

# Human Vision: Electrophysiology and Psychophysics



# The Lens



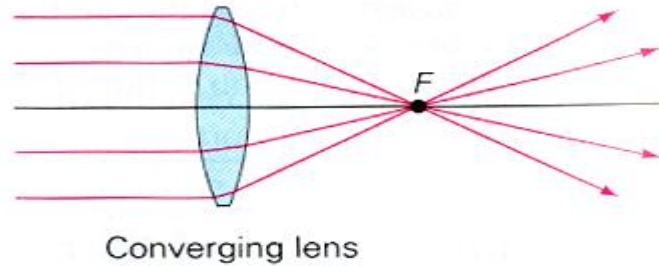
Several biological visual systems include one or several lenses



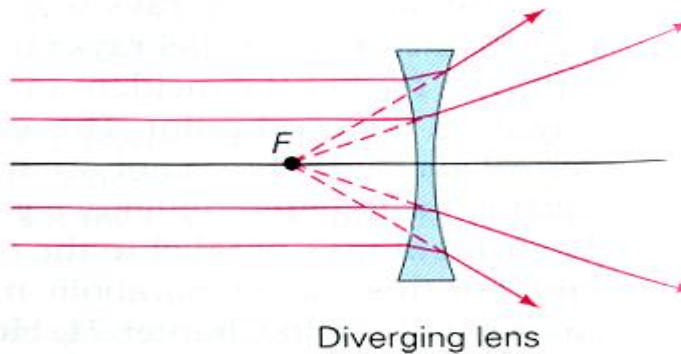


Cats have better night vision but poorer color vision.

# What is a lens?



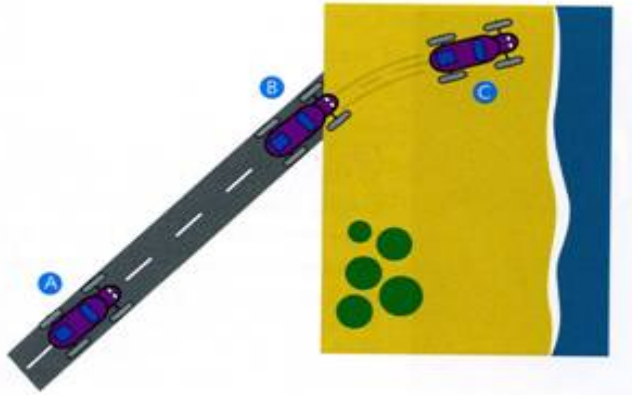
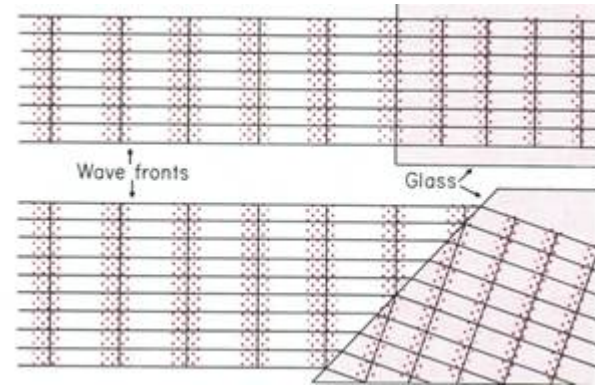
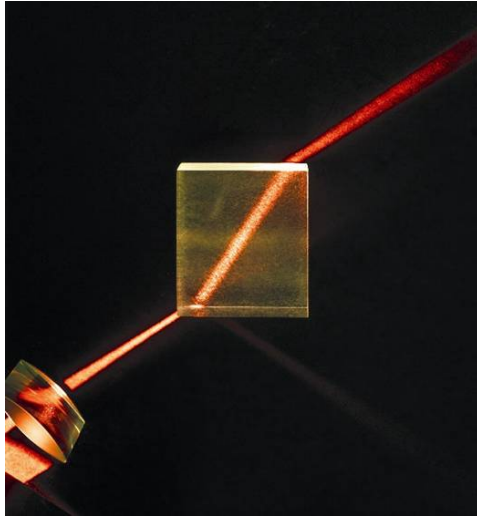
Convex lens



Concave lens

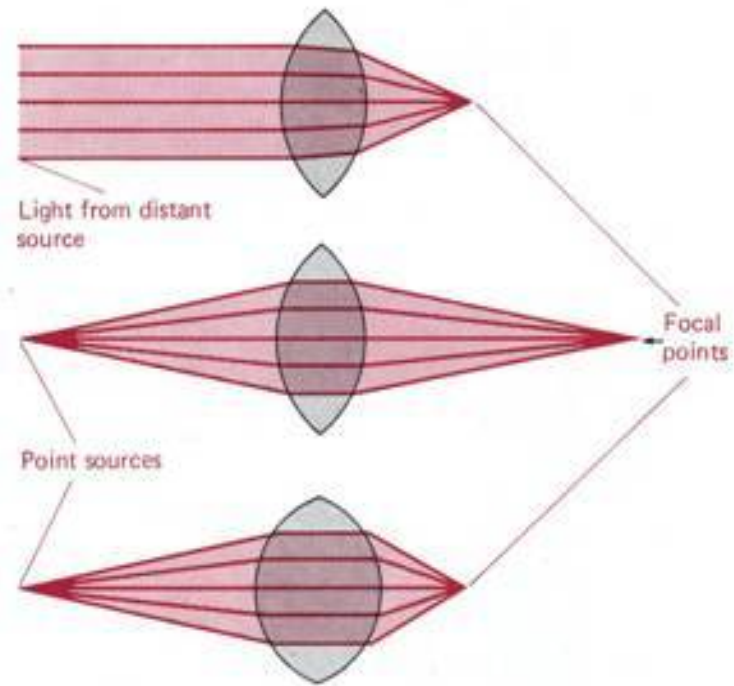
This takes place by refraction

# What is refraction?

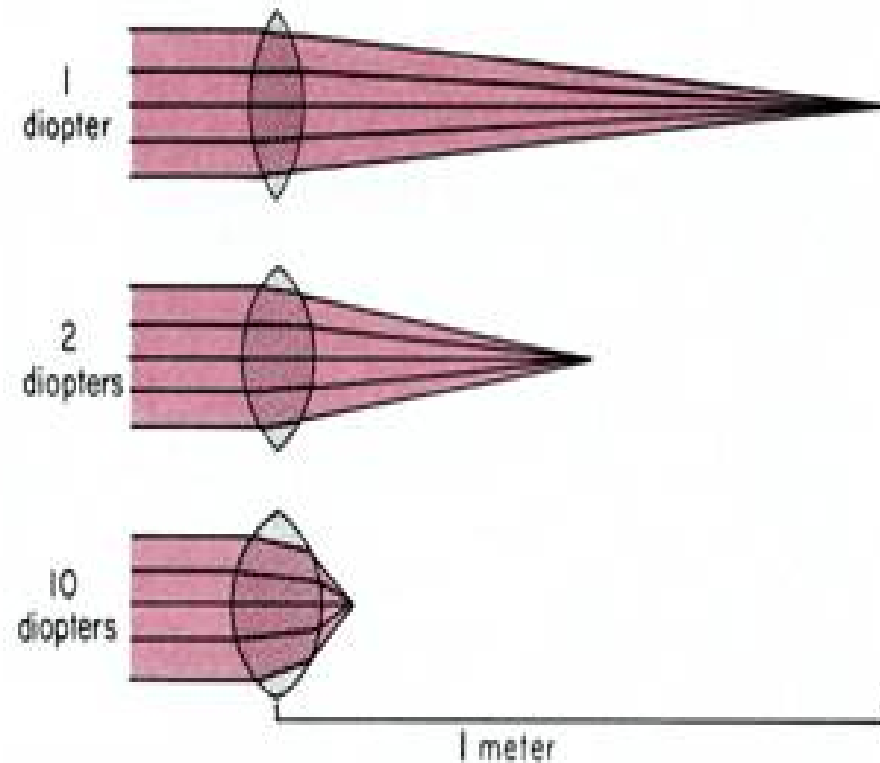


The refractive index of a transparent substance is the ratio of the velocity of light in air to that in the substance

# Converging lens

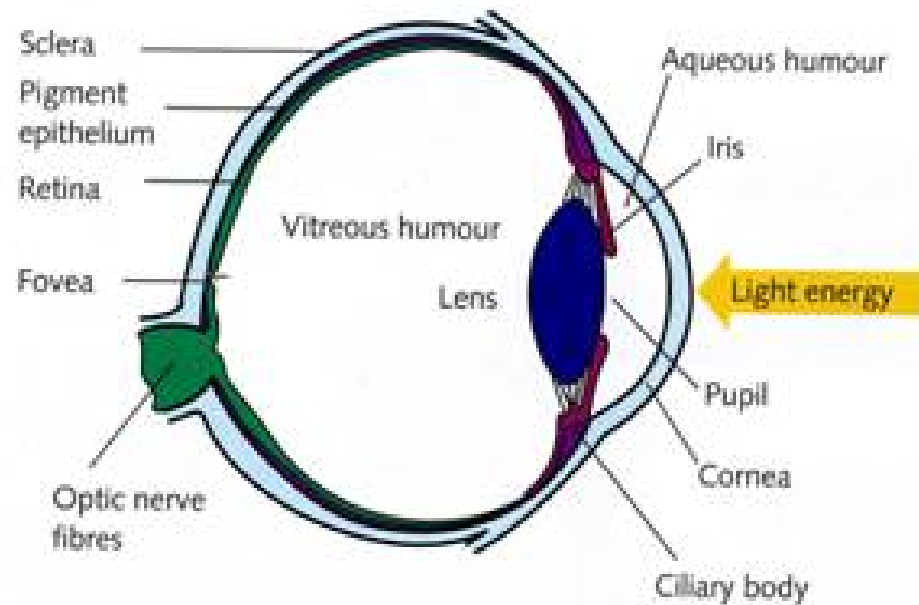


# The Diopter



Refractive power = 1 m/ focal length

# The eye



Eye is equivalent to a camera with a variable aperture system. The retina is the film and the pupil the variable aperture.



**The cornea** – transparent window through which light enters the eye. Main refractive surface of the eye.

**Lens** – refracts light so that image falls on the retina

**Aqueous humour, vitreous humour** – liquid filling eye. Glaucoma is a disease in which there is too much pressure in the eye. Air is puffed into eye to see if cornea moves enough. If pressure is too high the cornea would move very little.

**Pupil** – aperture through which light enters the eye

**Iris** – changes the width of the pupil

**Lens** – refracts light to reach retina

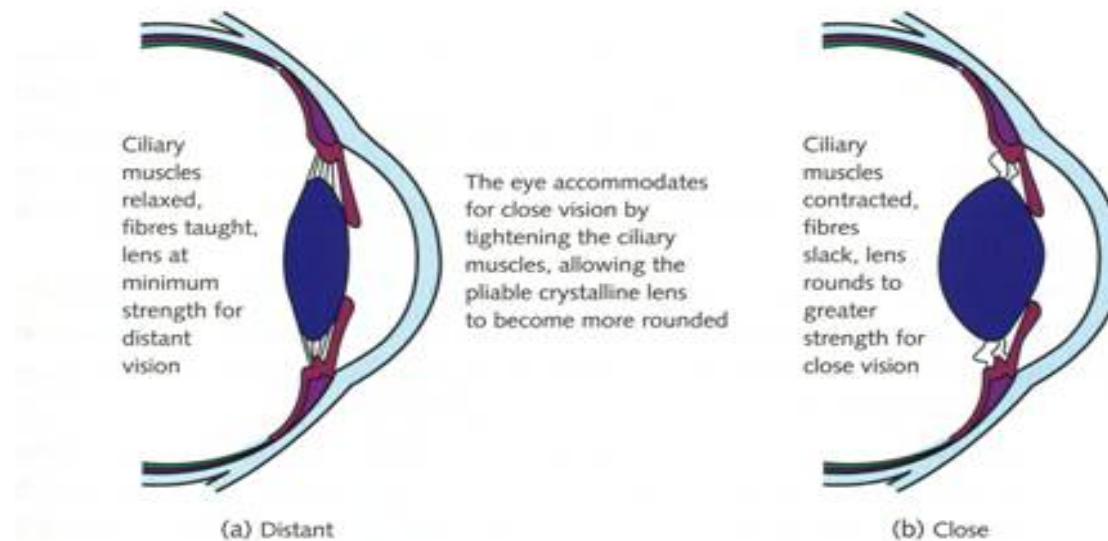
**Ciliary body** – changes thickness of lens

**Retina** – like the film of the eye

The eye is capable of vision in conditions of light that vary greatly in intensity



# Accommodation



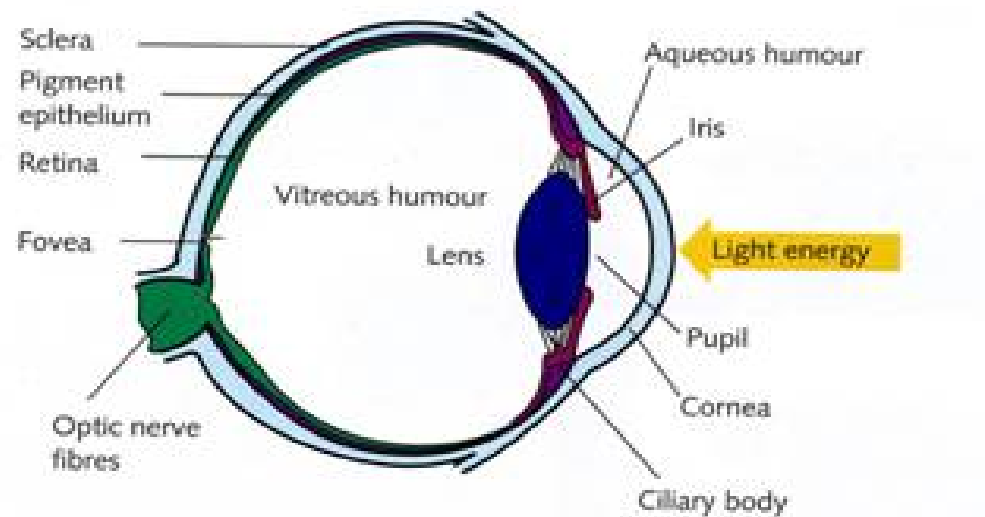
Distant vision

Close vision

Presbyopia – Condition in old age where the lens loses its capacity to change shape.

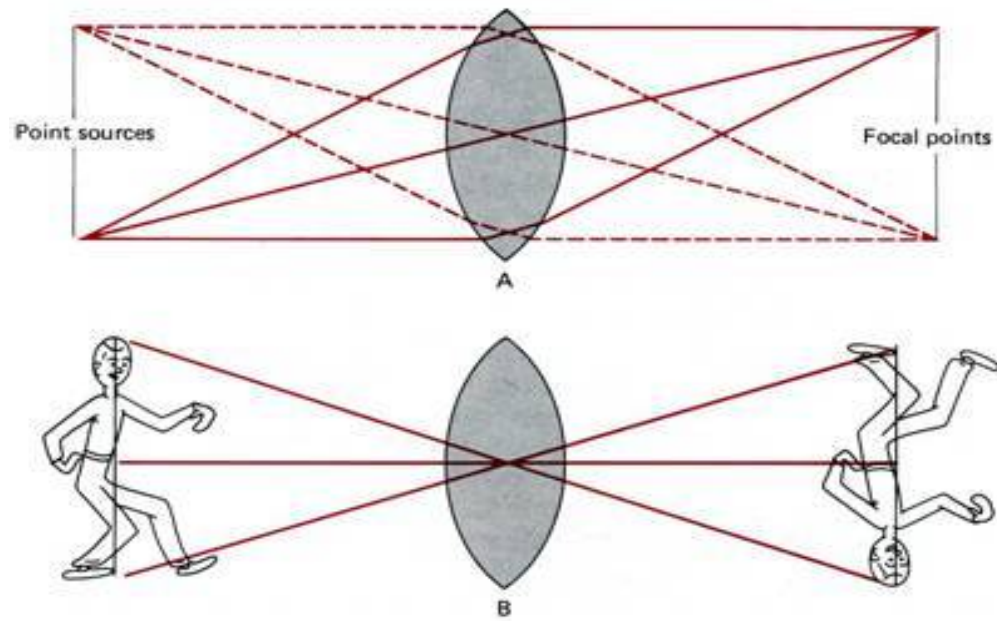
# Refractive indices of the eye

Total refractive power of the eye is 59 diopters

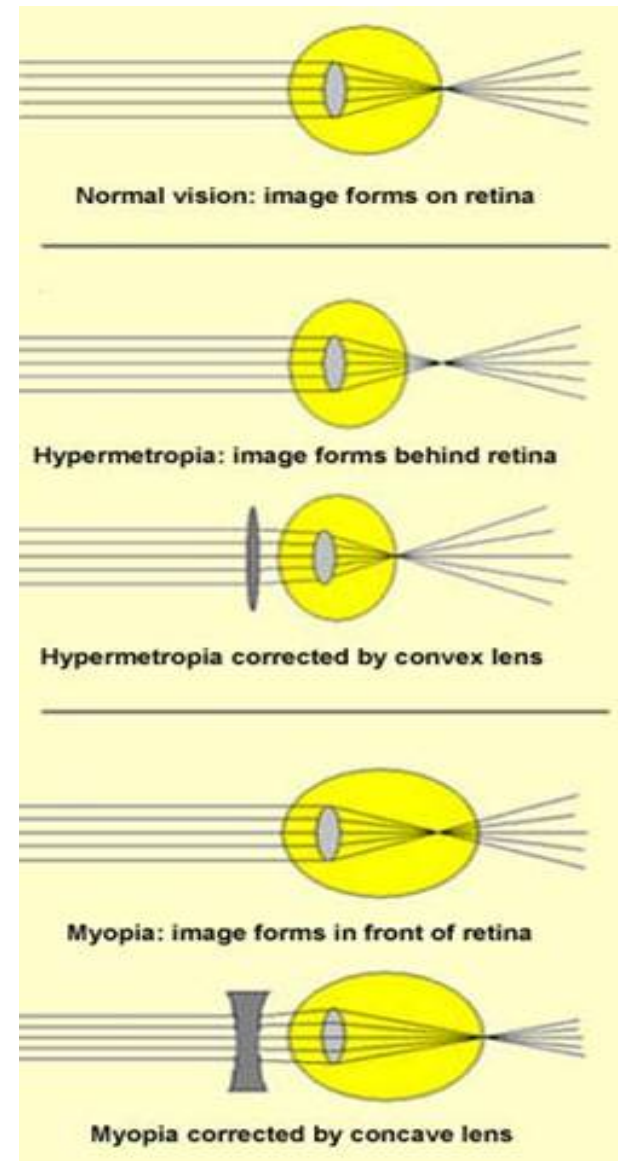


Vitreous humour	Lens	Aqueous humour	Cornea	Air
1.34	1.4	1.33	1.38	1.00

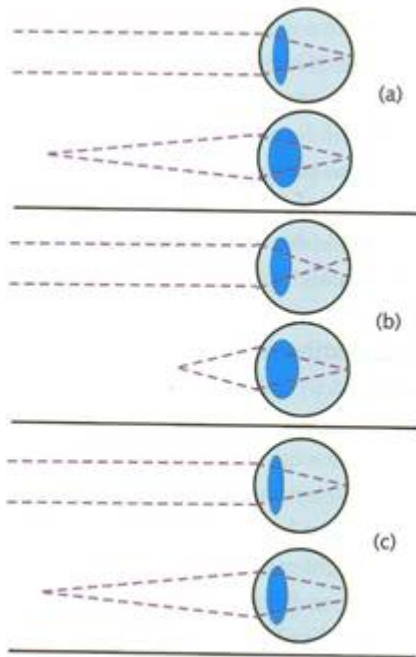
# Image inversion



# Common problems in vision



# Common problems in vision

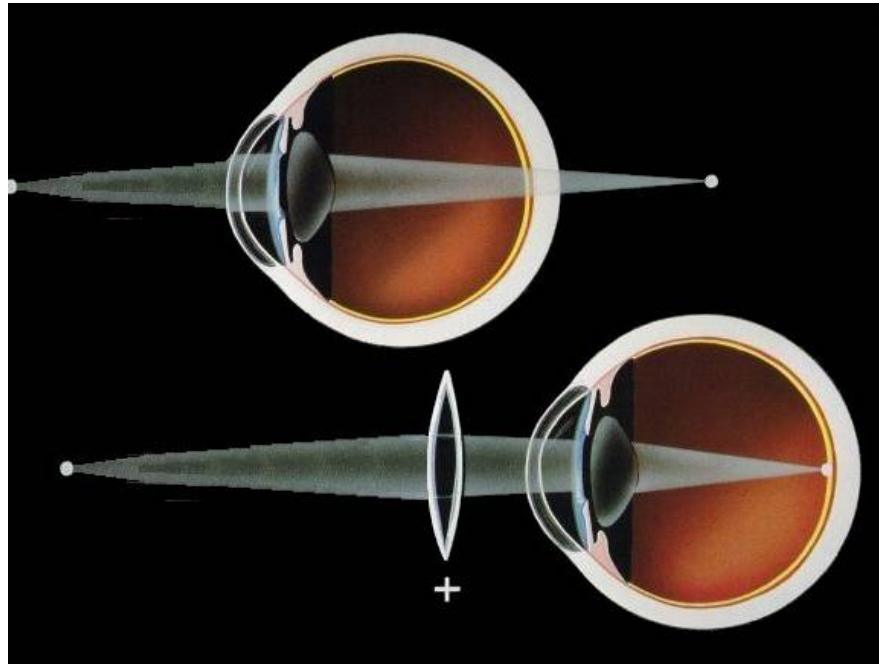


Emmertropia

Myopia (short sight)

Hypermetropia (long sight)

# Presbyopia



The inability to focus on close objects as the lens becomes inelastic with ageing.