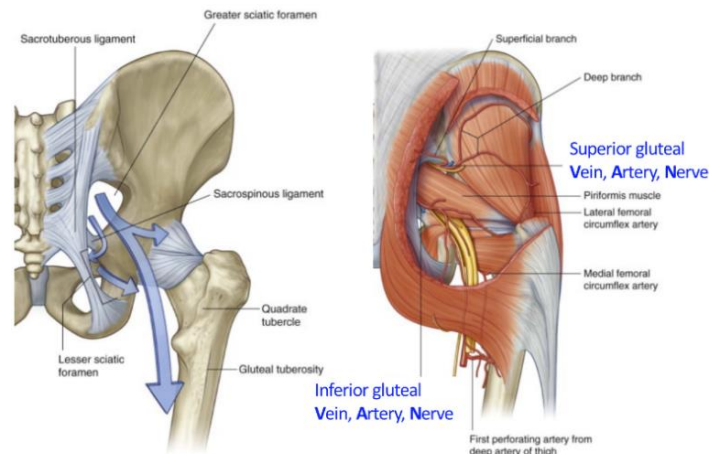
Nerve Name	Exit/ Pathway	Muscles Supplied
Iliohypogastric (L1)	Anterior to Quadratus Lumborum, posterior to Kidney, piercing T-Abdominis Cutaneous supplies posterolateral gluteal & pubic region skin (*kidney infections cause irritation of nerve & heat sensation on skin)	Lower Internal Oblique Abdominis & Transversus Abdominis
Ilioinguinal (L1)	Underneath Iliohypogastric, pierces T-Abdominis & Int. Oblique glides along Iliac Crest Enters Inguinal Canal crosses to pubic area	
Genitofemoral (L1-2)	Pierces Psoas Major anteriorly before descending posteriorly to Ureter Genital Branches into Inguinal Canal to innervate Scrotum & Labia Majora Femoral Branch crosses to anterior thigh to supply sensory over Femoral Triangle	Genital Branch: Cremaster Muscle
Femoral (L2-4) Saphenous	Passes Inguinal Ligament & Femoral Triangle Terminates into cutaneous branches & Saphenous N (sensory over medial thigh, leg & foot)	Anterior Thigh
Lateral Femoral Cutaneous (L2-3)	Emerges Lateral Border of Psoas, crosses Iliacus towards ASIS, passes Inguinal Ligament to enter Lateral Thigh	(sensory to anterolateral thigh)
Obturator (L2-4)	Emerges medial to Psoas near Pelvic Brim , posterior to Iliac Vessels & thru Obturator Foramen Supplies medial thigh	Obturator Externus

SACRAL PLEXUS (L5-S5)

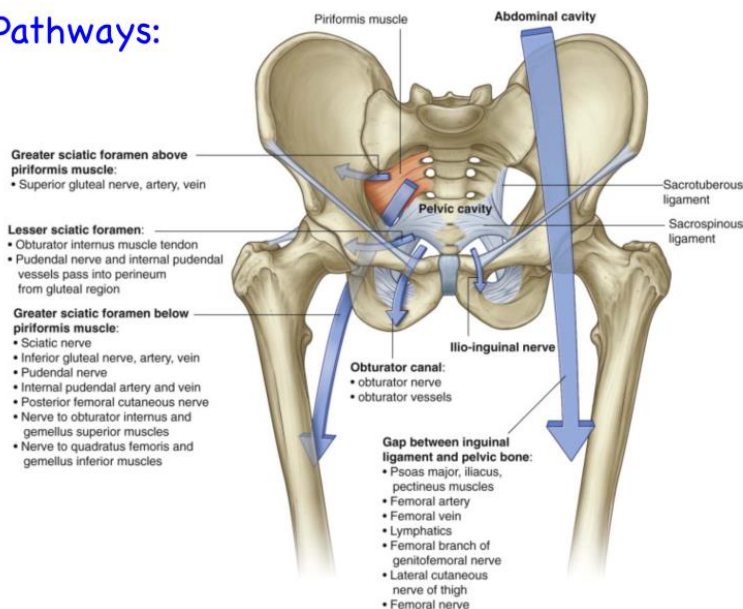
Nerve Name	Exit/ Pathway	Muscles Supplied
Superior Gluteal (L4-S1)	Greater Sciatic Foramen , above piriformis	Gluteus Medius & Minimus TFL
Inferior Gluteal (L5-S2)	“ “ below piriformis	Gluteus Maximus
Direct Branches from Sacral		Obturator Internus Piriformis Quadratus Femoris Superior/ Inferior Gemelli
Post. Fem. Cutaneous	Lateral to Inguinal Ligament	(sensory of posterior thigh)
Pudendal	Exits via Greater Sciatic Foramen over Sacrospinous Ligament → Re-enters Lesser Sciatic Foramen	Urogenital Diaphragm
Tibial (L4-S3) Medial Plantar N Lateral Plantar N	1. Exits Greater Sciatic Foramen below piriformis & passes into posterior midline thigh between Ischial Tuberosity & Greater Trochanter 2. Travels w/ Common Fibular in Sciatic N, becomes Tibial N after passing midshaft of femur 3. Passes Popliteal Fossa & Tarsal Tunnel (below medial malleolus) 4. Branches into Plantar N @ foot	Hamstrings (*Long Head of BF) Posterior Leg Foot Intrinsic
Common Fibular (L4-S2)	Travels w/ BF tendon, then around Fibular Neck	Short Head of BF
Superficial Fibular	Descends laterally deep to FL to dorsal foot anterior to Lateral Malleolus	FL & FB
Deep Fibular	Descends anteriorly deep to EDL between tendons of TA & EHL w/ Dorsalis Pedis Artery to dorsal foot's 1 st web space	TA, EDL & EDB, EHL & EHB, Fibular Tertius

Pathways

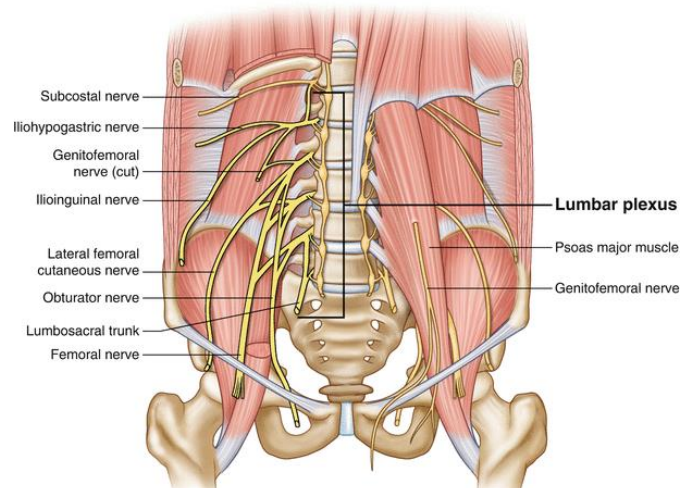
- **Greater Sciatic Foramen** (above & below piriformis, formed by boundaries of Posterior Ilium & Sacrospinous Ligament)
 - Superior Gluteal N (above piriformis)
 - Sciatic N (below piriformis)
 - Inferior Gluteal N, Artery & Vein
 - Direct Nerve to Deep Lateral Rotators (except piriformis)
 - Pudendal N (exits)
- **Lesser Sciatic Foramen** (space between Sacrospinous & Sacrotuberous ligament)
 - Obturator Internus Muscle tendon
 - Pudendal N (re-enters)
- **Obturator Canal**: Obturator N
- **Abdominal Cavity** (Gap between Inguinal Ligament & Ilium)



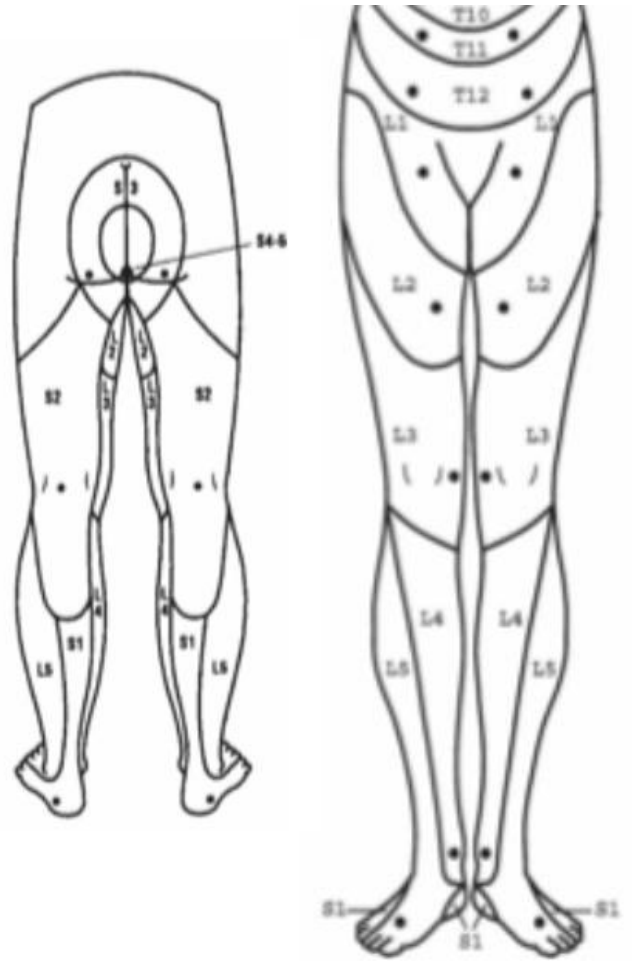
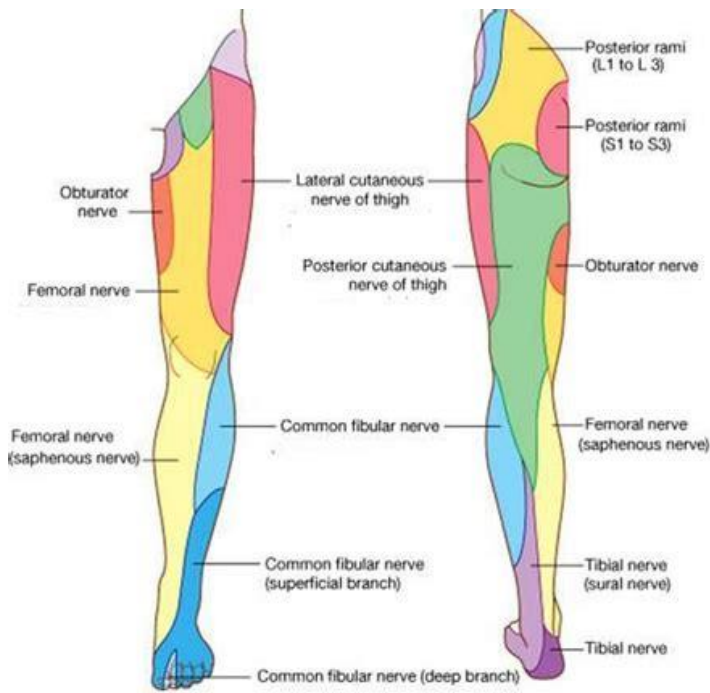
Pathways:



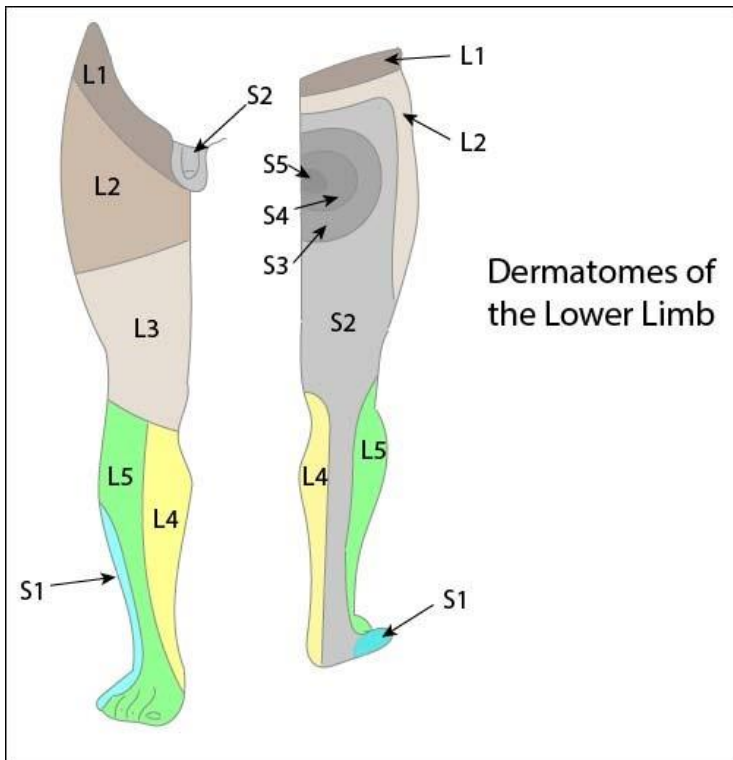
- Femoral N, Artery & Vein
- Psoas Major, Iliacus & Pectineus Muscles
- Lateral Cutaneous N



PERIPHERAL NERVE INNERVATION



Myotome Level	Action + Contribution
L2	Hip Flexors (Iliopsoas)
L3	Knee Extensors (Quads)
L4	Ankle DF (TA)
L5	Long Toe Extensors (EDL)
S1	Ankle PF (Gastro, Soleus etc.)
S2	Knee Flexors (Hamstrings)



Dermatome Level	Key Sensory Point
L1	Midpoint Between Mid-Inguinal & L2 Point
L2	Ant.- Medial Thigh Between Mid-Inguinal & Medial Femoral Condyle
L3	Medial Femoral Condyles
L4	Medial Malleolus
L5	Dorsum of Foot @ 3 rd MTP
S1	Lateral Heel
S2	Popliteal Fossa
S3	Ischial Tuberosity
S4-5	*Wrong hole, pull up*

ASCENDING PATHWAYS

Neuron Types	Conduction Velocity	Function
Ia	70-120	Muscle Spindles (Muscle Tension)
Ib	60-80	Golgi Tendon Organs (Proprioception) & Ruffini's Endings (Joint Pressure)
II	30-80	Skin Receptors
III (Aδ Type)	10-30	Fast Pain
IV (C Type)	0.5-2.5	Slow Pain

Temperature

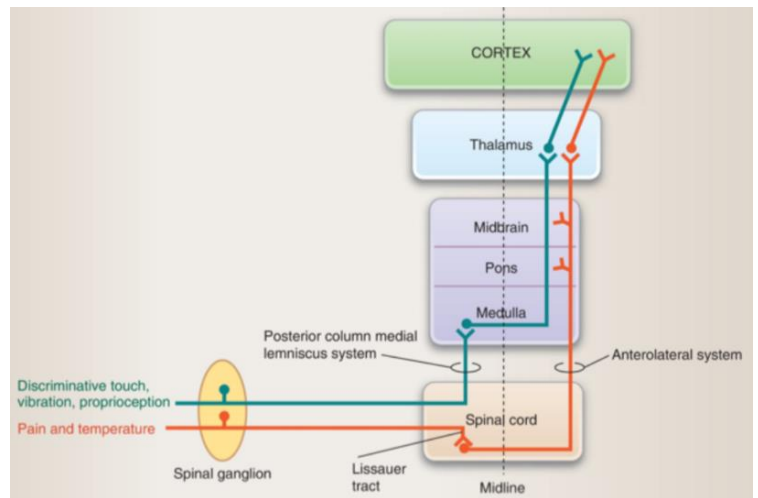
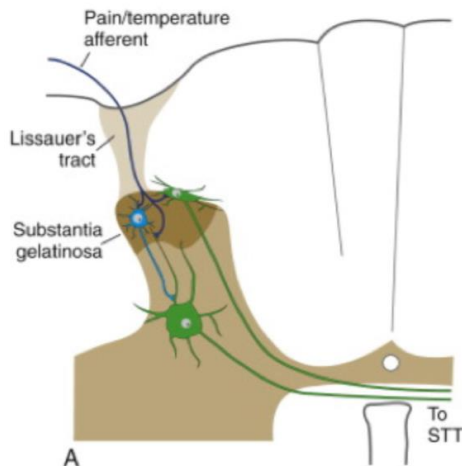
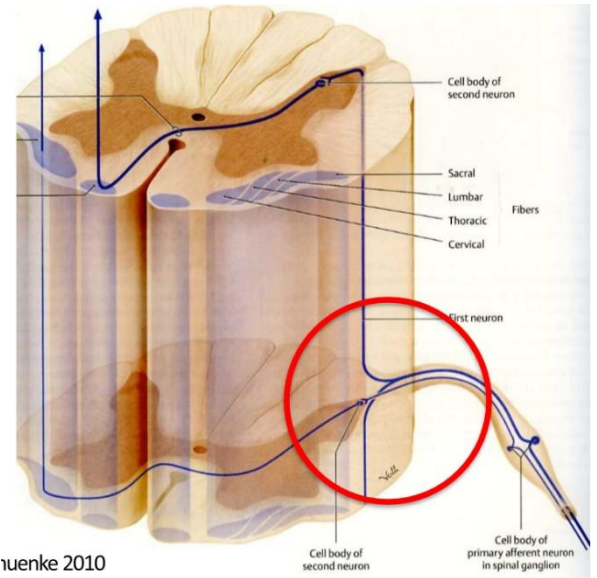
*Conduction Velocity dependent upon: **Axon Diameter** & **Myelination**

ANTEROLATERAL Pathway (pain sensory)

Aδ & C Fibres:

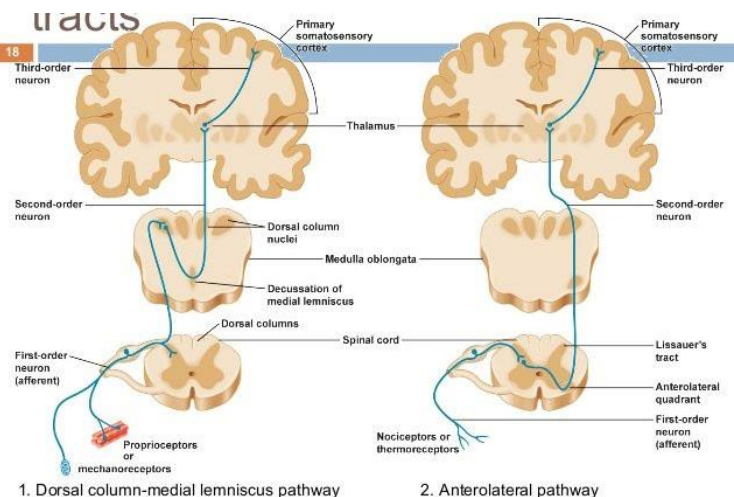
- 1st Cell Body @ Dorsal Root Ganglion → 1st Synapse @ **Rexed Lamina I & II** (via **Lissauer's Tract**) with their **2nd Neuron** OR **Interneuron**
- 2nd Order Neuron decussate via the **Ventral White Commissure** to **Contralateral** Anterolateral Tract
3. Some fibres synapses within brainstem (thus tract size diminishes) but main branch continues till their **2nd Synapse** at the **Thalamus** → 3rd Synapse @ Somatosensory Cortex

*Somatotopic Organisation: Sacral = Lateral, Cervical = Medial



Major Anterolateral Tracts

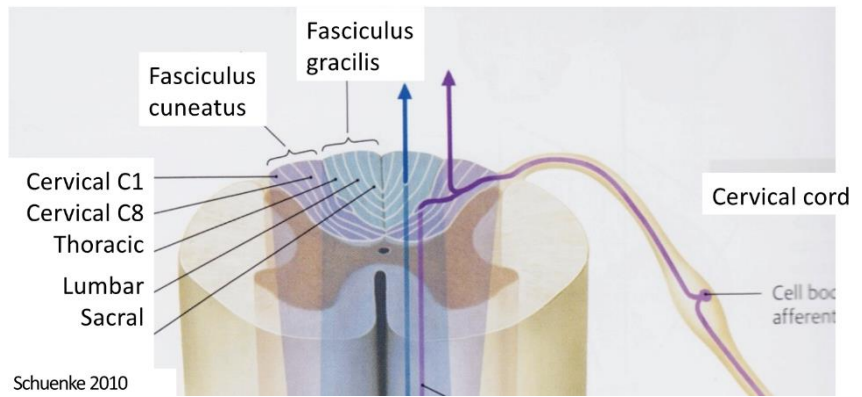
- **Spinoreticular**: arousal/ attention
- **Spinothalamic**: conscious awareness of pain
- **Spinomesencephalic**: intrinsic mechanism for pain control
- **Spinohypothalamic**: automatic responses to pain



DORSAL COLUMN – MEDIAL

LEMNISCUS Pathway (*muscle sensory*)

- 1st Order Neurons of Type Ia & Ib Fibres enter Dorsal Funiculus and ascend via the **Cuneatus Funiculus & Gracilis Funiculus**
2. 1st Synapse @ **Nucleus Gracilis & Cuneatus**, 2nd Order Neurons **decussates @ Medulla** and continues as the **Medial Lemniscus**
3. Synapses once more at **VPL Subnuclei** of Thalamus



*Somatotopic Organisation: Sacral = Medial, Cervical = Lateral (new fibres enter the column laterally)

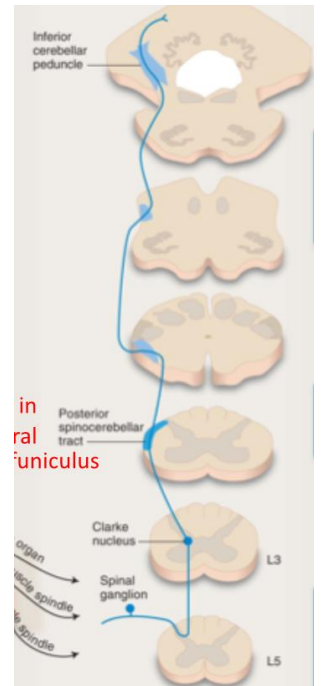
*Poster Limb of IC innervates entire body's somatosensory

Major Non-Conscious Proprioception Pathways

- Anterior Spinocerebellar (trunk & LL)
- Posterior Spinocerebellar (trunk & LL)
- Cuneocerebellar Tract (trunk & UL)
- Rostral Spinocerebellar (UL)

POSTERIOR SPINOCEREBELLAR Pathway (*Trunk & LL*)

1. 1st Synapse @ **Clarke's Nucleus (C8-L2, for non-conscious proprioception)** after entering Dorsal Horn, fibres from below L2 travel up Gracilis Funiculus until Clarke's Nucleus
2. Ascends via the **Ipsilateral Lateral Funiculus**
3. Enters Cerebellum via ICP

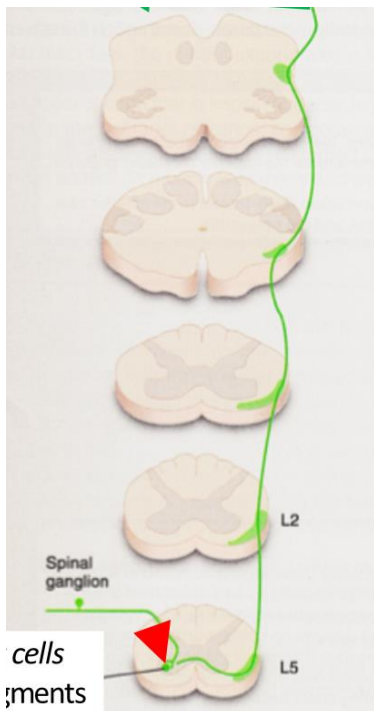
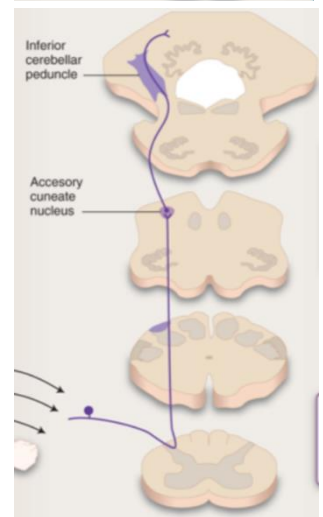


ANTERIOR SPINOCEREBELLAR Pathway (*Trunk & LL*)

1. 2nd Order Neuron Bodies @ **Lateral side of Ventral Horn**
2. Decussates to **Contralateral Ventral Funiculus**
3. Decussates again @ Cerebellum to original side before entering via SCP

CUNEOCEREBELLAR Pathway (Trunk & UL)

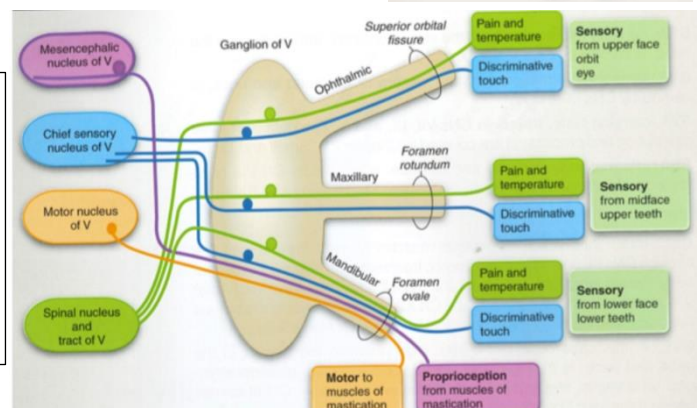
1. Ascend via **Ipsilateral Cuneatus Funiculus**
2. 1st Synapse @ **Accessory Cuneatus Nucleus**
3. Enters Cerebellum via ICP



Trigeminothalamic Pathways "Proprioception pathways of the Face"

*Only 1 Mesencephalic fibres to Muscles of Mastication via the Mandibular Branch of CNV

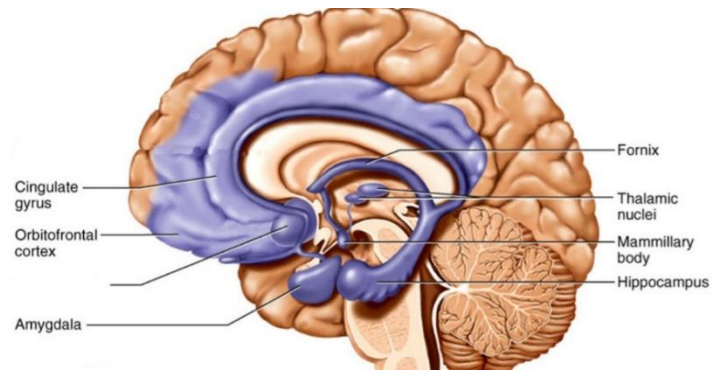
*Chief & Spinal fibres to all Branches



LIMBIC CORTICES

Major Cortices

- Hippocampal Formation:
 - o Hippocampus **Proper**
 - o **Dentate Gyrus** (involved in formation of episodic memory & spontaneous exploration of new environments)
 - o **Subiculum** (most inferior portion of hippocampus before becoming the parahippocampal gyrus)
- **Parahippocampal Gyrus & Entorhinal Cortex** (serves as gateway for Hippocampus, functions as a network for memory, spatial navigation & perception of time)
- **Fornicate Gyrus** = Cingulate + Parahippocampal Gyrus
- **Orbitofrontal Cortex** (prefrontal cortex region involved in cognitive processing & decision making)



Major Nuclei

- **Amygdala** (@ anterior medial tip of hippocampus proper, key role in emotion processing)
- Hypothalamus (including **mammillary body** relays amygdala & hippocampus → thalamus)
- **Anterior Thalamus Nucleus** (receives input from the mammillary body and projects → cingulate gyrus)

Major Fibre Tracts

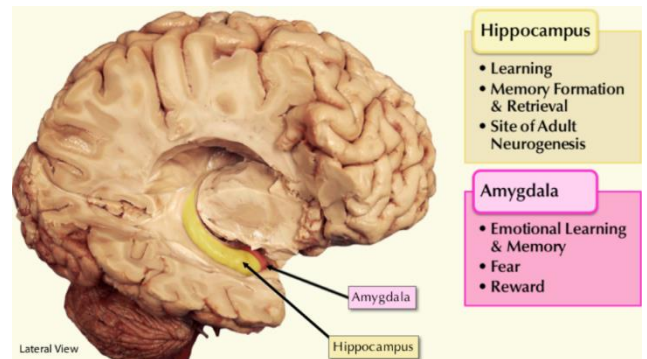
- **Fornix** (major output tract connecting the hippocampus → diencephalon/ basal forebrain)
- **Fornical (Hippocampal) Commissure** (connects fornices)
- **Cingulum** (connects cingulate cortex → parahippocampal gyrus, surrounds corpus callosum)
- **Uncinate Fascicle** (connects hippocampal formation & amygdala → orbitofrontal cortex)

General Function

- Learning & Memory
- Control of Emotions & Instinctive Behaviour
- Analyses Stimuli for Emotional Significance
- Stores Emotional Memory
- Tags Sensory Input w/ Emotional Component
- Impacts Cognitive Responses that is require for normal cognitive Social Behaviour & Survival

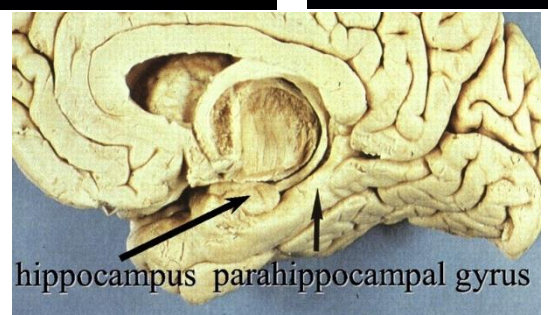
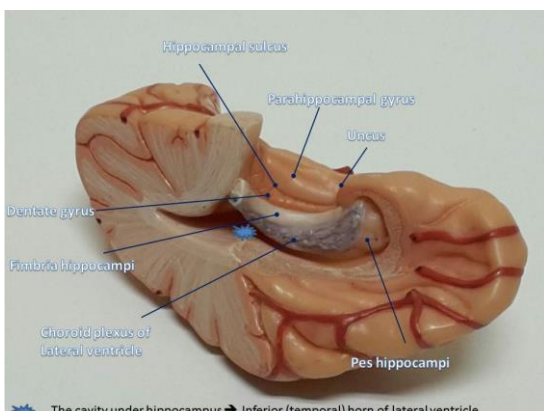
Hippocampus FORMATION Function

- Converts short-term memory from prefrontal cortex into long-term memory
- Memory may contain 3 components:
 - o Verbal (posterior parietal cortex & Broca's Area)
 - o Visual (frontal cortex)
 - o Spatial (prefrontal subregions)
- Bilateral Removal: patient retains intact long-term, skilled memory & short-term memory but unable to form new memories (transfer short-term to long-term)



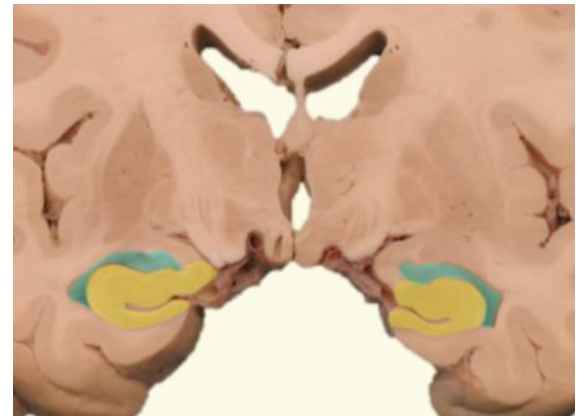
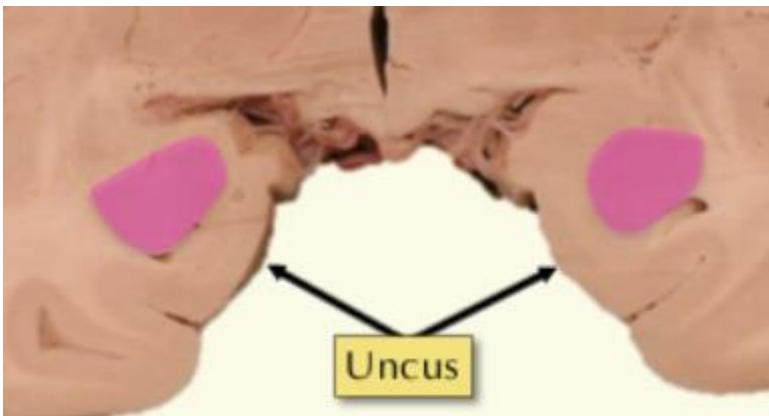
HIPPOCAMPUS PROPER

- Located deep temporal lobe on the **Inferior Floor** of the **Inferior Horn** (shaped like a seahorse)
 - o Deals w/ Memory Formation & Retrieval
 - o Possesses **place neurones** for spatial memory & navigation along w/ **time neurones** for flow of events



AMYGDALA

- Amygdala situated @ Anterior, Medial end of the Hippocampus Proper, Inferior to Caudate Nucleus's Tail and deep to Uncus. Positioned @ the End of the Inferior Horn
 - o Involved in Emotional Learning, Memory, Fear & Reward Modulation
 - o Bilateral Damage will cause emotional changes (i.e. reduced fear in dangerous stimuli)
 - o Can trigger 'Flight OR Fight' response in hypothalamus (Limbic Loop w/in sensory-motor loop)

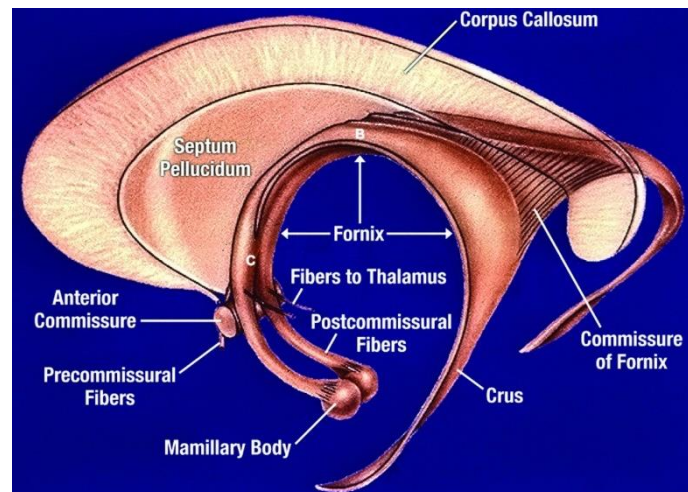


FORNIX

- Hippocampus's Main Efferent Pathway → Thalamus in a C-shaped formation, located @ Roof of 3rd Ventricle
- Divided into four portions
 - o Fimbria (connection to hippo)
 - o Crus
 - o Fornical Commissure (connects both sides)
 - o Body
 - o Columns (penetrates hypothalamus before terminating in the basal forebrain)

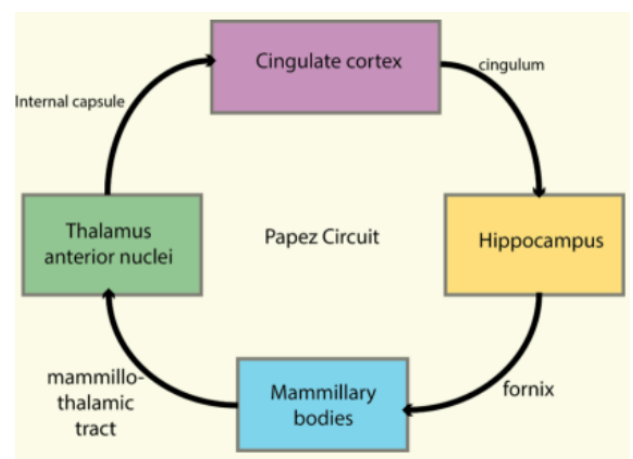
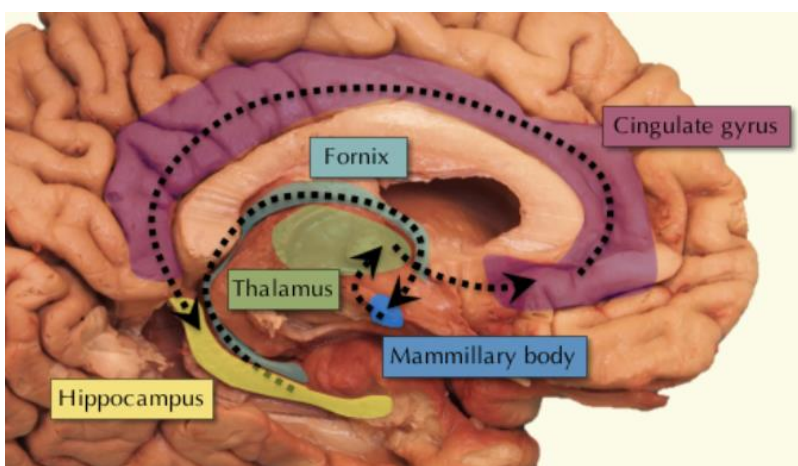
*Anterior Commissure @ anterior end of the Fornix

*Septum Pellucidum spans between the Corpus Callosum & Fornix, serving as a vertical membrane to separate the anterior horns of lateral ventricles



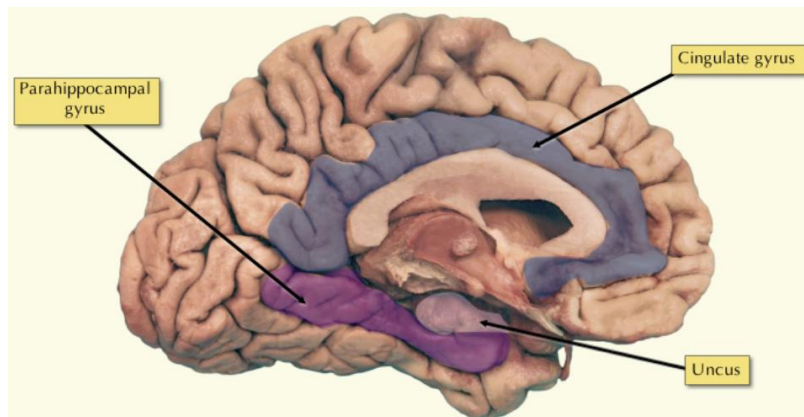
PAPEZ (Limbic) CIRCUIT

1. Hippocampus → Mammillary Bodies (via Fornix)
2. Mammillothalamic Tract → Anterior Nucleus
3. Thalamus's Anterior nucleus → Cingulate Cortex (via Internal Capsule's Thalamo-cortical Tract)
4. Cingulate Cortex → Entorhinal Cortex, then Dentate Gyrus and finally ending @ the Hippocampus (via the Cingulum, an association tract w/in the cingulate cortex that surrounds basal forebrain)



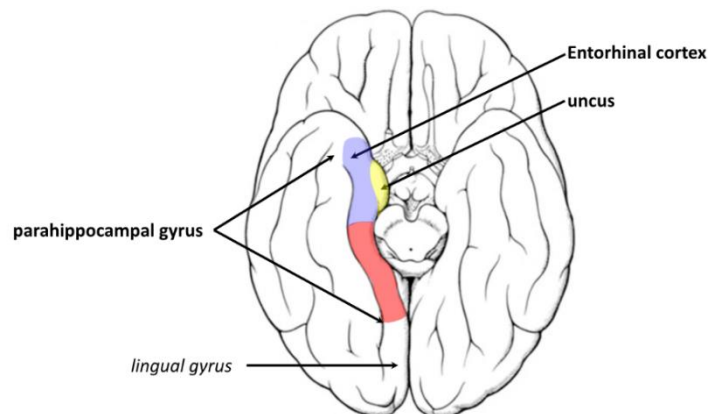
LIMBIC LOBE

- Ring of cortex spanning across medial frontal, parietal & temporal lobes involves
 - o Cingulate Gyri
 - o Parahippocampal Gyri (just lateral to hippocampus proper & deep to the inferior temporal gyrus, continues posteriorly as the **Lingual Gyrus**)
 - o **Uncus** (houses **primary olfactory cortex** that provides input to parahippocampal)



ENTORHINAL CORTEX

- @ anterior portion of the parahippocampal gyrus, lateral to the uncus
- Essential to the development of learning, **memory** & **spatial navigation**
- Gateway of Input from Parahippocampus → Hippocampus

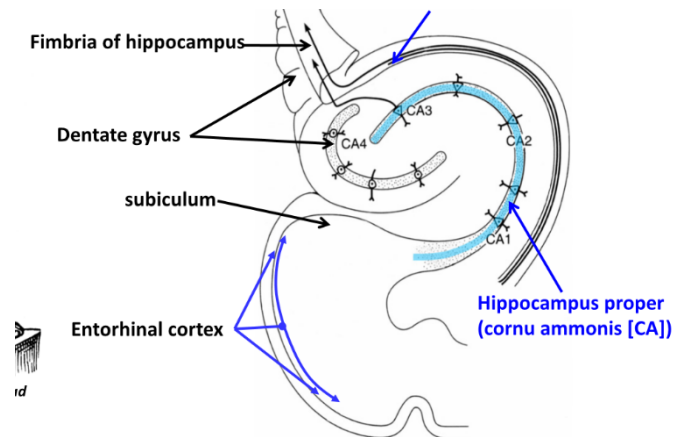
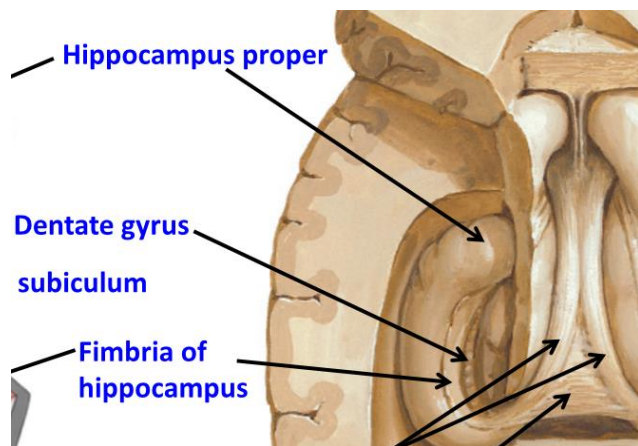


UNCUS

- Houses **Primary Olfactory Cortex** so connections between emotional memories & smell are prominent
- Lies w/in the **Semilunar Gyrus** in the Temporal Lobe
- Medial to Entorhinal & Lateral to Mammillary Bodies

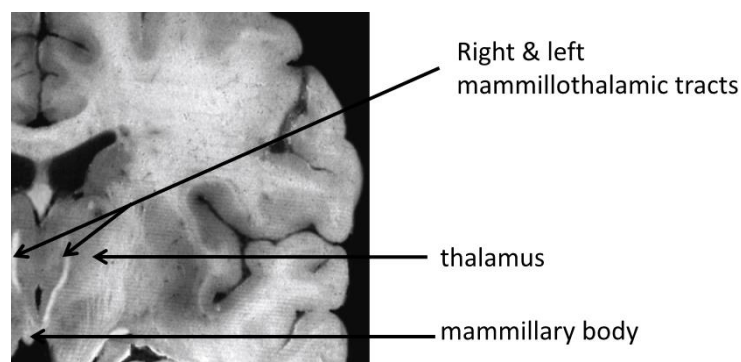
DENTATE GYRUS & SUBICULUM

- Structures hidden deep to parahippocampus w/in the U-shaped folds of the Hippocampus Proper (also named **Cornu Ammonis/ Ammon's Horn**)
- Dentate gyrus exists as slightly furry structure adjacent to fimbria, only site of **adult neurogenesis**
- **Alveus** is a **fibre tract** of the Hippocampus that **enters the Fimbria** to become the Fornix



MAMMILLARY BODIES

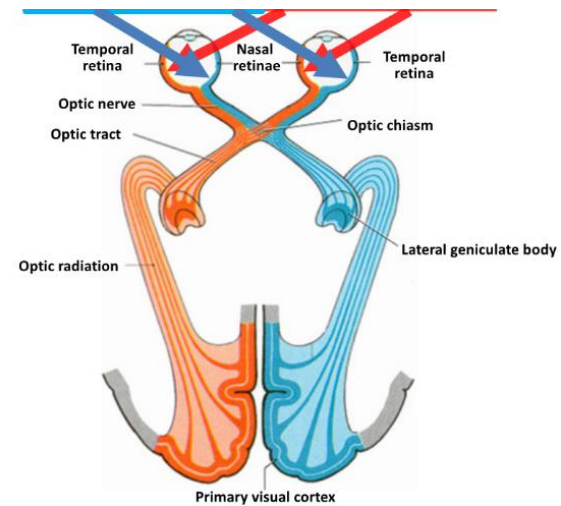
- **Mammillothalamic tracts** piercing the sides of the thalamus
- Small round bodies just posterior the optic chiasm
- **Wernicke- Korsakoff Syndrome** is the degeneration of the mammillary bodies due to a **B1 vitamin deficiency** (possibly due to chronic alcoholism or severe malnutrition) causing **memory loss**



CRANIAL NERVES

OPTIC N (CNII)

- Receptor = rods & cones
 - 1st Neuron = **bipolar cell** (special sense)
 - 2nd Neuron = **sensory ganglion** (axons extend out to become the optic nerve)
- Optic N = fibres from only one eye
- Optic Tract = **Contralateral Visual Field** (OR Ipsilateral Side)
- Optic N exits Optic fibres from both eyes
- Decussates @ Optic Chiasm to unify **nasal** (facing nose) & **temporal retinas** (facing away)
- Visual information @ the Primary Visual Cortex
- Reflexes located @ Superior Colliculus

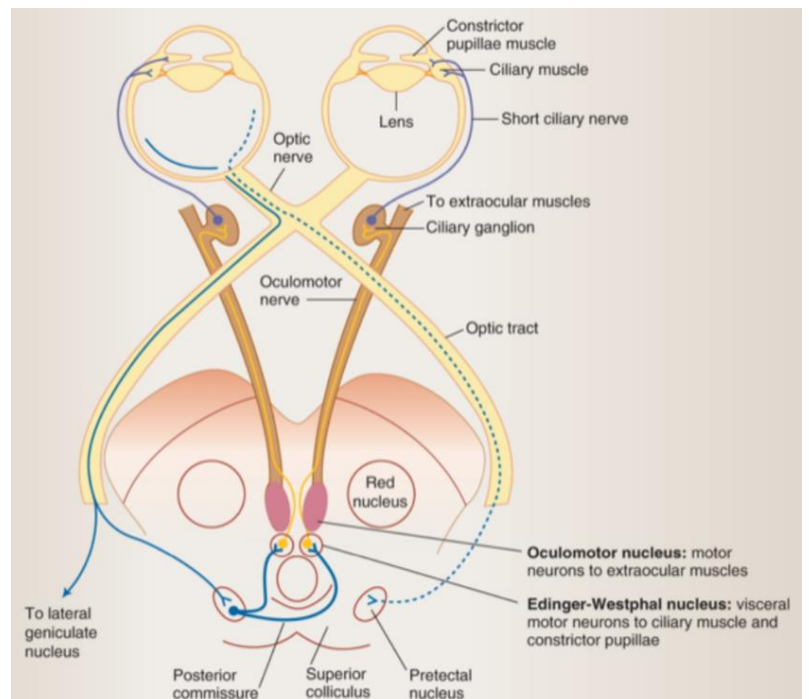
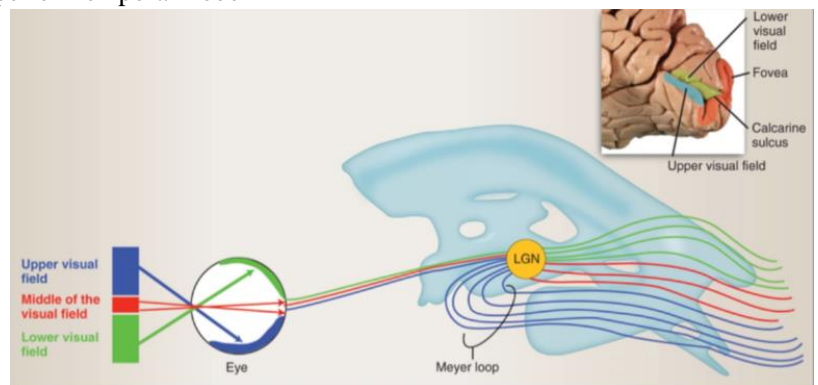


RETINOTOPY

- Visual Field is divided into three portions: Upper, Middle & Lower. Each of which have a specific pathway through the LGN, thru **Optic Radiation** towards Primary Visual Cortex in the **Calcarine Sulcus**
- **Lower** Visual field is aligned **superiorly** after LGN @ Inferior Parietal Lobe
- **Superior** Visual field is carried **inferiorly** @ Superior Temporal Lobe

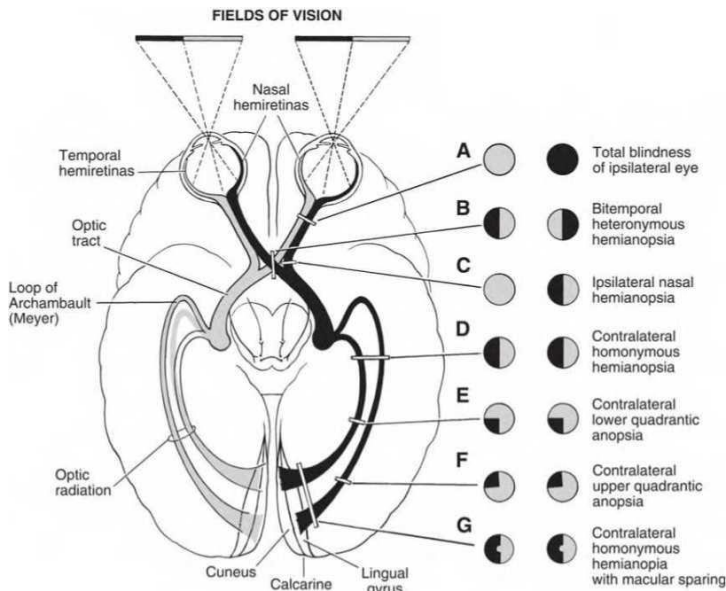
Optic Pathway

1. Special Sensory (Bipolar Neuron) Receptors
2. Retinal Ganglion (still in eye)
2. Optic Nerve
3. Optic Chiasm (intermixing of retinae axons)
4. Optic Tract (carrying axons from Contralateral Visual Field)
5. Lateral Geniculate Nucleus (LGN)
 - a. **COLLATERALS**
 - b. **Pretectal Nucleus** (Superior Colliculus)
 - c. **Edinger-Westphal Nucleus** (CNIII parasympathetic nuclei)
 - d. Oculomotor Nuclei (extends out preganglionic axons)
 - e. **Ciliary Ganglion**
 - f. Ciliary Body & Constrictor Pupillae
6. **Retrolenticular** portion of Internal Capsule
7. **Optic Radiation**
8. Calcarine Sulcus
9. **Gennari Stripe** (Primary Visual Cortex)



Order of Synapsing

1. Bipolar Sensory Receptors
2. Retinal Ganglion
3. Thalamus
4. Primary Visual Cortex



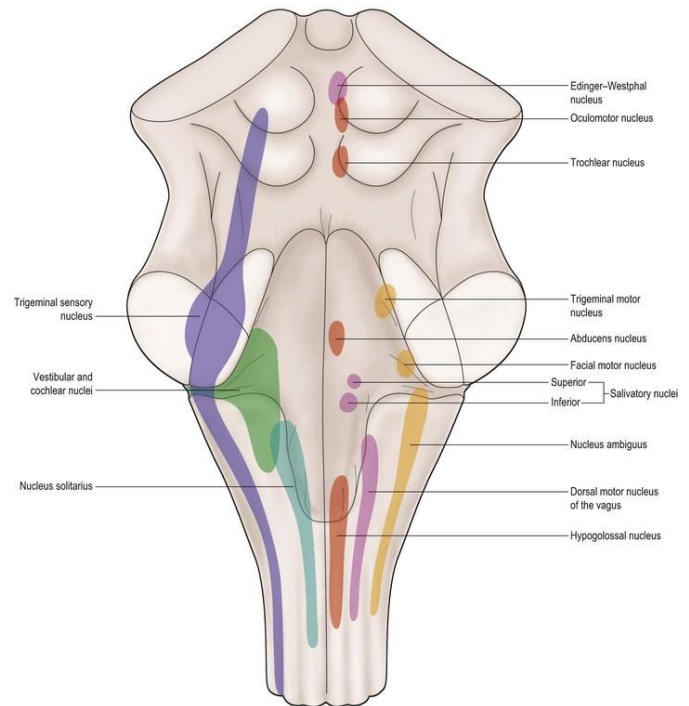
Optic Pathway Lesions

- A. Optic N → **Monocular Vision** Loss: complete loss of vision from one side
- B. Centre of Optic Chiasm → **Bitemporal** Hemianopia: Loss of **both temporal retinae's** visual field
- C. Side of Optic Chiasm → **Ipsilateral Nasal Hemianopia**: Loss of **nasal retinae's** visual field on ipsilateral side
- D. Optic Radiation → **Contralateral Homonymous** Hemianopia: Loss of vision from of the same pattern in each eye **contralateral** to the **location of the lesion**
- E. Inferior Fibres → **Contralateral Superior Quadrantanopia**: Loss of View from Superior Quarter of Vision
- F. Superior Fibres → **Contralateral Inferior Quadrantanopia**: Loss of View from Superior Quarter of Vision

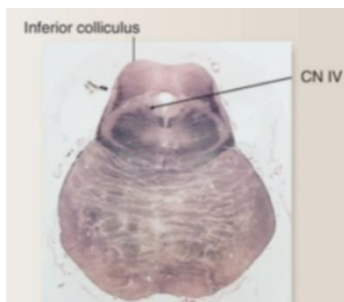
- *Hemianopia = loss of half the visual field
- *Quadrantanopia = loss of a quarter of the visual field
- *Homonymous = same pattern in each eye

OCULOMOTOR N (CNIII)

- Somatic Functions
 1. Superior, Inferior & Medial Rectus
 2. Inferior Oblique
 3. Levator Palpebrae Superioris
- Sympathetic Functions
 1. Constrictor Pupillae
 2. Ciliary Body
- Somatic Nucleus
 1. Anterior to PAG @ rostral midbrain (in tegmentum) on **level of Superior Colliculus**
 2. @ rostral end of MLF
 3. Fibres travels anteriorly to emerge from the **interpeduncular fossa** as the **CNIII nerve**
- Parasympathetic Nucleus (Edinger-Westphal Nucleus)
 1. Posterior & slightly superior to somatic nucleus in PAG
 2. Preganglionic axons travels w/ somatic axons thru the CNIII nerve to the ciliary ganglion



- *parasympathetic nerve is situated superior to the somatic neurons, so it is more at risk to compression & it is the first to functionally fail due to CNIII compression w/ a continually dilated pupil as a symptom
- *cranial nerves are **only located @ tegmentum**

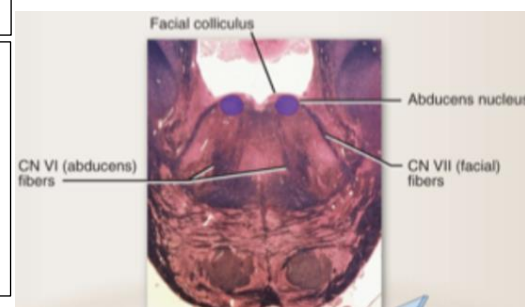


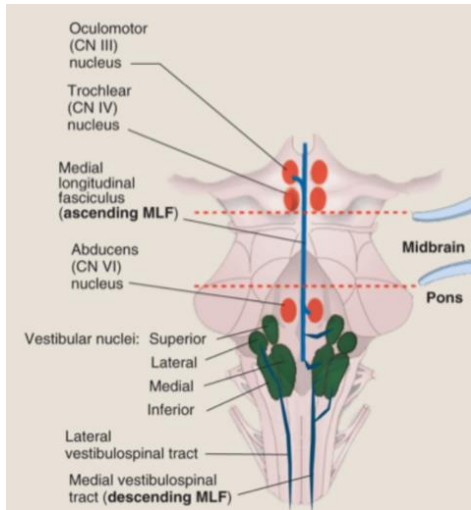
TROCHLEAR N (CNIV)

- Innervates Superior Oblique (of eye)
- Midbrain @ level of **Inferior Colliculus** near midline
- Axons exit dorsally (smallest cranial nerve)
- Emerges posteriorly (only cranial nerve)

ABDUCENS N (CNVI)

- Near midline of caudal pons @ on level of **Facial Colliculus**
- Axons of facial nerve travel around the abducens nucleus to produce the 'facial colliculus'
- Exits Brainstem @ **Pontomedullary Junction**
- Exits the skull through the **Superior Orbital Fissure**





MEDIAL LONGITUDINAL FASCICULUS (MLF)

- A heavy myelinated tract that connects oculomotor (CNIII), trochlear (CNIV), abducens (CNVI) & vestibular (CNVIII) nuclei to efficiently coordinate eye movement in conjunction w/ head movement (monitored by vestibular nuclei)
- Anterior to PAG, cerebral aqueduct & 4th vent.

TRIGEMINAL N (CNV)

1. Ophthalmic (V1): sensory forehead, eyelids & upper nasal cavity
 2. Maxillary (V2): sensory midface, lower nasal cavity, upper teeth, paranasal sinus
 3. Mandibular (V3): sensory lower face, motor muscles of mastication
- Before splitting into branches, it exits as the trigeminal (semilunar) ganglion, containing pseudounipolar sensory neurons (same as the neurons in Dorsal Root Ganglion)
 - Consists of 3 sensory nuclei & 1 somatic nuclei:

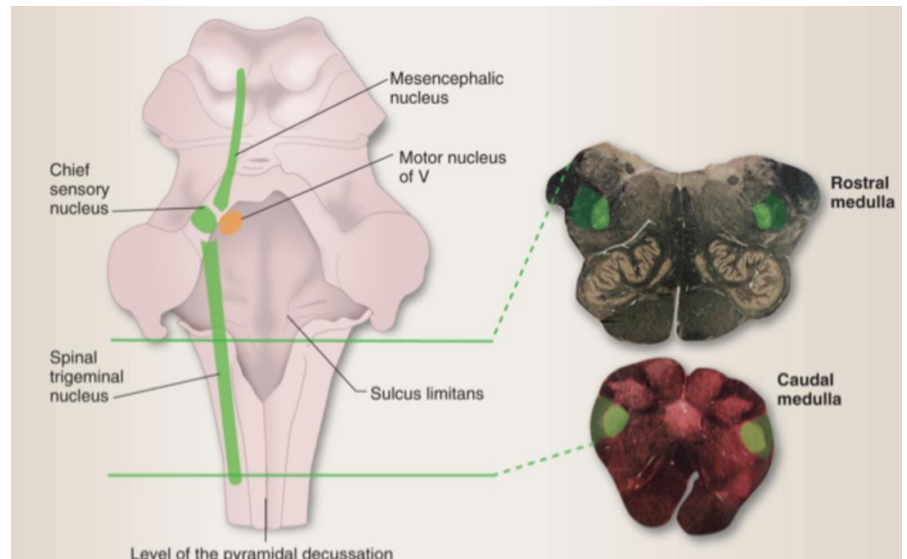
Mesencephalic (non-conscious proprioception): extends superiorly from SCP through the midbrain

Chief (conscious proprioception, touch): located @ the SCP

Spinal (pain modulation): extends down from SCP through the lateral margins of the medulla posterior to the Inferior Olivary Complex

Somatic Nuclei (innervation of mastication muscles): medial to Chief Nuclei

*Trigeminal ganglion rests upon the Foramen Lacerum on the middle cranial fossa



FACIAL N (CNVII)

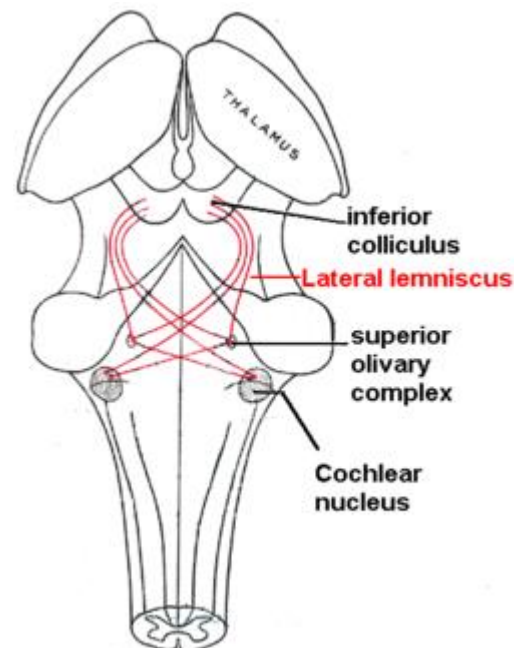
- Motor: Facial Expression
- Sensory: Anterior 2/3 tongue (*however tongue pain is sensed by trigeminal nerve)
- Parasympathetic Function: Lacrimal Gland (tears), Submandibular & Sublingual Salivary Glands
- Located @ caudal pons where its axons loop around abducens nucleus to form the Facial Colliculus
- Emerges lateral @ the pontomedullary junction

VESTIBULAR Nuclei (CNVIII)

- Located w/in the vestibular ganglion in the internal auditory canal innervating the semicircular ducts, utricle & saccules
- Emerges at lateral margin of pontomedullary junction
- Receives inputs from the cerebellum, spinal cord, cortex & MLF (CNIII, IV & VI)

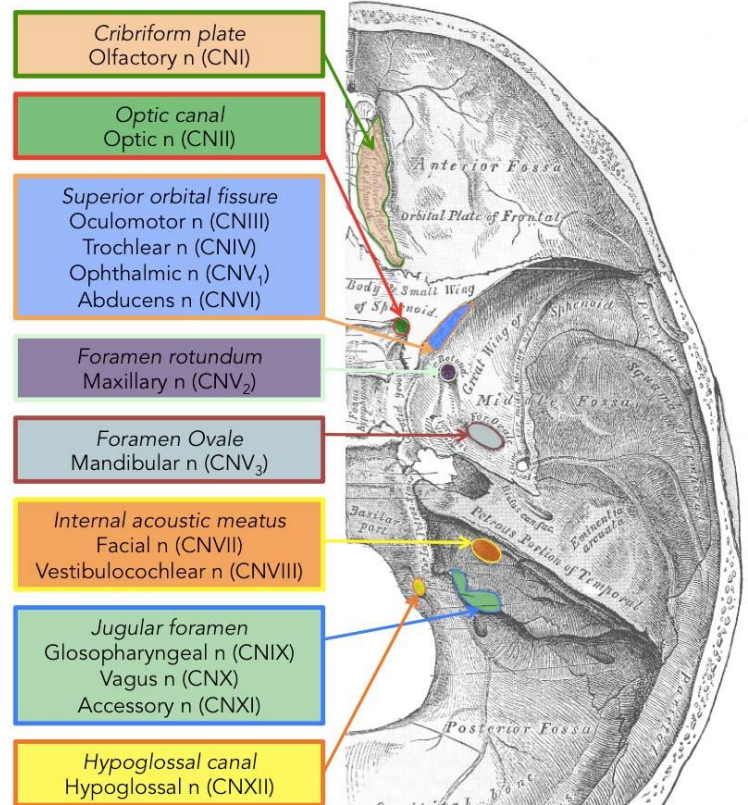
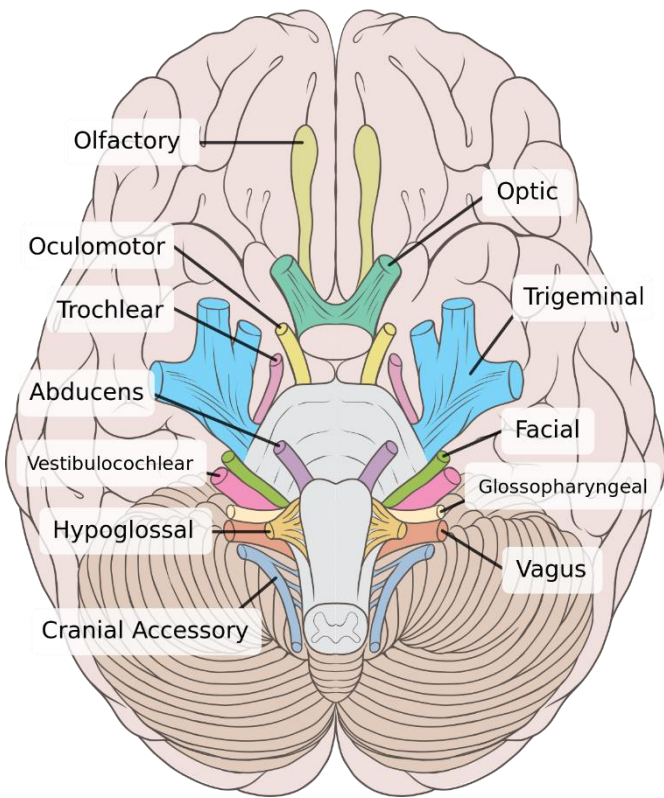
COCHLEAR Nuclei (CNVIII)

1. Spinal Ganglion (bipolar cells) in Cochlear Duct → Vestibulocochlear N → Cochlear Nuclei (located @ rostral medulla, lateral & slightly inferior to vestibular nuclei)
2. Lateral Lemniscus () → Superior Olivary Complex (centre of ascending pathways dedicated to auditory axons) → Contralateral Inferior Colliculus → Brachium → MGN
3. Heschl's Gyri/ Transverse Temporal Gyri



Cranial Nerve Summary

	Cranial Nerve	Site of Exit/ Entry	Site of Attachment to Brain	Nuclei Location
I	Olfactory	Cribriform Plate	Olfactory Bulb, Telencephalon	Telencephalon
II	Optic	Optic Canal	Diencephalon	Optic Chiasm
III	Oculomotor (midbrain)	Superior Orbital Fissure	Superior Colliculus (interpeduncular fossa)	Edinger-Westphal Nuclei = PAG Somatic Nuclei = anterior to PAG
IV	Trochlear (midbrain)		Inferior Colliculus (exits dorsal)	Posterior to Inf. Colliculus
V	Trigeminal (pons) Ophthalmic (V1) -	Foramen Rotundum Ovale	SCP of Pons (three nuclei: mesencephalic, chief & spinal)	Trigeminal (Semilunar) Ganglion
	Maxillary (V2)			
	Mandibular (V3)			
VI	Abducens (pons)	Superior Orbital Fissure	Pontomedullary Junction	Posterior to Facial Colliculus
VII	Facial (pons)	Internal Acoustic Meatus + Stylomastoid Foramen		Facial Colliculus
VIII	Vestibulocochlear (pons/ medulla)	Internal Acoustic Meatus		Caudal Pons/ Rostral Medulla @ Lateral Margins
IX	Glossopharyngeal	Jugular Foramen	Medulla	
X	Vagus			
XI	Accessory			
XII	Hypoglossal			



CORNEAL BLINK Reflex

“Protects against foreign particles by removing them thru blinking (& distributing lubricant across eye)”

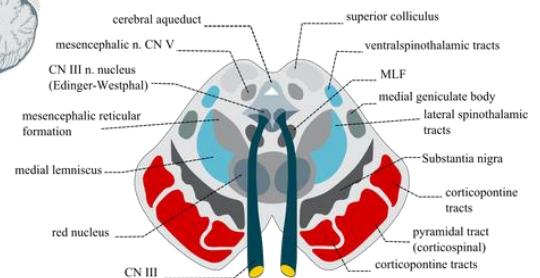
1. **Ophthalmic** Branch of CNV is activated by touch
2. **Chief & Spinal** Nuclei of CNV is stimulated
3. **Interneurons** synapse **bilaterally** w/ Facial Nuclei
4. Mobilises Orbicularis Oculi to close eye



PUPILLARY LIGHT Reflex (direct & consensual)

“Shining Light on Eyes”

1. Stimulation of CNII fibres (light) in both eyes (nasal retinae cross-over)
2. Projects to LGN with collaterals to the Superior Colliculus to the **Pretectal Nuclei**



3. Pretectal neurons project **bilaterally** thru the **Posterior Commissure** to the Edinger-Westphal nuclei
4. Activates Constrictor Pupillae to contract and restrict amount of light entering eye (thru postganglionic parasympathetic axons)

Eye Movement Coordination

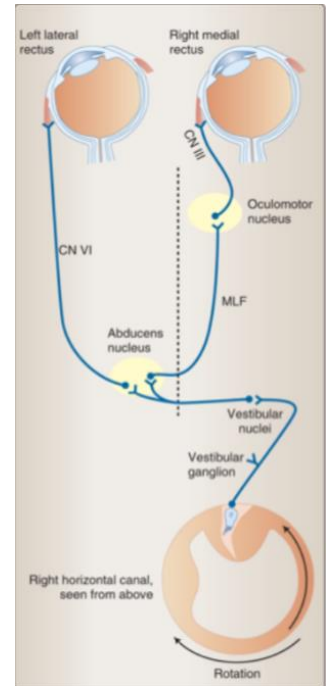
Saccade: “fast rapid movement of the eyes so that different images fall upon the fovea”

1. **Frontal Eye Field (FEF):** provides the decision from the frontal cortex
 2. **Supplementary Eye Field (SEF):** centre for movement input to eyes
 3. **Parietal Eye Field (PEF):** allocated attention to external stimuli
 4. Projects also to **Superior Colliculus** before to the **PPRF** (paramedian pontine reticular formation)
- Smooth Pursuit: used to keep same image on fovea w/ coordination against movement of object OR of oneself (feedback from vestibular, cortical/visual & cerebellar to coordinate movement)

VESSTIBULO-OCULAR Reflex (VOR)

“Fast reflex keeping image focused on fovea by generating fast eye movements to compensate for fast head movements” (adjusts saccades but cerebellar input can cancel VOR)

1. **Vestibular Apparatus** (ipsilateral vestibular nuclei @ pontomedullary junction) detects head movement
2. Projection to **contralateral abducens** nuclei (for contralateral lateral rectus) whilst MLF links to **ipsilateral oculomotor** nucleus (for ipsilateral medial rectus)

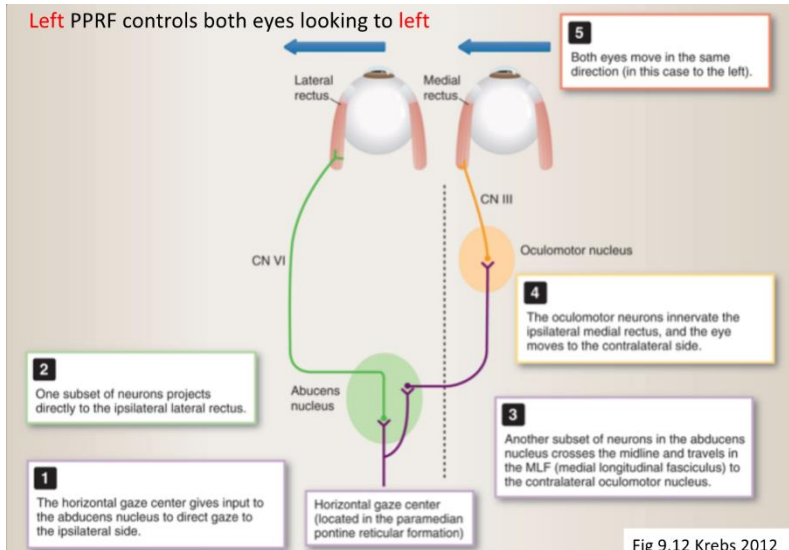


ACCOMODATION

“Focusing on Close Image”

- **Convergence** (to focus on close object)
- ↑ Curvature of Lens (increases refractive power to focus image on fovea)
- Constricted Pupillae (reduces blur & increases depth of field)

Process: CNII afferents → bilateral LGN → Primary Visual Cortex → (integrated @) Visual Association Cortex → Pretectal Area → Oculomotor & Edinger-Westphal Nuclei to produce ‘accommodation’



Horizontal Conjugate Eye Movements

- **Horizontal Gaze Centre (HGC):** located @ **paramedian pontine reticular formation (PPRF)** coordinates eyes mvmts to follow an object on the horizontal plane

- HGC → **Ipsilateral Abducens** nuclei → MLF → **MLF** → **Contralateral Oculomotor** nucleus

