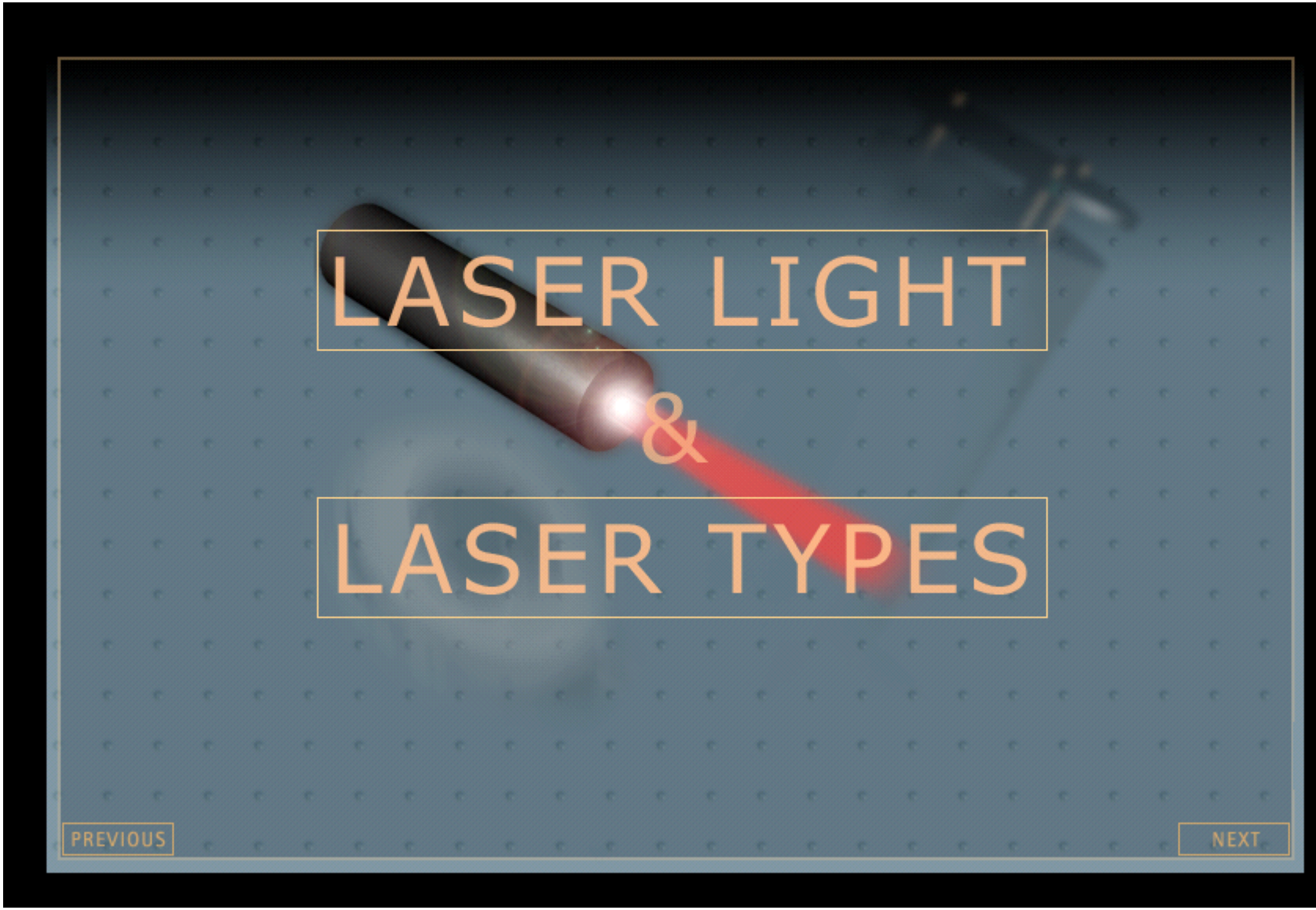
LASER LIGHT
&
LASER TYPES
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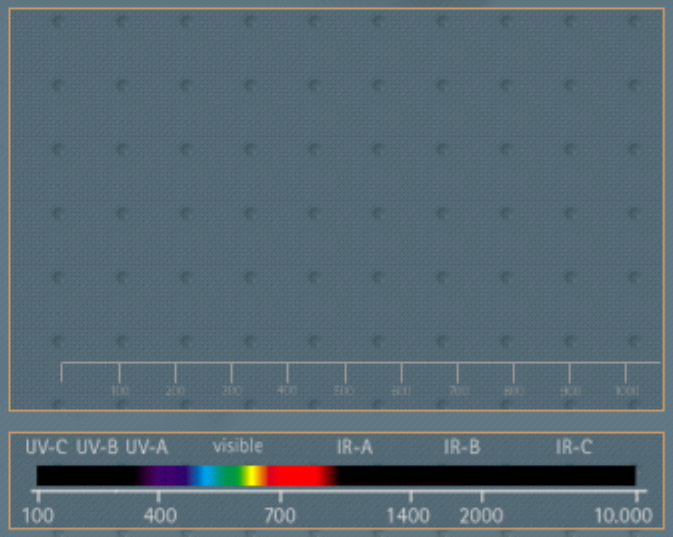
NEXT

The active medium gives a laser its name.

An [active medium] represents the 'heart' of a laser system. Gases, crystals, liquids and semiconductors are typical examples for such media.

The laser beam is generated in the active medium. The medium defines the wavelength ('color') of the emitted beam.

Lasers emit energy in the ultraviolet, visible or infrared part of the spectrum.



[excimer] [argon] [Cu] [dye] [KTP] [Au] [HeNe] [krypton] [ruby] [alexandrite] [Ti:sapphire] [diodes] [Nd:YAG] [Ho:YAG] [Er:YAG] [CO_2]

PREVIOUS NEXT

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The medium, which gives the laser its name, is embedded in a so-called resonant cavity.

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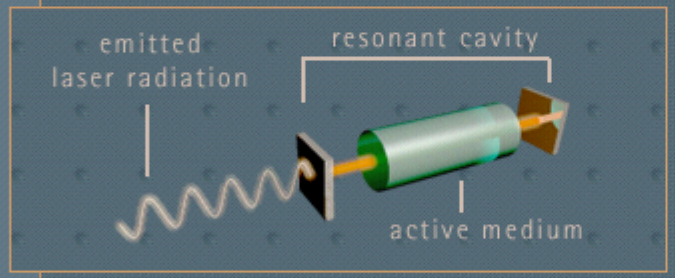

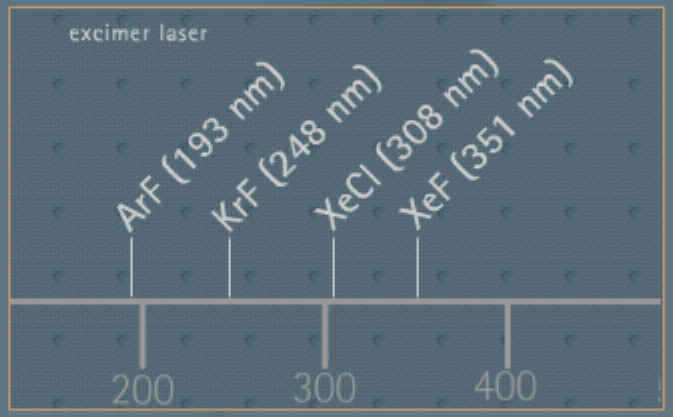

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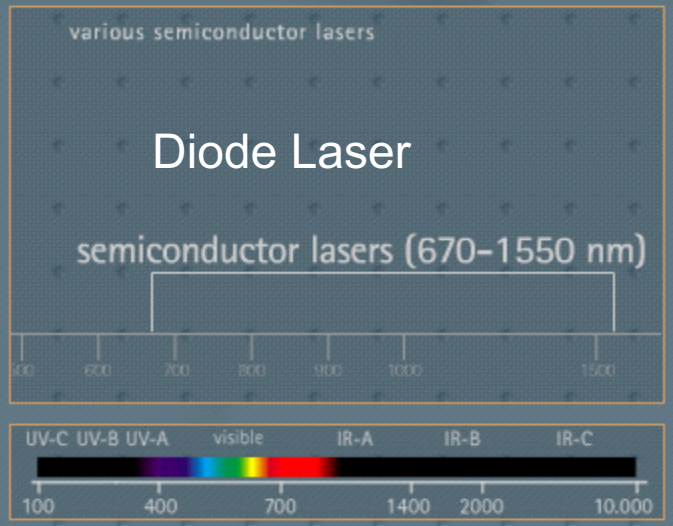

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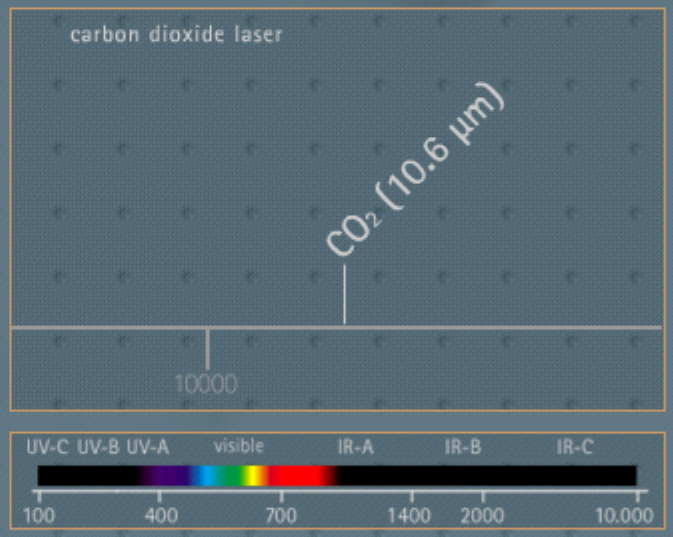

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PREVIOUS NEXT

The method of choice for beam delivery is determined by the wavelength.

In order to deliver the laser beam to the desired site, it needs to be directed by a beam delivery system.

There are different methods of directing a laser beam: a series of lenses in a fixed system, [articulated arms], [glass fibers] or [hollow fibers]. The wavelength of the laser beam is the critical factor that determines which delivery system could be used.

The laser beam leaves the delivery system through an [applicator] which directs the radiation onto the target tissue. Some of these end pieces may in addition be coupled to a [microscope] or an [endoscope].

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Articulated arms are primarily used as beam delivery systems for infrared radiation from CO_2 lasers and Er:YAG lasers.

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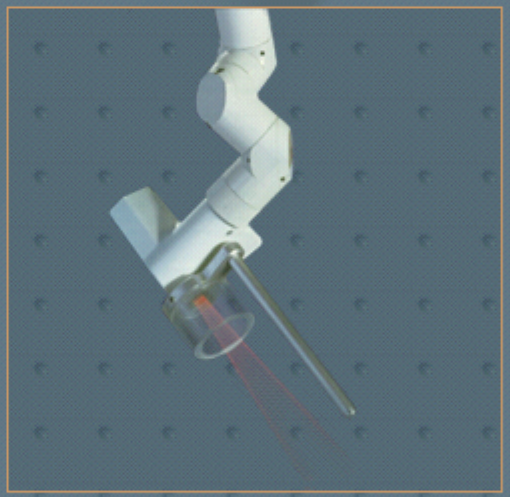

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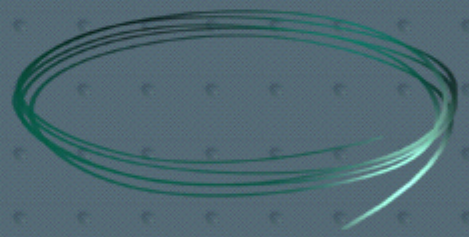
Fibers made of various types of glass are only practical for wavelengths from about 350 to 2100 nm. Beams emitted from fibers are highly divergent.



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The method of choice for beam delivery is determined by the wavelength.

Hollow fibers are glass fibers with a hollow core. In contrast to solid fibers, they are capable of transporting infrared radiation which would normally be absorbed in glass fibers. Beams emitted from hollow fibers are highly divergent.

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PREVIOUS

NEXT

The method of choice for beam delivery is determined by the wavelength.

In order to deliver the laser beam to the desired site, it needs to be directed by a beam delivery system.

bare fibers
hand pieces
micro manipulators
sapphire tips
scanners
slit lamps
wave guides

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Applicators

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Laser Microscope

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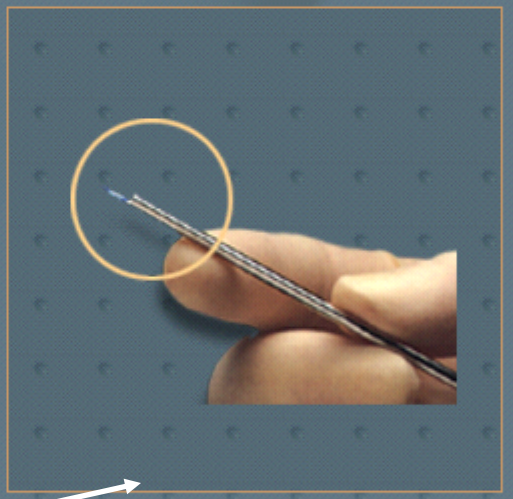
Endoscopes are designed to transport light into the human body. Lenses inside the endoscope help focus the beam.



PREVIOUS

NEXT

Lasers emit beams of light.

Ordinary light sources emit light in all directions.

Lasers however can emit very narrow beams of light in one direction. A typical laser beam is well [collimated].

All of the laser power is concentrated in a narrow beam. Even after traveling a large distance in air, a laser beam still has most of its concentrated power.

PREVIOUS

NEXT

Lasers emit beams of light.

The divergence of a laser beam describes how its diameter increases with increasing distance from the laser aperture. Low divergence means that the beam has to travel a large distance before the diameter increases significantly.

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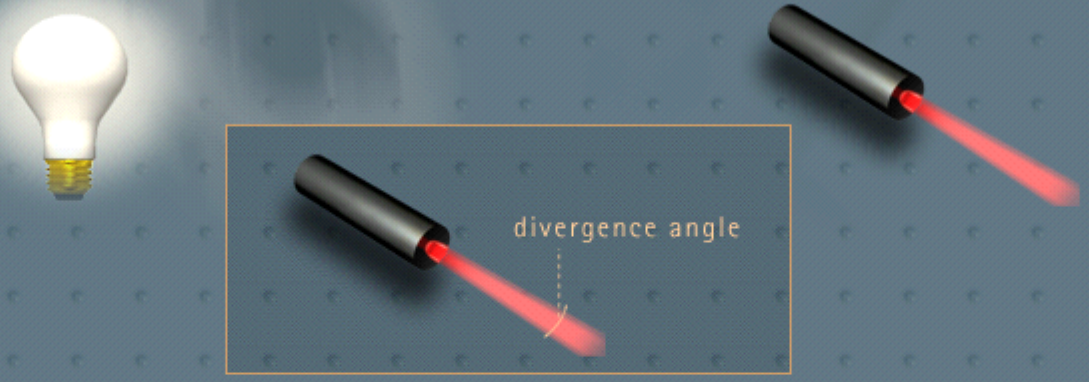

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NEXT

How large is the laser beam ?

The ratio of the beam diameter (in meters) to the distance (in meters) from the emitting aperture is expressed in radians.
1 radian (rad) is the ratio of beam diameter (in meters) and distance (in meters) from the emitting aperture.
1 milliradian (mrad) is the ratio of beam diameter (in millimeters) and distance (in meters !) from the emitting aperture.
A divergence of 1 mrad is therefore equivalent to an increase of the beam diameter

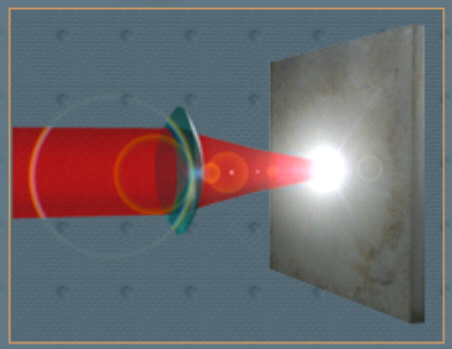
by 1 mm after travelling 1 m
by 1 cm after travelling 10 m
by 1 m after travelling 1 km !

Some laser beams still have small diameters even after traveling long distances !

The power of a laser beam can be focused to a very small spot.

Due to their collimation, laser beams can be [focused] to very small spots in which all of the energy is concentrated.

This is the reason why lasers are very powerful tools in materials processing and surgery.



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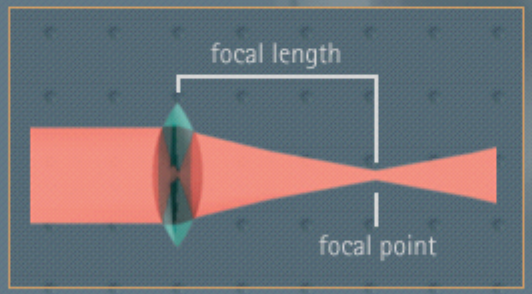
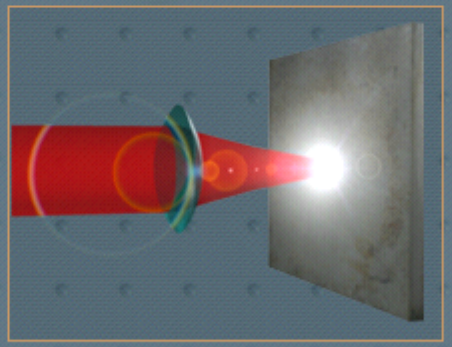
When a beam of light passes through a lens, the beam diameter is smallest at the focal point. The distance between a lens and its focal point is called the focal length. It is determined by the curvature and material of the lens.





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