



Instituto Politécnico Nacional Escuela Superior de Cómputo

Image Analysis

I. Introduction

Dr. Flavio Arturo Sánchez Garfias



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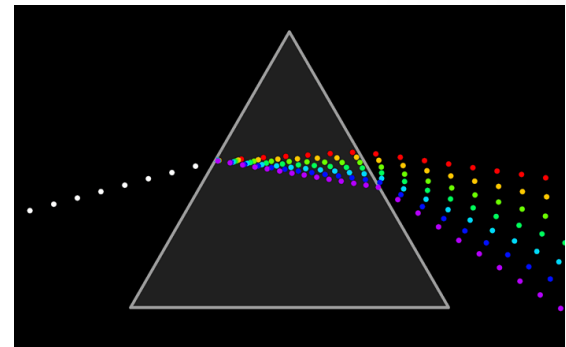
The human vision system.

What is light?

- It's electromagnetic radiation.
- Electromagnetic radiation can travel through empty space at a constant speed of

$$2.99792458 \times 10^8 \text{ ms}^{-1}$$

- Some of their characteristics are: amplitude, wavelength and frequency.
- They can be reflected and refracted.

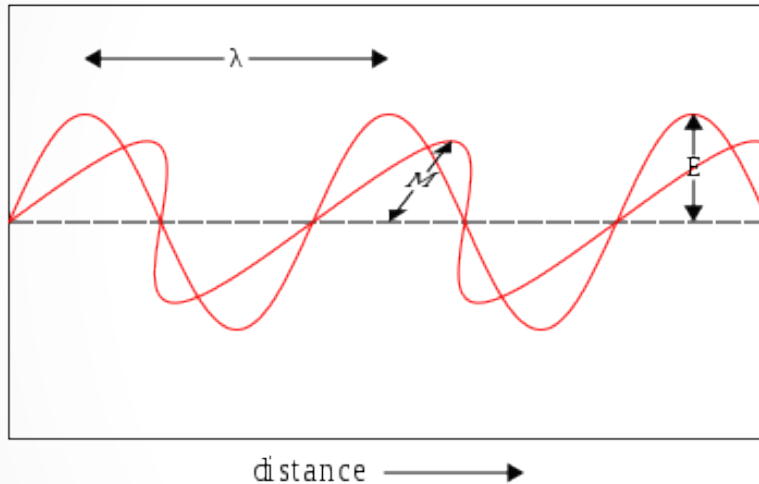




The human vision system.

The electromagnetic waves

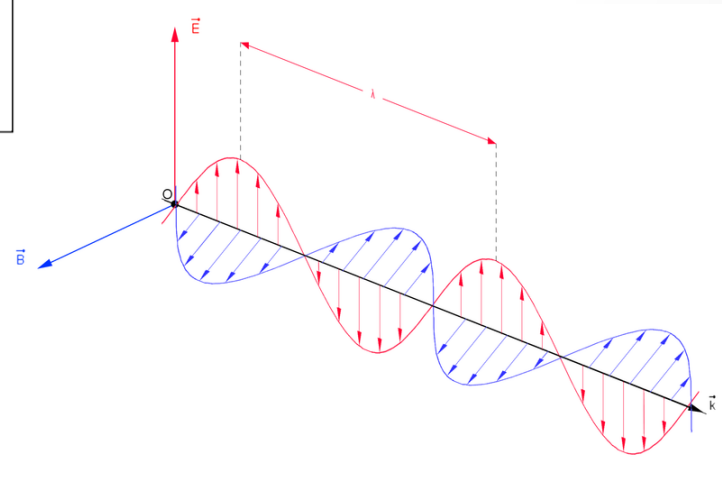
Light wave



λ = wave length

E = amplitude of electric field

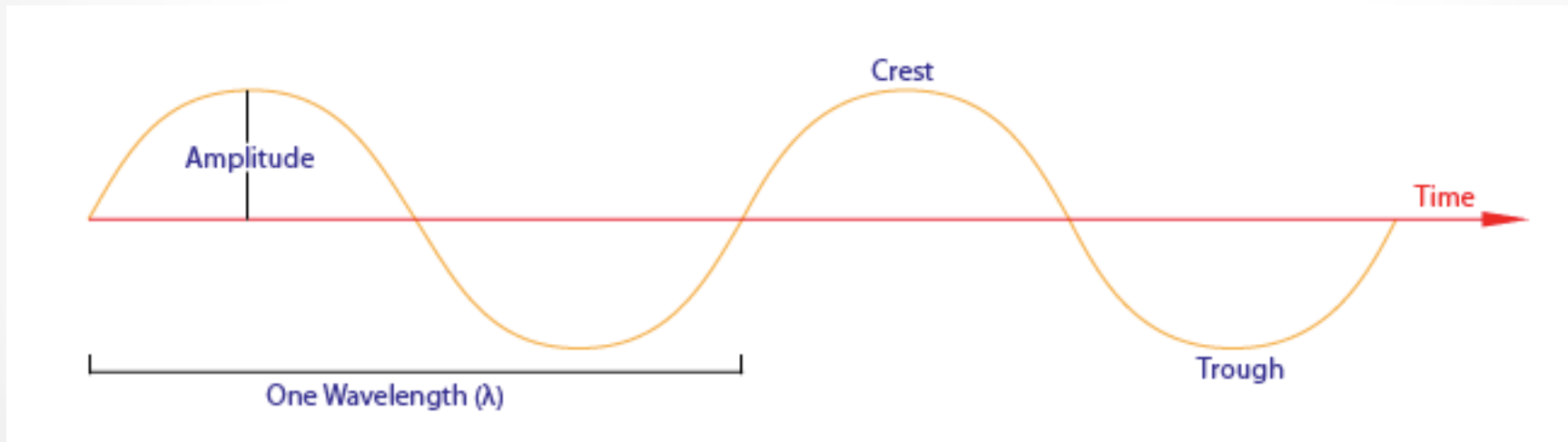
M = amplitude of magnetic field





The human vision system.

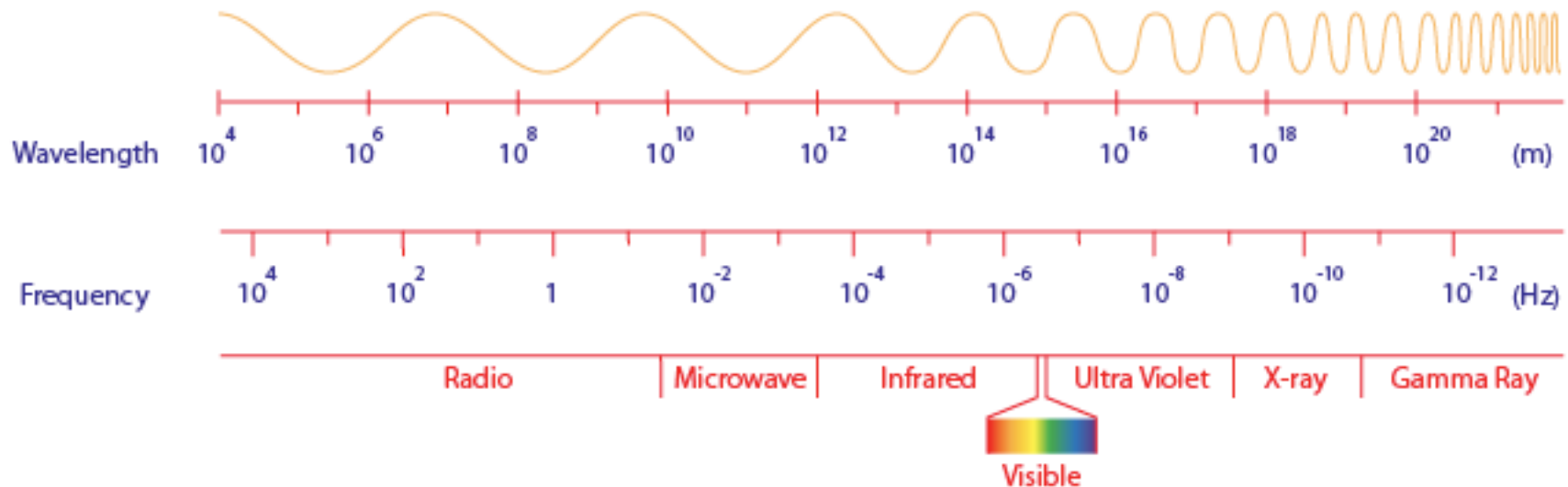
Frequency is the number of cycles per second.





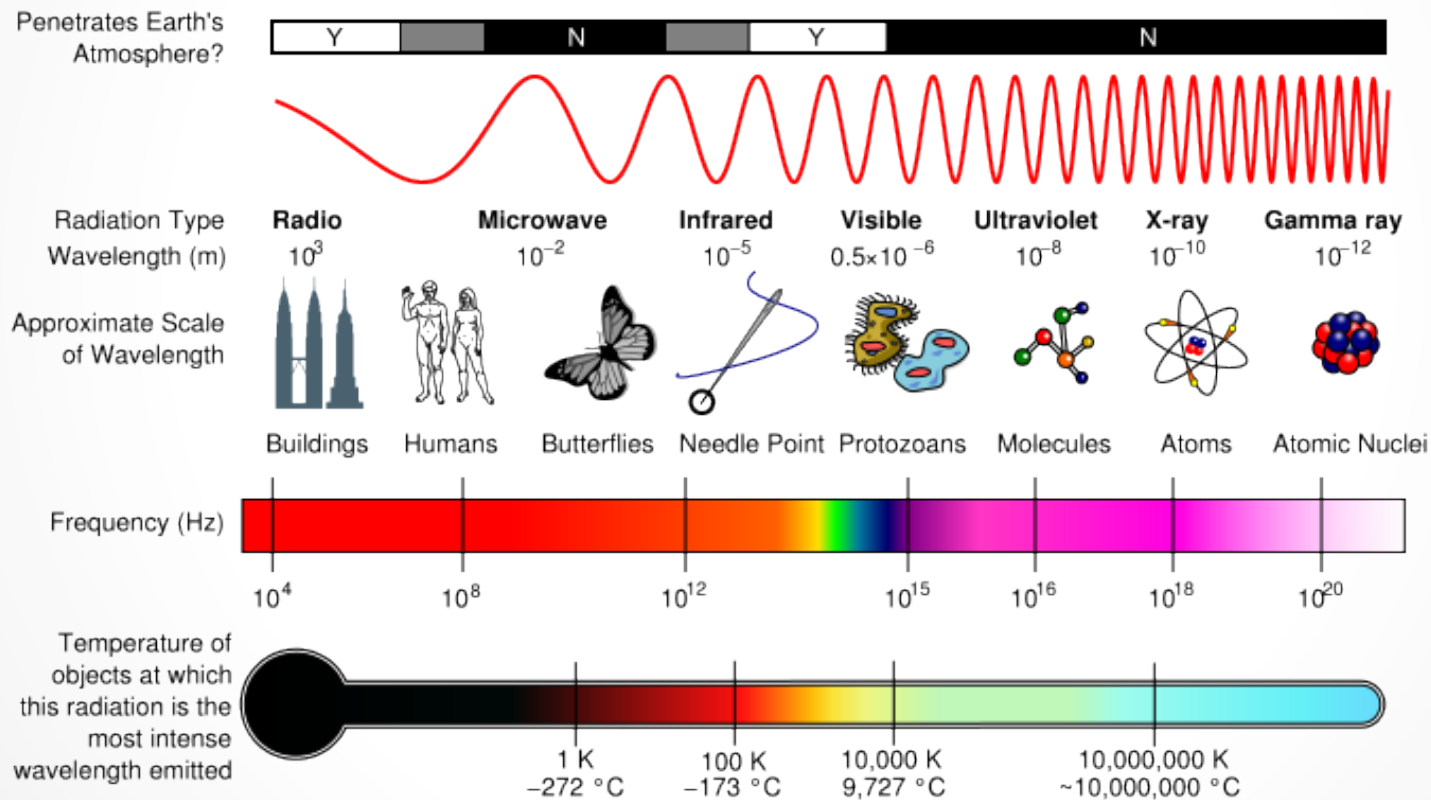
The human vision system.

The electromagnetic spectrum



The human vision system.

The electromagnetic spectrum

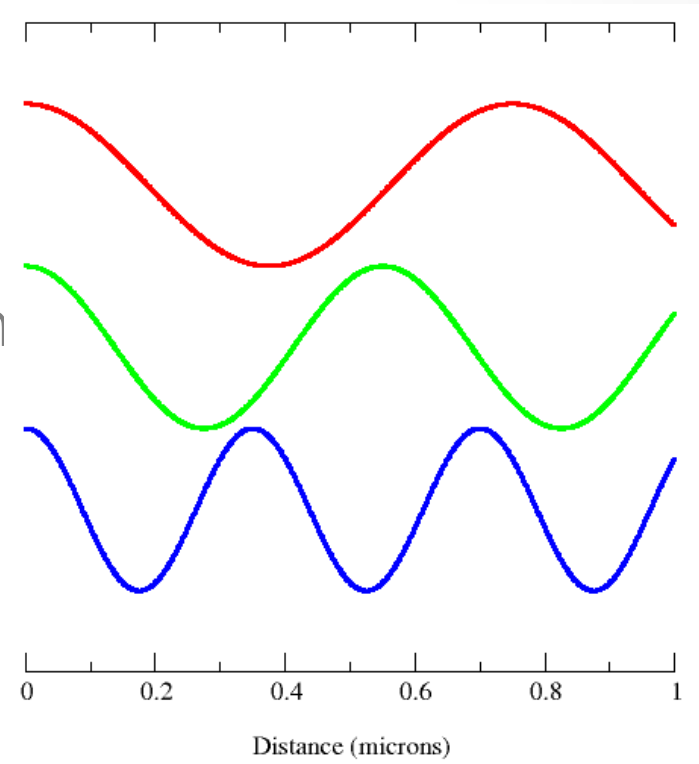




The human vision system.

The visible light:

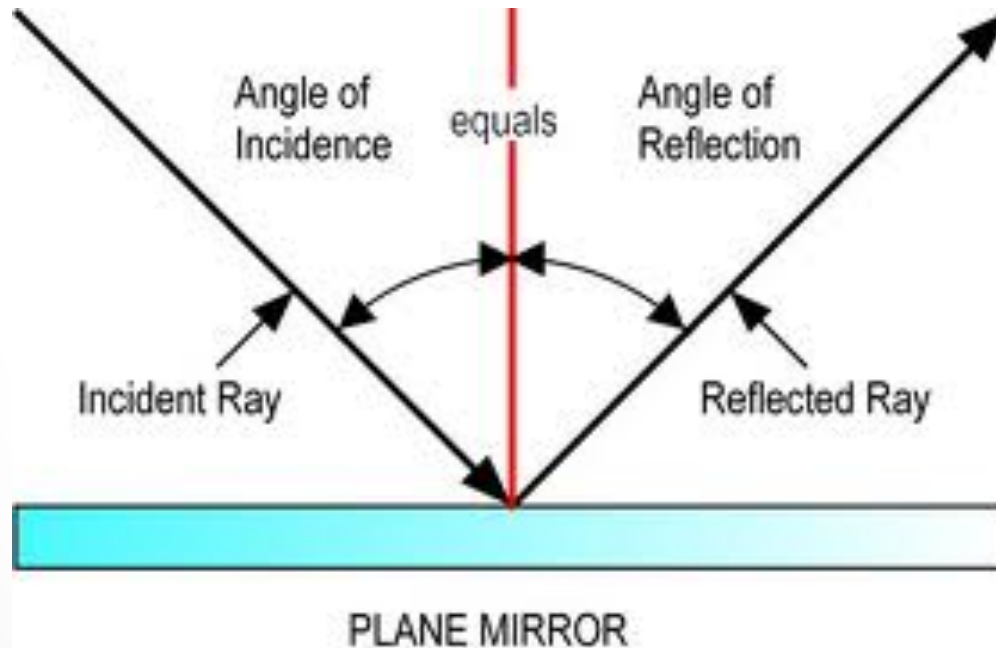
- It's From red to blue
- Wavelength: type of light
- Amplitude: Intensity of light
- Every color is a combination of the three primary colors





The human vision system.

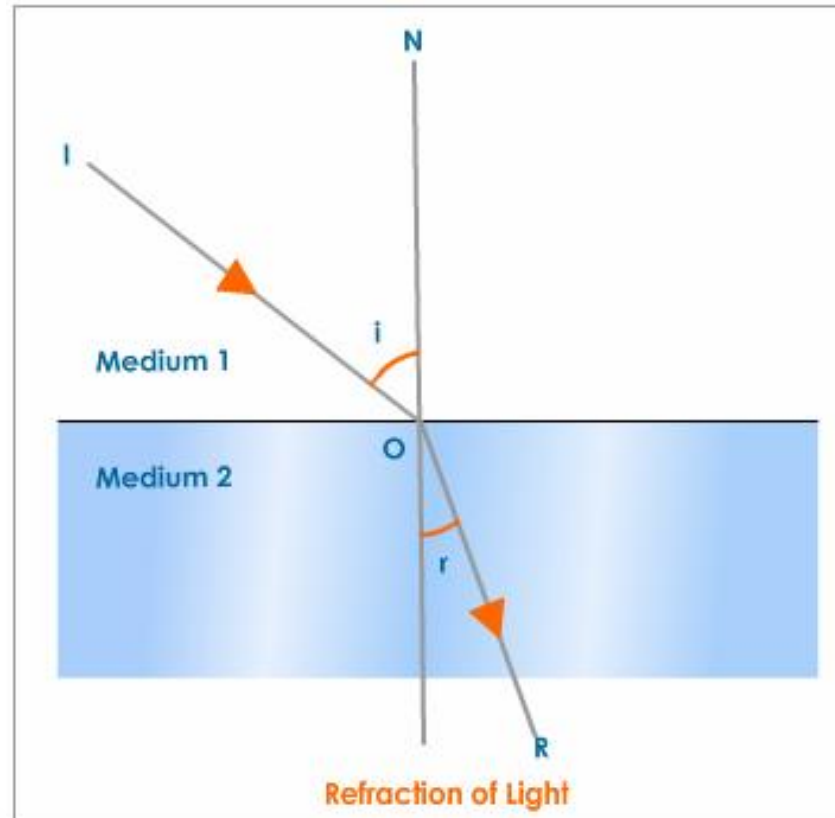
Reflection





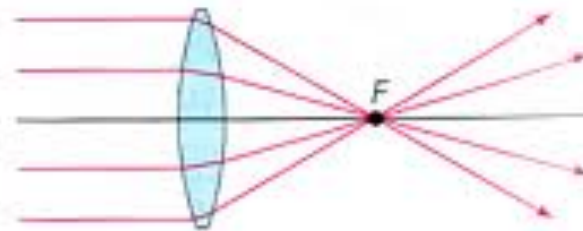
The human vision system.

Refraction

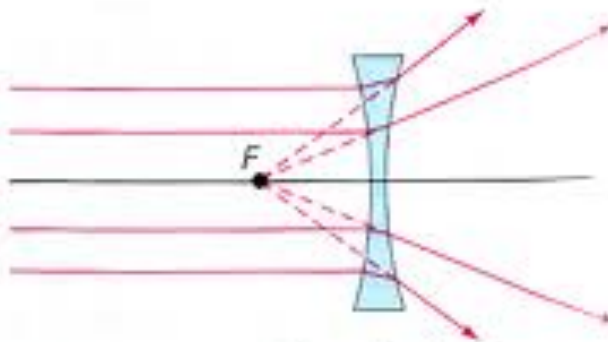


The human vision system.

Convergent and divergent lens



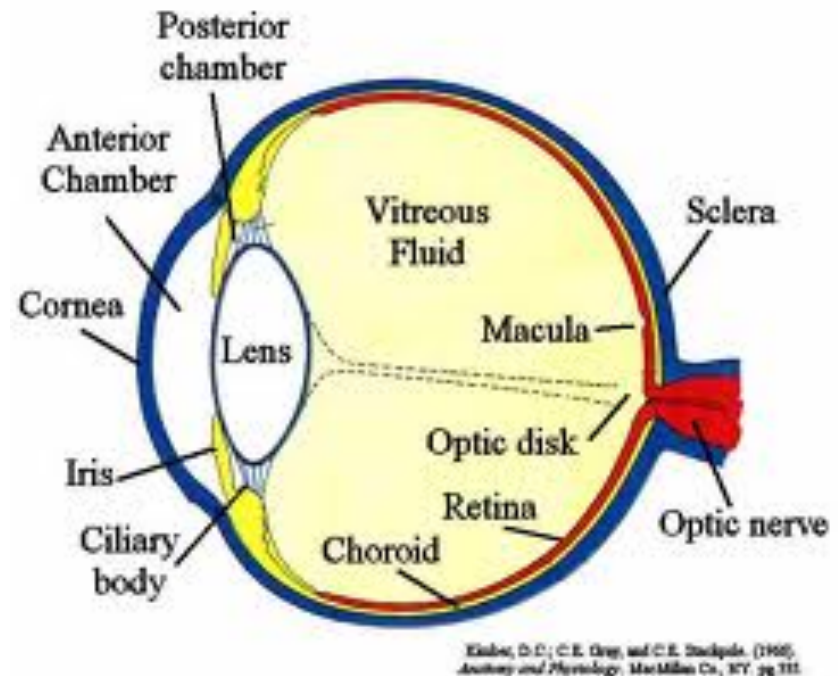
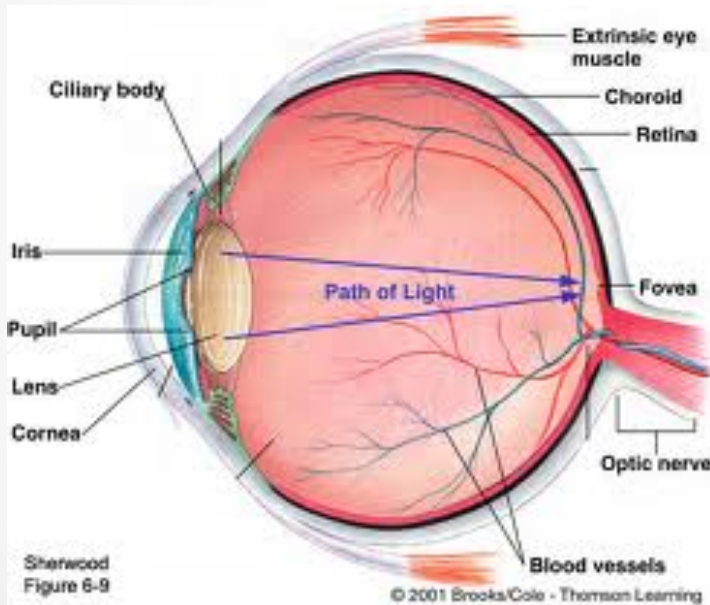
Converging lens



Diverging lens

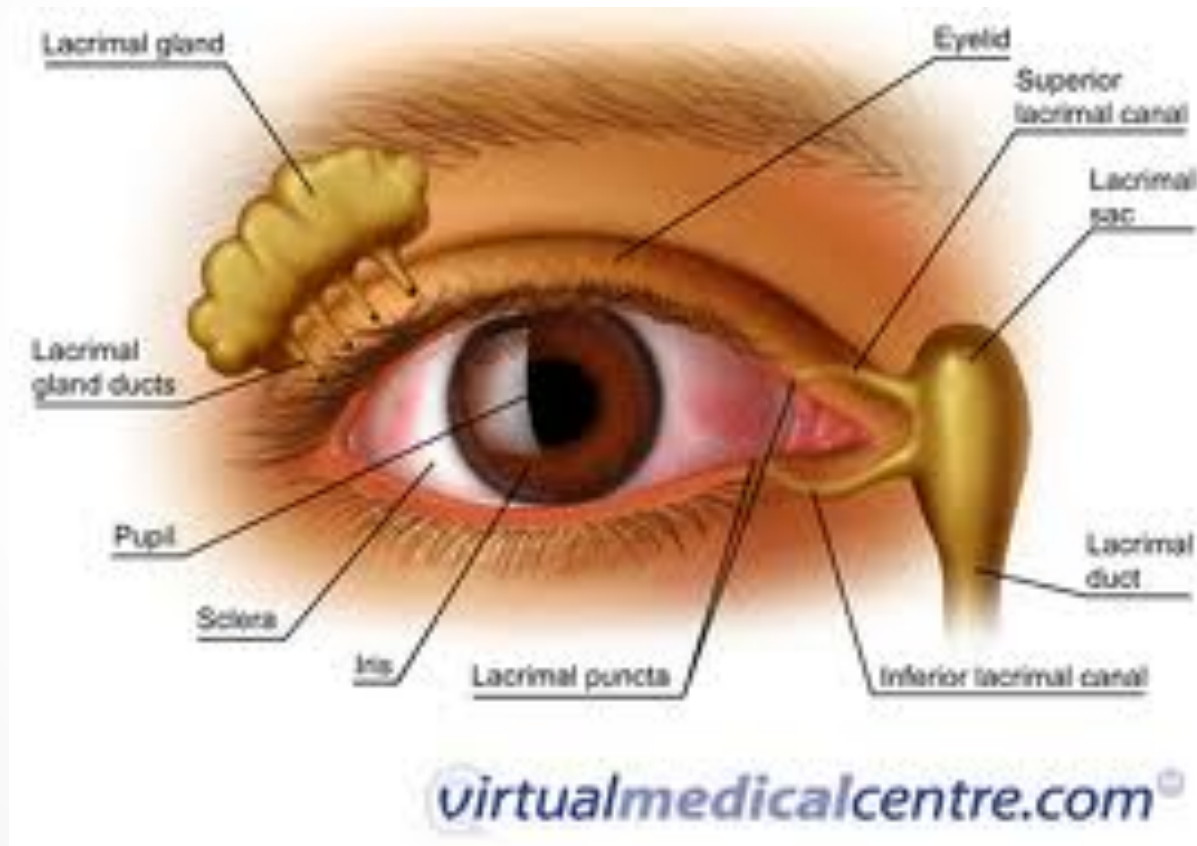
The human vision system.

The eye



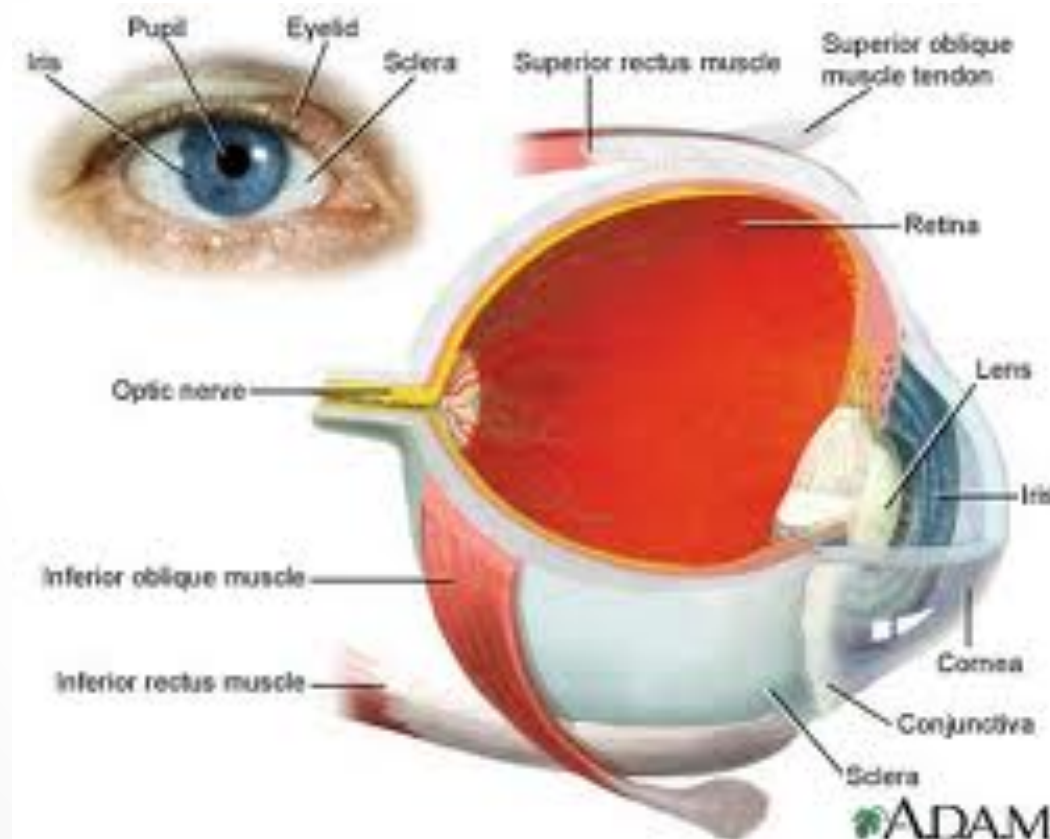
The human vision system.

The eye



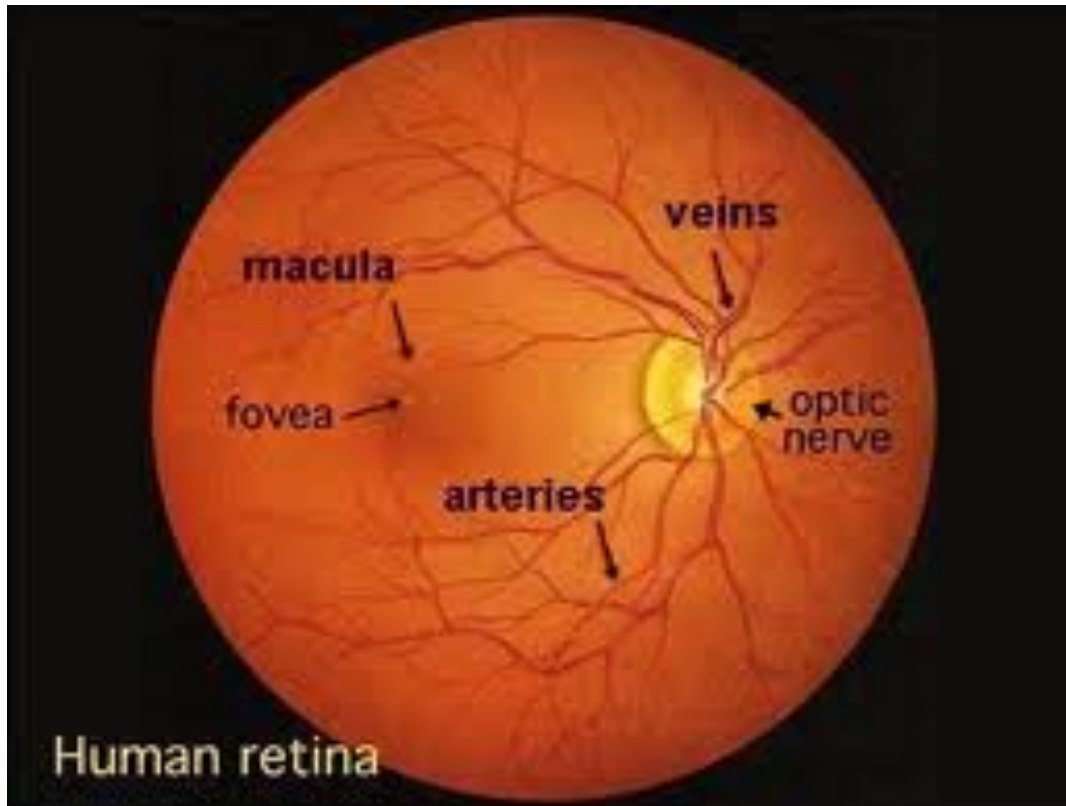
The human vision system.

The eye



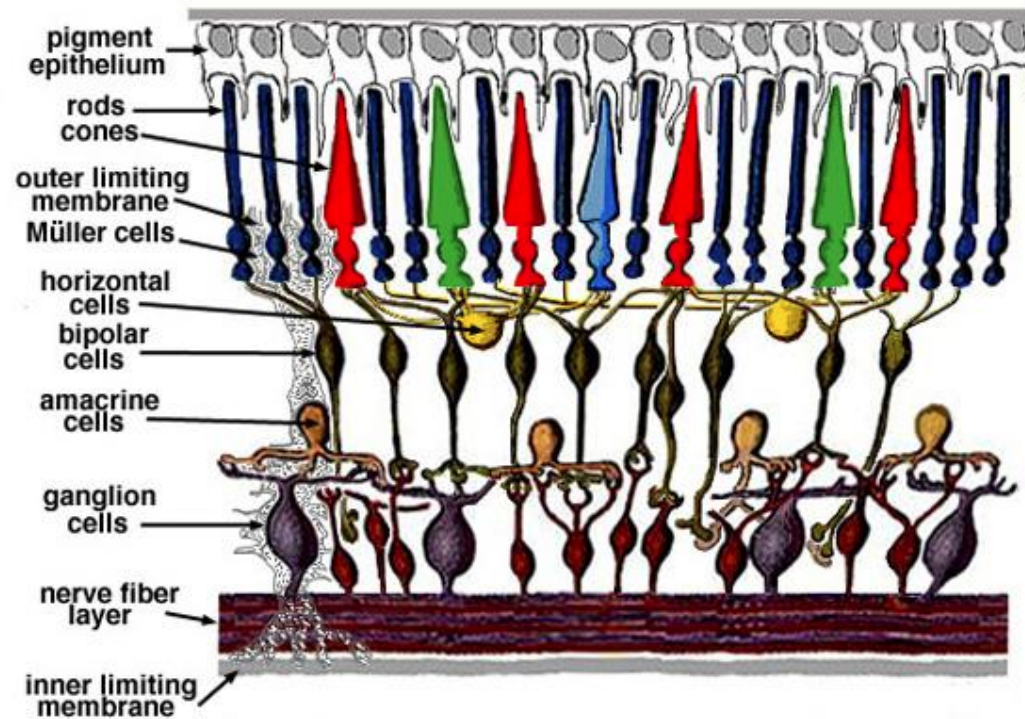
The human vision system.

The retina



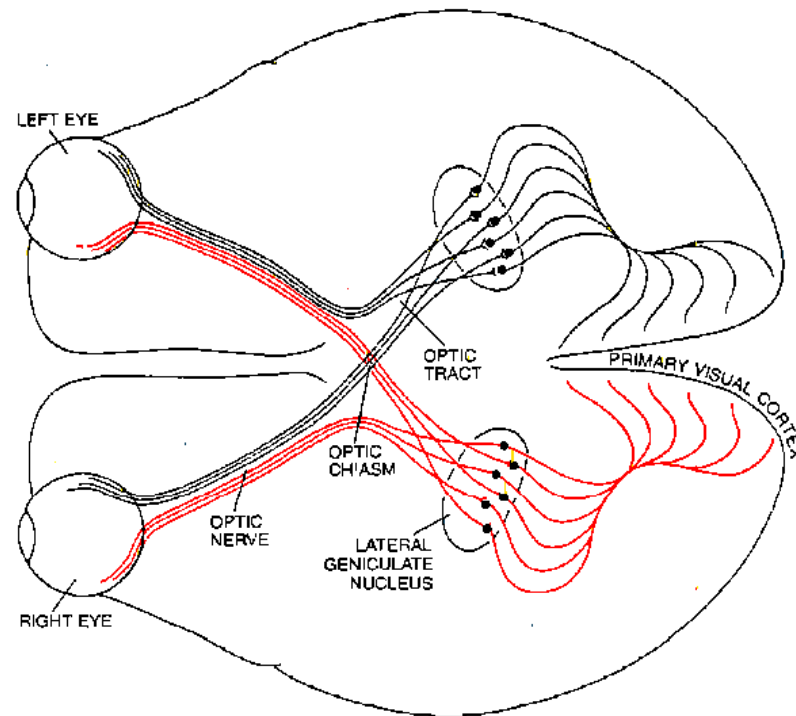
The human vision system.

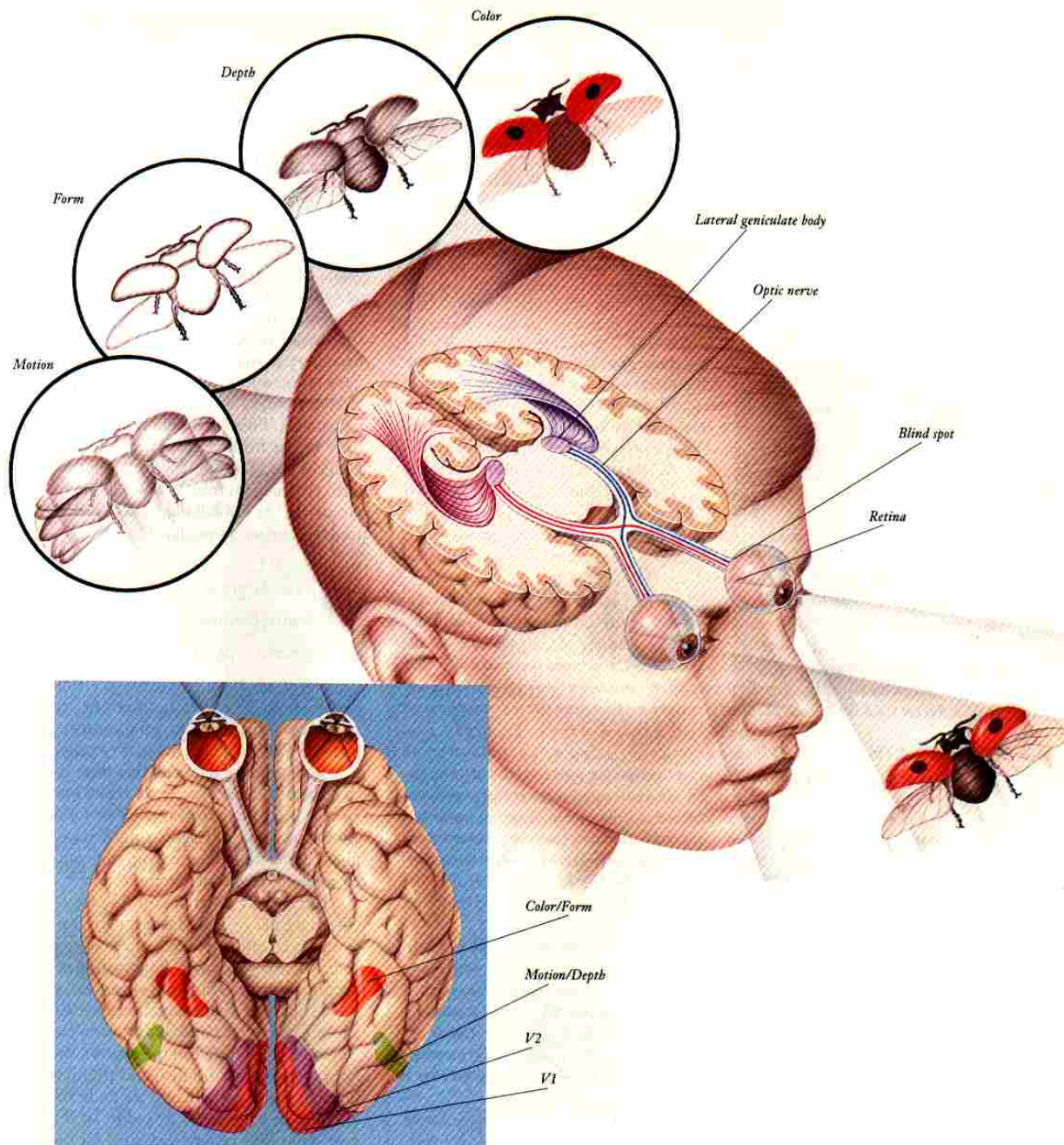
The retina



The human vision system.

The eye and the brain







The human vision system.

- How many cones? 6-7 millions
- How many rods? 75-150 millions
- How many images per second can we see? About 30 but in an emergency it can be reach the 60
- What percentage of the brain is used for the vision system? About 75%
- How many colors can we see? About 10 million
- How many colors can we see an the same time? About 250