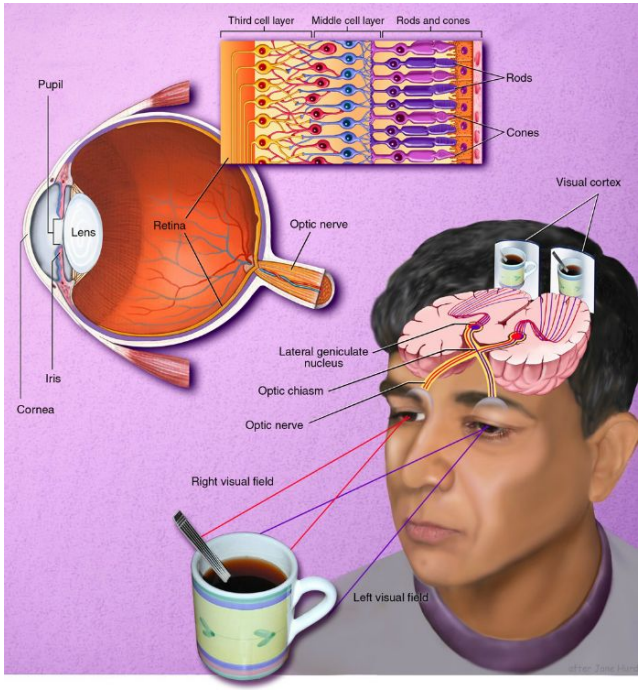
Human Vision System

Tue, July 7 (Week 3)

Human Vision System for AR Headsets

Overall Goal: Make a display that adds light in a way that fools human vision.



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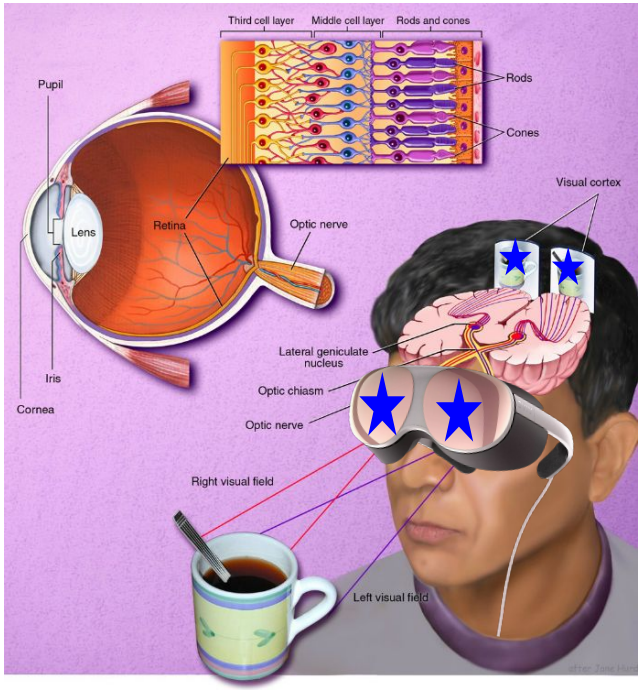


Human Vision System for AR Headsets

Specific Targets:

Color Perception

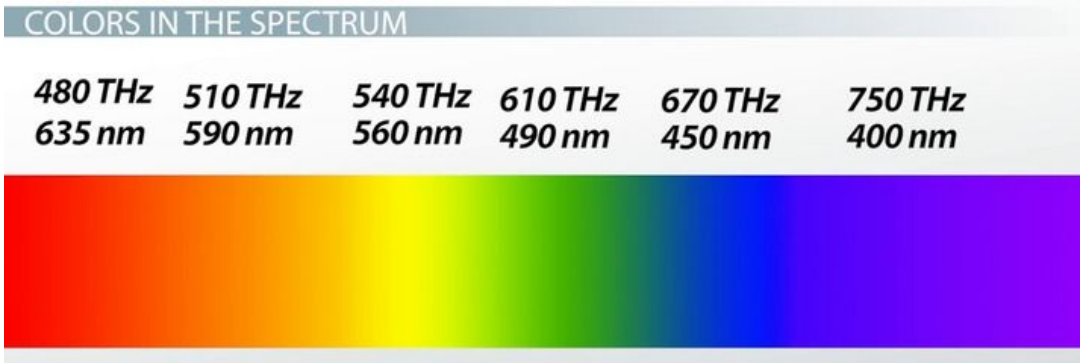
: RGB in 3 dimensional space, not frequencies

Depth Perception

: Binocular Disparity, Focal Length, with Motion Parallax and etc.

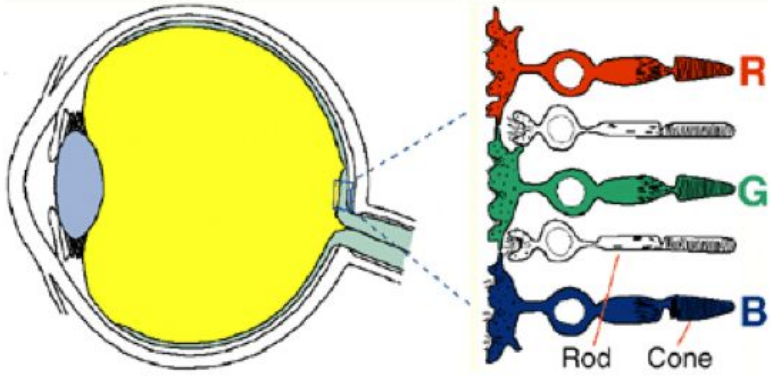
Color Perception

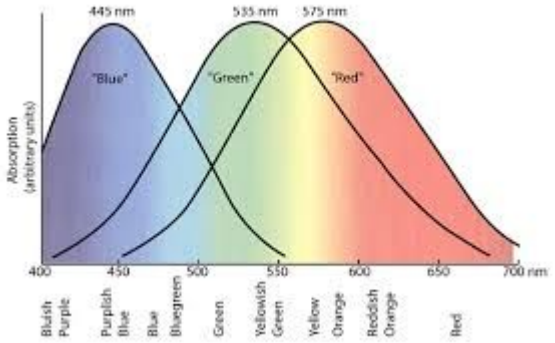
Color in the nature: the frequency of electromagnetic wave (light)



Color Perception

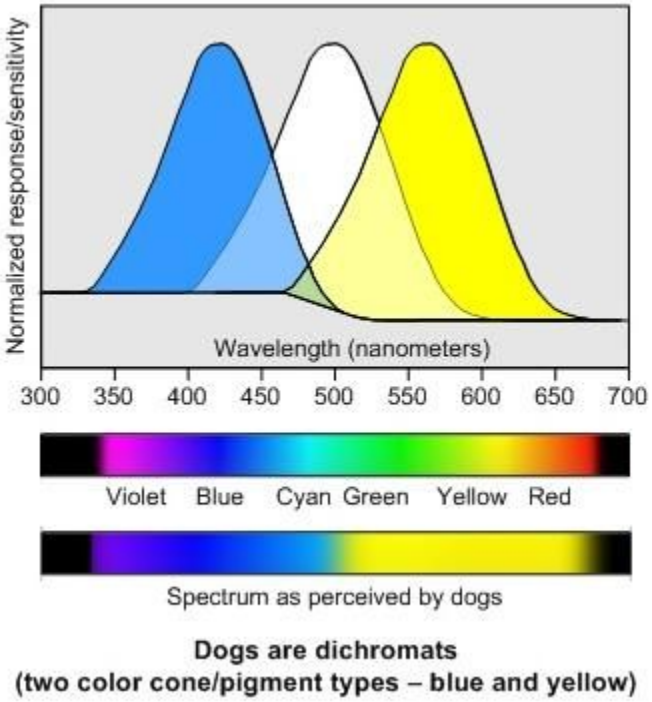
Color we see: activation of RGB cones





Color Perception

RGB framework only works for humans, not others (e.g., dogs)



Dogs are dichromats
(two color cone/pigment types – blue and yellow)

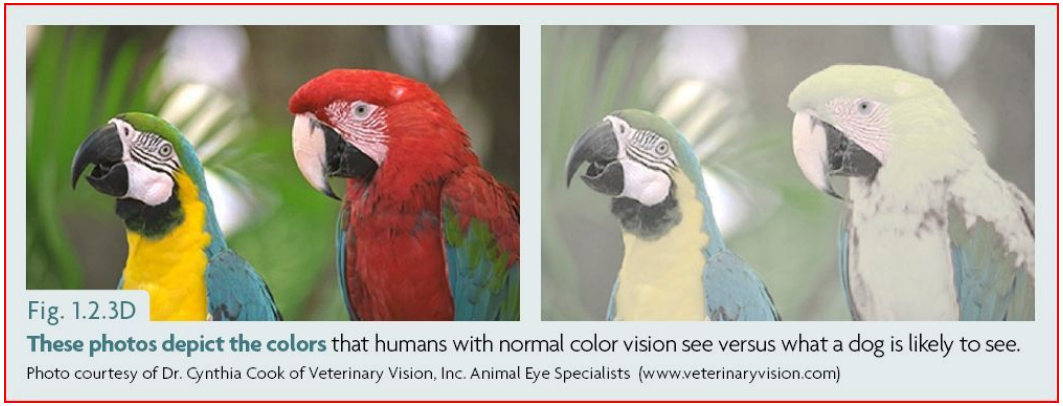


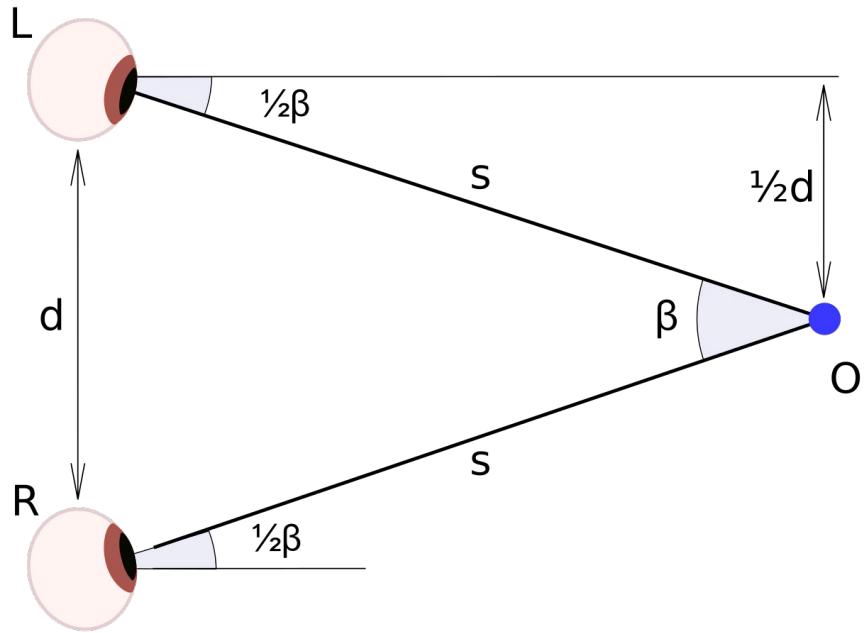
Fig. 1.2.3D

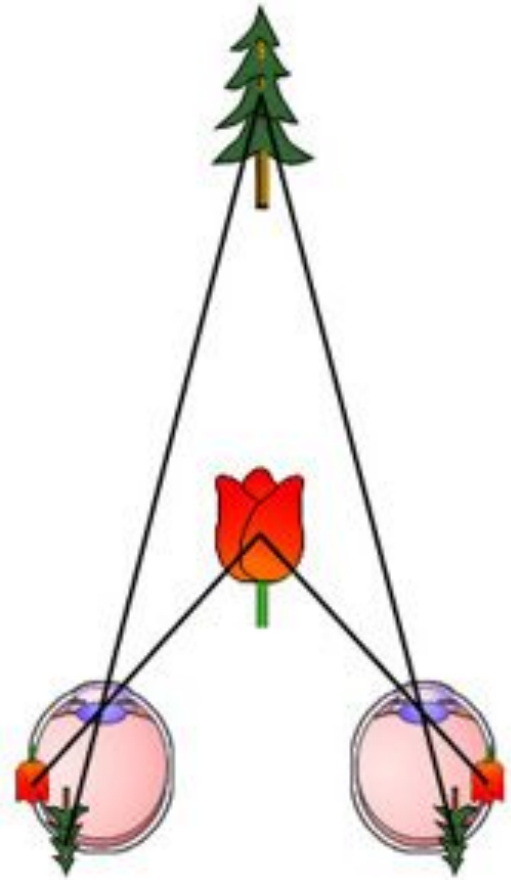
These photos depict the colors that humans with normal color vision see versus what a dog is likely to see.

Photo courtesy of Dr. Cynthia Cook of Veterinary Vision, Inc. Animal Eye Specialists (www.veterinaryvision.com)

Depth Perception

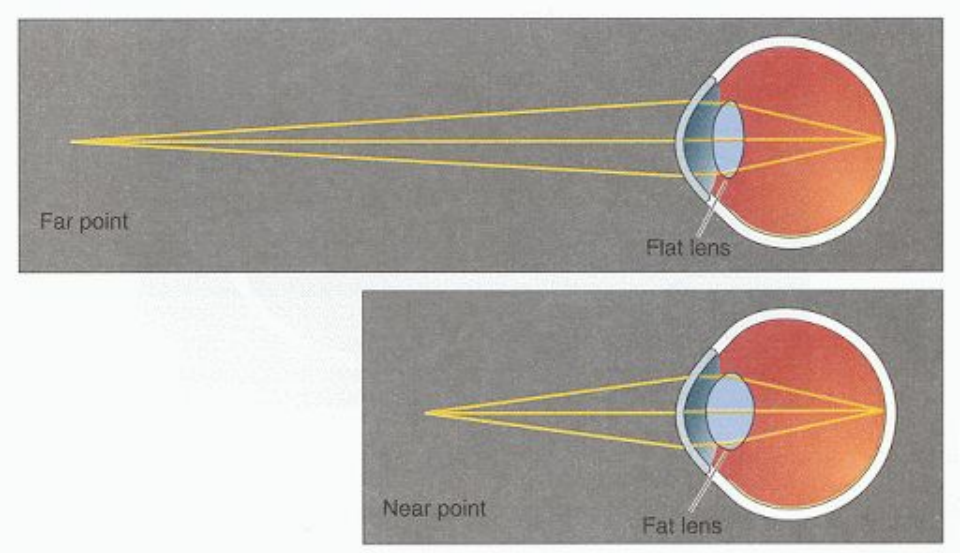
Binocular Disparity





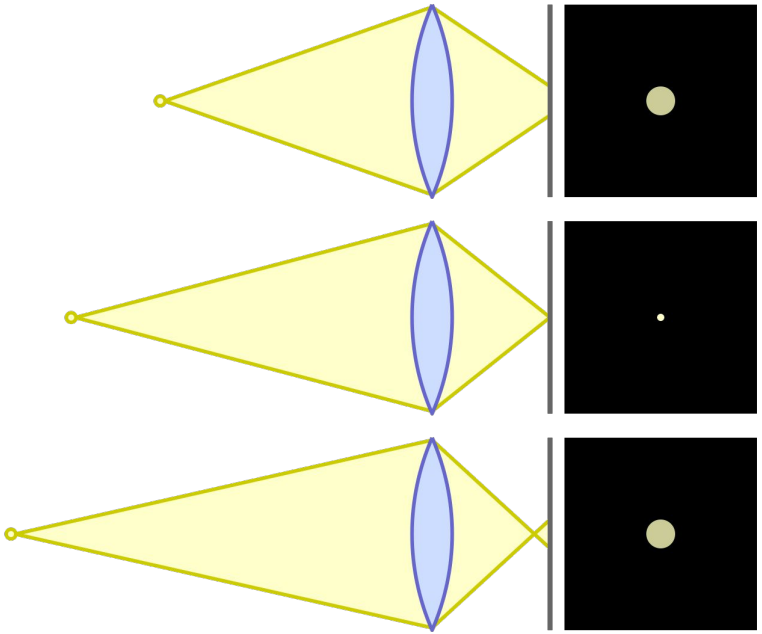
Depth Perception

Focal Length: the target distance

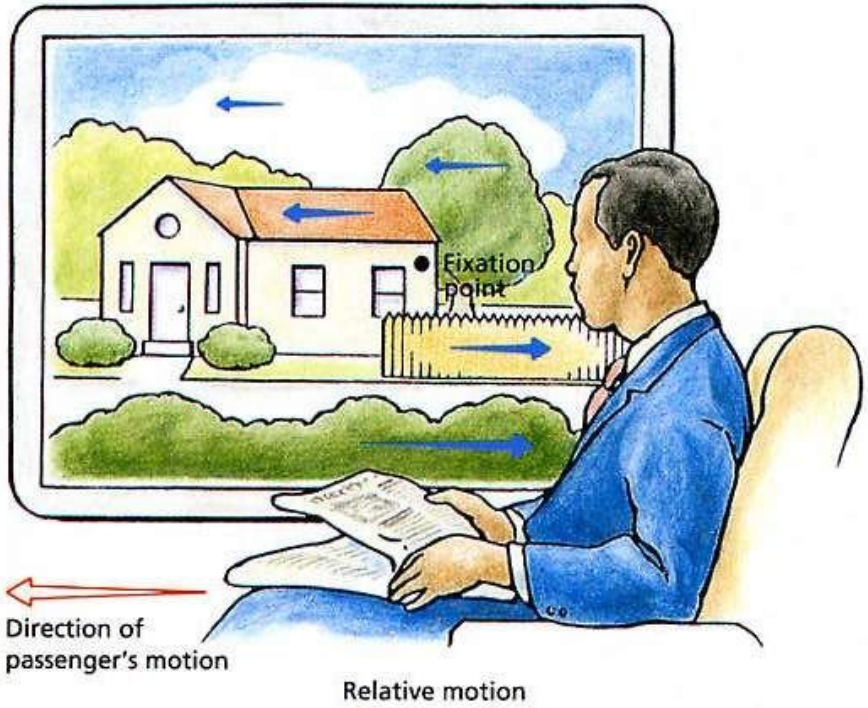


Depth Perception

Larger the error (focal length - actual distance), larger the circle of confusion.

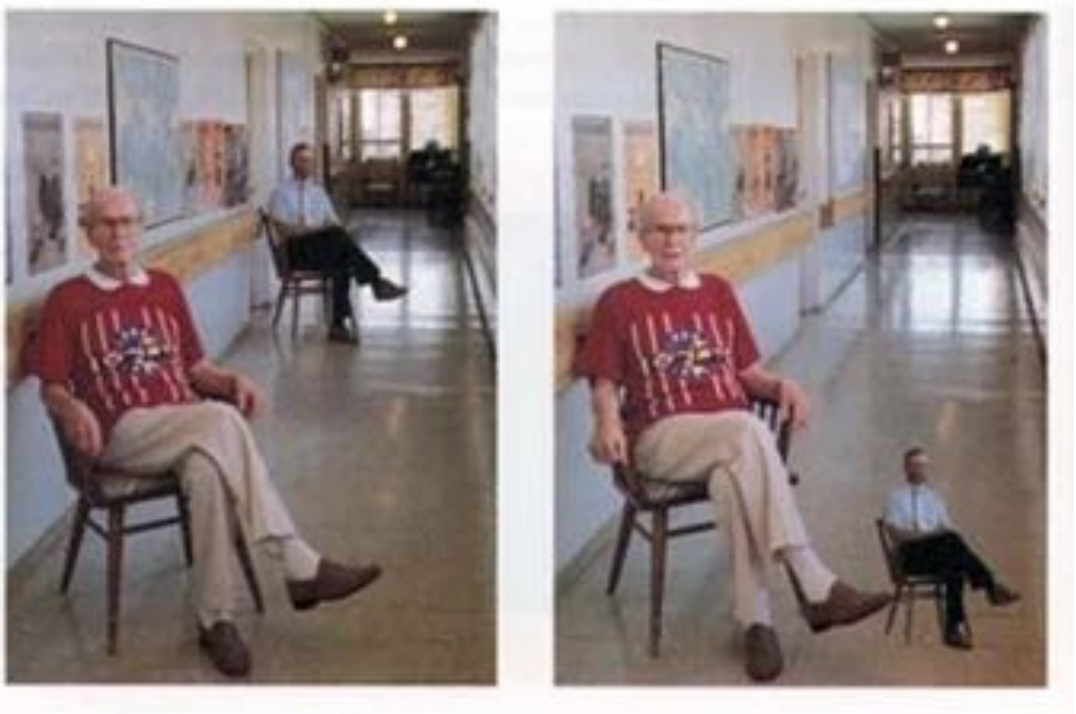


Motion Parallax



https://youtu.be/gGwb_GQZajE

Relative Size



Perspective

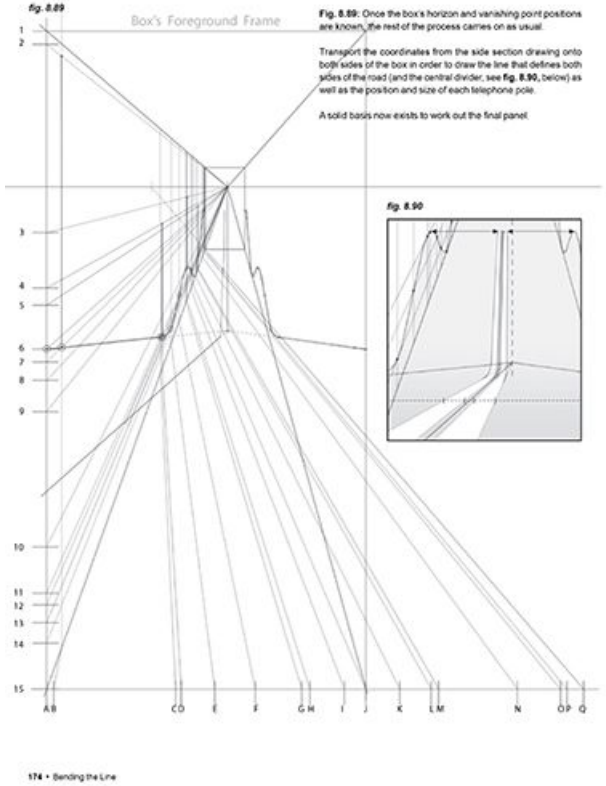
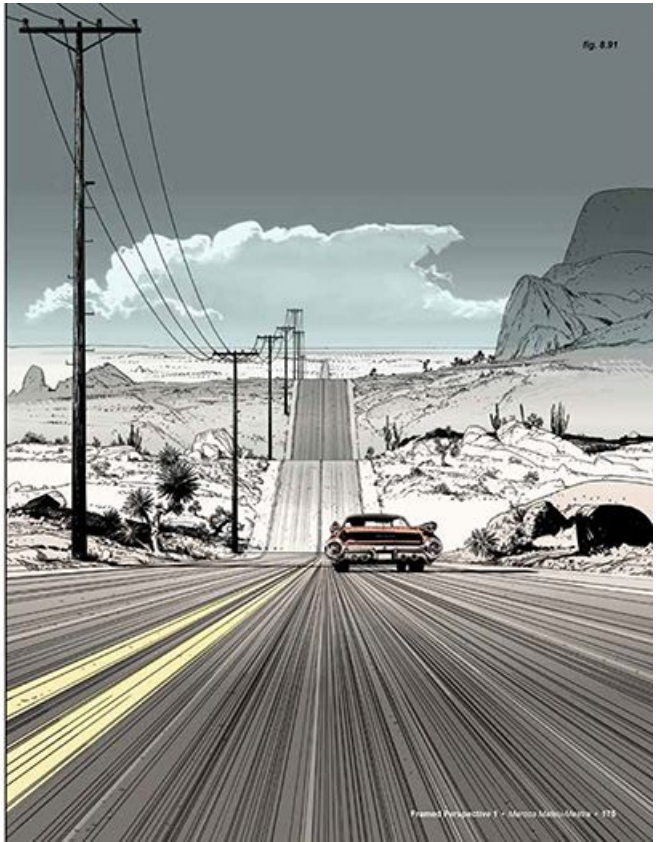


Fig. 8.89: Once the box's horizon and vanishing point positions are known, the rest of the process carries on as usual.

Transport the coordinates from the side section drawing onto both sides of the box in order to draw the line that defines both sides of the road (and the central divider, see **fig. 8.90,** below) as well as the position and size of each telephone pole.

A solid basis now exists to work out the final panel.



Field of Vision

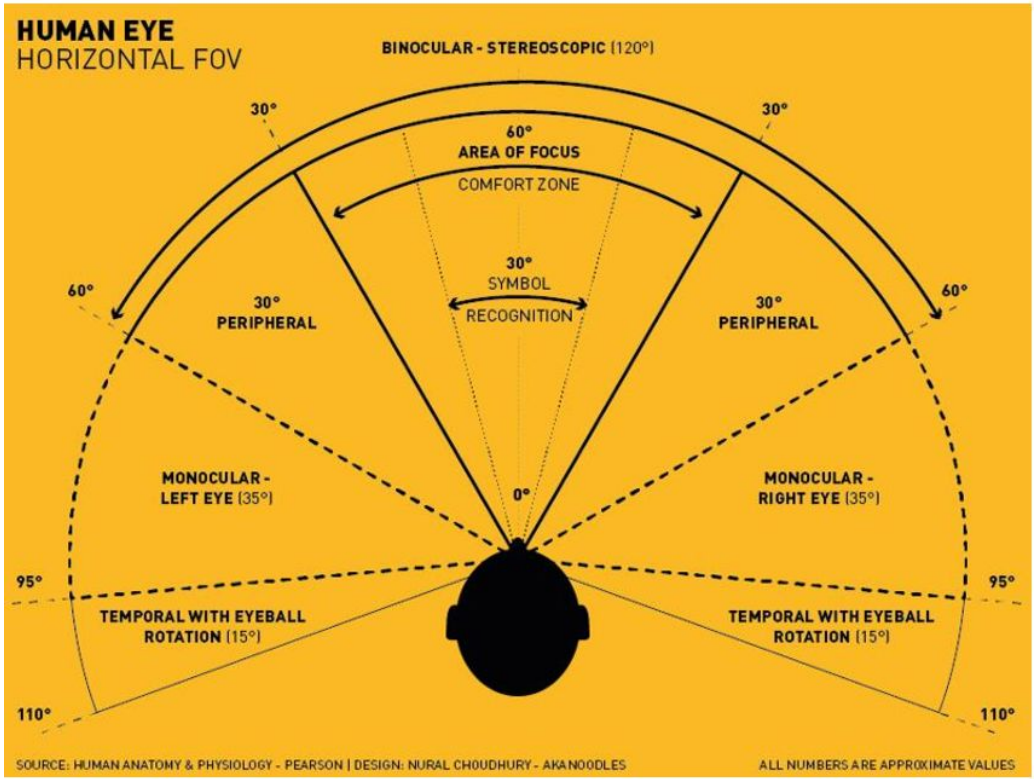
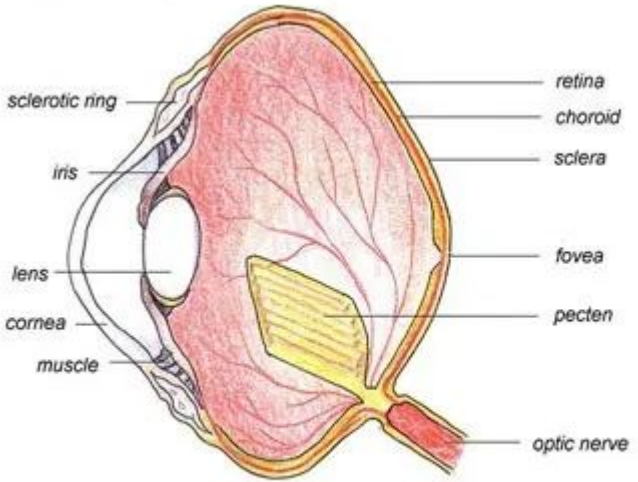


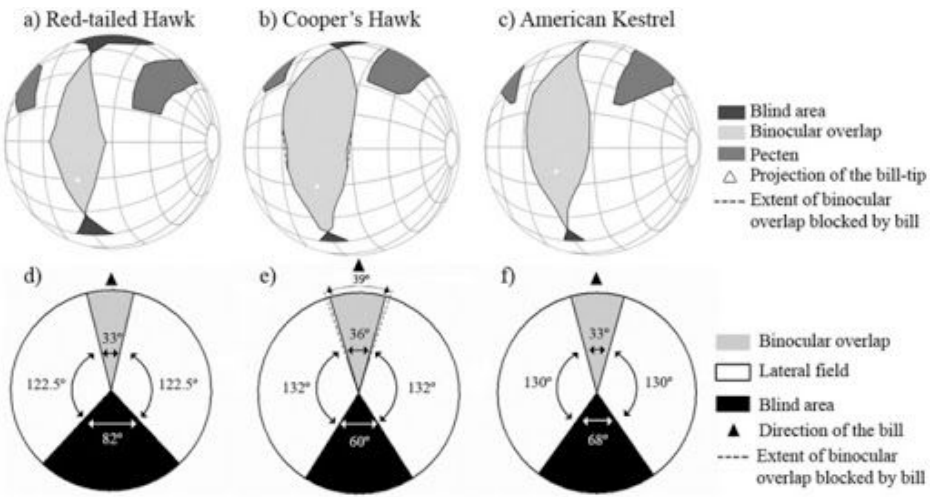
Figure 4. Human field of vision. *Diagram showing symbol recognition*

https://youtu.be/UTwtgjz4FBM

https://youtu.be/lISWJFkcM1Q

Example of Another Species: Birds





Selective Attention


https://youtu.be/vJG698U2Mvo
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Selective Attention

It is very inefficient and also impossible for humans to look at and understand the whole scene.