

Ophthalmology

OPHTHALMOLOGICAL INSTRUMENT

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1) Slit lamp:

Basic Design :

1. Mechanical system
2. Illumination system
3. Biomicroscope /observation system

Associated instruments:

**Applanation Tonometer/ Gonioscopic Lens/ Fundoscopy Lens/Micrometer
Eyepieces/ Image archiving device/Laser delivery system**

Mechanical system :

Basic 3 parts :

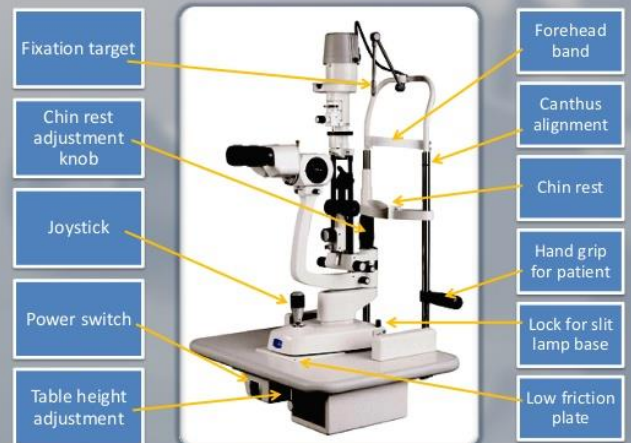
1. Motorized table (Base)
2. Patient positioning frame
3. Joystick

It concern with :

**Positioning & adjustment of patient and
system together with joystick
Providing base to other parts**

Cont...

Parts of mechanical system :

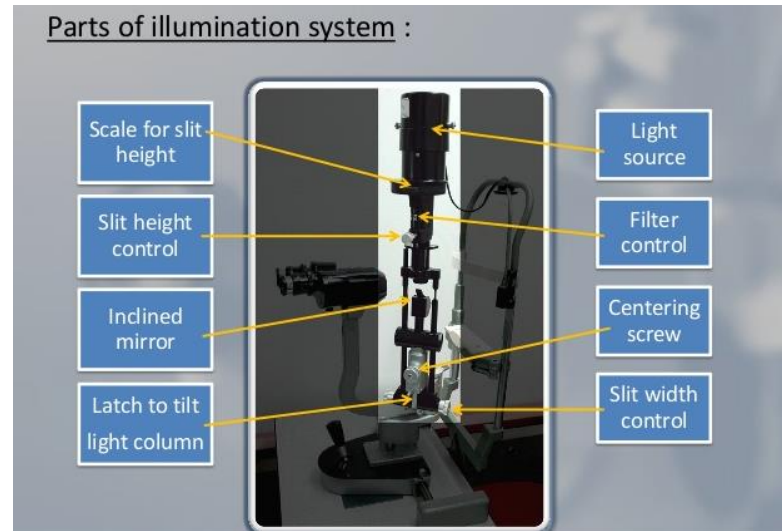


Illumination system :

Provides a bright, evenly illuminated, finely focused, adjustable slit of light at the eye.

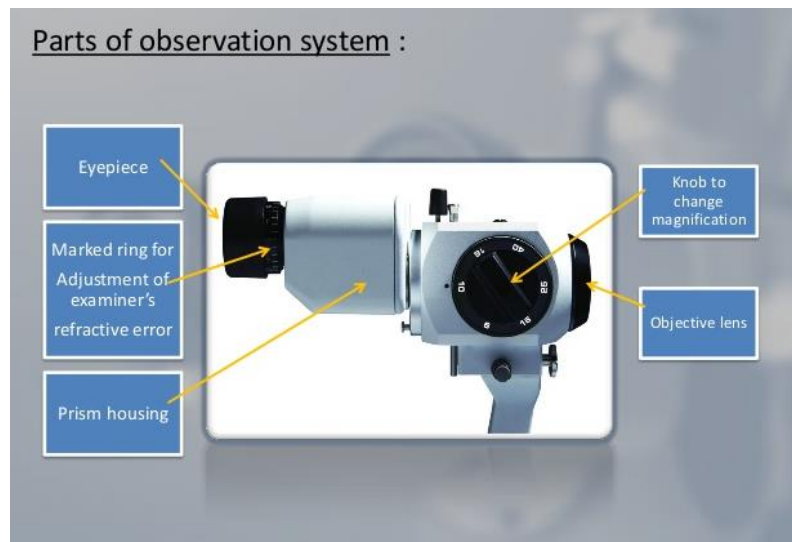
Contains the following components:

- Light source
- Condenser lens system
- Slit and other diaphragms
- Filters
- Projection lens
- Reflecting mirror or prisms



Observation part::

- eyepiece
- prism housing
- knobe to change magnification
- objective lens

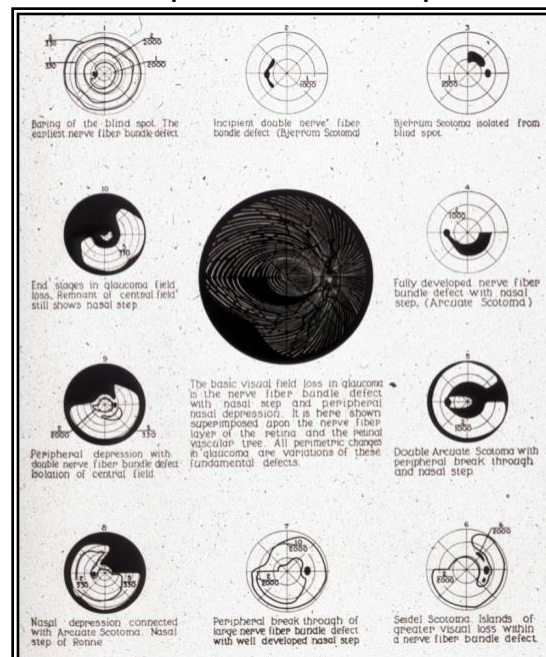
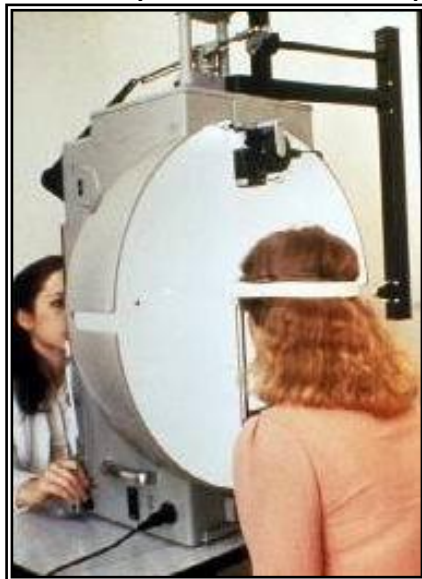


2-Visual Field assessment

a-Confrontation test: subjective, for detecting of peripheral visual field defects

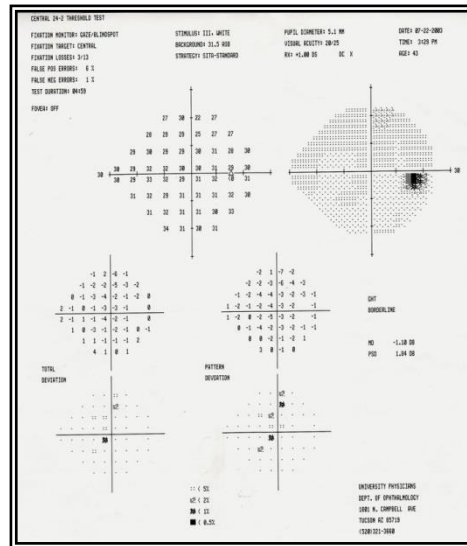


b- Kinetic Method: Goldman's perimetry (Kinetic because a target with fixed illumination is continuously moved until it is no longer seen) mainly for peripheral field defects like Bitemporal hemianopia, homonymous hemianopia



c- Static: Humphrey Field Analyser (the target is not moving but its illumination intensity is changed until it is no longer seen) mainly to

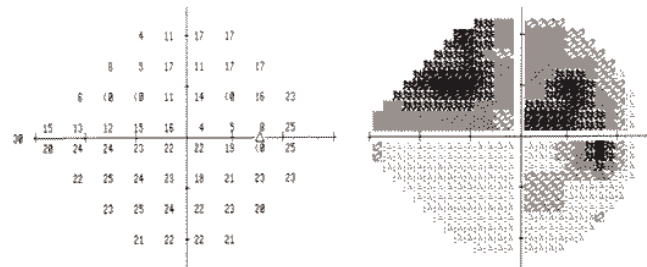
detect central visual field defects for e.g. in Glaucoma and Optic nerve diseases



Scotoma visual loss in an area.

*Absolute no vision

*Relative loss of vision (depressed)



3- motility and alignment tests

a-Hirschberg test



Shine penlight into eyes from 30 cm –corneal light reflex should be in the center and similar in both eyes

b-Cover test



Place a target 30 cm from the patient's eyes for fixation and cover one eye.. observe the movement for fixation in the non-covered eye ---this test confirm the presence of manifest squint(-tropia) and detect its type:

- eye moves outward to refixate—esotropia
- eye moves inward to refixate--- exotropia
- eyes move up to refixate---hypotropia
- eyes move down to refixate—hypertropia

c-Cover uncover test

place a target in front of the patient eyes for fixation
cover one eye and uncover it and observe the movement of the eye under the cover

this test detect the presence of latent squint(-phoria) and determine its type

- eye move outward on removing the cover—esophoria
- eye move inward on removing the cover--exophoria
- eye move up on removing the cover--- hypophoria
- eye move down on removing the cover-----hperphoria



Eyes straight (maintained in position by fusion).



Position of eye under cover in orthophoria (fusion position). The right eye under cover has not moved.



Position of eye under cover in esophoria (fusion-free position). Under cover, the right eye has deviated inward. Upon removal of cover, the right eye will immediately resume its straight-ahead position.



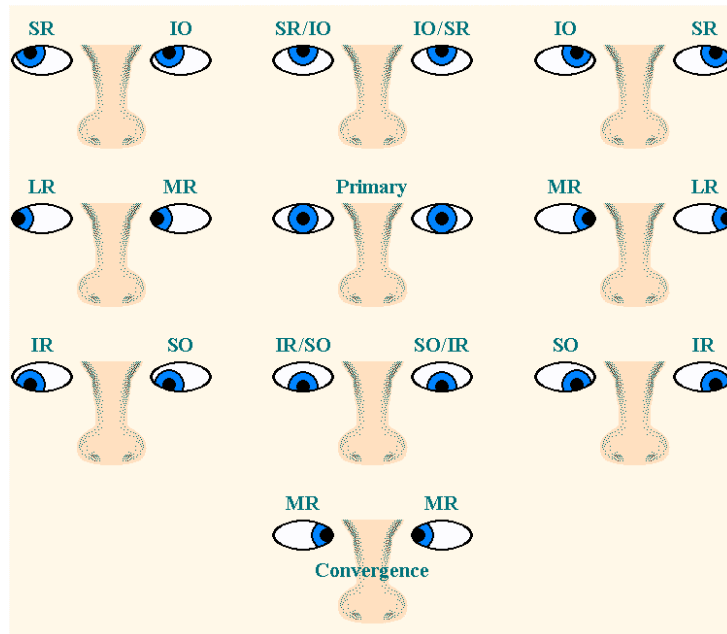
Position of eye under cover in exophoria (fusion-free position). Under cover, the right eye has deviated outward. Upon removal of the cover, the right eye will immediately resume its straight-ahead position.

d-determining angle of squint either crudely by Hirschberg test or by using prisms to neutralize the deviation.

e-Ocular motility test

--Examine the six cardinal position

--notice the presence of ophthalmoplegia, diplopia, nystagmus



4- Intraocular pressure measurement

Normal range: 10-21 mm Hg

Diurnal fluctuation normally < 6 mmHg

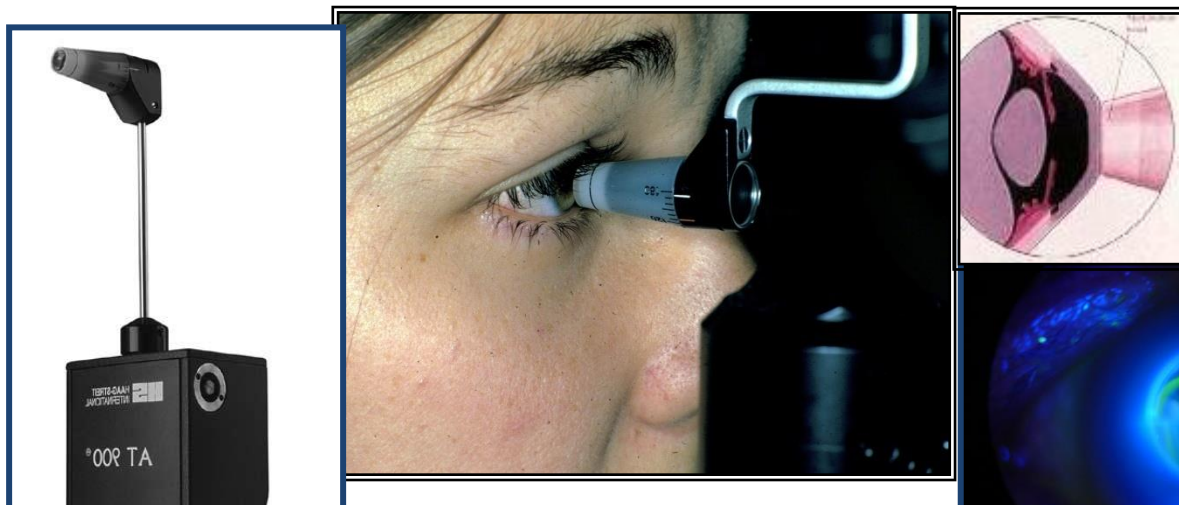
Women have slightly higher pressures

Normal central corneal thickness: 545 – 550 u

Add or subtract 0.6 mmHg for each 10 u change in central corneal thickness

a- Applanation method

1) Goldman's Applanation tonometry : incorporated with the slit-lamp, the most accurate method

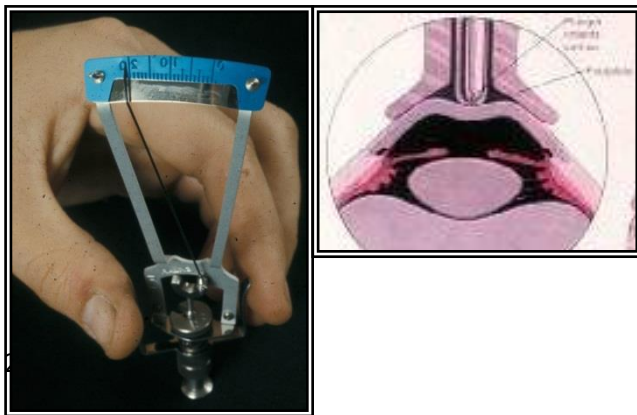


2)Air puff tonometer: rapid screening technique & also depend on applanation principle



b-Indentation method

Shiotz tonometer



Tonopen



c-Crude method by digital palpation

5-Fundoscopy/Ophthalmoscopy

1- Direct Ophthalmoscope

This instrument provides a quick means for fundal examination especially the optic disc.

It characterised by the following

- Magnified view of the fundus about 15 times
- Limited field, only 6 degrees
- Image formed is erect
- Can be affected by refractive errors of the patient
- Monocular no stereopsis (3D image)



2- Indirect Ophthalmoscope:

It is composed of head mounted light source and a condensing lens of either 20 or 30 dioptic power in front of the eye being examined.

Thus forming a real image between the condensing lens and the observer.

Indirect Ophthalmoscope has the following features:

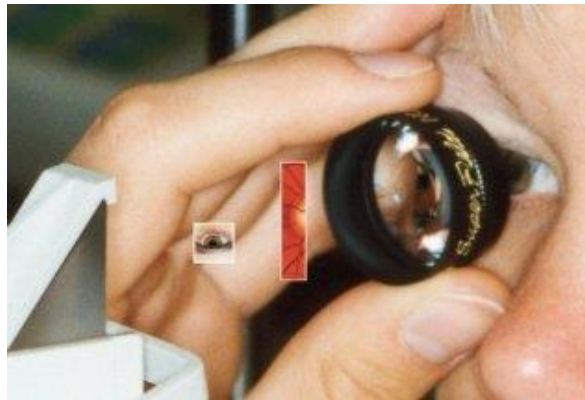
- Magnification is less than that obtained with the direct ophthalmoscope (3-5 times only)
- The field is larger about 25 degree
- Image is inverted and laterally reversed
- The image is little affected by refractive errors
- Binocular vision (stereoscopic view)



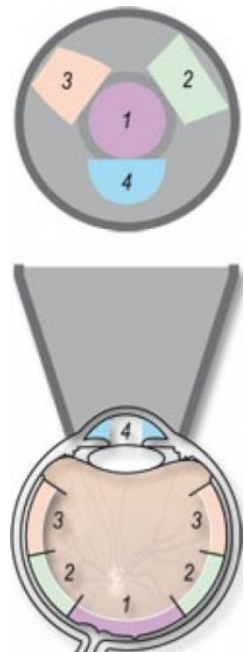
3- Slit lamp

a-with condensing lens

Slit lamp can also be used to examine the posterior segment (vitreous and retina) with the use of high power condensing lens; 66, 78 and 90 dioptic power. It is mainly to examine the central 30 degrees.



b-For examining the peripheral retina we should use a special lens called 3-mirrors lens & of course with slit lamp.



c-with diverging lens such as Hruby lens(-58 diopter)



d- with Panfundoscopic lens

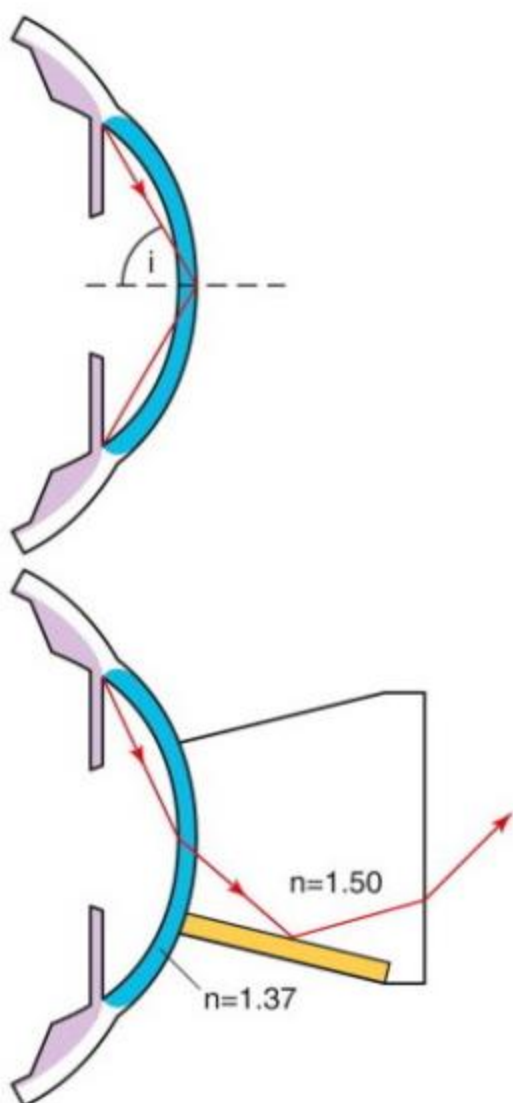


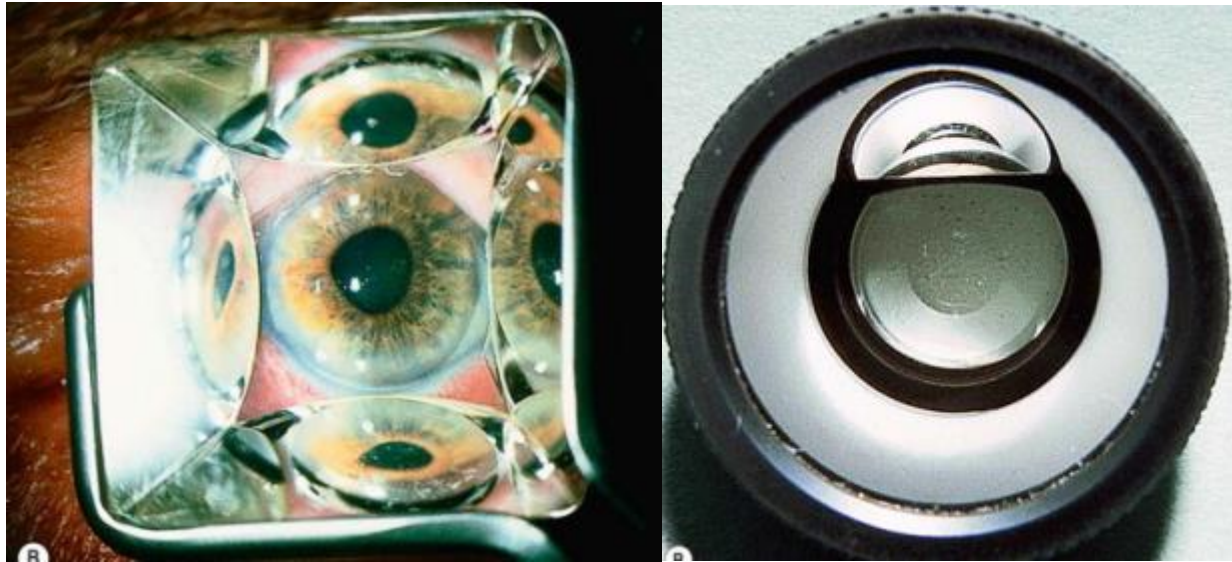
4-Fundus camera with or without fluorescein angiography

6-Gonioscopy: is a method of evaluating the anterior chamber angle to provide information regarding the type of glaucoma. It can also be utilized therapeutically for procedures such as laser trabeculoplasty and goniotomy.

Optical principles

The angle of the anterior chamber cannot be visualized directly through the intact cornea because light from angle structures undergoes 'total internal reflection' at the anterior surface of the precorneal tear film. Because the refractive index of a goniolens is similar to that of the cornea, it eliminates total internal reflection by replacing the tear film-air interface with a new tear film-goniolens interface. Light rays can then be viewed as they exit the contact lens. The two main types of goniolenses are indirect goniolens (by goniolens +slit lamp) and direct goniolens.



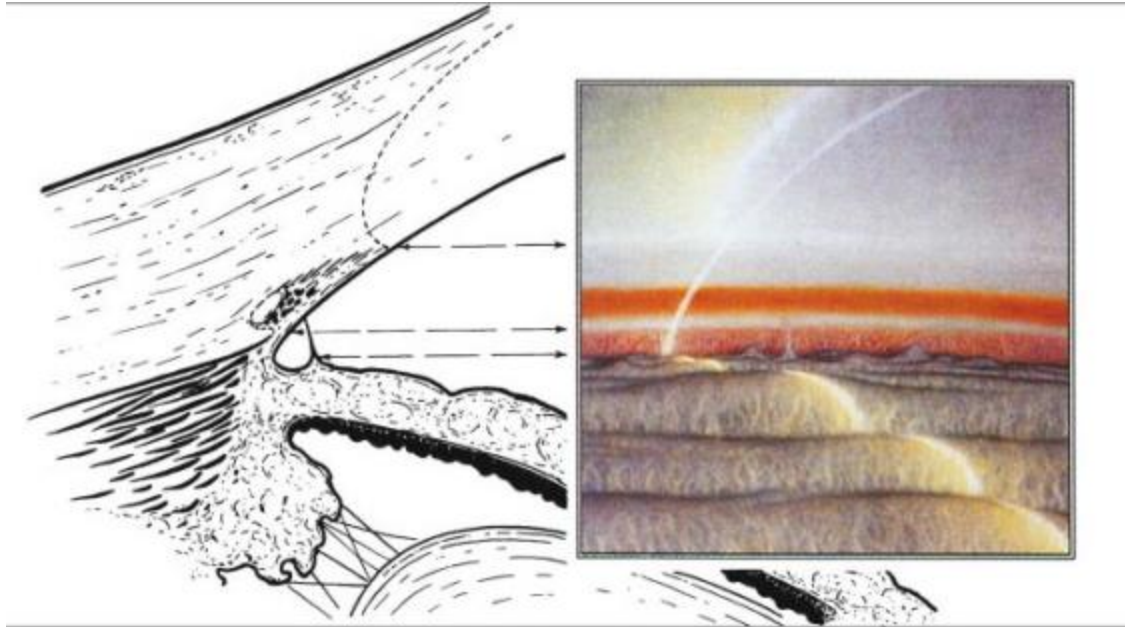


Indirect type



Fig. 10.13 Koeppe goniolenses

Direct type



1. 10.15 Normal angle structures

7-Detection of refractive errors done by:

a-auto refractometer.



b-manual retinoscopy.

- *Retinoscopy* - an objective method of measuring the optical power of the eye.
- *Retinoscope* - an instrument that we used to illuminate the inside of the eye, and to observe the light that is reflected from the retina.
- By examining just how these emerging rays change, we determine the refractive power of the eye.



