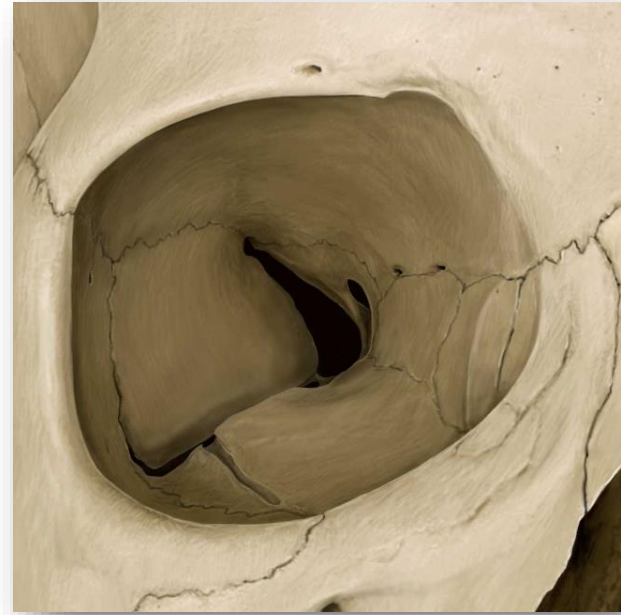
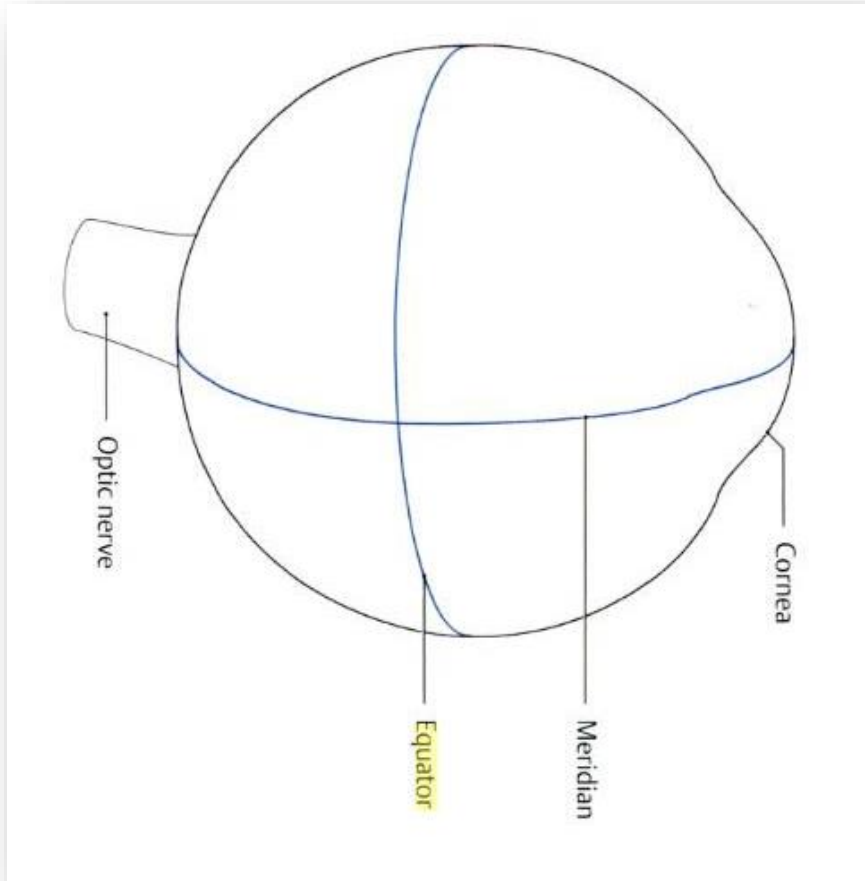


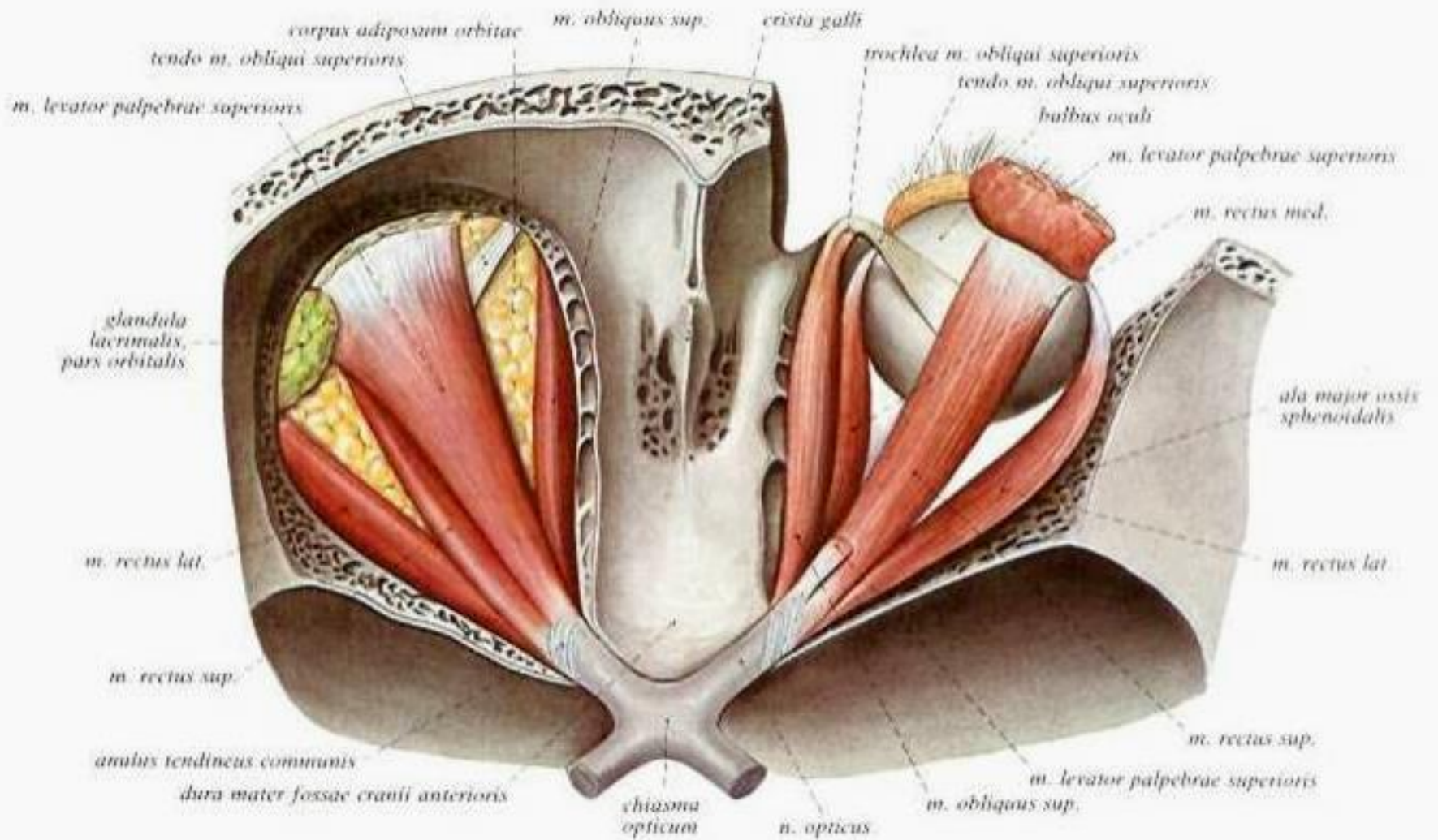


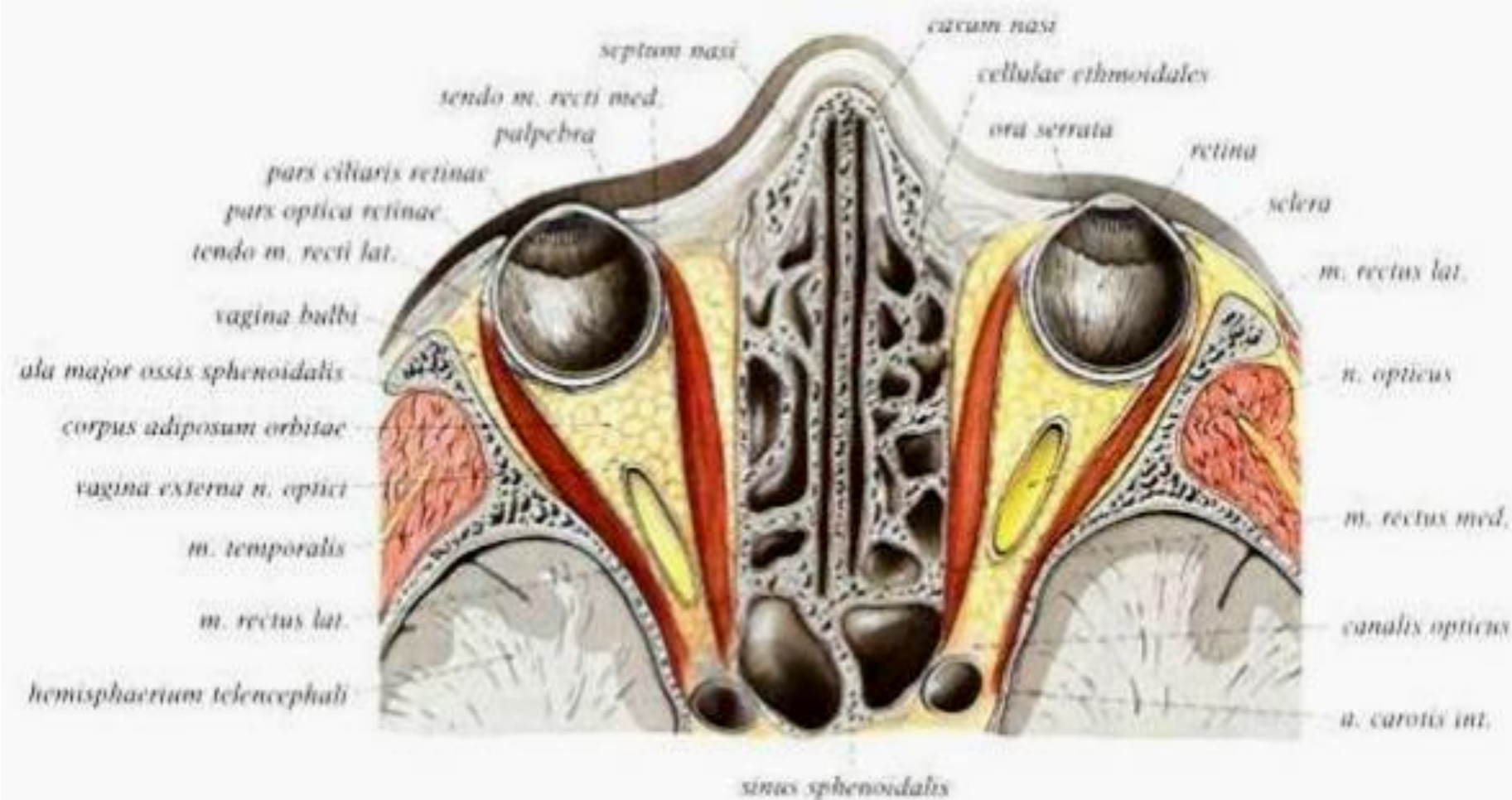
# Extraocular muscles and eye movements, conjugated eye movements, strabismus. 3D vision

Dr. Gábor GERBER

# Orbita

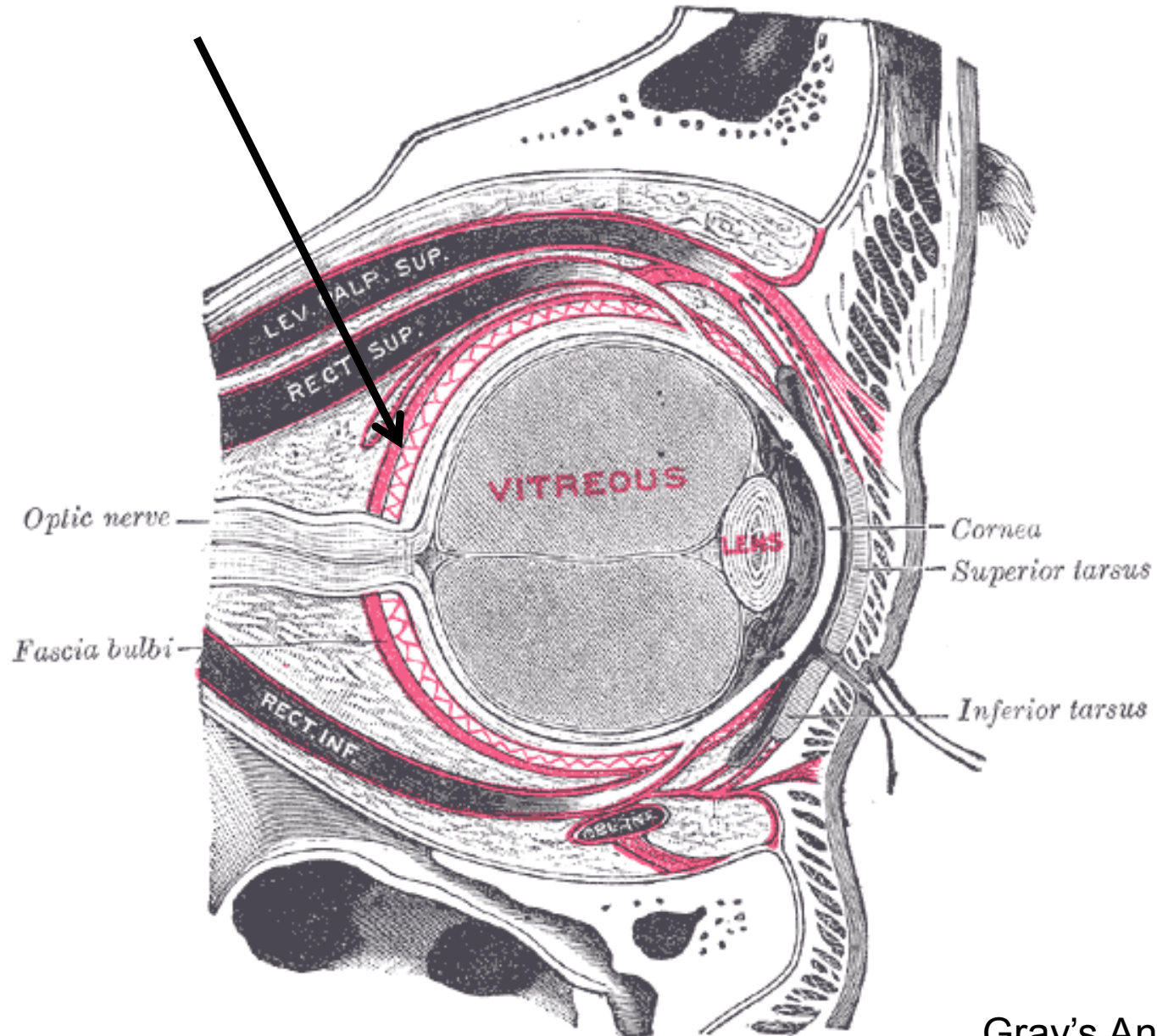


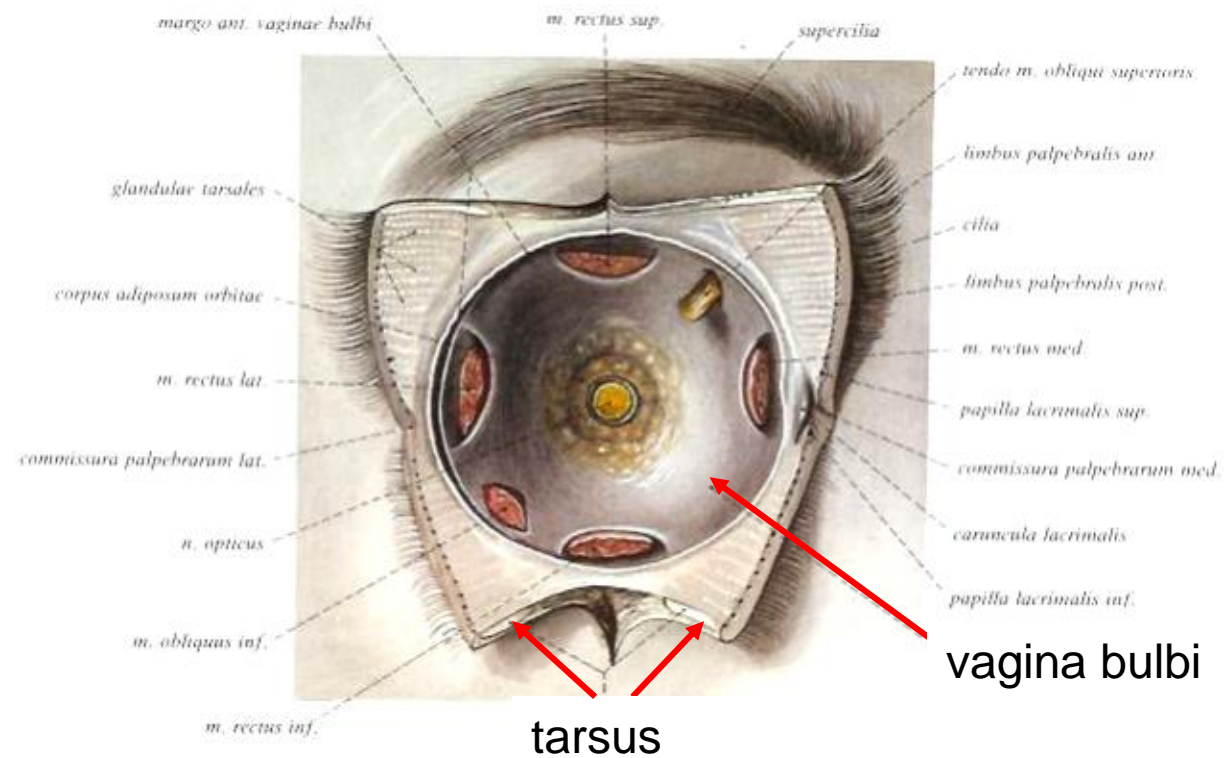
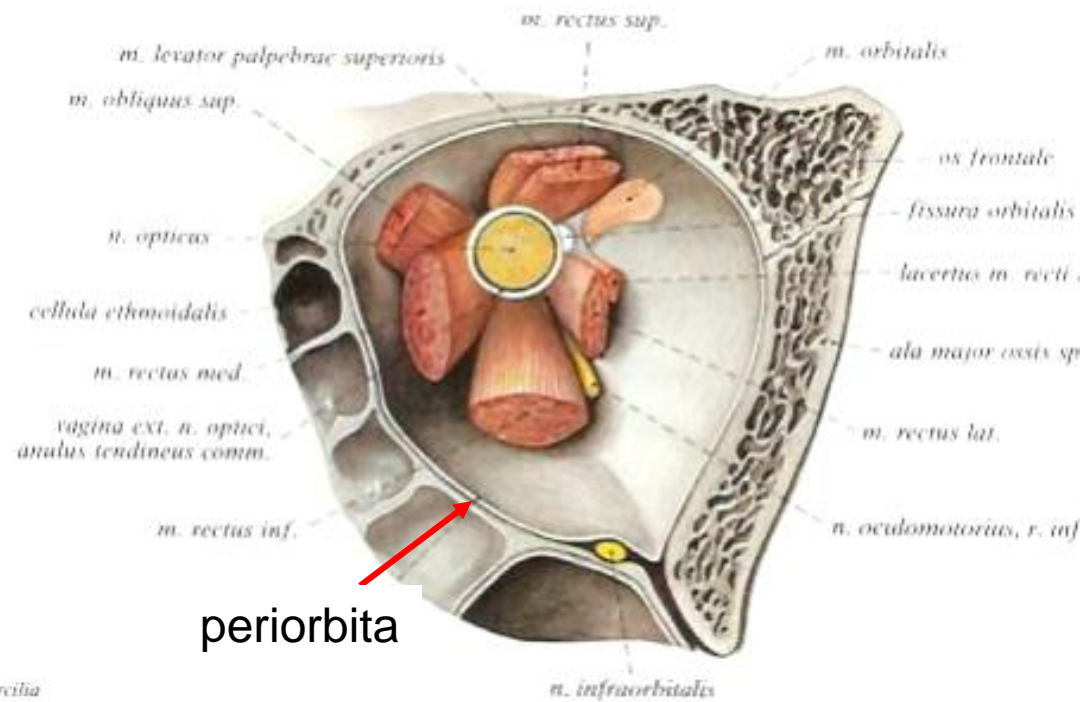




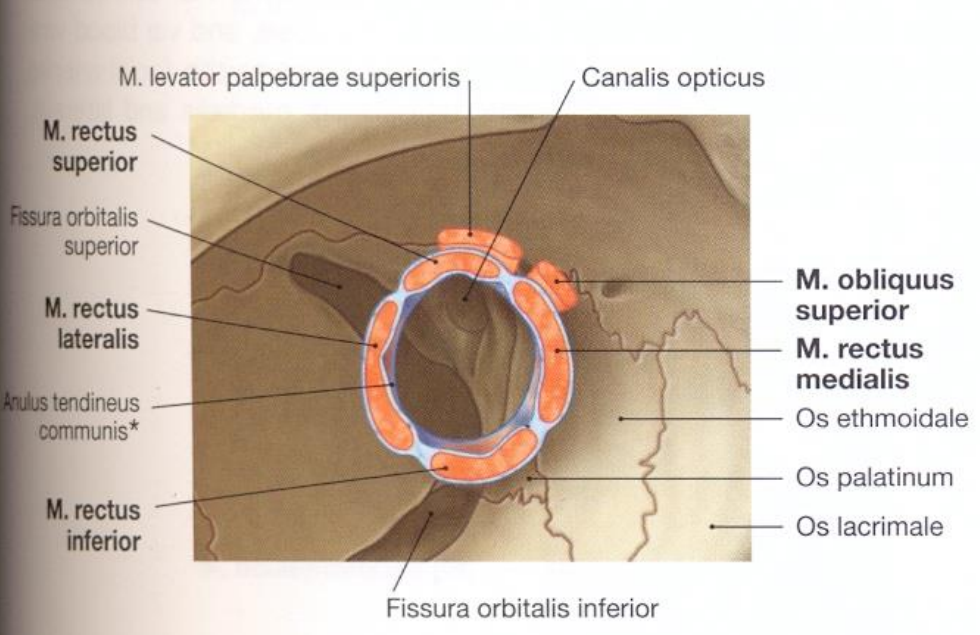
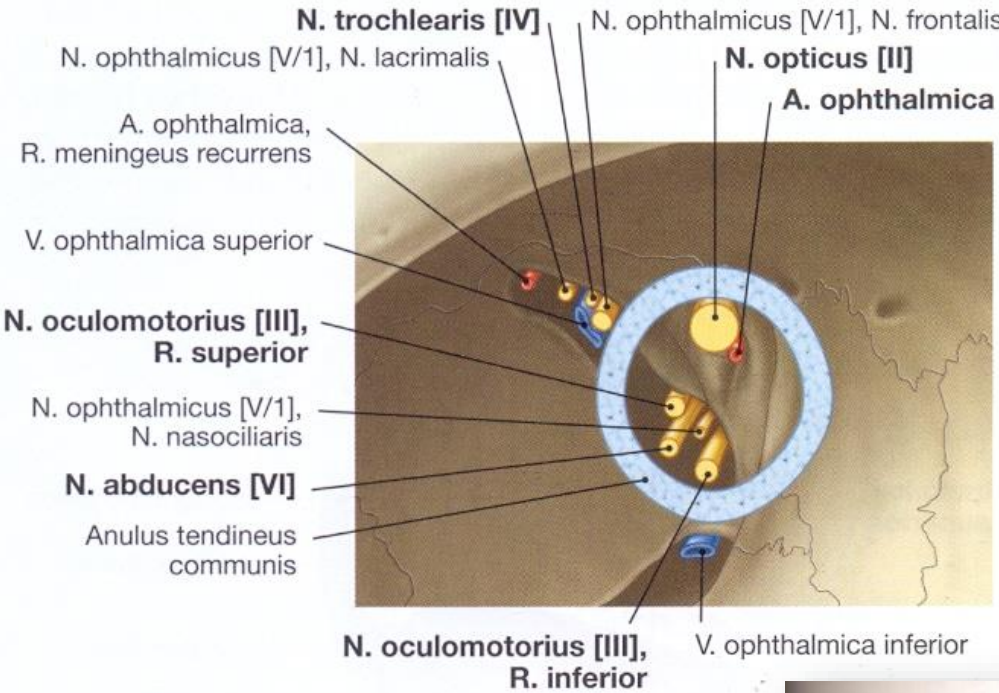


# Tenon's capsule (Vagina bulbi)



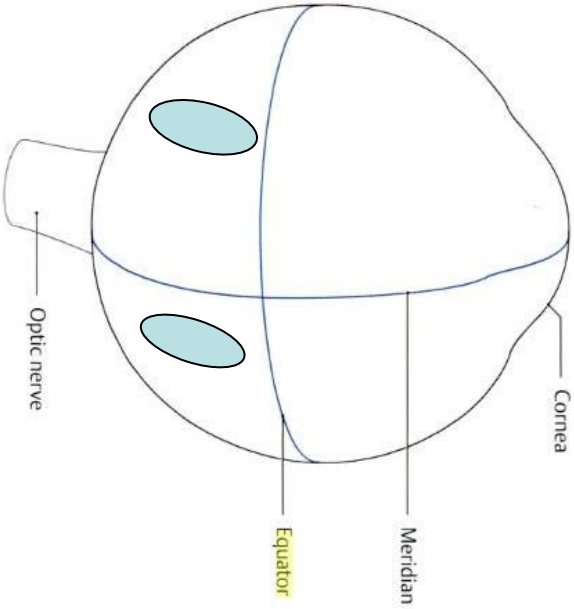
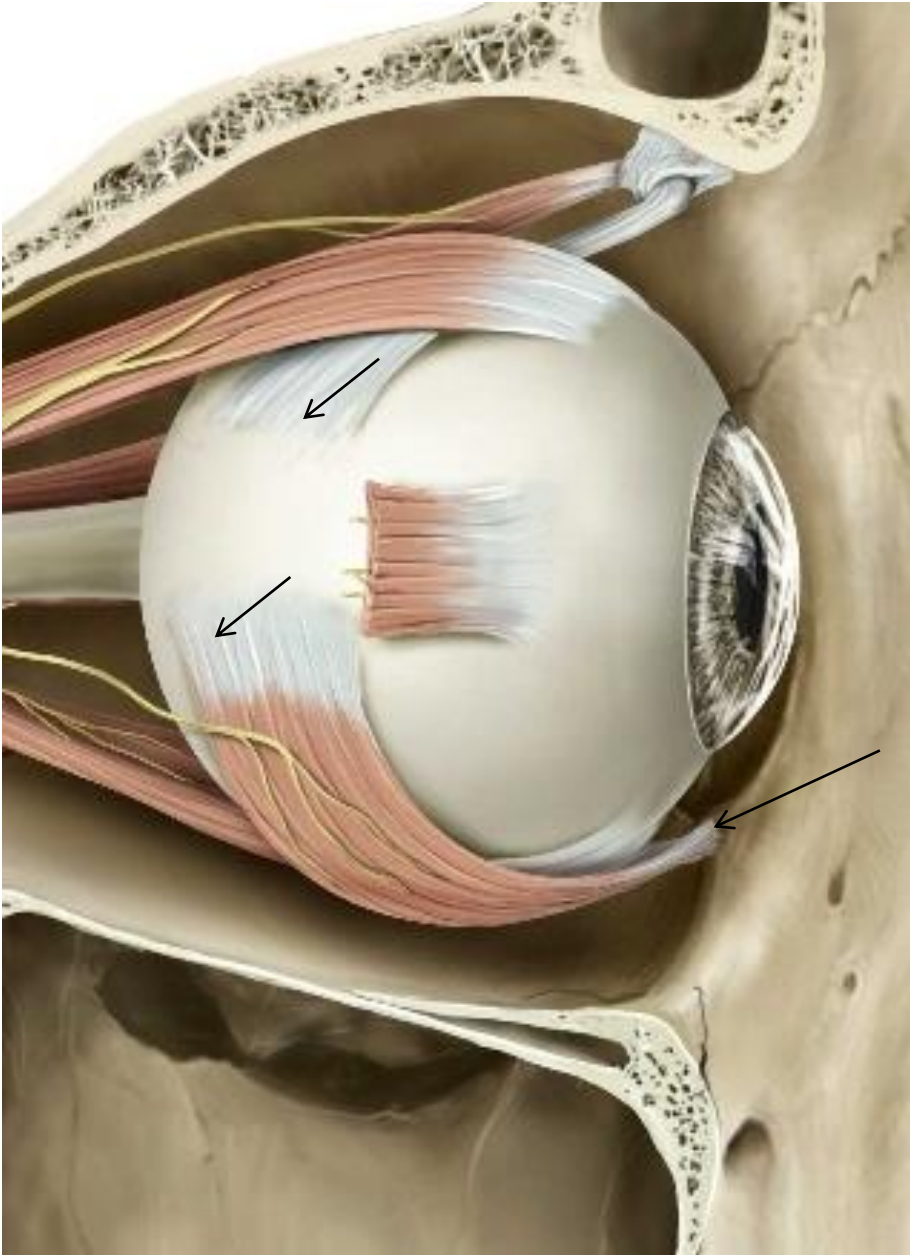


# Common annular tendinous ring

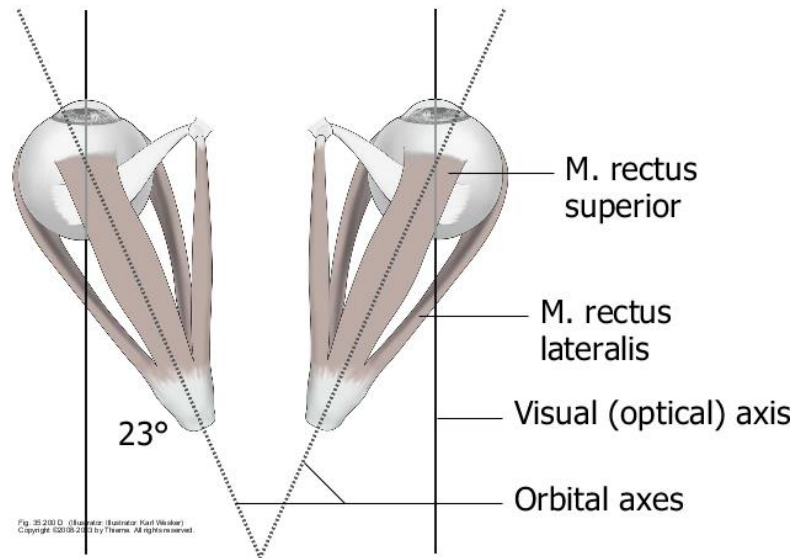
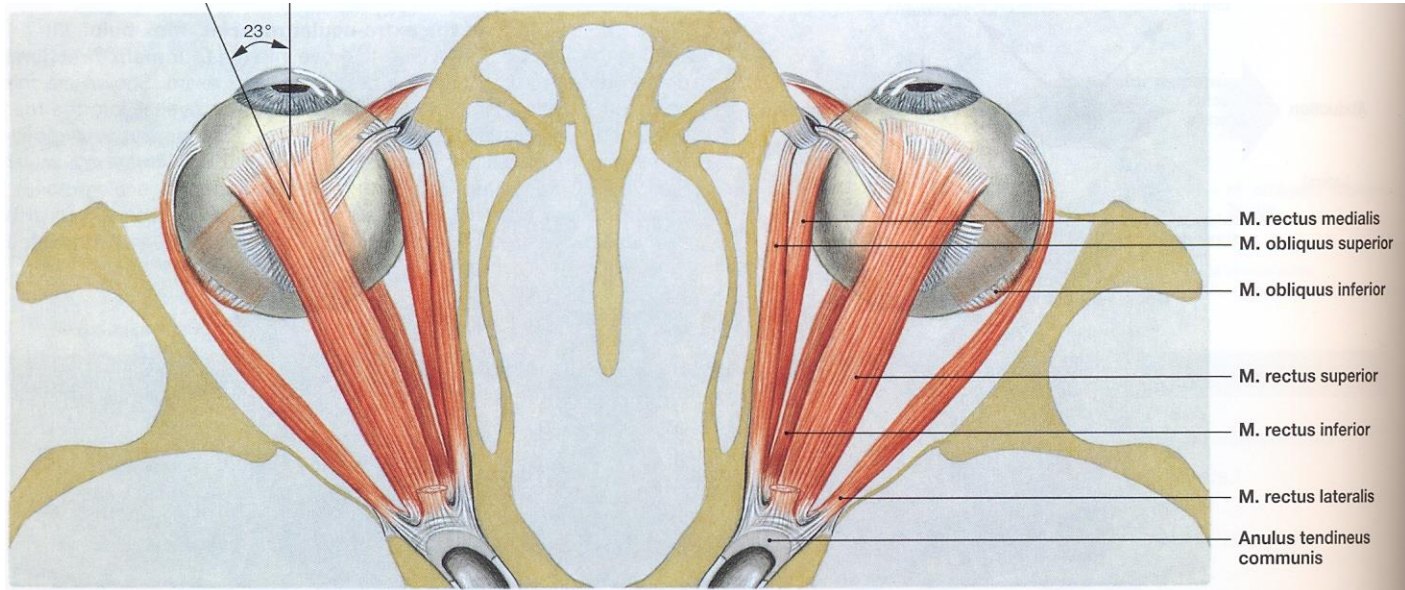




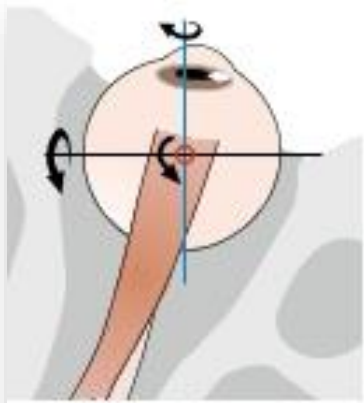
# Insertion of extraocular muscles



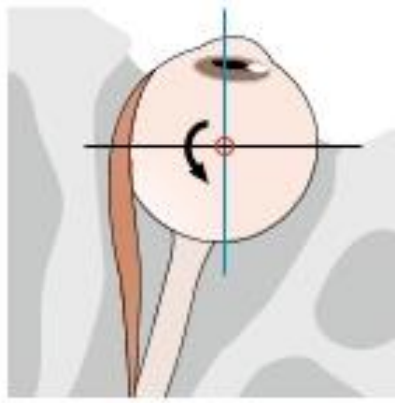




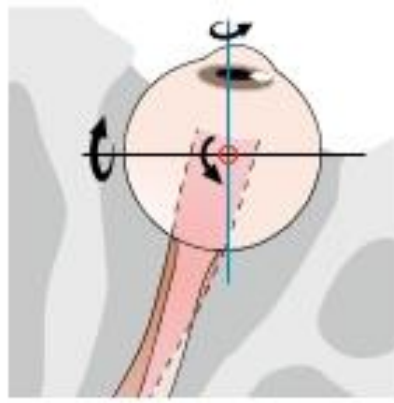
# Szemizmok működése



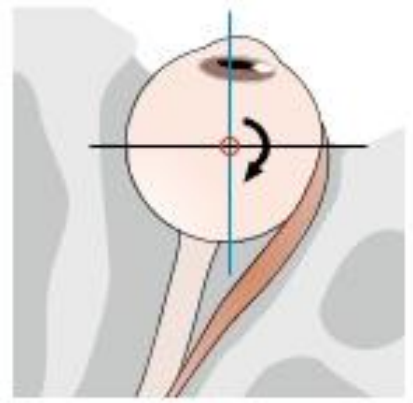
rectus superior



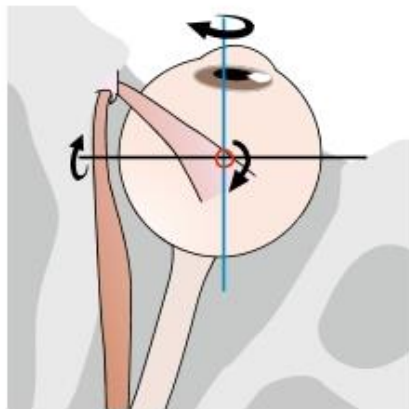
rectus medialis



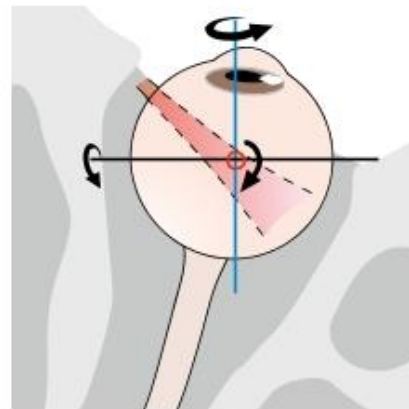
rectus inferior



rectus lateralis

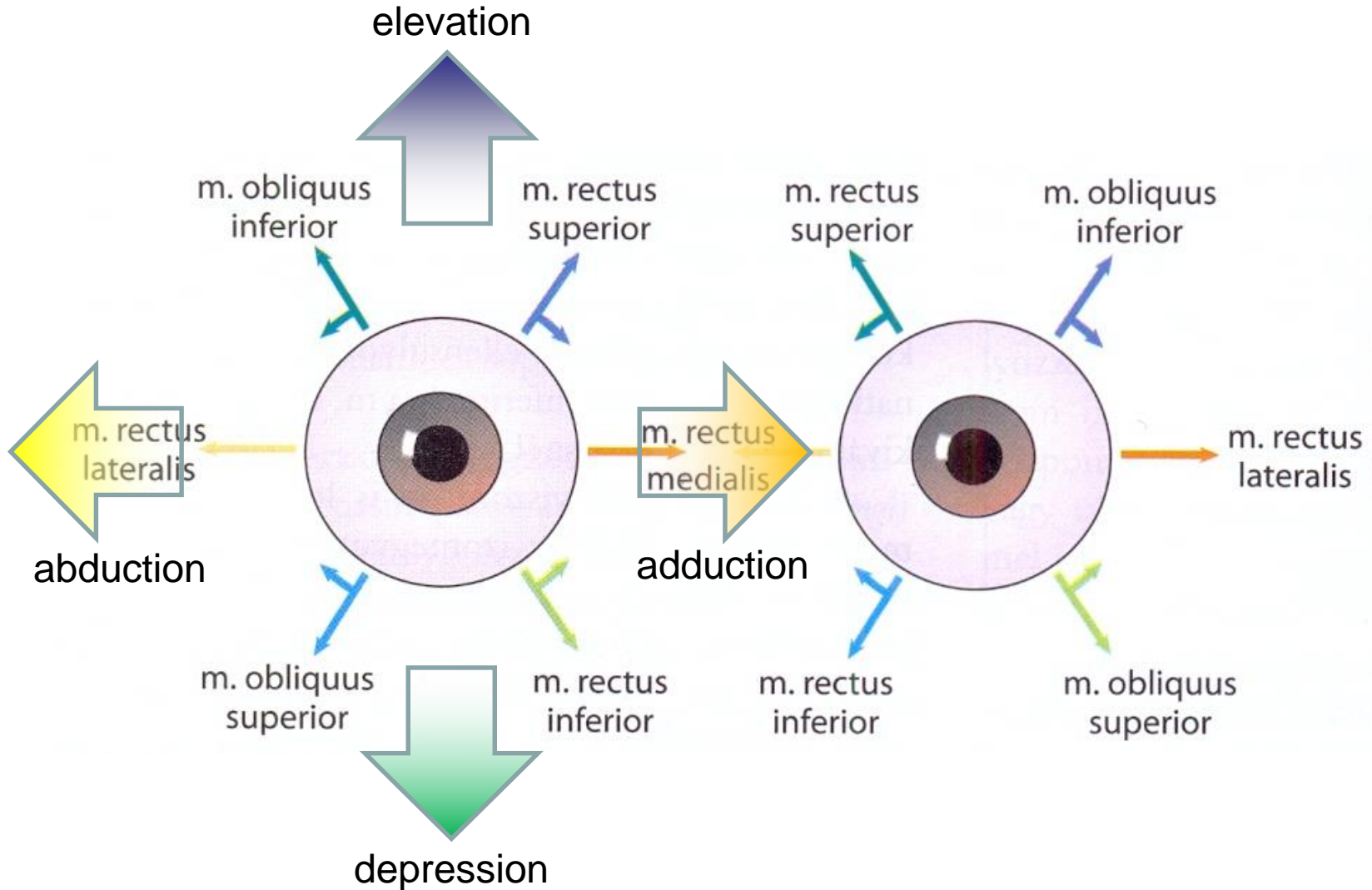


obliquus superior



obliquus inferior

# synergy and antagonism



conjugate and convergence movement



# Coordination of eye movements

## **Cortical centers:**

**Frontal eye field (Br8):** voluntary

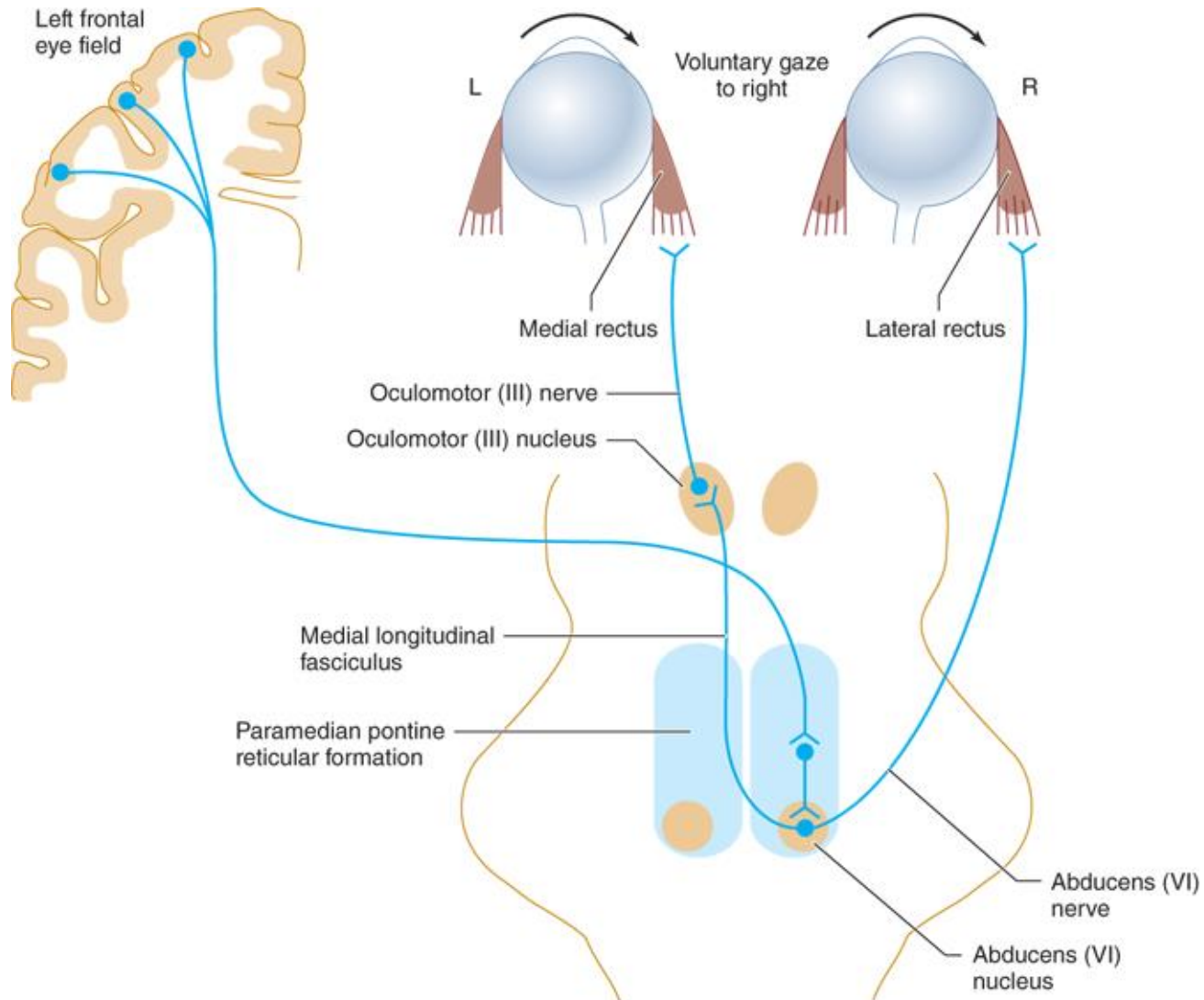
**Occipital eye field (Br17, Br18):** a reflex movement, permit locking of the eyes onto the target (fixation reflexes and the optokinetic reflexes)

**Horizontal gaze center:** *paramedian pontine reticular formation.*

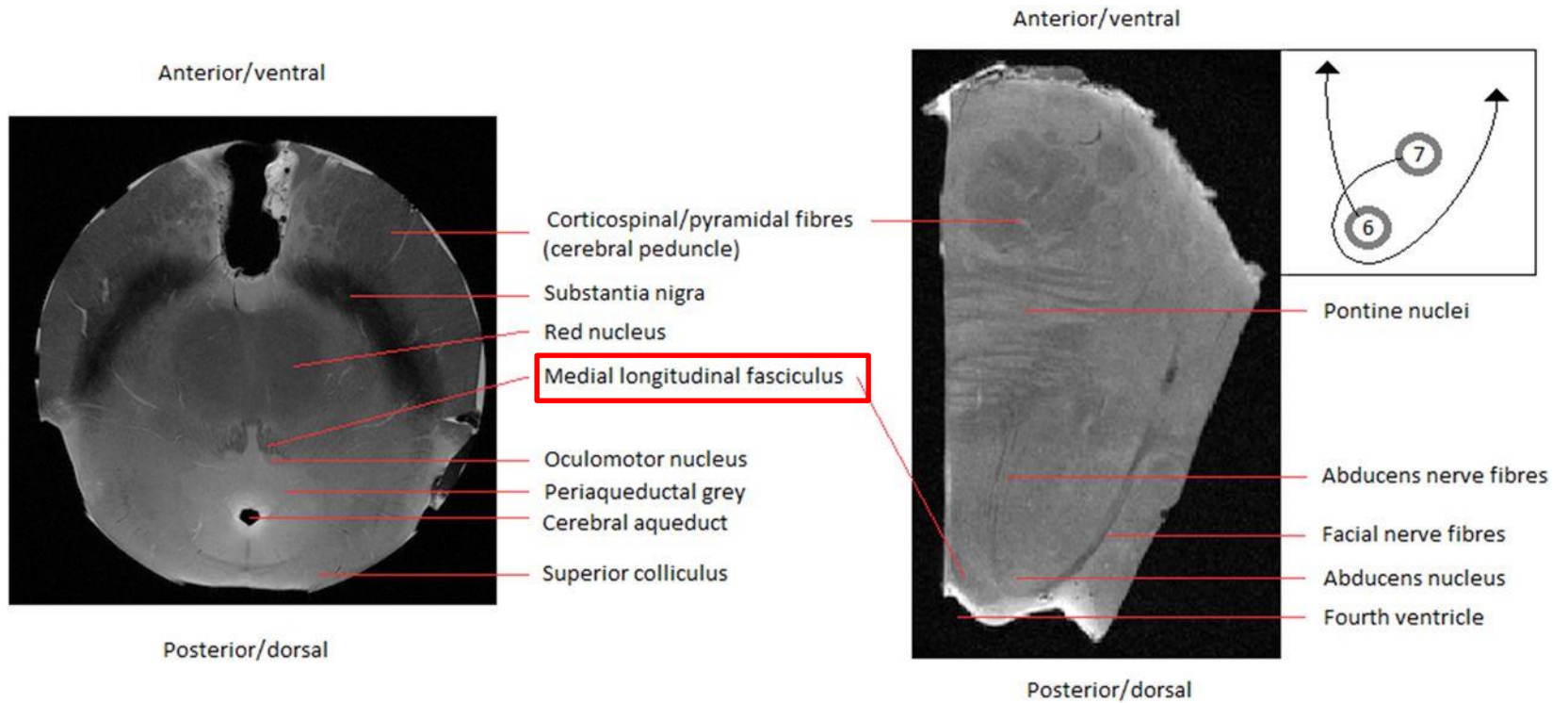
**Vertikal gaze center:** midbrain *Interstitial nucleus of Cajal* (= medial longitudinal fascicle (MLF) rostral interstitial, *riMLF*).

**medial longitudinal fascicle (MLF):** connects the cranial nerve nuclei III, IV and VI together, and integrates movements directed by the gaze centers (frontal eye field) and information about head movement (from cranial nerve VIII, Vestibulocochlear nerve). It is an integral component of saccadic eye movements as well as vestibulo-ocular and optokinetic reflexes.

# Horizontal Conjugate Gaze Pathway



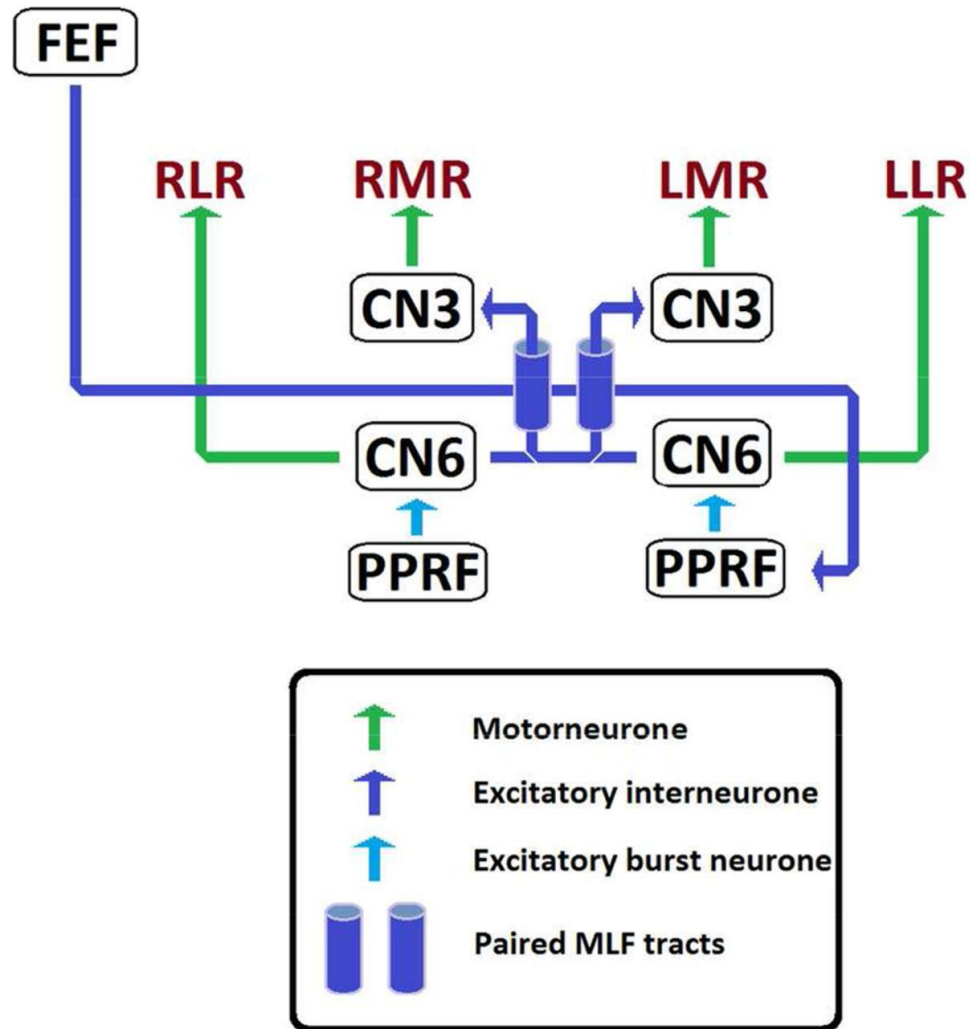
# Medial longitudinal fasciculus (MLF).



Jonathan D Virgo, and Gordon T Plant Pract Neurol  
2017;17:149-153



## Horizontal eye movements: anatomy and physiology.



FEF: Frontal eye field

PPRF: paramedian pontine reticular formation

RLR: right lateral rectus

RMR: right medial rectus

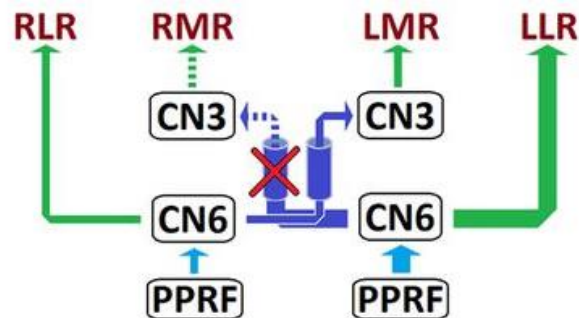
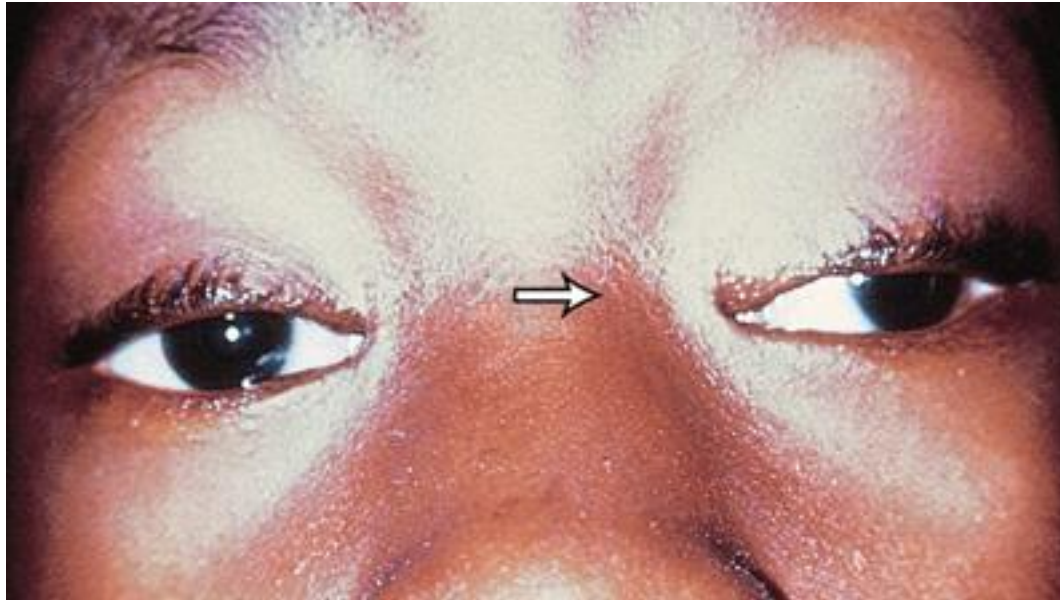
LMR: left medial rectus

LLR: left lateral rectus

Jonathan D Virgo, and Gordon T Plant Pract Neurol  
2017;17:149-153

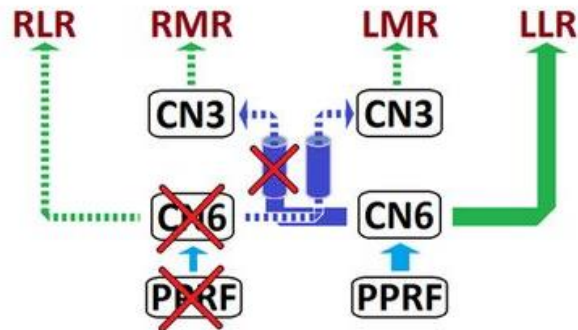
# Internuclear ophthalmoplegia

Medial longitudinal fasciculus damage



# Hídi tekintő mező sérülése

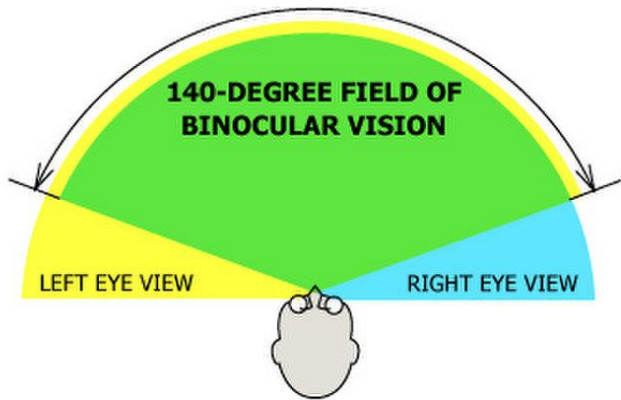
## "one-and-a-half" syndrome





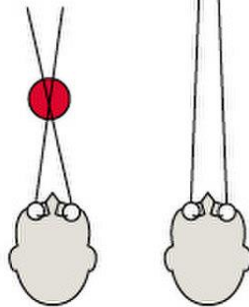
## Seeing in 3D

The brain uses several tricks to make us see in three dimensions. Despite our almost 180-degree field of view, binocular vision is only possible in the area where the view from both eyes overlap.

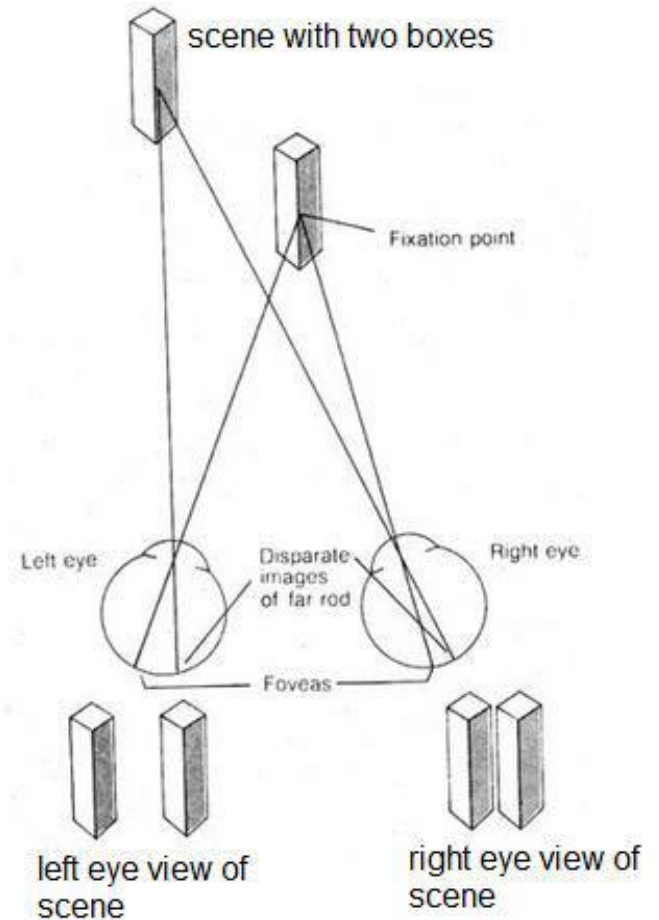
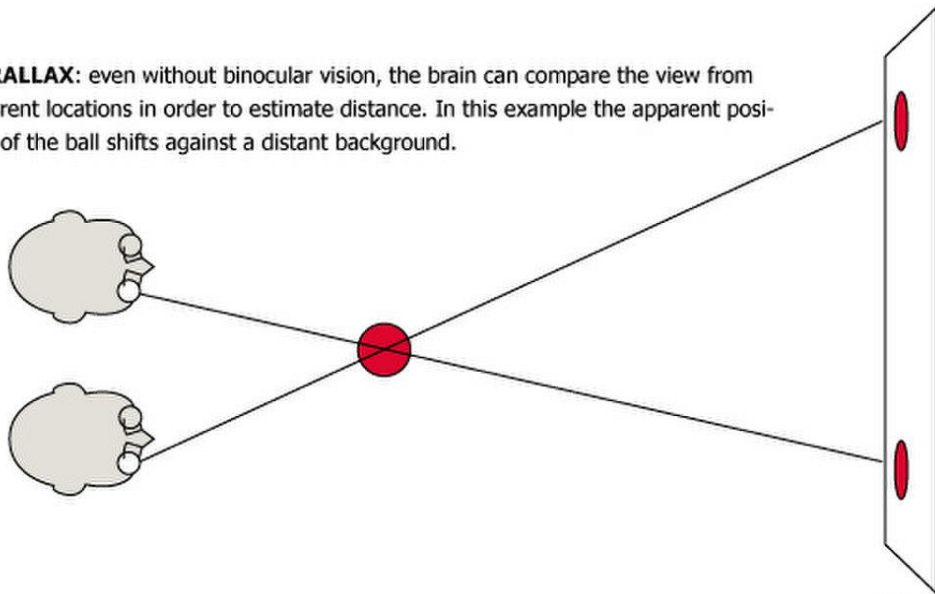


### CONVERGENCE:

if an object is nearby, the brain can judge distance by how converged or "crossed" your eyes are.

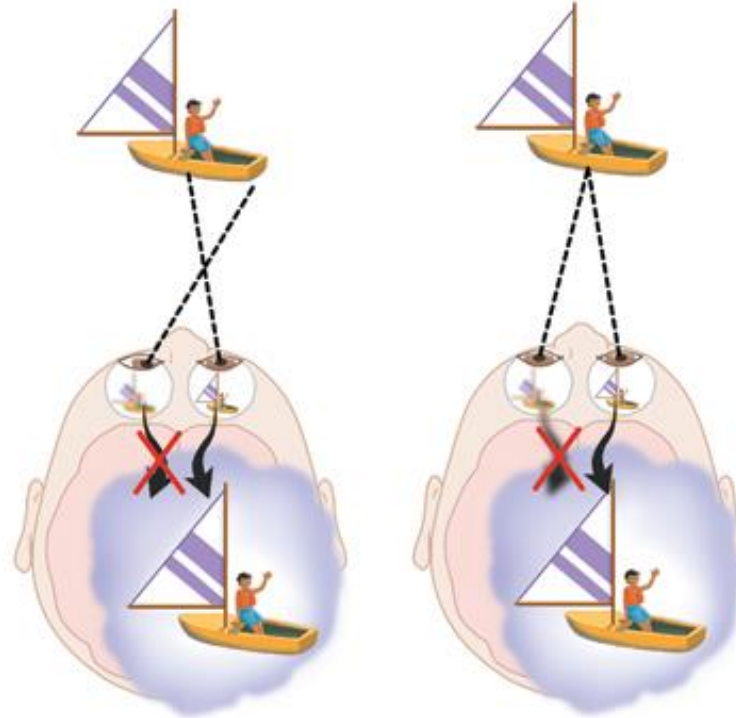


**PARALLAX:** even without binocular vision, the brain can compare the view from different locations in order to estimate distance. In this example the apparent position of the ball shifts against a distant background.



# •Strabismus (Crossed eyes)

Lazy eye  
(several causes)



Eyes are not aligned, brain receives pictures it can't fuse together, one of the pictures is suppressed

One eye has poor vision, brain receives a blurry picture from that eye, the blurry picture is suppressed



**Thank you for your attention!**

