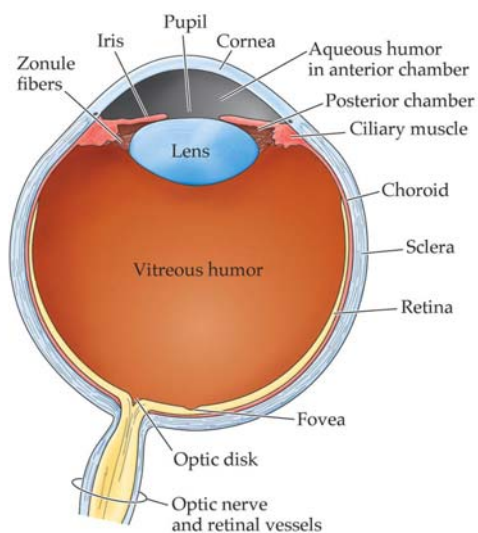


Learning Objectives

At the end of this lesson, you will be able to

1. explain the functional importance of eye movements for vision, i.e., the reason why humans (and other animals move their eyes).
2. describe the characteristics of different types of human eye movements.
3. appreciate some of the applications of eye movements (research, clinical, technological, social).

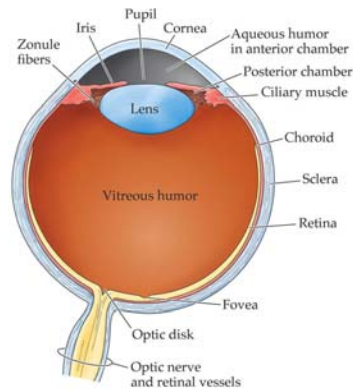
Vision Starts in the Eye



NEUROSCIENCE, Third Edition, Figure 10.1 © 2004 Sinauer Associates, Inc.

Why Do We Move Our Eyes?

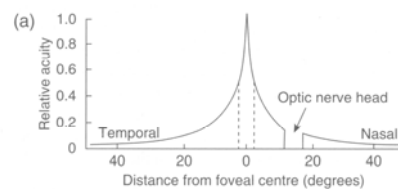
- Eye movements support vision by bringing an object of interest into the fovea and keeping it steady



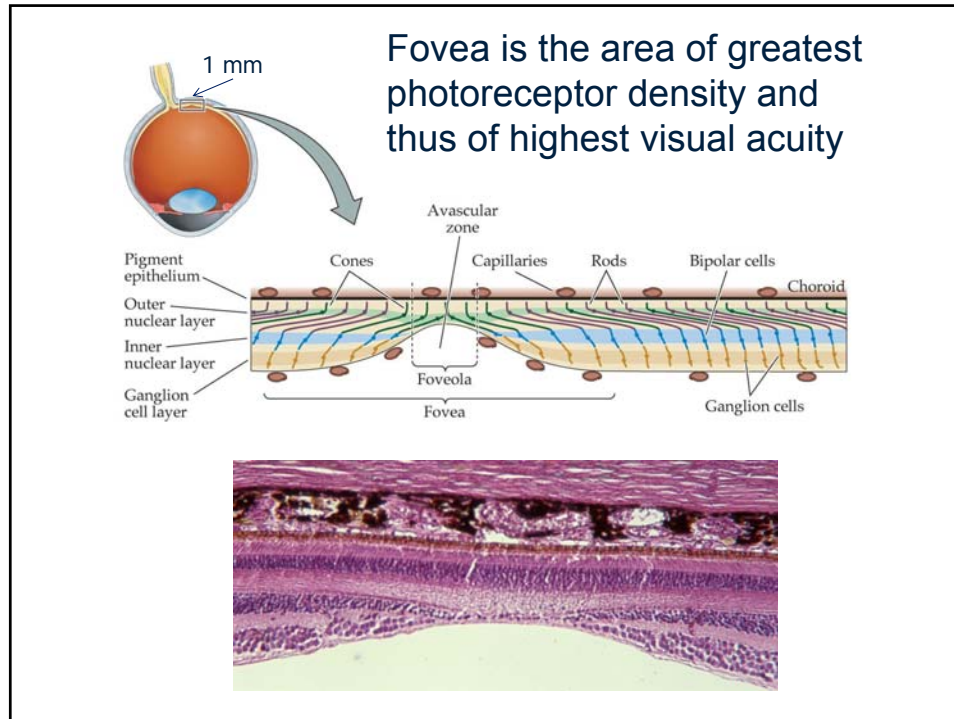
NEUROSCIENCE, Third Edition, Figure 16.1 © 2004 Sinauer Associates, Inc.

Why Do We Move Our Eyes?

- Eye movements support vision by bringing an object of interest into the fovea and keeping it steady

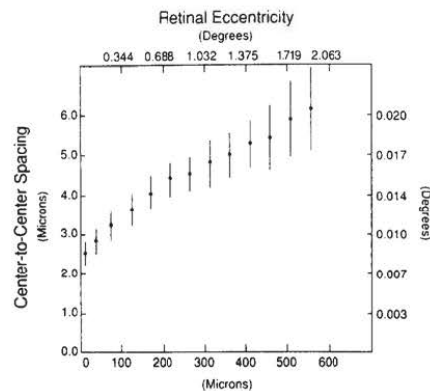


Land & Tatler, "Active vision", 2009



Foveal Cone Spacing

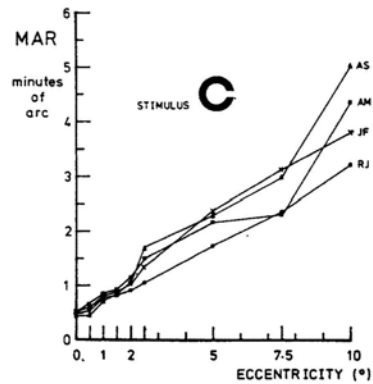
- The fovea consists of densely-packed cones; ganglion cell to photoreceptor ratio: 2.5:1
- Cone density drops exponentially with increasing distance from the fovea



Hirsch & Curcio, Vision Res 1989

Visual Acuity Outside the Fovea

- As we move away from the fovea, visual acuity drops exponentially (50% decline at 2 deg away from the fovea's centre)



- For optimal (non-blurry) vision, the image of an object should be held fairly steady within 0.5 degrees of the centre of the fovea



Jacobs, *Vision Res* 1979

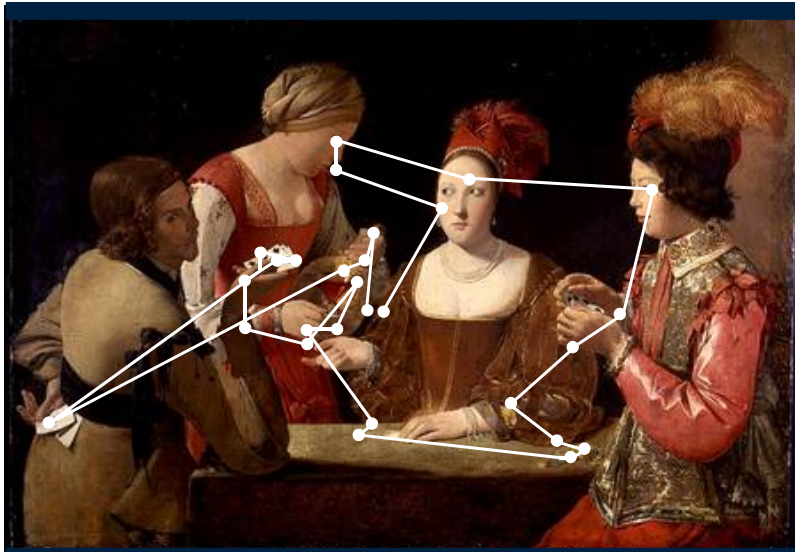
What Types of Eye Movements
Do You Know?

We Move Our Eyes All The Time



Georges de la Tour, "Le tricheur a l'as de carreau" (1620)

Saccades: Quick Scanning Movements



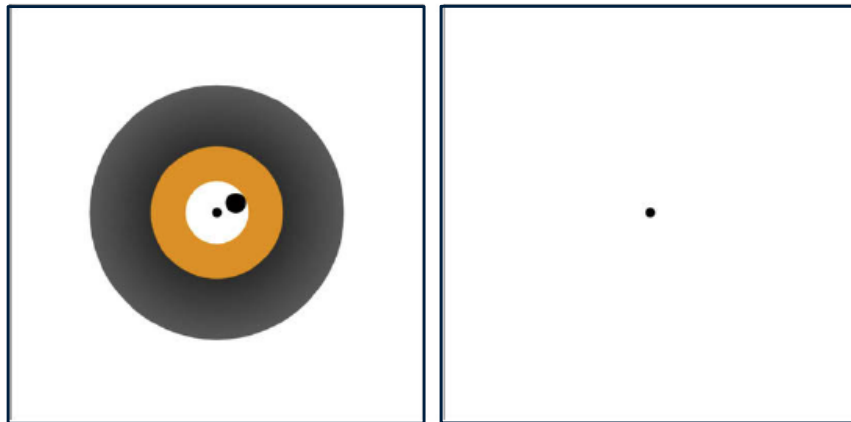
Georges de la Tour, "Le tricheur a l'as de carreau" (1620)

Saccade Demo

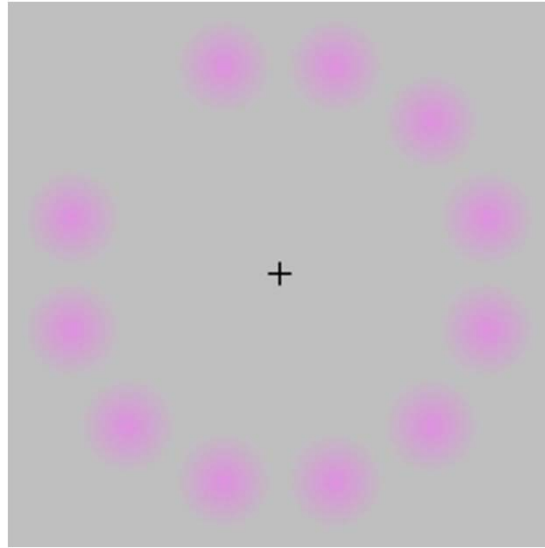
- Visually-guided saccades
- Reflexive saccades
- Antisaccades
- Memory-guided saccades
- Anticipatory saccades
- Predictive saccades

- These types of saccades tap into different underlying cortical mechanisms

Microsaccades



Microsaccades Are Small Fixational Movements That Prevent Fading



Troxler's fading

Tracking Moving Objects



Partner Exercise: Track a Moving Finger / Track an Imaginary Finger

Applications

Get together in groups of 4-6 and

...think about what you have learned about eye movements so far. Then come up with one possible application of eye movements in “real life”.

You have 5 minutes for your discussion!

Why is Knowledge of Eye Movements Important?

- Eye movements are a model system that can help us understand general principles of visual and motor processing in the brain
- Studying the visual inputs and the perceptual consequences of eye movements can provide insights into the basics of human behavior
- Abnormalities of ocular motility can serve as clues to the localization of a disease process and lead to new tools for diagnosis and therapy



Muddiest Point

Please think about the following question and write the answer on the piece of paper provided:

- In today's session, what was least clear to you?
and/or
- What would you have liked to learn more about?