Eye Movements - Low Level

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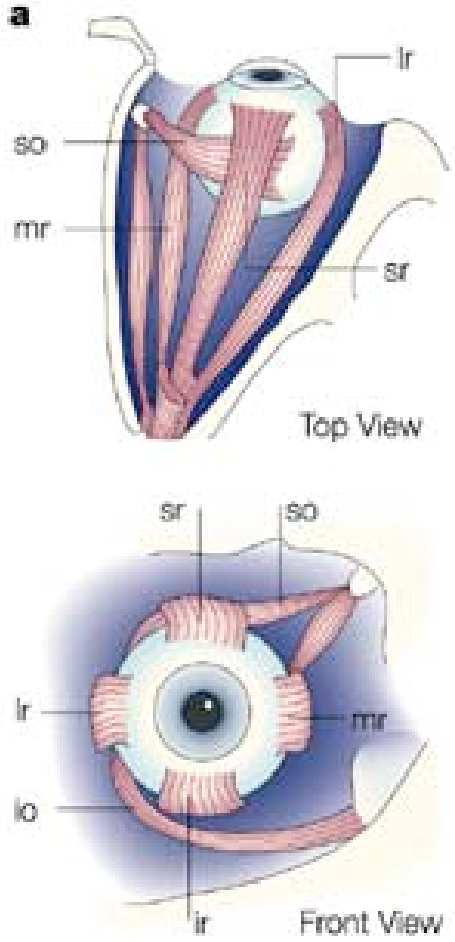
It is obvious that the motor apparatus of the visual organ has to fit the sensory apparatus as the shell does an egg. For, whether one assumes that they were set up according to a wise plan, or that they developed with each other and through each other in an inevitable way as the evolutionary series is traversed, in any case: the capabilities of the one have to correspond to the needs of the other. -E. Hering (1868) *Die Lehre vom binocularem Sehen*

Suggested Reading

Munoz DP, **Schall JD** (2003) Concurrent distributed control of saccades. In *The Oculomotor System: New Approaches for Studying Sensorimotor Integration*. Edited by WC Hall, AK Moschovakis. CRC Press, Boca Raton, FL. Pages 55-82.

The problem of vision - what is where?

- Foveal vs. peripheral vision
- Vision is an active process
    - Animate Vision Systems
        - Ill-posed problem of snapshot vision is solved by moving.
    - Problem of economically scanning image
        - Vision is degraded off of fovea, so saccades needed to bring fovea to bear on object…
        - but vision is degraded by saccades, so too many adjustments allows no time for vision…
        - so control mechanisms select targets and delay or prevent unwanted saccades.

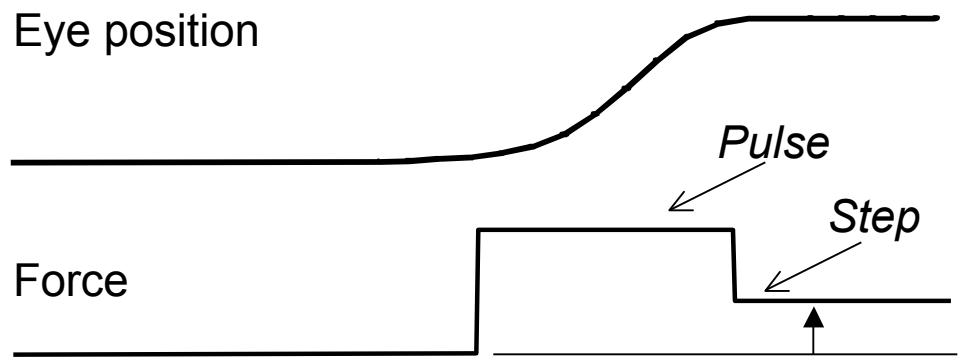


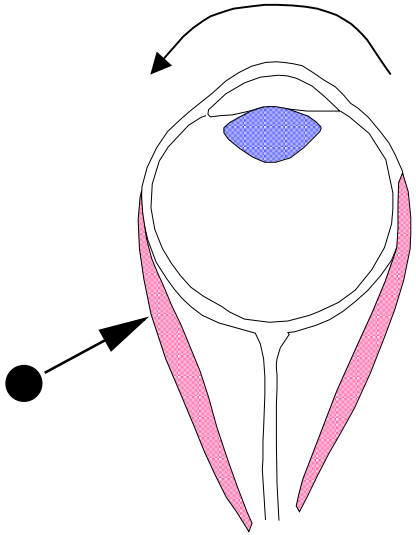
Six extraocular muscles rotate the eyes.

Types of movements of the eyes

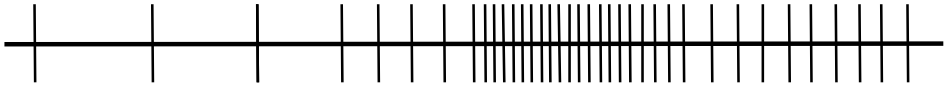
- Gaze shifting
  - Saccade
  - Pursuit
  - Vergence
- Gaze holding
  - Vestibular-ocular reflex
  - Optokinetic reflex

Brainstem Saccade Generator





Oculomotor neuron



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Brainstem Saccade Generator