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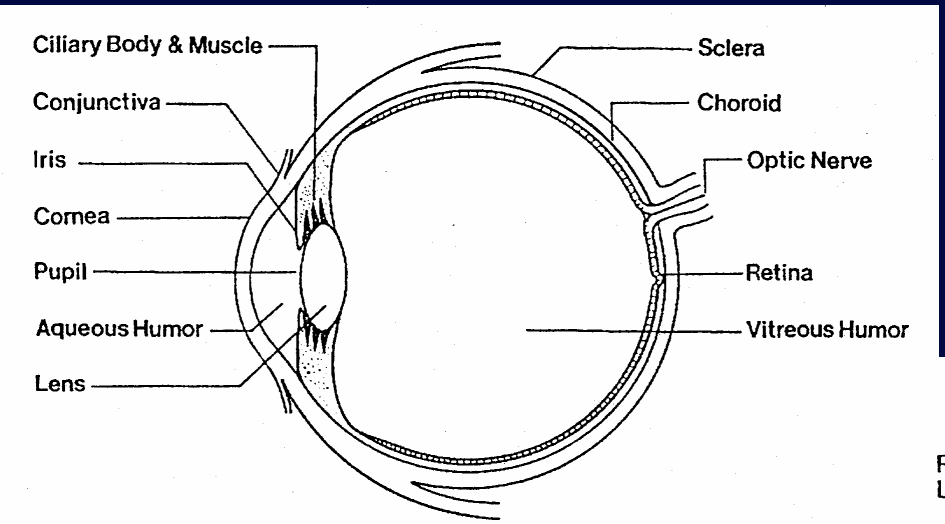
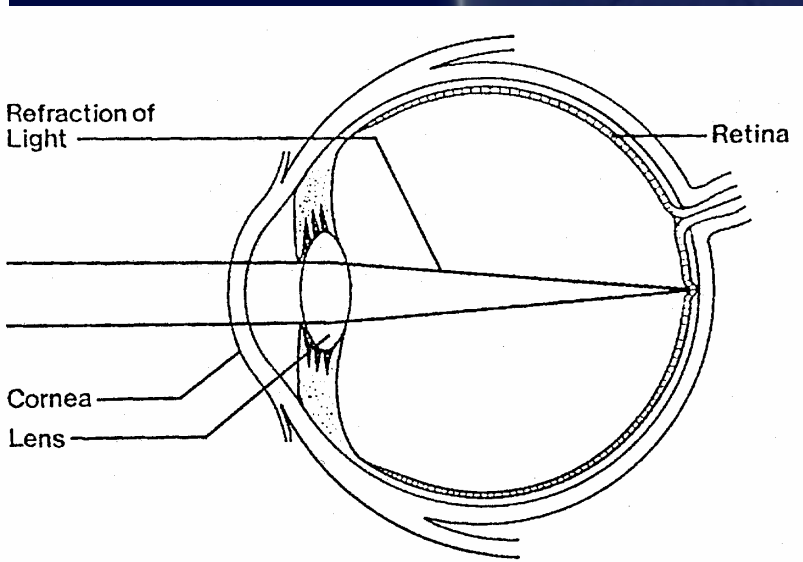
Refractive Surgery

Anatomy/ Optical System of the Human Eye



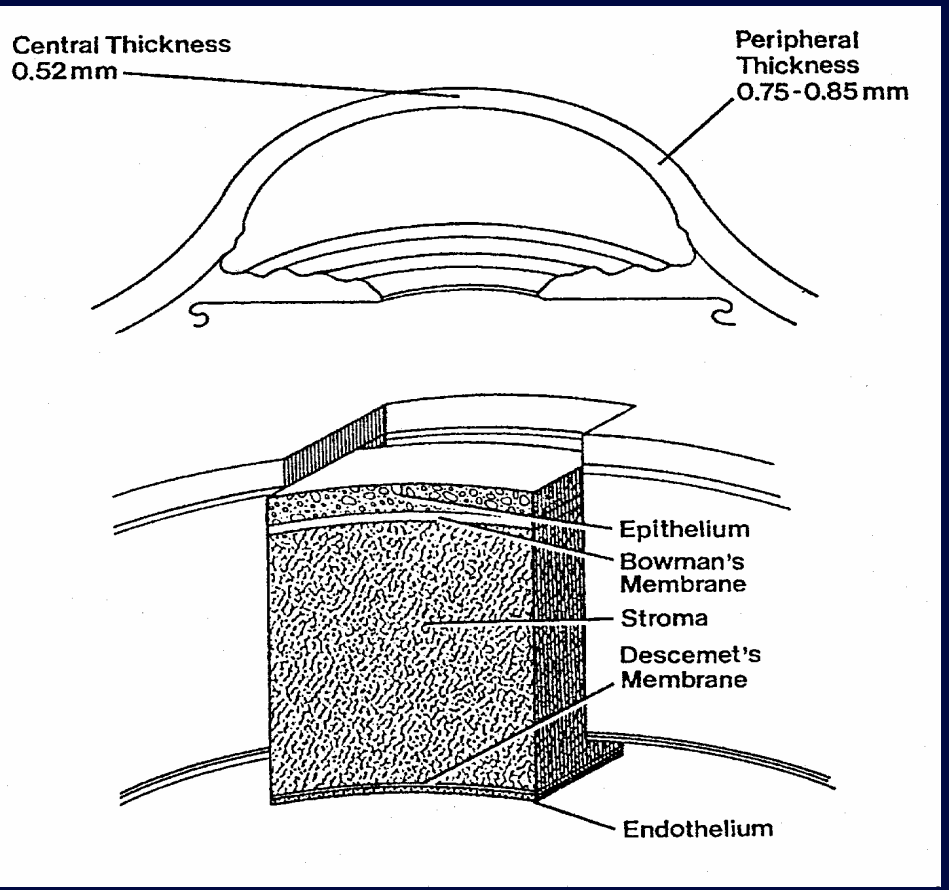


lmages are focused on the retina.

The images created in the brain are sharp, clear and true in color.

Refractive Surgery

Anatomy - Cornea



Cornea thickness
500 -600 µm

Most refraction of light rays is accomplished by the cornea

Refractive Surgery

Disorders of the Human Eye

- Myopia - myope/ nearsightedness
- Hyperopia - hyperope / farsightedness
- Astigmatism
- Presbyopia after age 40 - 45
  (cannot treat with excimer laser)

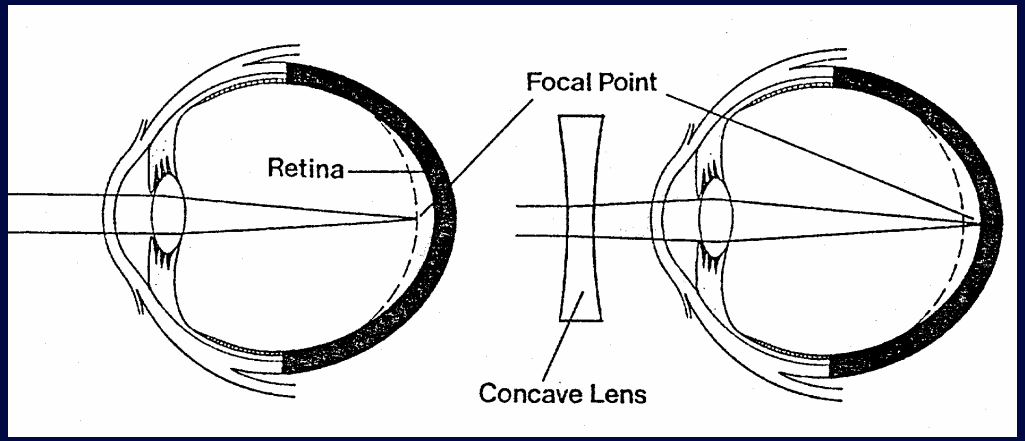
Refractive Surgery

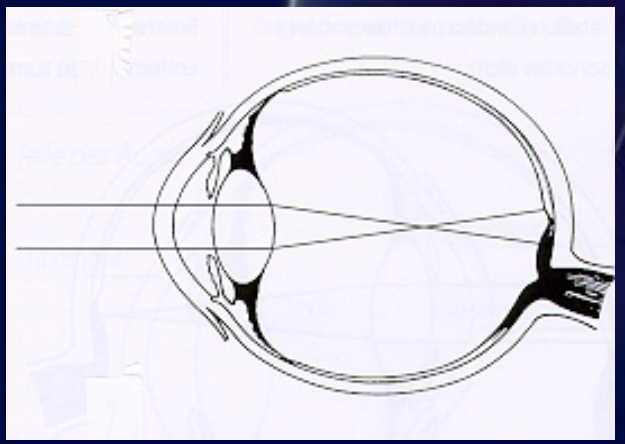
Myopia - shortsightedness / nearsightedness

The eyeball is elongated or cornea is steeply curved.

The light rays are focused at a point in front of the retina.

The image is distorted or blurred. Many myopes can see nearby objects well. Correction with concave glasses.



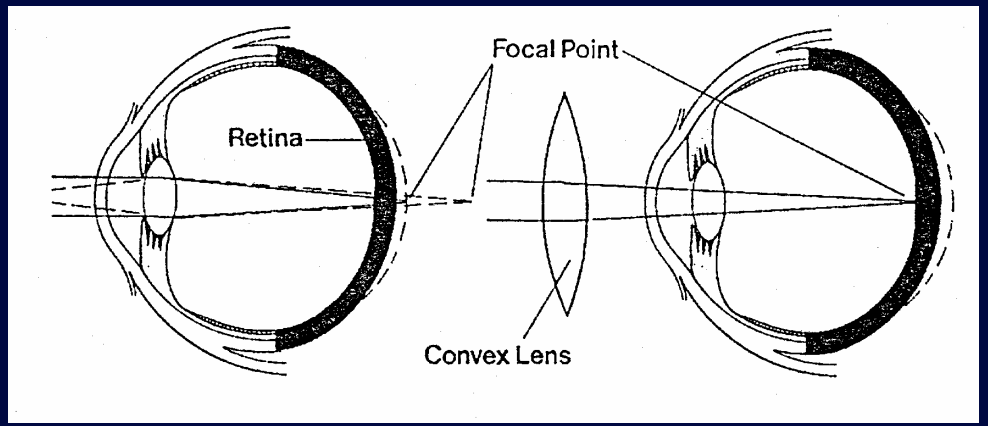


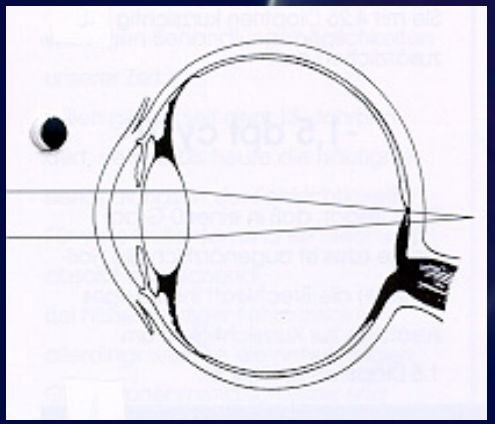
Refractive Surgery

Hyperopia - farsightedness

The distance between cornea and retina is too short or the cornea is flattened.

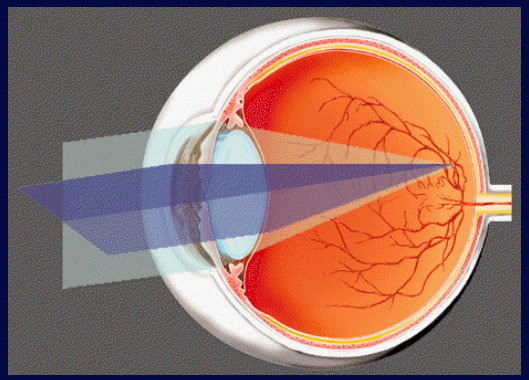
Objects seen at a distance are focused at a point behind the retina. The image is distorted or blurred. Many hyperopes can see far objects well. Correction with convex glasses.

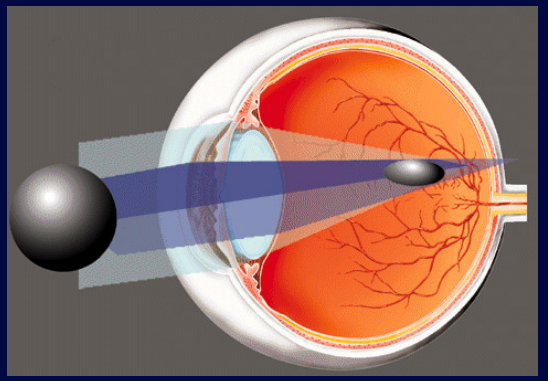


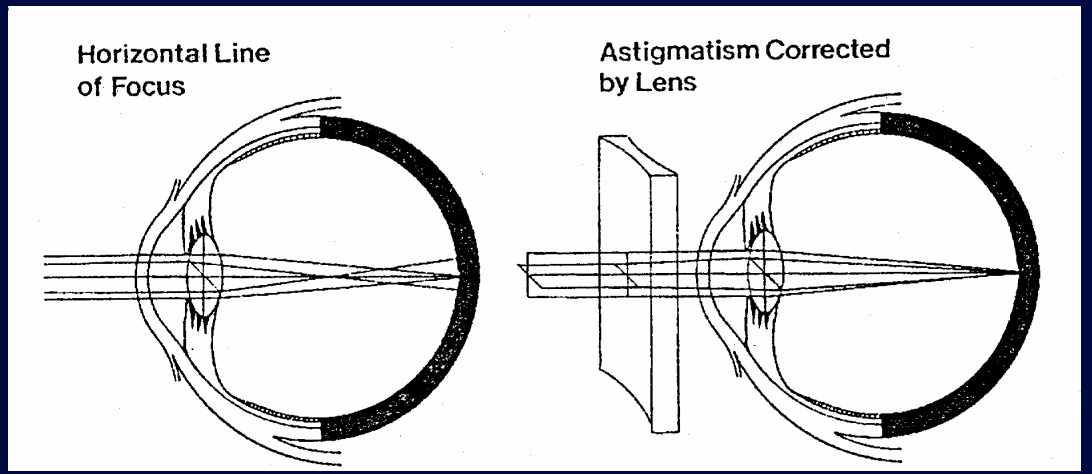


Refractive Surgery

Astigmatism







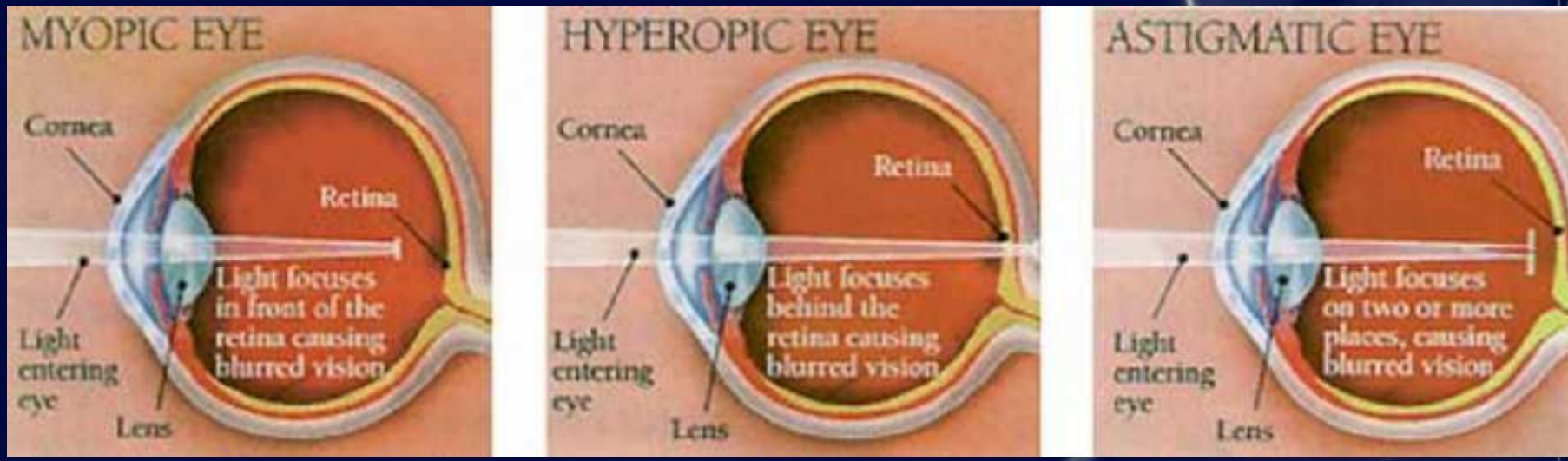
The cornea is irregular, not spherical in shape. The focus is distorted.

„cylinder“

regular or irregular astigmatism

Refractive Surgery

Overview of Basic Refractive Disorders



Refractive Surgery

Options in Refractive Surgery

Treatment with Excimer laser:

- PTK phototherapeutic keratectomy
- PRK photorefractive keratectomy
- LASIK Laser in situ keratomileusis
- EPI-LASIK Epithelial Laser in situ keratomileusis
- LASEK Laser Epithelial keratomileusis
- ORK Optimized Refractive Keratectomy (Wave Front/Topo)

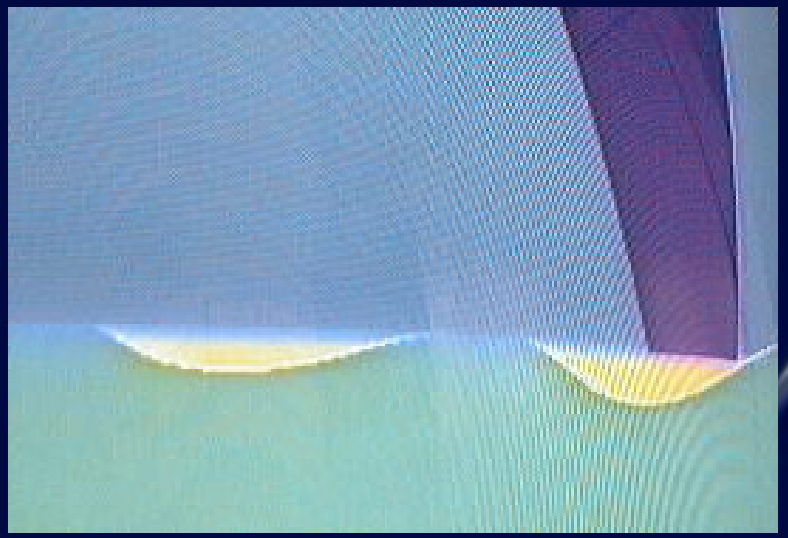
Others:

- RK Radial Keratotomy
- ICR Intra Corneal Ring
- IOL Phakic Intraocular Lense (implant into anterior / posterior chamber)
- CLE Clear Lens Extraction (removing the eye´s lens - inserting an artificial lens)
- ALK Automated Lamellar Keratoplasty

Refractive Surgery

PTK - Phototherapeutic Keratectomie

Surface corneal re-profiling procedure using an excimer laser to correct for a therapeutic corneal abnormality.



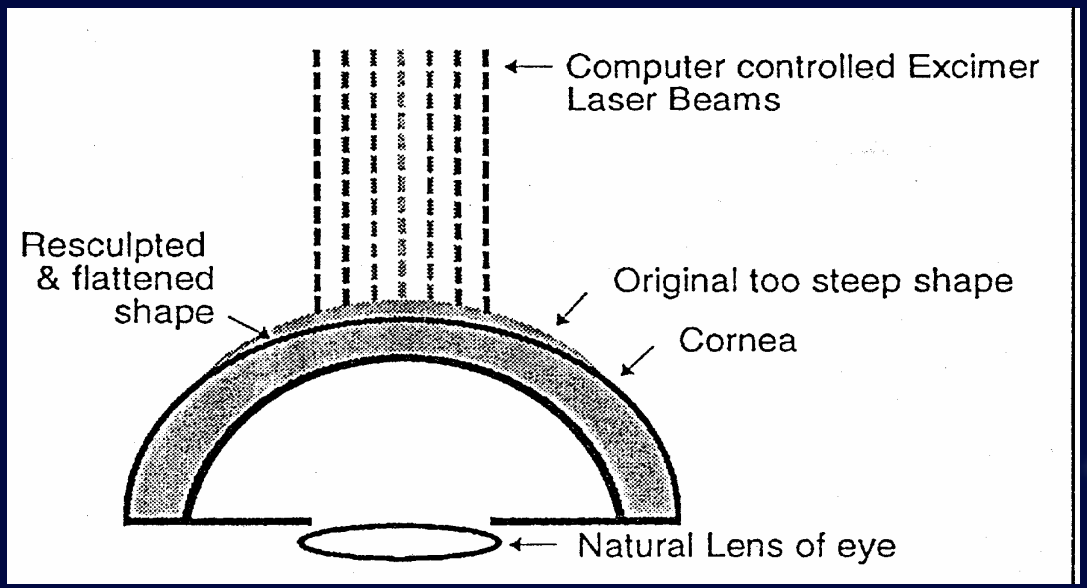
Refractive Surgery

PRK Photorefractive Keratectomy

PRK is similar to LASIK

In both surgical procedures a computer-controlled excimer laser is employed to reshape the cornea of the affected eye.

LASIK, however, preserves the epithelium.



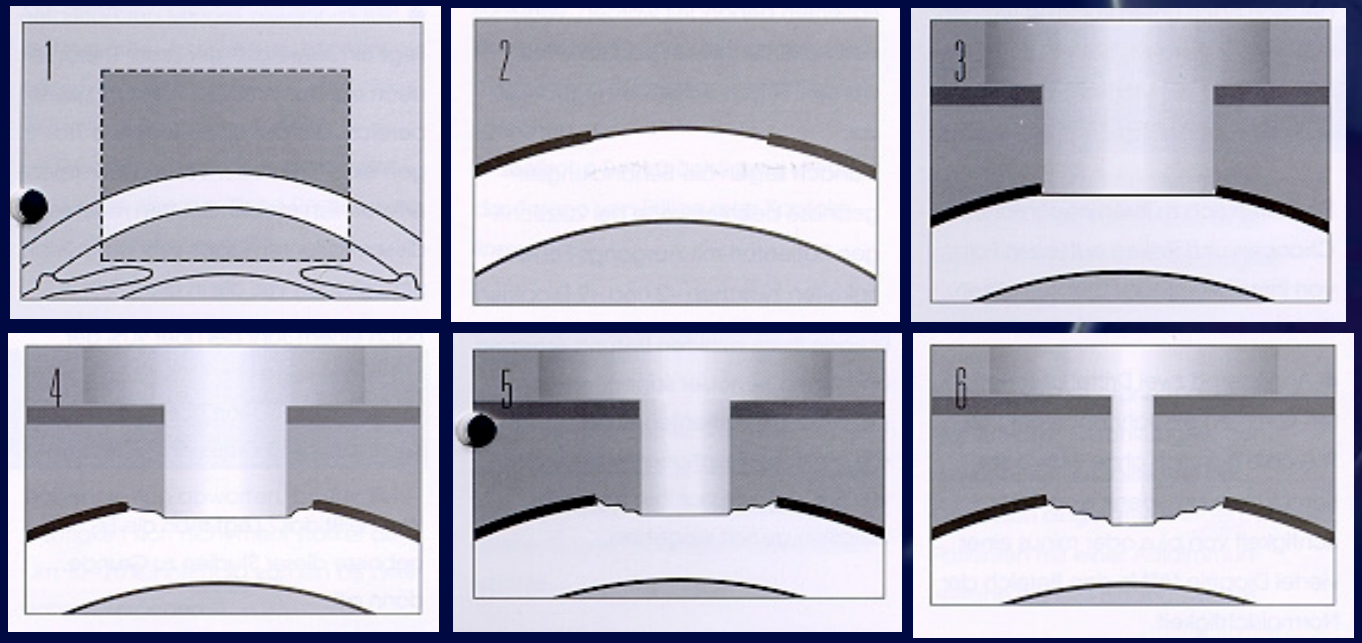
Refractive Surgery

PRK

Epithelium is removed by gently scraping the surface.

Excimer laser is then applied.

painful - longer healing process…but fewer complications

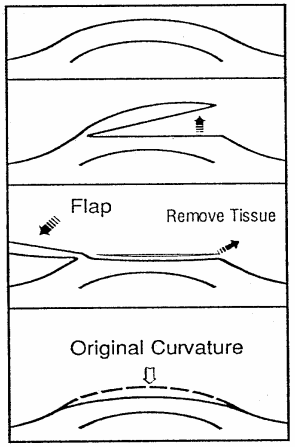


Refractive Surgery

LASIK - Laser in situ Keratomileusis

ALK & LASIK PROCEDURES

FOR NEARSIGHTEDNESS



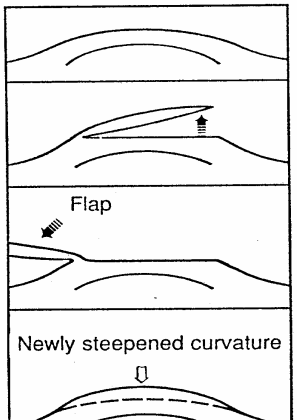
Nearsighted Cornea before reshaping.

Corneal Tissue flap created.

Exposed corneal tissue is sculpted by either a Microkeratome in the ALK procedure or Excimer Laser in the LASIK procedure to flatten the shape of the cornea in order to correct for myopia (nearsightedness)

Corneal tissue flap is replaced without sutures to complete the procedure

FOR FARSIGHTEDNESS

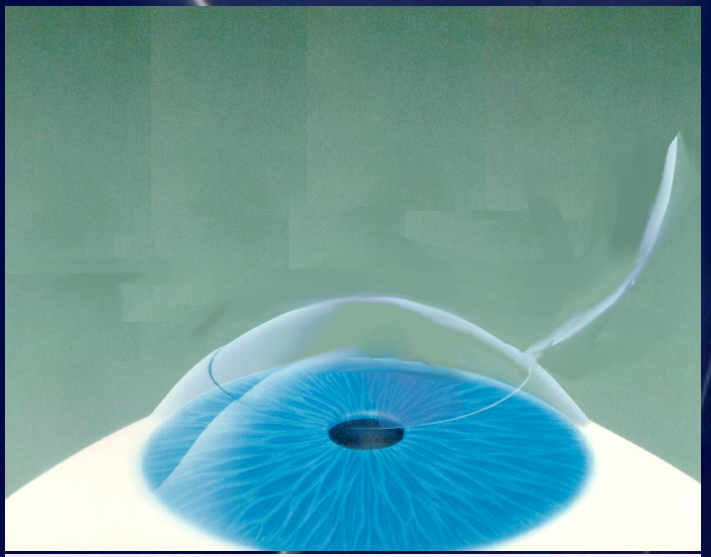


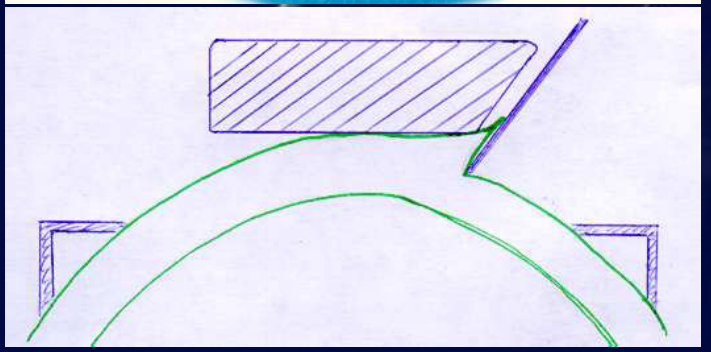
Farsighted Cornea before reshaping.

Corneal Tissue flap created.

Exposed corneal tissue steepens by pressure in the eye in the ALK procedure or is resculpted by the Excimer Laser in the LASIK procedure to steepen the shape of the cornea in order to correct for hyperopia (farsightedness)

Corneal tissue flap is replaced without sutures to complete the procedure





Refractive Surgery

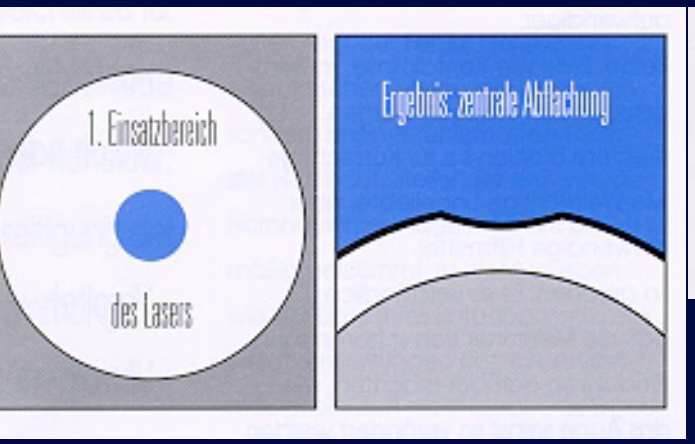
LASIK- Step by Step

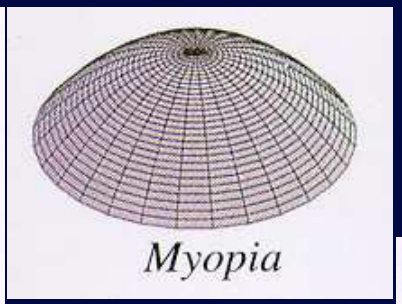
Refractive Surgery

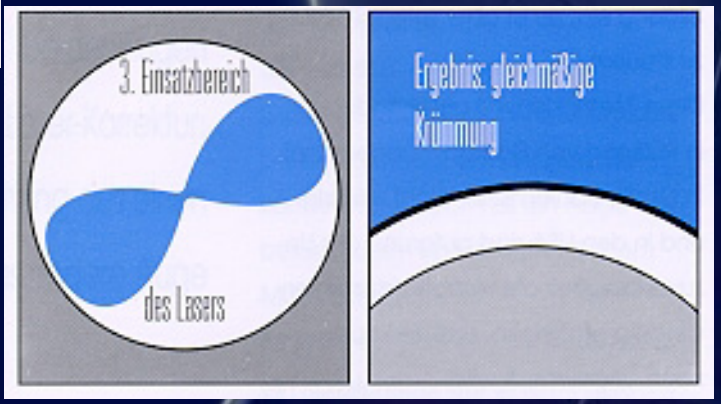
LASIK- Retreatment

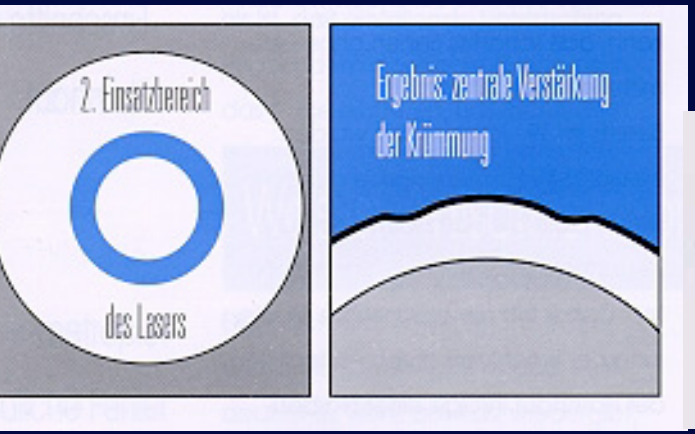
Refractive Surgery

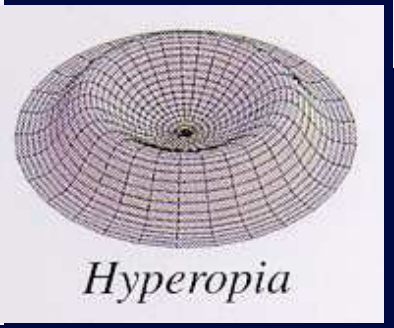
PRK and LASIK





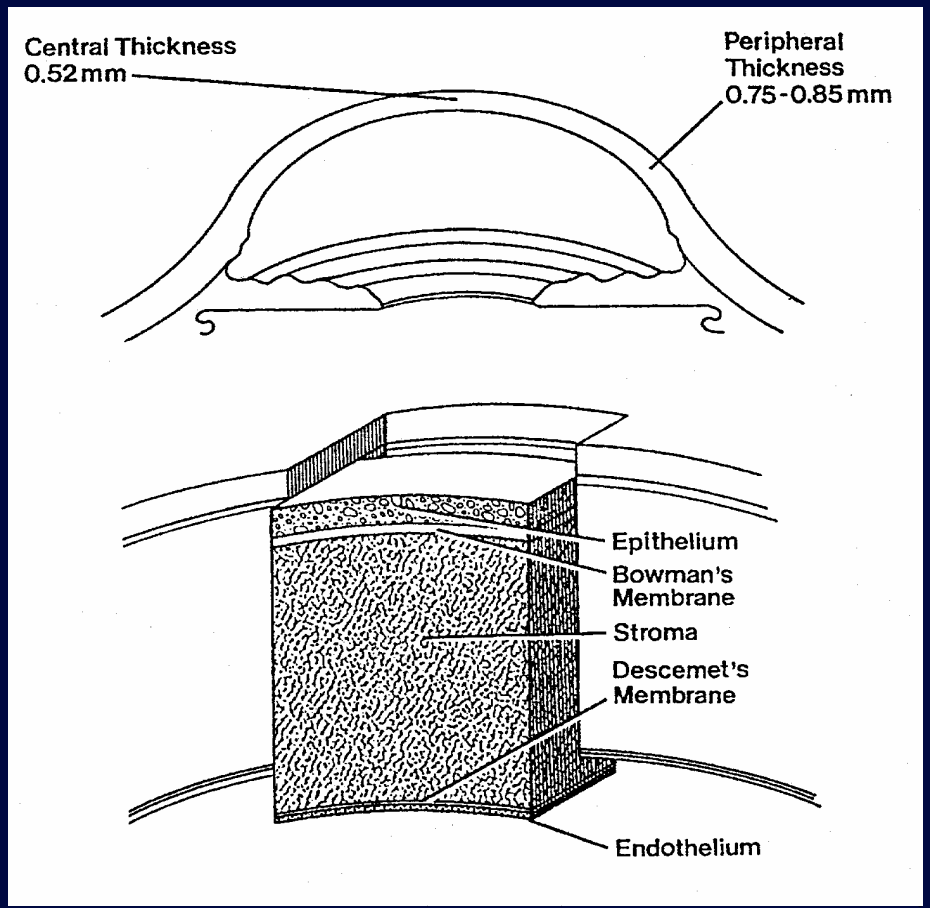






Refractive Surgery

Treatment Considerations - Cornea



LASIK:

550µm corneal thickness

- 150 µm flap thickness

- 250 µm residual stroma

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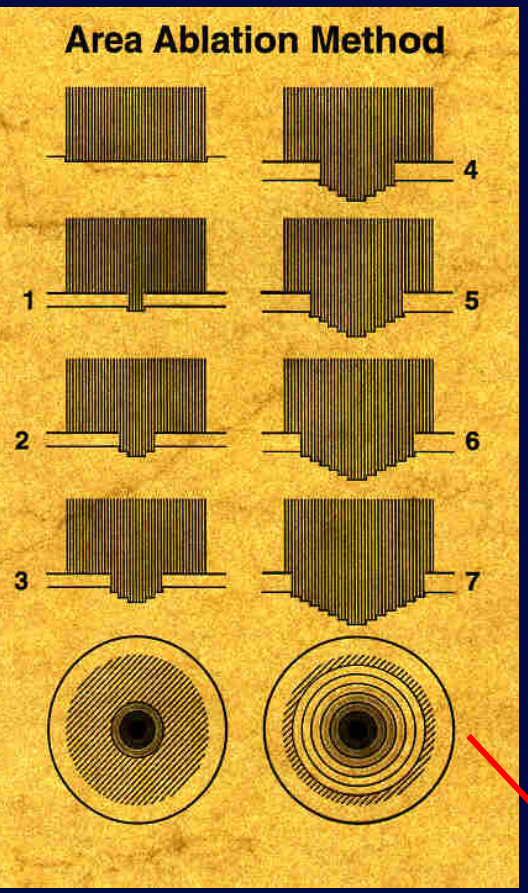
x = 150µm

max. ablation depth

Different Techniques of Ablation

SCHWIND Mask Band



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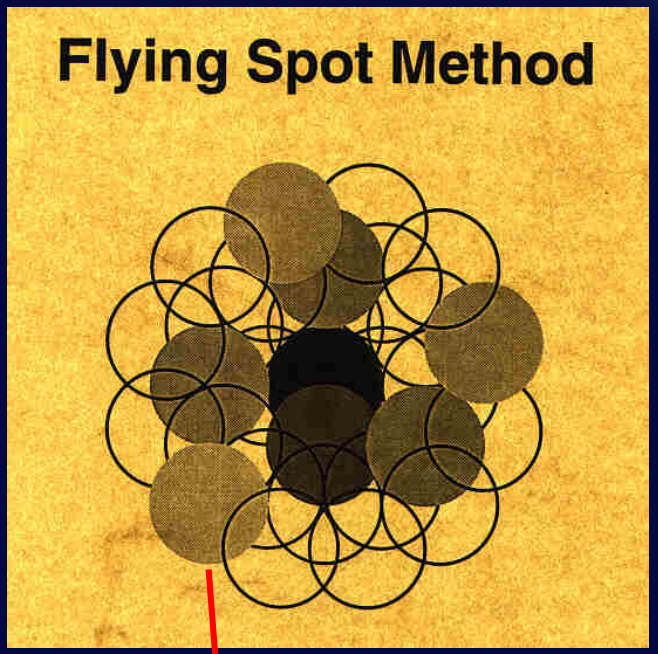
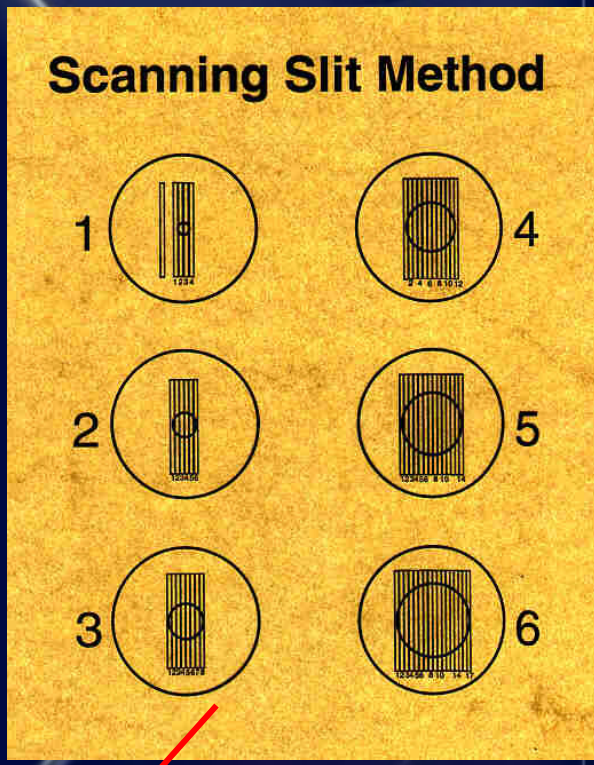




SCHWIND MultiScan

Refractive Surgery

Laser Definition

Light

Amplification by

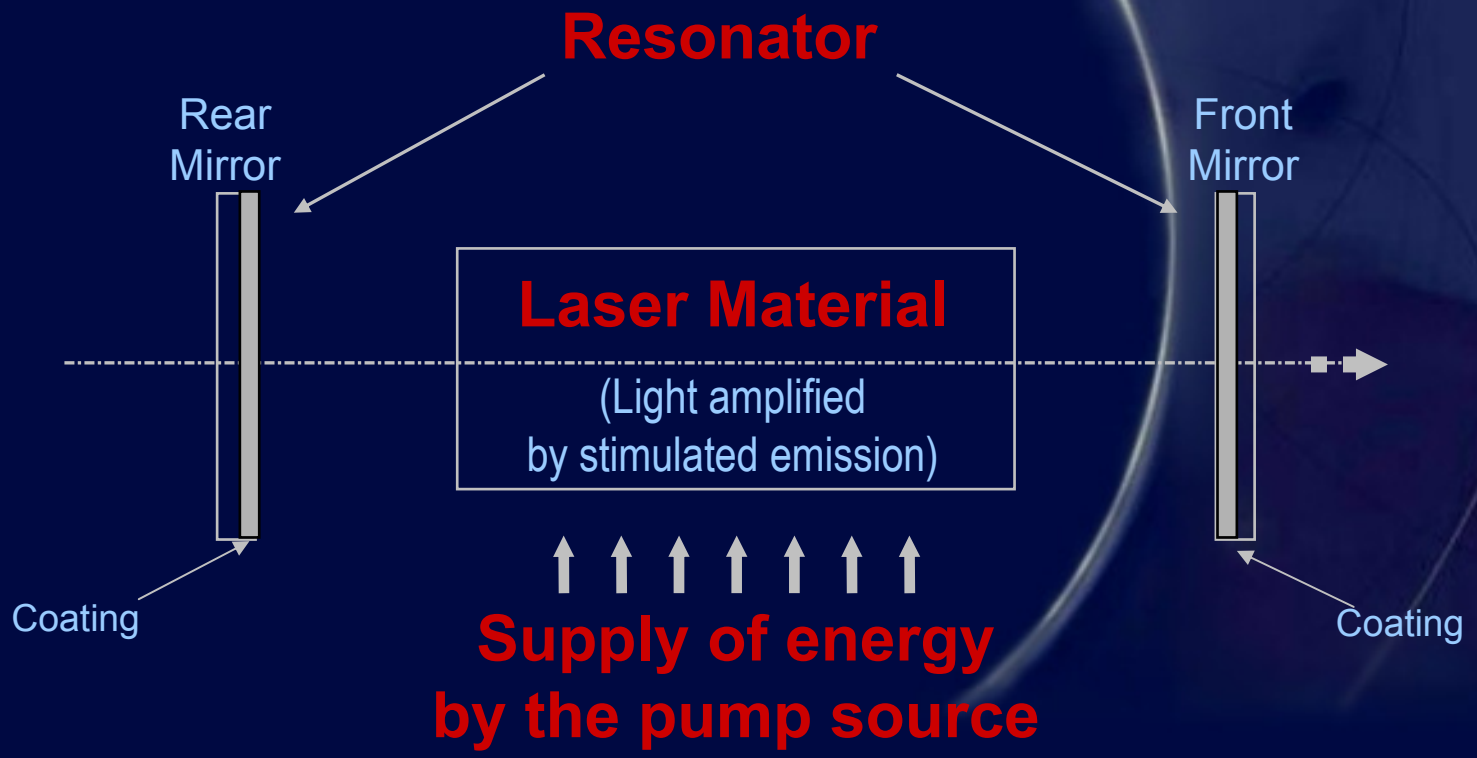
Stimulated

Emission of

Radiation

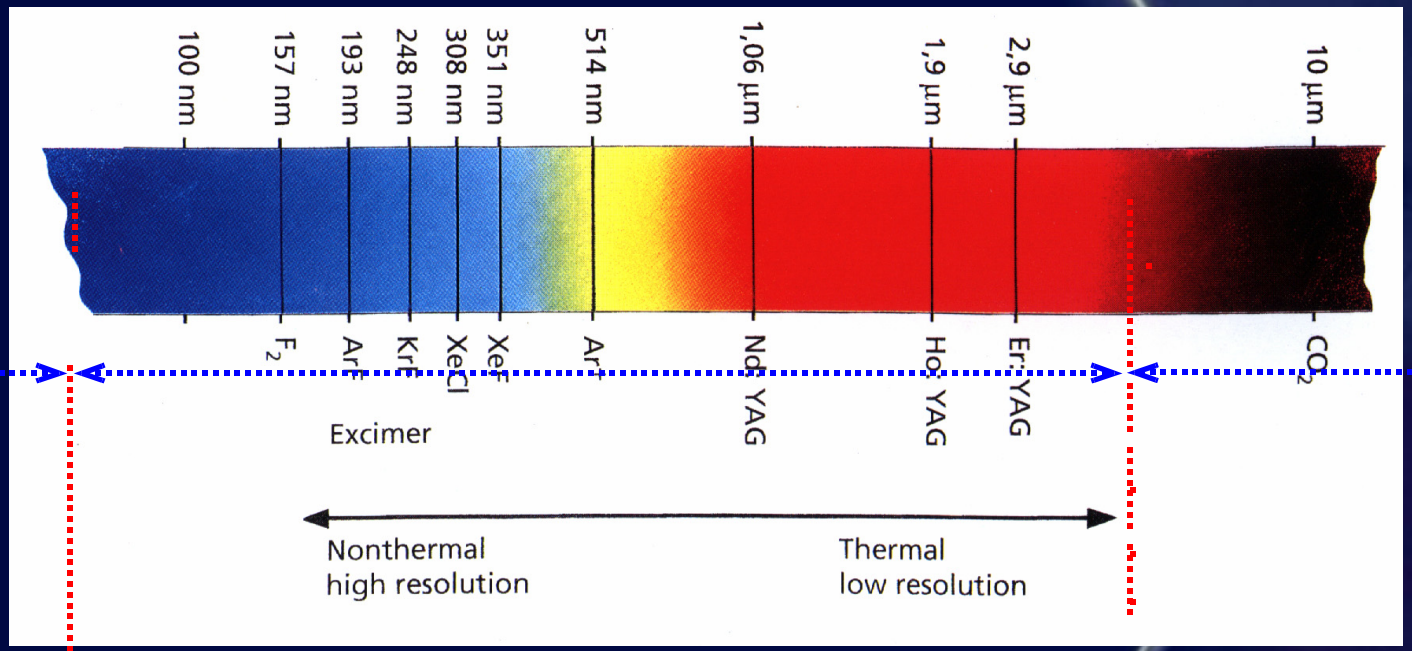
Refractive Surgery

Laser Principle



Refractive Surgery

Unit Indicator



UV

IR

λ

380 nm

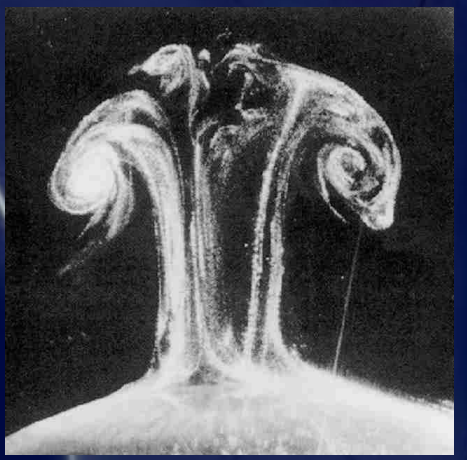
visible light

780 nm

1 mm = 0,001 m = 10^{-3} m
1 µm = 0,000001 m = 10^{-6} m
1 nm = 0,000000001 m = 10^{-9} m
1 pm = 0,000000000001 m = 10^{-12} m

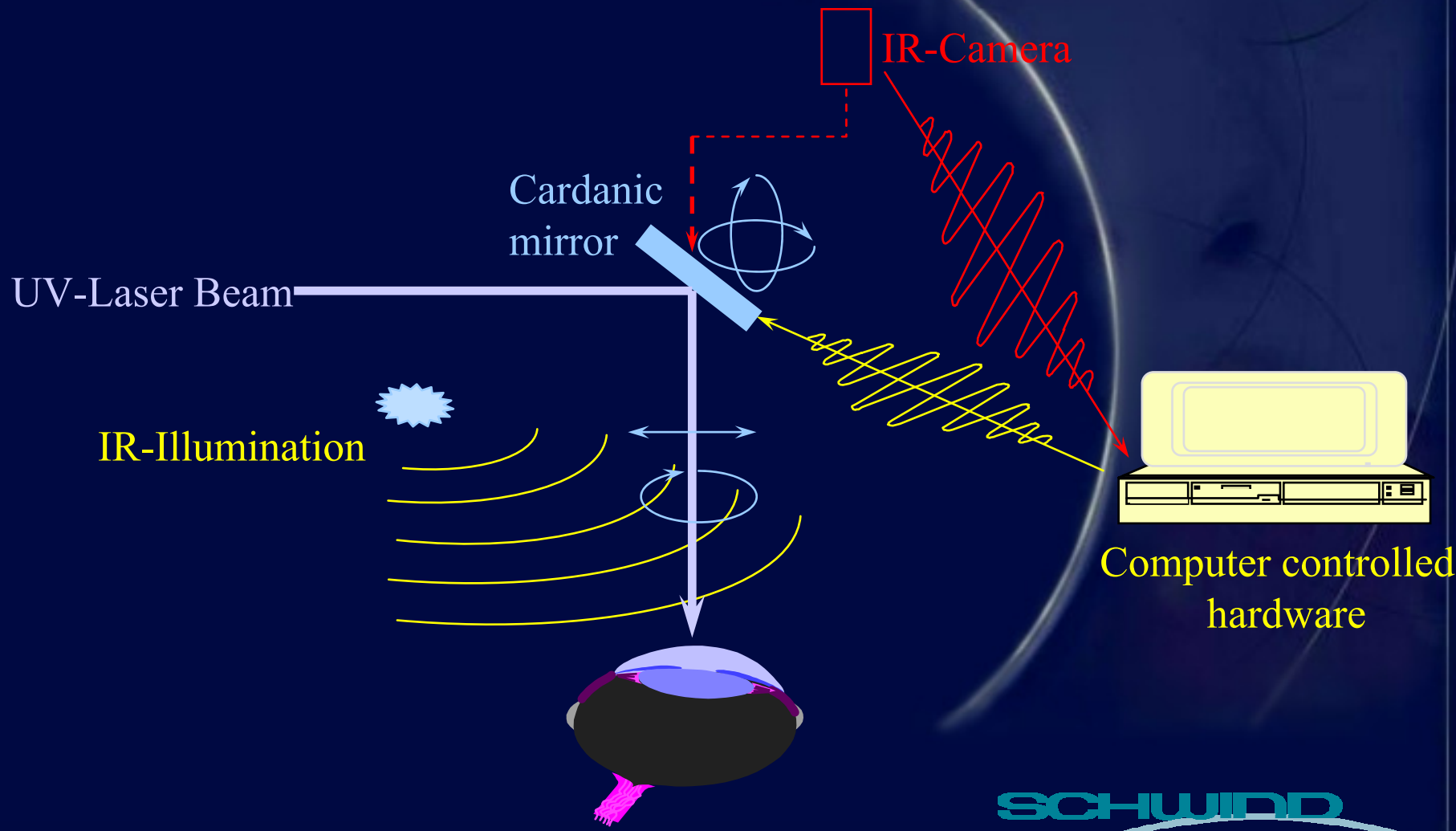
Refractive Surgery

Why Excimer Laser in Ophtalmology?



- Excimer lasers with short 193 nm wavelength allow surgeons to remove tissue with no unwanted heat effect.
- Excimer lasers are used for corneal reshaping operation.
- Excimer lasers are used in refractive eye surgery for the treatment of Myopia/ Hyperopia with PTK, PRK,LASIK, Epi-LASIK, LASEK and ORK.

SCHWIND AET
Active Eye Tracking System



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