Advanced Slit Lamp Skills

OR

How to adjust the lighting to see stuff!

2 types of slit lamp biomicroscope

1)Zeiss slit lamp biomicroscope

-light source is at the base

2)Haag-Streit slit lamp biomicroscope

-light source is at the top

Zeiss slit lamp biomicroscope

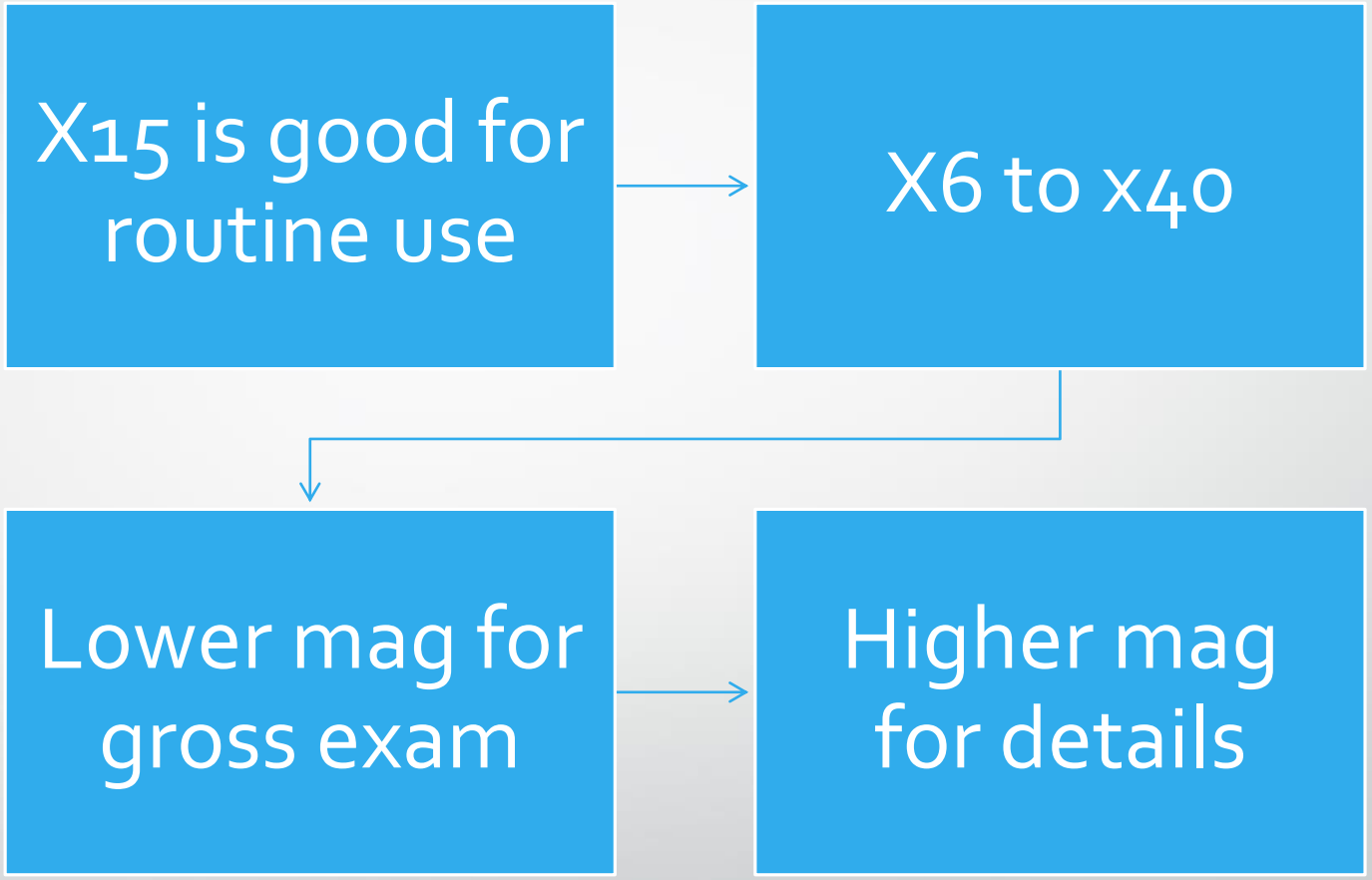
Haag streit slit lamp biomicroscope

Good Illumination

Lighting controls:

- Narrow the beam of light to a narrow slit
- Vary the length of the slit to a small pinpoint of light
- Introduce color filters to provide a green and a deep cobalt blue
- Rotate the slit
- Adjust the angle between the slit beam and line of sight

Magnification



Slit Beam Size

Longer and wider

- Examine lids, cornea, conjunctiva, and sclera

Fine and short

- Examine fine details
- Produce Tyndall effect when looking at aqueous and vitreous

Examination setup

Adjust	Adjust interpupillary distance for binocularity
Neutralize	Neutralize the eyepiece to correct refractive error
Adjust	Adjust height of table for the patient
Adjust	Adjust chinrest to give forehead support. Use eye mark on post
Maneuver	Maneuver beam to the correct position and adjust beam to 1-2mm
Start on	Start on low mag and build to higher

Table 6.1 Filters available on most slit-lamp biomicroscopes.

Filter	Typical symbol	Use
Cobalt blue	Blue filled circle	Enhances the view of fluorescein dye in the tear film of the eye. Typically used for fluorescein staining and Goldmann tonometry.
Red free	Green filled circle	Used to enhance the view of blood vessels and haemorrhages
Neutral density	Circle with hashed lines	Decreases maximum brightness for photosensitive patients
Heat absorbing	Built into most slit-lamps	Decreases patient discomfort
Grey	Circle with thick line	Decreases maximum brightness for photosensitive patients
Yellow filter	Yellow filled circle Located in the observation system	For good contrast enhancement when using fluorescein and the cobalt blue filter
Diffuser	May be a flip-up filter placed on the illumination source	Used for general overall observations of the eye and adnexa

Illumination techniques

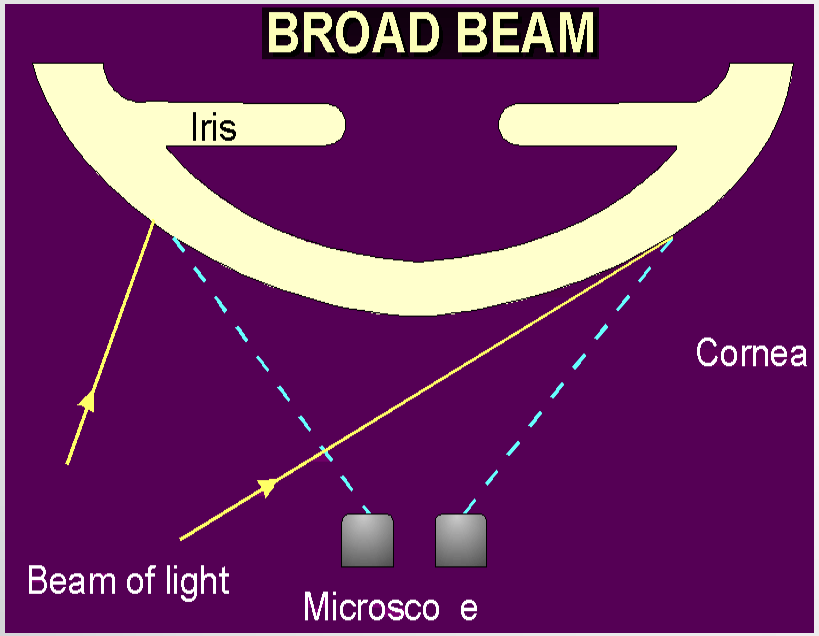
- Diffuse illumination
- Direct illumination
  - Parallelepiped
  - Optic section
  - Conical(pinpoint)
  - Tangential
  - Specular reflection
- Indirect illumination
  - Retro-illumination
  - Sclerotic scatter

- Von Herrick Technique
- Contact Lens Evaluation
- Fluorescein techniques
- Gonioscopy
- Fundus views

DIFFUSE ILLUMINATION

SETUP:

- Angle between microscope and illumination system should be 30-45 degree.
- Slit width should be widest.
- Filter to be used is diffusing filter.
- Magnification: low to medium
- Illumination: medium to high.



Optics of diffuse illumination

Diffuse illumination with slit beam and background illumination

DIFFUSE ILLUMINATION

OBSERVATIONS:

- Gives a good overall picture of the eye, but no fine details. It is used primarily for a general survey of the eye.
  - corneal scar or infiltration.
  - The presence of folds in Descemet's membrane.
  - invading blood vessels in the cornea
  - Edema of the epithelium looks hazy, gray, and somewhat granular
  - Contact Lens fitting
- *Observe: eyelids, lashes, conjunctiva, sclera, pattern of redness, iris, pupil, gross pathology, and media opacities*

PARALLELEPIPED:

SETUP:

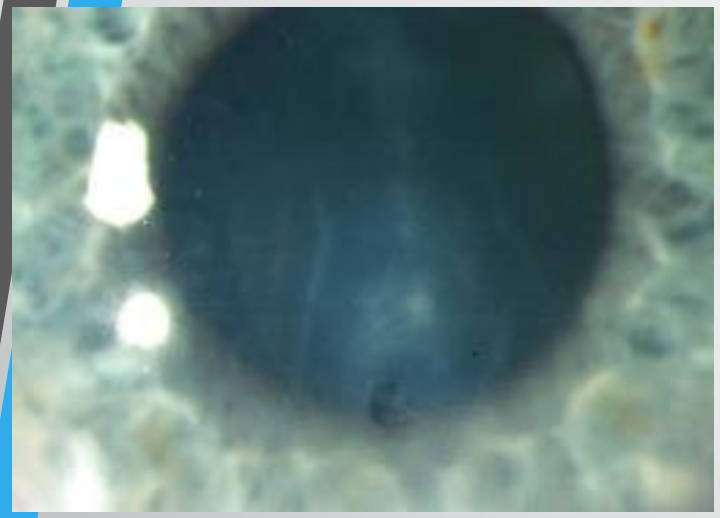
- Narrowing the beam to 1-2mm in width to illuminate a rectangular area of cornea.
- Microscope is placed directly in front of patients cornea.
- Light source is approximately 45 degree from straight ahead position.

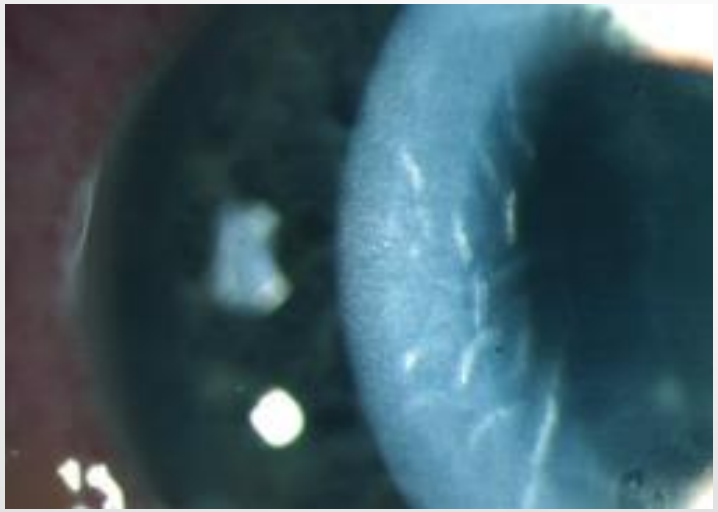
PARALLELEPIPED

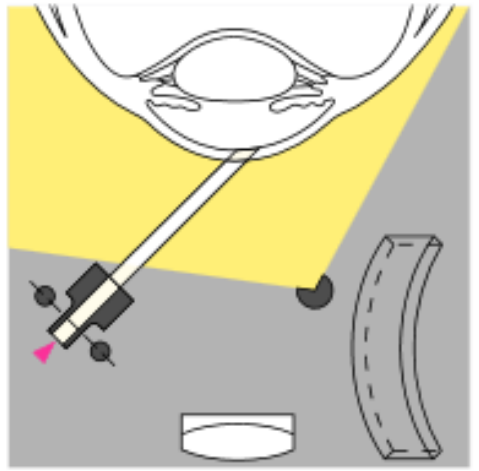
OBSERVATIONS:

- Detect and examine corneal structures and defects.
  - Opaque features in the cornea such as scars, abrasions, nebulae, blood vessels, and folds in Descemet's membrane reflect the light and thus appear whiter than the surround. These should also be examined under retro-illumination.
- Higher magnification than that used with wide beam illumination is preferred to evaluate both depth and extent of corneal scarring or foreign bodies.
- Corneal nerves appear under higher magnification as fine white silk threads usually branching into a Y (seen mostly in middle third of stroma).
- Detect corneal striae that develop when corneal edema occurs with hydrogel lens wear and in keratoconus.
- Used to examine the endothelium.

Cornea





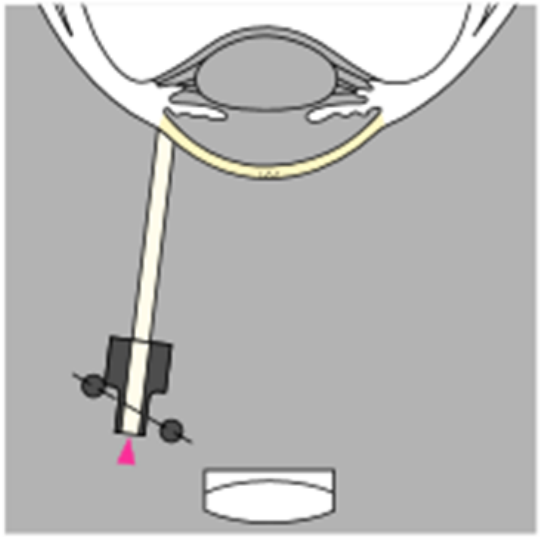


ISO:	200			
Flash Intensity:	high			
Background:	0%–25%			
Angle:	30°			
Slit Beam:	2–3 mm			
Filter:	–			
Angle:	45°			
Magnification:	10x	16x	25x	40x
Aperture:	–	3	3	2

SCLEROTIC SCATTER

SETUP:

- Focus a bright but narrow slit beam on the limbus
- Use microscope on low magnification- 10X
- The slit beam placed approximately 40-60 degree from the microscope
- Microscope directed straight ahead
- *When the light is properly aligned with regard to the eye, a ring of light will appear around the cornea.*
- The light is absorbed and scattered through the cornea highlighting pathology.

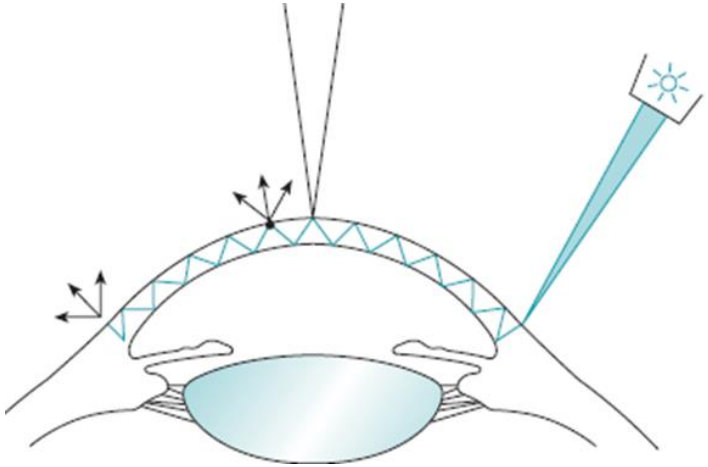


ISO:	200			
Flash Intensity:	high			
Background:	0%			
Angle:	–			
Slit Beam:	2 mm			
Filter:	–			
Angle:	decentred			
Magnification:	10x	16x	25x	40x
Aperture:	–	2	1	1

SCLEROTIC SCATTER

OBSERVATIONS:

- Central corneal epithelial edema
- Corneal abrasions
- Corneal nebulae and maculae



OPTIC SECTION

SETUP:

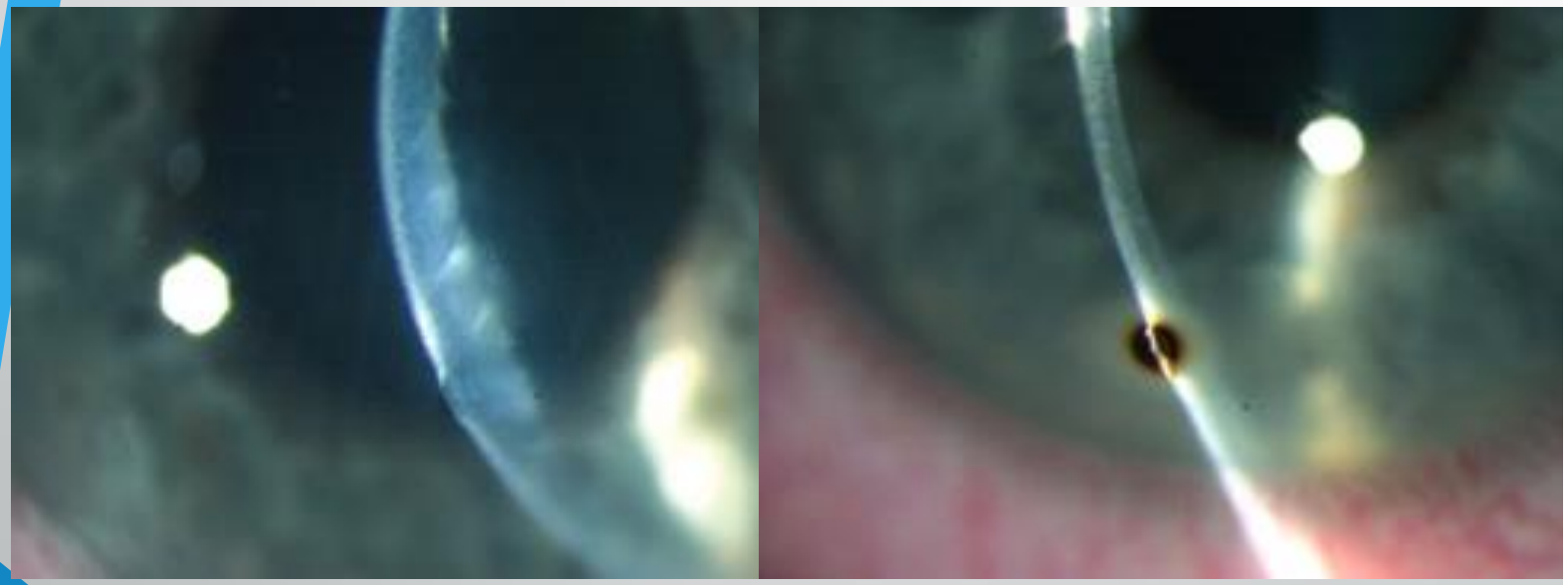
- Optic section is a very thin parallelepiped and optically cuts a very thin slice of the cornea.
- Magnification: maximum.
- Slit length should be kept small
- Examination of AC depth is performed by wider slit width .1-.3mm
- Angle between illuminating and viewing path is 45 degree. intersect in the area of anterior eye media to be examined e.g. the individual corneal layers.

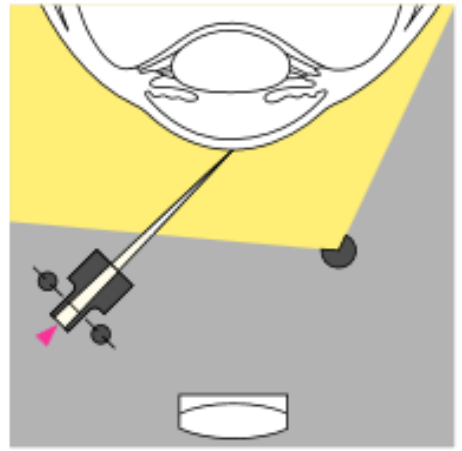
OPTIC SECTION

OBSERVATIONS:

- Used to localize: Nerve fibers, Blood vessels, Infiltrates, Cataracts, AC depth.
- To discover thickening, thinning, and distortions in the corneal contour.
- To determine the depth of foreign bodies or opacities in the corneal substance. (*a percentage of the total corneal thickness*)
- To see a wide slice of stroma. (*The angle between the microscope and illuminating arm can be increased*.)
- To perceive the flare in normal aqueous. The luminous beam is directed so that the upper portion of the beam enters the lower part of the pupil. This permits dark areas immediately above to serve as a dark contrasting background.

Cornea





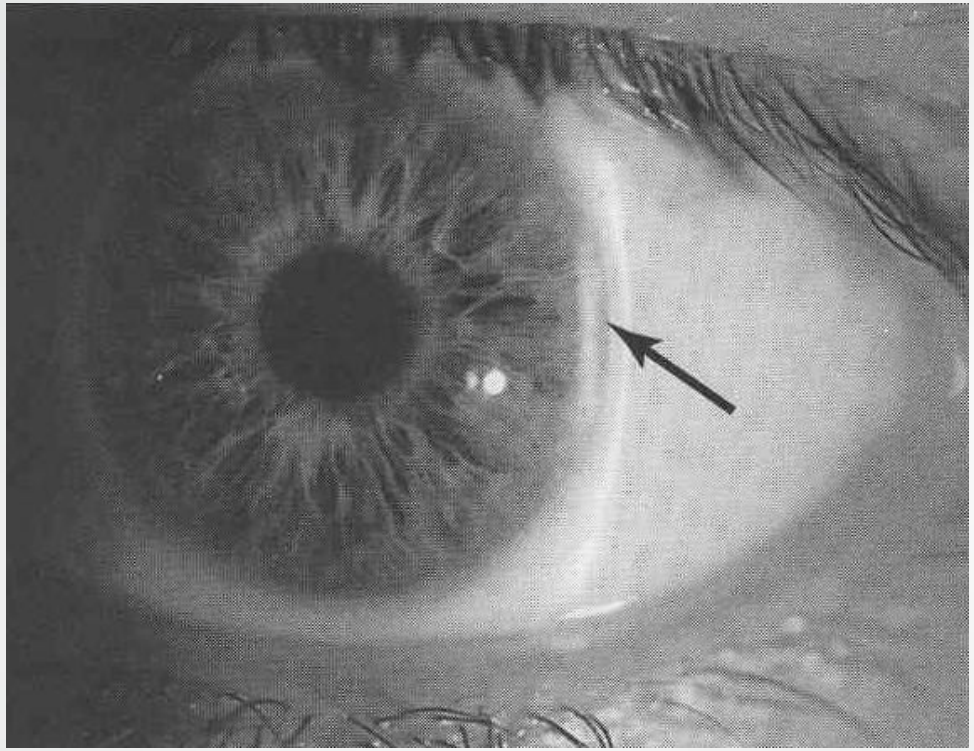
ISO:	200			
Flash Intensity:	high			
Background:	0–10%			
Angle:	45°			
Slit Beam:	0.1 mm			
Filter:	–			
Angle:	45°–60°			
Magnification:	10x	16x	25x	40x
Aperture:	–	1	1	–

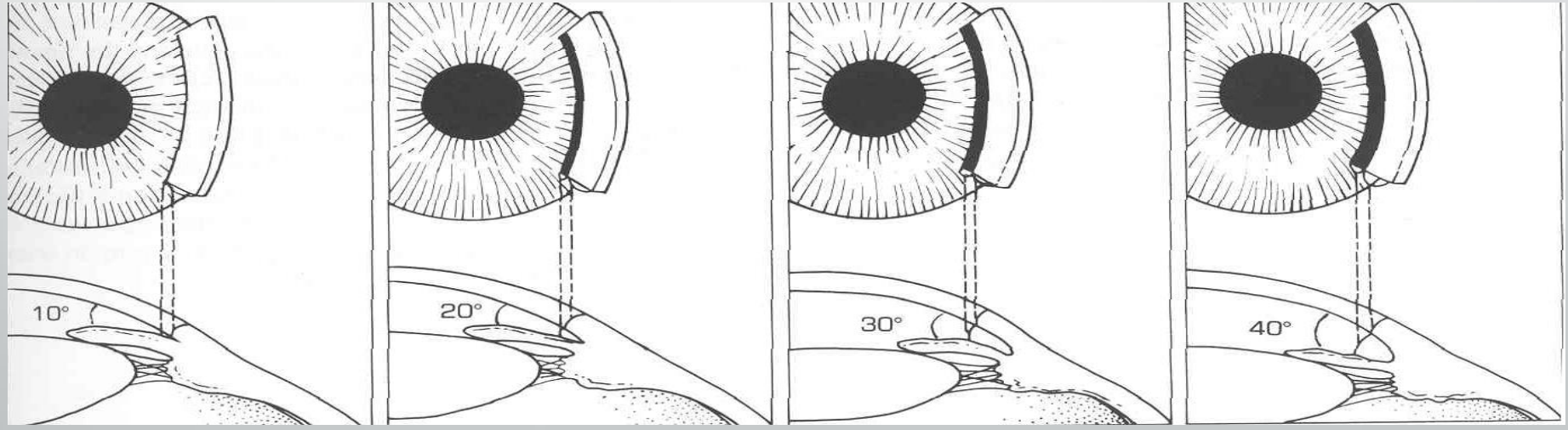
VAN HERRICK TECHNIQUE

- To evaluate anterior chamber angle without gonioscopy
- Medium magnification
- Angle 60 degrees
- Narrow beam close to limbus

- Depth of anterior chamber is evaluated to the thickness of cornea:

4. grade – open anterior chamber angle 1:1 ratio
3. grade – open anterior chamber angle 1:2 ratio
2. grade – narrow anterior chamber angle1:4 ratio
1. grade – risky narrow anterior chamber angle less than 1:4 ratio
0. grade – closed anterior chamber , cornea “sits” on iris

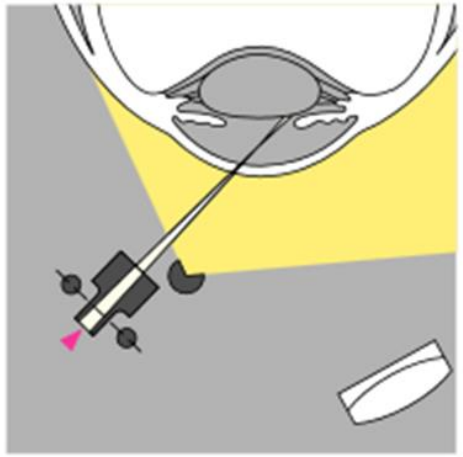



10°
20°
30°
40°

CONICAL BEAM(pinpoint)

SETUP:

- Produced by narrowing the vertical height of a parallelepiped to produce a small circular or square spot of light.
- Source is 45-60 degree temporally and directed into pupil.
- Biomicroscope: directly in front of eye.
- Magnification: high(16-25x)
- Intensity of light source to highest setting.

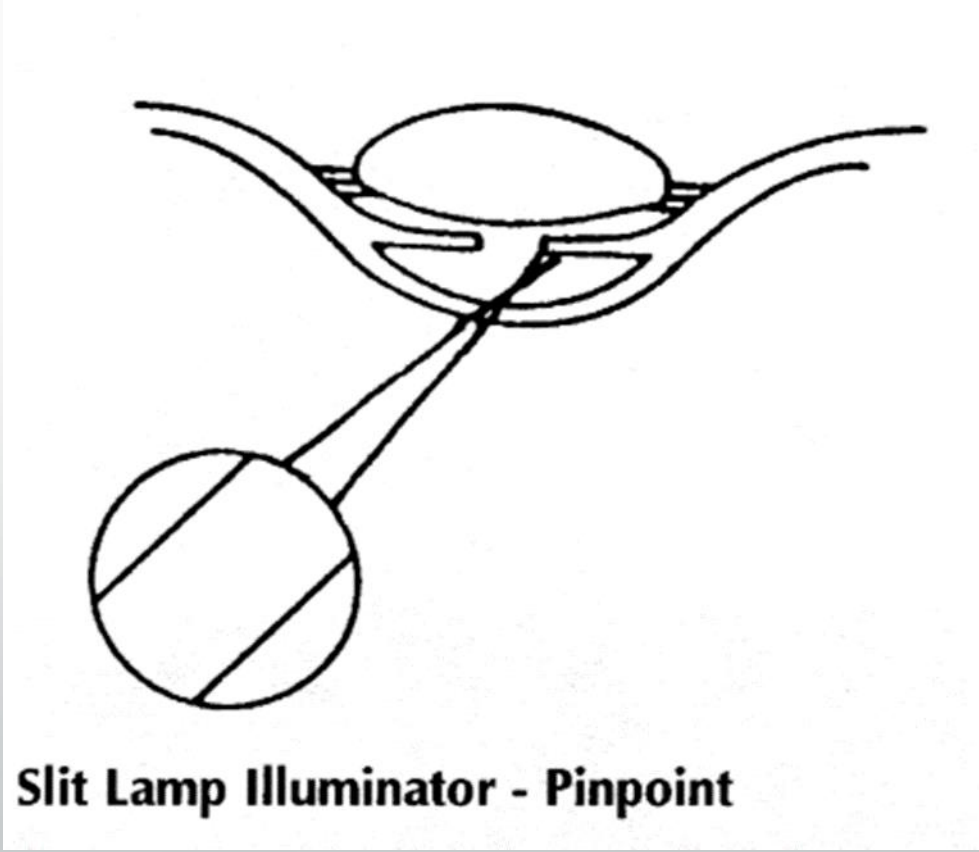


ISO:	200			
Flash Intensity:	high			
Background:	0%–25%			
Angle:	30°			
Slit Beam:	0.1–1 mm			
Filter:	–			
Angle:	50°			
Magnification:	10x	16x	25x	40x
Aperture:	–	1	1	1

CONICAL BEAM

OBSERVATIONS:

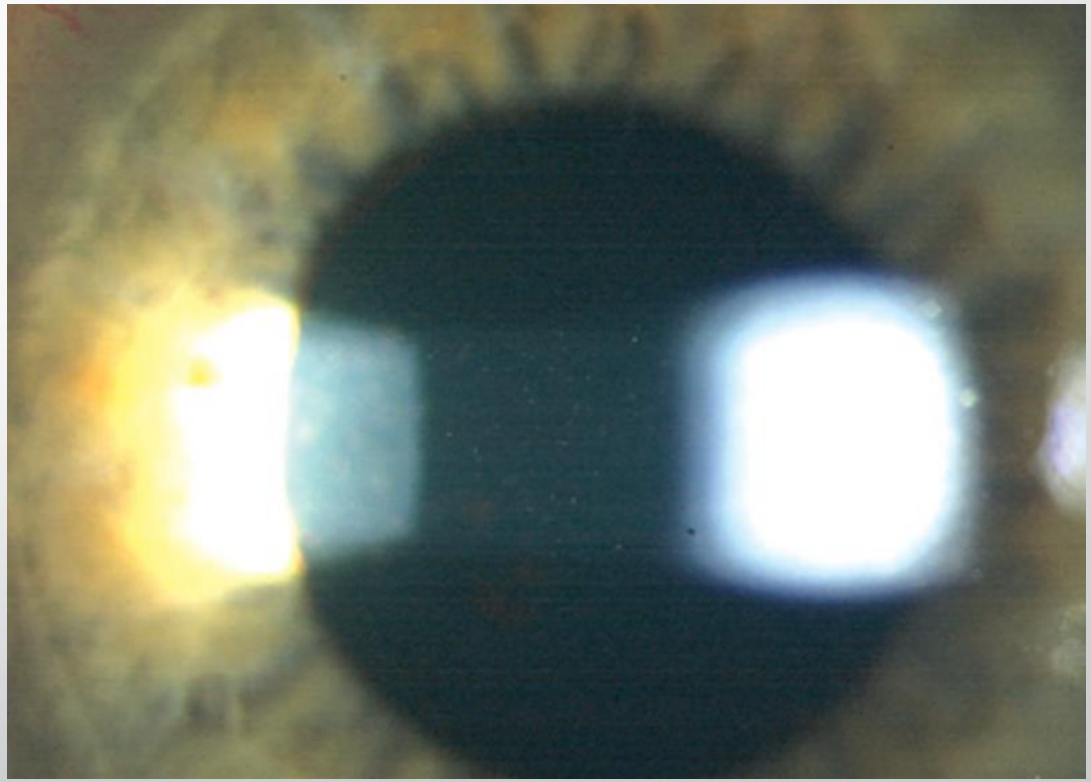
- Beam is focused between cornea and anterior lens surface and dark zone between cornea and anterior lens observed.
- Most useful when examining the transparency of anterior chamber for evidence of floating cells and flare seen in anterior uveitis.



Slit Lamp Illuminator - Pinpoint

Tyndall phenomenon

- Principle is same as that of beam of sun light streaming through a room illuminating airborne dust particles.
- Cells, pigment or proteins in the aqueous humour reflect the light like a faint fog.
- To visualize this the slit illuminator is adjusted to the smallest circular beam and is projected through the anterior chamber from a 42° to 90° angle.
- The strongest reflection is possible at 90°.

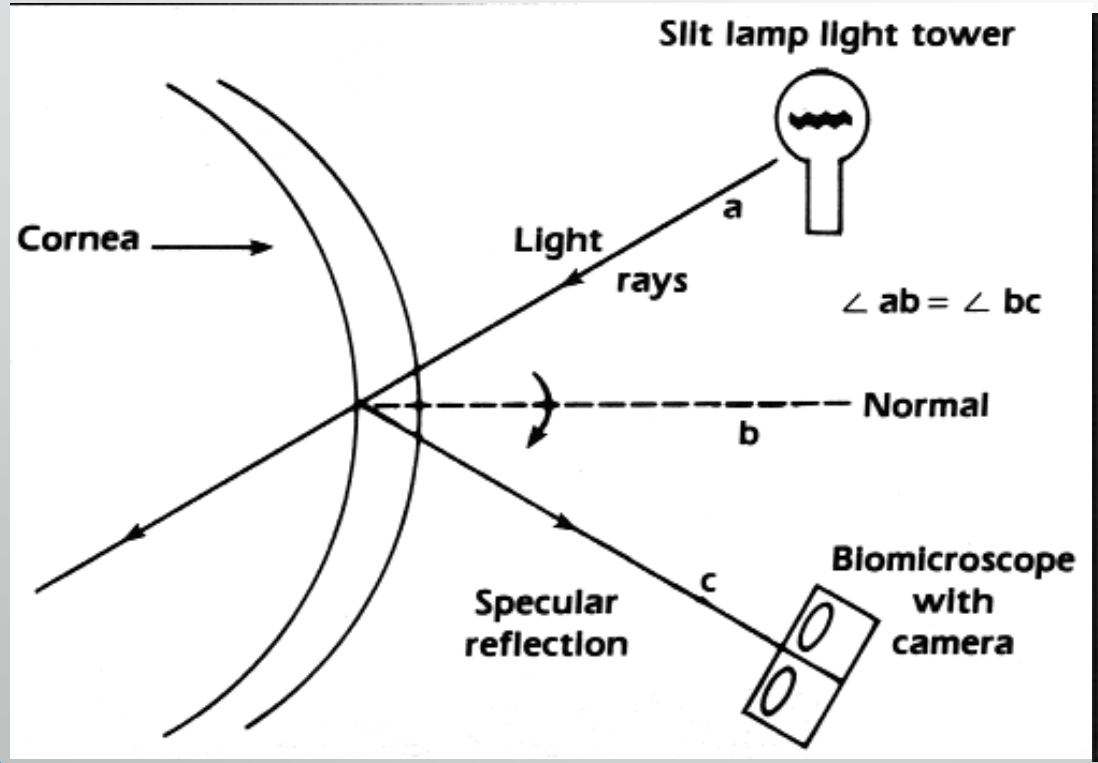


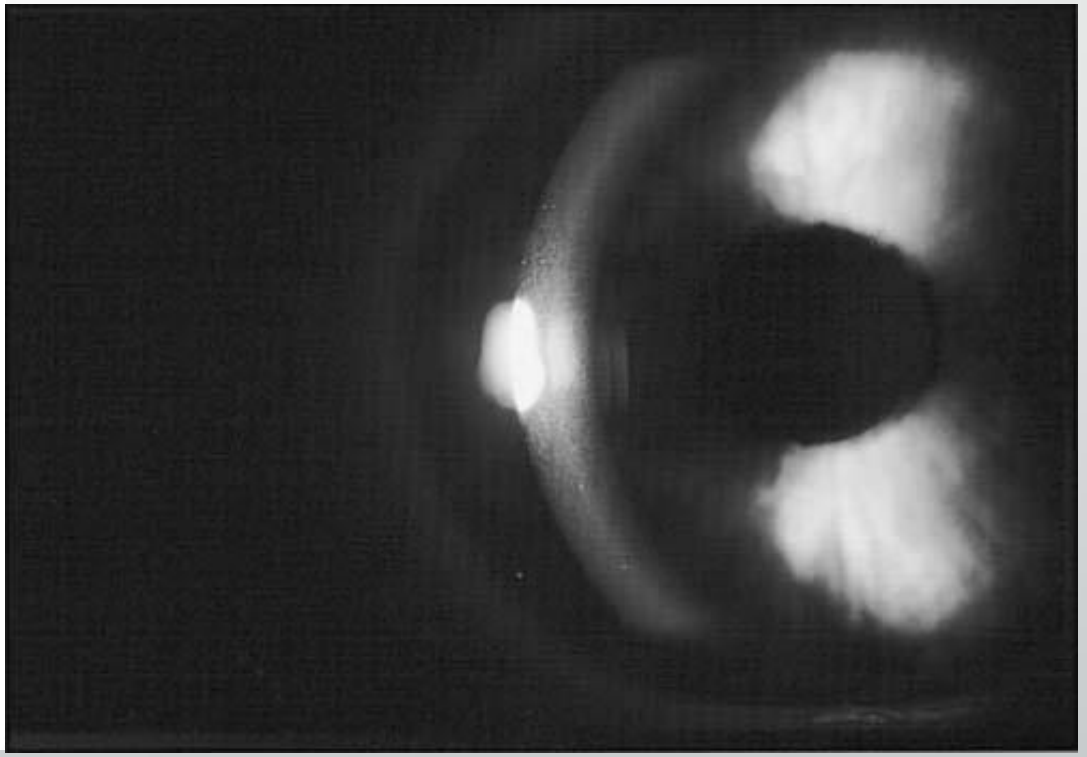
SPECULAR REFELCTION

SETUP:

- Established by separating the microscope and slit beam by equal angles from normal to cornea.
- Position of light source: 30 degree to one side position of microscope: 30 degree to other side.
- Angle of illuminator to microscope must be equal and opposite.
- Angle of light should be moved until a very bright reflex obtained from corneal surface which is called zone of specular reflection.

SPECULAR REFLECTION





SPECULAR REFLECTION

OBSERVATIONS:

- Specular reflection is used to visualize the integrity of the corneal and lens surfaces.
  - If the surface is smooth, the reflection will be smooth and regular;
  - if the surface is broken or rough, Irregularities ,deposits will fail to reflect light and these appears darker than surrounding
- To visualize the endothelium, start with lower magnification (10X to 16X). Direct a relatively narrow beam onto the cornea
- Switch to the highest magnification available
- Endothelium is best viewed using only one ocular.
- Under specular reflection anterior corneal surface appears as white uniform surface and corneal endothelium takes on a mosaic pattern.

RETRO-ILLUMINATION

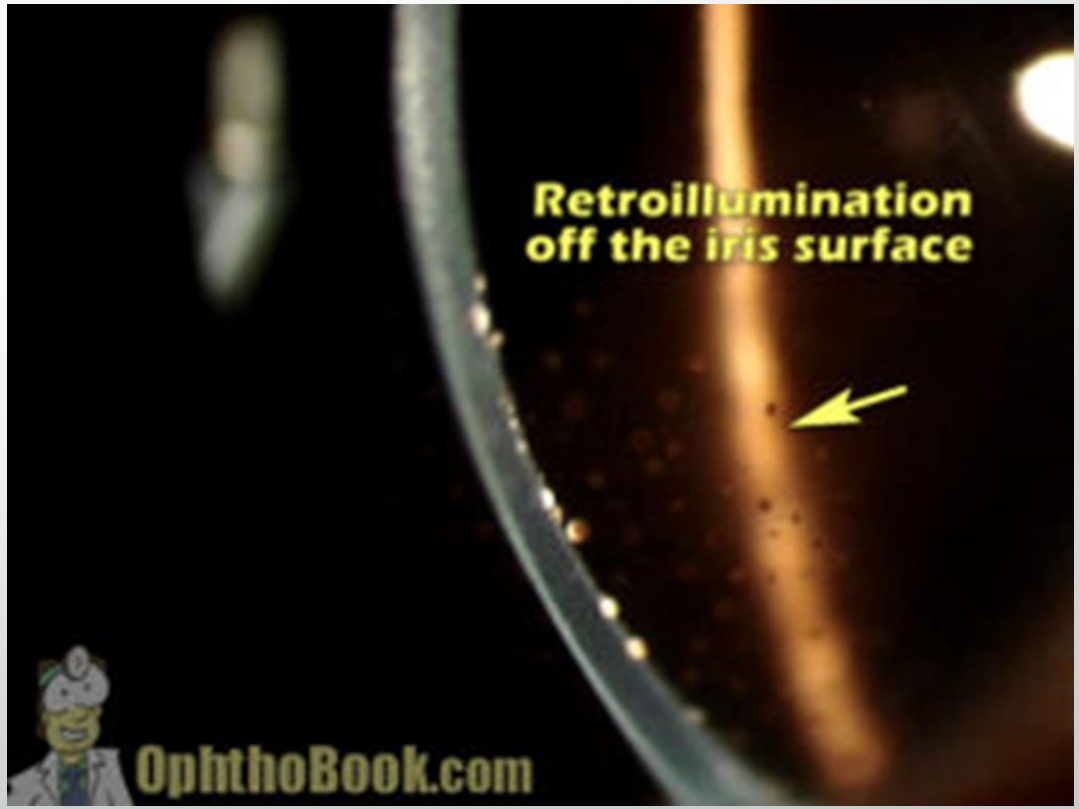
SETUP:

- Formed by reflecting light of slit beam from a structure more posterior than the structure under observation.
- A vertical slit beam 1-4mm wide can be used.

RETROILLUMINATION

OBSERVATIONS:

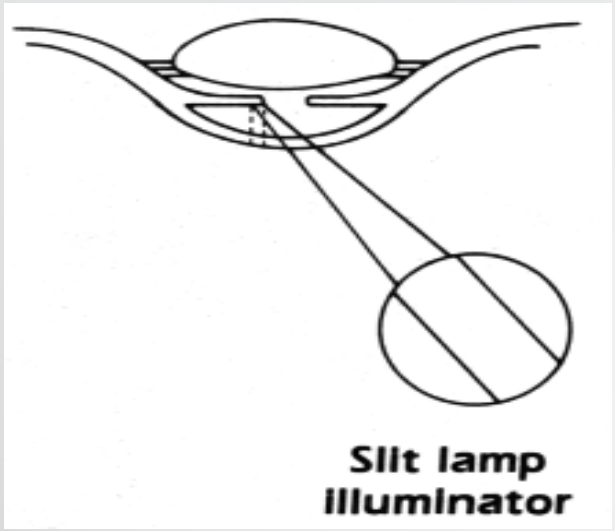
- Used most often in searching for keratic precipitates and other debris on corneal endothelium.
- The crystalline lens can also be retroilluminated for viewing of water clefts and vacuoles of anterior lens and posterior subcapsular cataract



Direct retro-illumination from iris:

SETUP and OBSERVATION

- Use magnification of 16x to 25x and direct the light from 45 degree.
- Microscope is directed straight ahead .
- View corneal pathology.
- A moderately wide slit beam is aimed towards the iris directly behind the corneal anomaly.



Schematic of
direct retroillumination from the iris.

direct retroillumination from the iris.

Indirect retroillumination from iris:

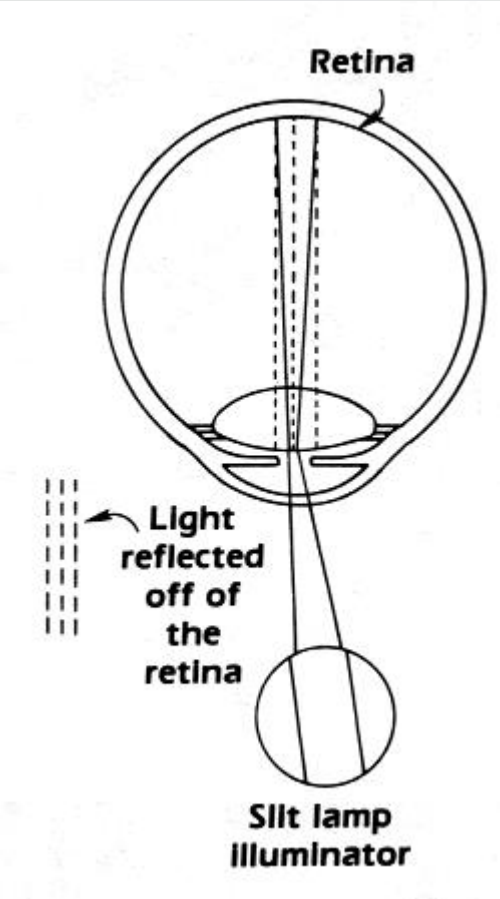
SETUP and OBSERVATION

- Performed as with direct retroillumination but the beam is directed to an area of the iris bordering the portion of iris behind pathology.
- It provides dark background allowing corneal opacities to be viewed with more contrast.
- Observe: Cornea, angles.

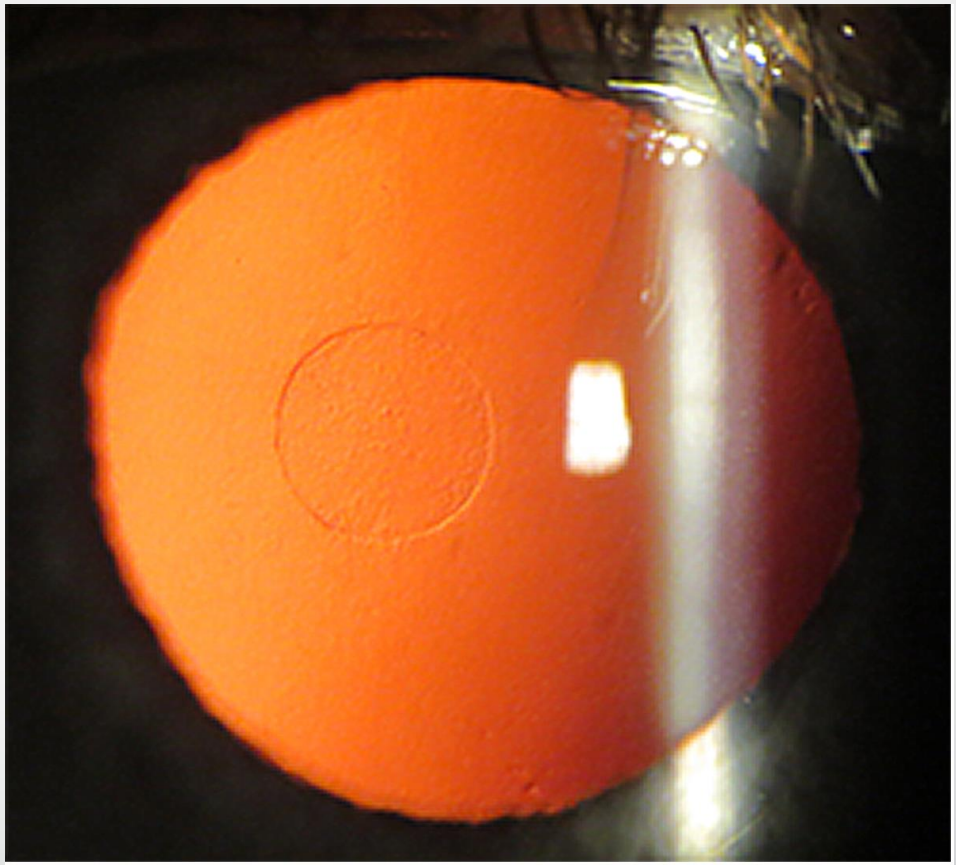
Retroillumination from fundus(red reflex photography)

SETUP and OBSERVATIONS:

- The slit illuminator is positioned in an almost coaxial position with the biomicroscope. The slit beam at 2 to 4 degrees
- Shorten the beam to the height of the pupil to avoid reflecting the bright light off of the iris.
- The decentered slit beam is projected near the pupil margin through a dilated pupil.
- Focus the microscope directly on the pathology using 10X to 16X magnification. Opacities will appear in silhouette.



Schematic of retroillumination from the retina.



Example of retroillumination from the retina.

TRANSILLUMINATIION

SETUP:

- The pupil must be at mid- mydriasis (3to 4 mm when light stimulated).
- Place the light source coaxial (directly in line) with the microscope.
- Use a full circle beam of light equal to the size of the pupil.
- Project the light through the pupil and into the eye .
- Focus the microscope on the iris.
- Magnification of 10X to 16X is adequate

TRANSILLUMINATION

OBSERVATIONS:

- The iris is evaluated by how light passes through it.
- This technique takes advantage of the red reflex.
- Normally the iris pigment absorbs the light, but pigmentation defects let the red fundus light pass through.

TANGENTIAL ILLUMINATION

SETUP:

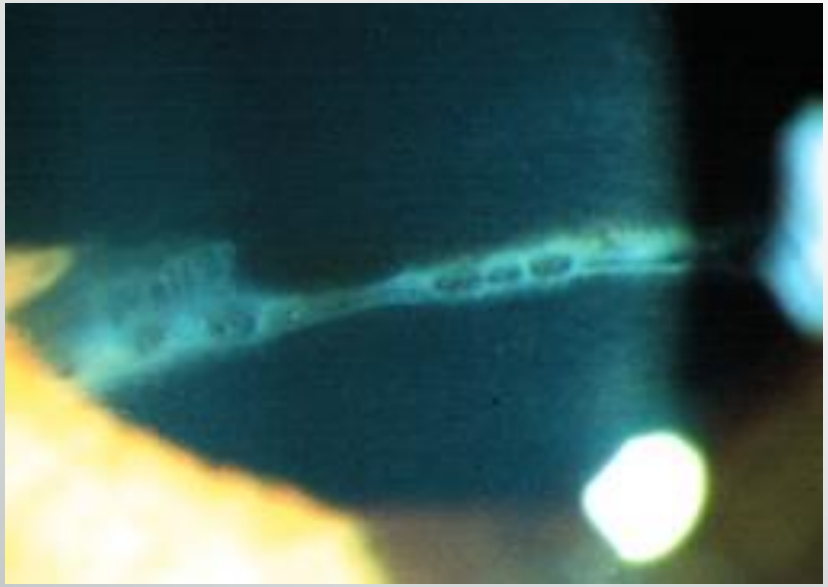
- Medium-wide beam of moderate height
- Swing the slit lamp arm to the side at an oblique angle
- Requires that the illumination arm and the viewing arm be separated by 90 degree.
- Magnifications of 10X, 16X, or 25X are used

TANGENTIAL ILLUMINATION

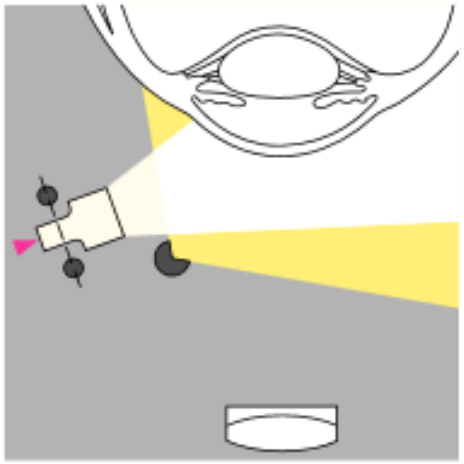
OBSERVATIONS:

- Anterior and posterior cornea
- Iris is best viewed without dilation by this method.
- Anterior lens (especially useful for viewing pseudoexfolation).

Cornea



- Wide slit beam



ISO:	200			
Flash Intensity:	high			
Background:	0%–25%			
Angle:	45°			
Slit Beam:	open			
Filter:	10%			
Angle:	60°–80°			
Magnification:	10x	16x	25x	40x
Aperture:	–	4	3	2

Cobalt blue filter

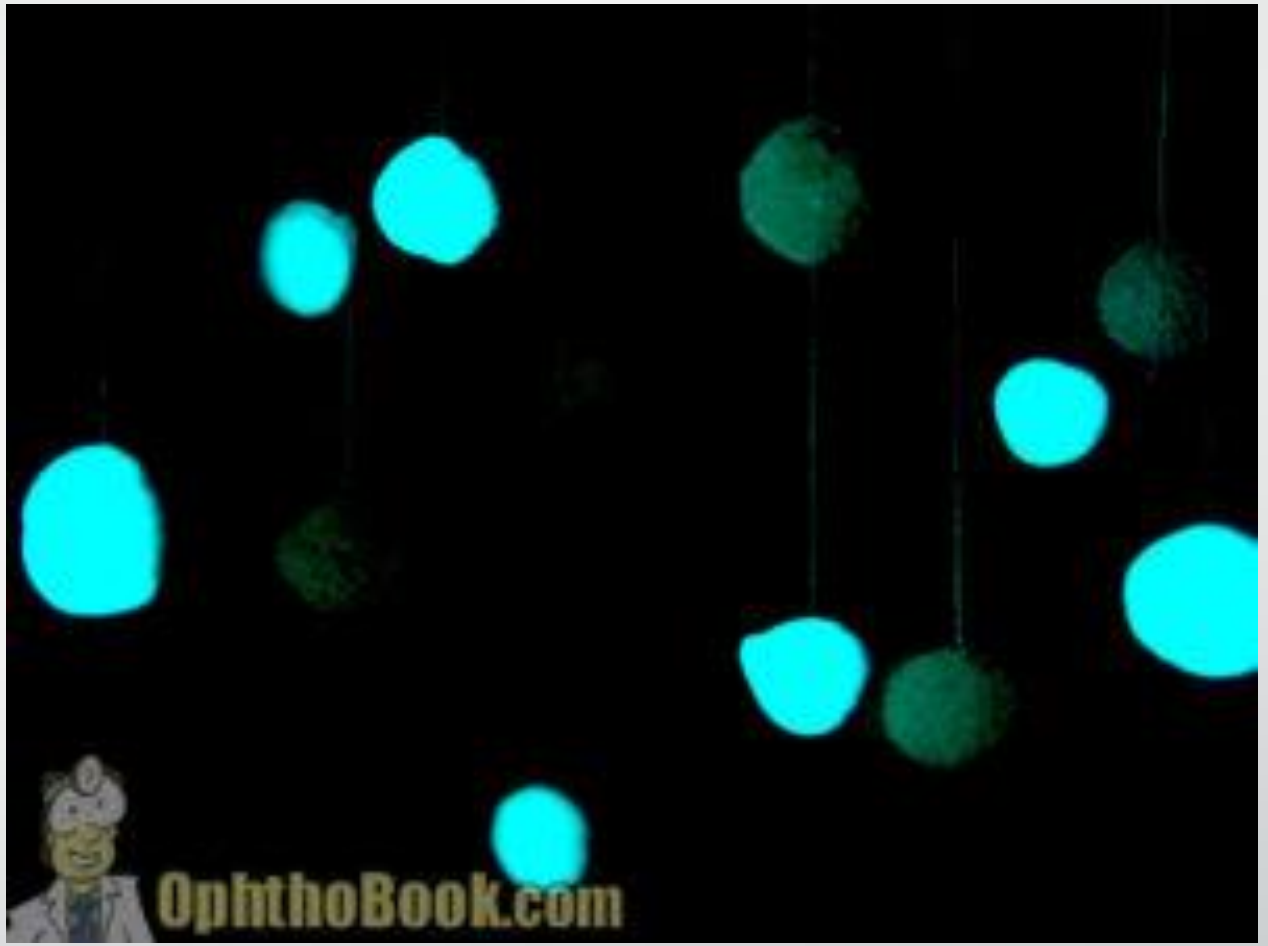
- Used in conjunction with fluorescein stain
- The dye absorbs blue light and emits green.
  - Ocular staining
  - RGP lens fitting
  - Tear layer
  - IOP
- Wratten yellow filter #15 to enhance contrast visibility of fluorescein staining with cobalt blue

Red free(green)filter:

Obscure any thing that is red so blood vessels or hemorrhages appears black.

This increases contrast revealing the path and pattern of inflamed blood vessels.

Fleischer ring can also be viewed satisfactorily with the red green filter.



Contact lens evaluation

- **Diffuse** setting used to determine gross fitting around limbus.
- **Parallelepiped** used to determine the fit of a contact lens
  - Adjust width of beam to CL beyond limbus on one side. Keeping same width, move to opposite limbus to compare.
  - After fluorescein has been instilled in the eye with RGPs to determine air spacing between CL and Cornea.

Using Lenses as an extension of the Microscope

- Gonioscopy
  - 3- or 4-mirror lens
  - Observe AC zones:
    - Iris surface- iris processes
    - Ciliary body- angle recess
    - Trabecular zone-Scleral spur, Schwalbe's line
    - Transition zone from white sclera to bluish cornea
- Hruby, Goldmann or 90-D
  - Vitreous- degeneration, floaters, cells, pigment, infiltrates
  - Retina- macular cyst or hole, hemorrhage, tears, tumors

Let's Play!

- Share what you have seen.
- Practice, Practice, Practice
- Thank-you!

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