

# Examination of special sense

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## The Visual Pathway

1<sup>st</sup> order neuron: bipolar cells of the retina

2<sup>nd</sup> order neuron: ganglion cells of the retina

Their axons form the optic nerve. Both optic nerves join at the **optic chiasma**.

In optic chiasma: fibers from nasal 1/2 of retina (temporal field) decussate into the contralateral optic tract, while fibers from temporal 1/2 of retina (nasal field) pass without decussation.

Macular fibers partially decussate.

So, optic tract contains: **ipsilateral** retinal **temporal** fibers, **contralateral** retinal **nasal** fibers and **bilateral macular** fibers.

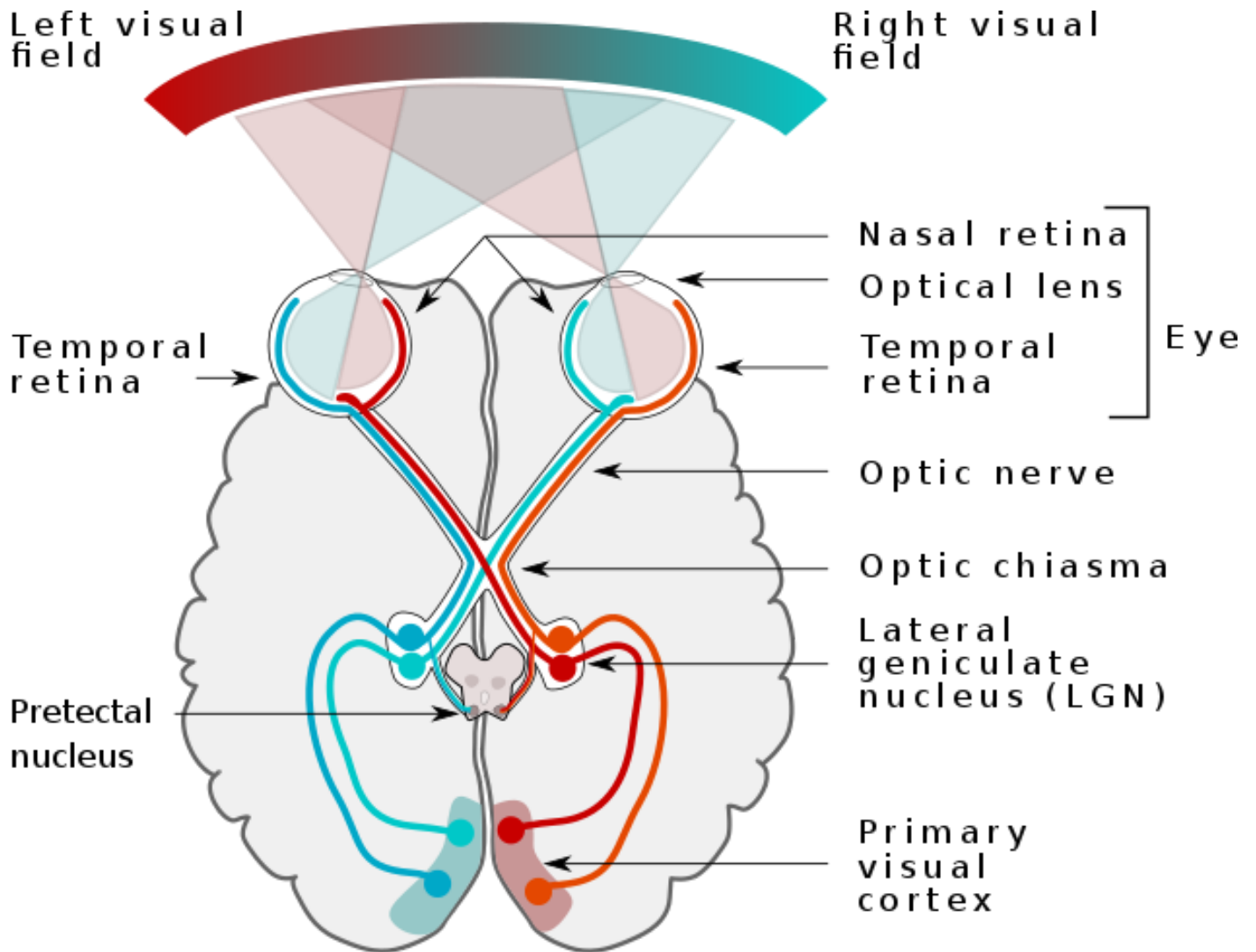
3<sup>rd</sup> order neuron: neurons of lateral geniculate body of thalamus

It's axons form the optic radiation

- Optic radiation passes through the retrolentiform part of internal capsule, dividing into 2 groups (dorsal and ventral group)

The visual area (17):

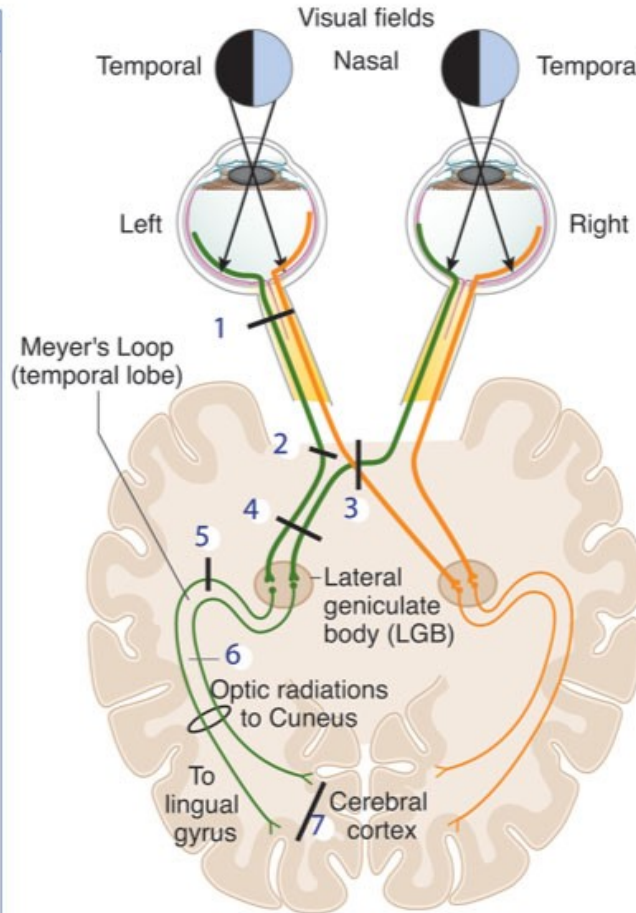
Located in the occipital lobe below the precalcarine sulcus and on either sides of postcalcarine sulcus, extending on occipital pole



## Lesions of Visual Pathway

- 1) Total lesion of optic nerve ~> **Anopia**
- 2) Lateral part of optic chiasma ~> **Nasal hemianopia**
- 3) Center of optic chiasma ~> **Bitemporal heteronymous hemianopia**
- 4) Optic tract ~> **homonymous hemianopia**
- 5) Lower (ventral) loop of optic radiation ~> **homonymous superior quadrantanopia**
- 6) Upper (dorsal) loop of optic radiation ~> **homonymous inferior quadrantanopia**
- 7) Total radiation lesion ~> **homonymous hemianopia with macular sparing**

Defects	
1	Anopia of left eye
2	Left nasal hemianopia
3	Bitemporal heteronymous hemianopia
4	Right homonymous hemianopia
5	Right homonymous superior quadrantanopia
6	Right homonymous inferior quadrantanopia
7	Right homonymous hemianopia with macular sparing



## Rinne and Weber test

**Conductive hearing loss** occurs when sound waves are unable to pass through the middle ear to the inner ear. This can be caused by problems in the ear canal, eardrum, or middle ear, such as:

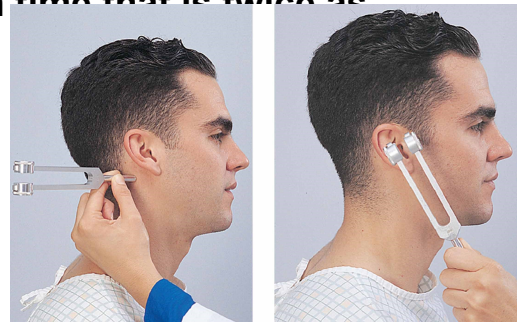
1. an infection
2. a buildup of earwax
3. a punctured eardrum
4. fluid in the middle ear
5. damage to the small bones within the middle ear

**Sensorineural hearing loss** occurs when there's damage to any part of the specialized nervous system of the ear. This includes the auditory

nerve, hair cells in the inner ear, and other parts of the cochlea. Ongoing exposure to loud noises and aging are common reasons for this type of hearing loss

## Rinne Test results

\* Normal hearing will show an air conduction time that is twice as long as the bone conduction time. In other words, you will hear the sound next to your ear twice as long as you will hear the sound behind your ear.



\* **If you have conductive hearing loss**, the bone conduction is heard longer than the air conduction sound.

\* **If you have sensorineural hearing loss**, air conduction is heard longer than bone conduction, but may not be twice as long.

## Interpretations of Rinne's Test

\* In a normal ear sound is conducted to the cochlear most efficiently via air conduction. Sound can also be transmitted to the cochlea, less efficiently, via bone

\* So...

1. If a patient can hear best when the tuning fork is in the air (**positive Rinne's**) then air conduction is better than bone conduction so there is no significant conductive hearing loss

~> Therefore in sensorineural hearing loss on the right, for example, Rinne's test should be positive on the right

2. If the patient can hear best when the tuning fork is on the mastoid (**negative Rinne's**) bone conduction is better than than air conduction, demonstrating a conductive hearing loss

## Weber Test results

- \* **Normal hearing** will produce equal sound in both ears.
- \* **Conductive loss** will cause the sound to be heard best in the abnormal ear.
- \* **Sensorineural loss** will cause the sound to be heard best in the normal ear.



## Interpretation of Weber's test

- \* Weber's test will 'lateralize', i.e. move to one side, with a relatively small amount of hearing loss (5dB)
- \* If a patient has a unilateral conductive hearing loss, the tuning fork sound will be heard louder in the deaf ear
- \* If a patient has a unilateral sensorineural hearing loss, the tuning fork sound will be heard louder in the normal ear
- \* In bilateral and symmetrical hearing loss of either type Weber's test will be normal

## Interpretation of Rinne's and Weber's tests

Test	Normal	Conductive Hearing Loss	Sensorineural Hearing Loss
Rinne's	Air louder than Bone (Rinne's Positive)	Bone louder than Air (Rinne's Negative)	Air louder than Bone (Rinne's false positive)
Weber's	Sound heard in midline	Sound heard in bad ear	Sound heard in good ear