



Laser output measurements being taken using a thermopile sensor and a power and energy meter

Only a few years after the first demonstration of a working laser in 1960, the unique properties of laser light were being utilised in the world of medicine.

This series of leaflets highlights the science and the scientists behind some widely used medical techniques.

They are produced by the Institute of Physics and Engineering in Medicine. To find out more about Medical Physics or Clinical or Biomedical Engineering, or to request free leaflets or posters in this series, contact us:

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The Science & The Scientists

Lasers in medicine

Lasers are used in medicine in a wide variety of applications such as ophthalmology, urology and surgical procedures.

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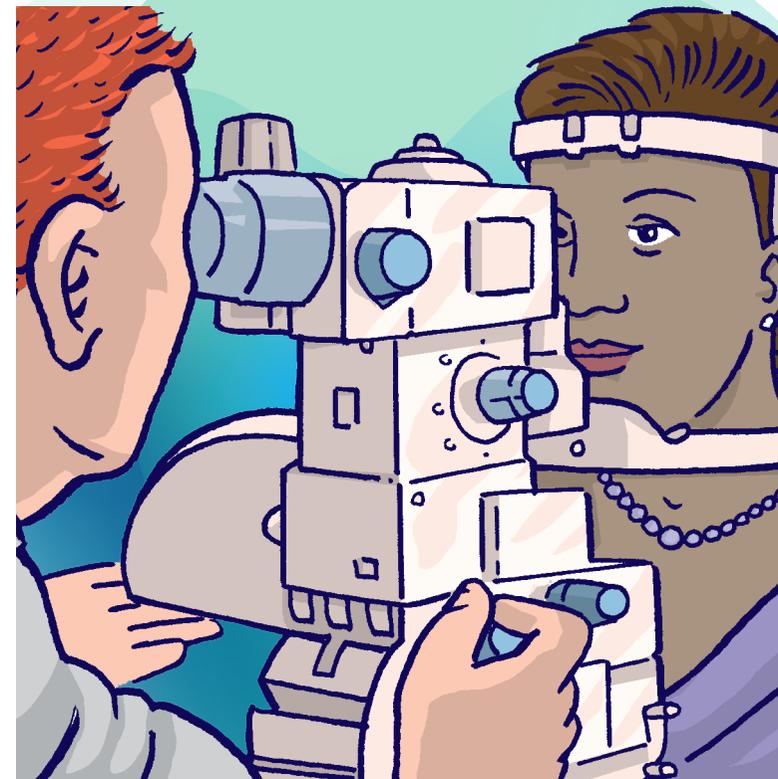
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The techniques described in this leaflet are only suitable in certain cases and some are not yet widely available. If you need laser treatment, your doctor will advise you.

This leaflet was produced with the help of IPEM's Ultrasound and Non Ionising Radiation Special Interest Group.

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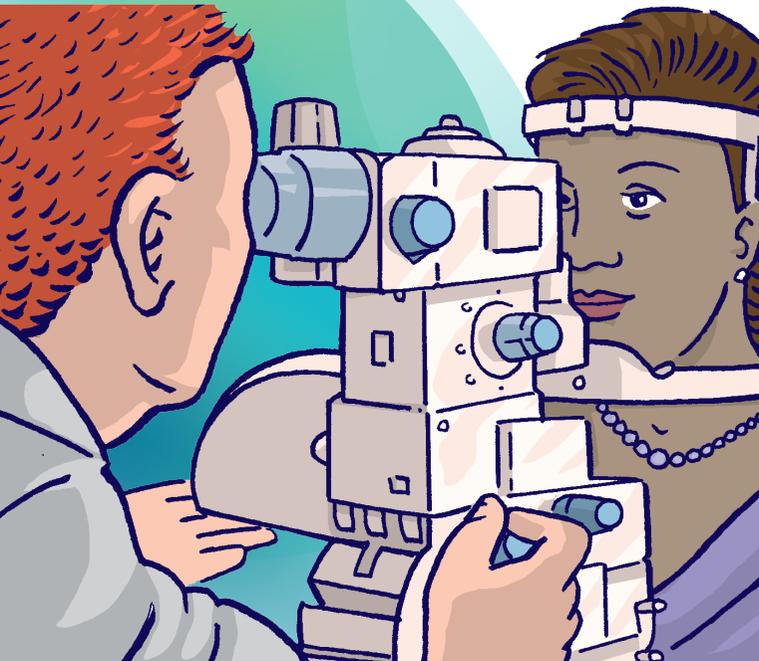
The Science

As well as being used in a variety of applications, lasers are also used for several investigative roles in medical diagnosis such as Optical Coherence Tomography, spectroscopy and imaging.

Laser light has many special properties arising from its method of generation that sets it apart from an ordinary light source like a lamp. The laser light is monochromatic, directional, and coherent. These properties mean the laser wavelength can be selected to target specific chemical groups within the structure of the human body (chromophores).

Additionally, the laser light can be focused to a very small spot with potentially very high-power densities, and the coherent nature of the light can be used in many diagnostic applications.

A slit lamp delivered laser



Some of the conditions that can be treated.

Laser light can be used in a wide variety of applications and in a wide range of procedures in the medical sector. Some examples are:

Ophthalmology

Photocoagulation, selected laser trabeculoplasty, capsulotomy

Urology

Stone fragmentation, treatment for benign prostatic hyperplasia

Surgery

Used in many areas, for example, photodynamic therapy of carcinomas within the body such pituitary adenocarcinoma, buccal and bladder cancers

Dermatology

Treatment of vascular and pigmented lesions

Cardiology

Removal of faulty pacemaker leads, angioplasty

Physiotherapy

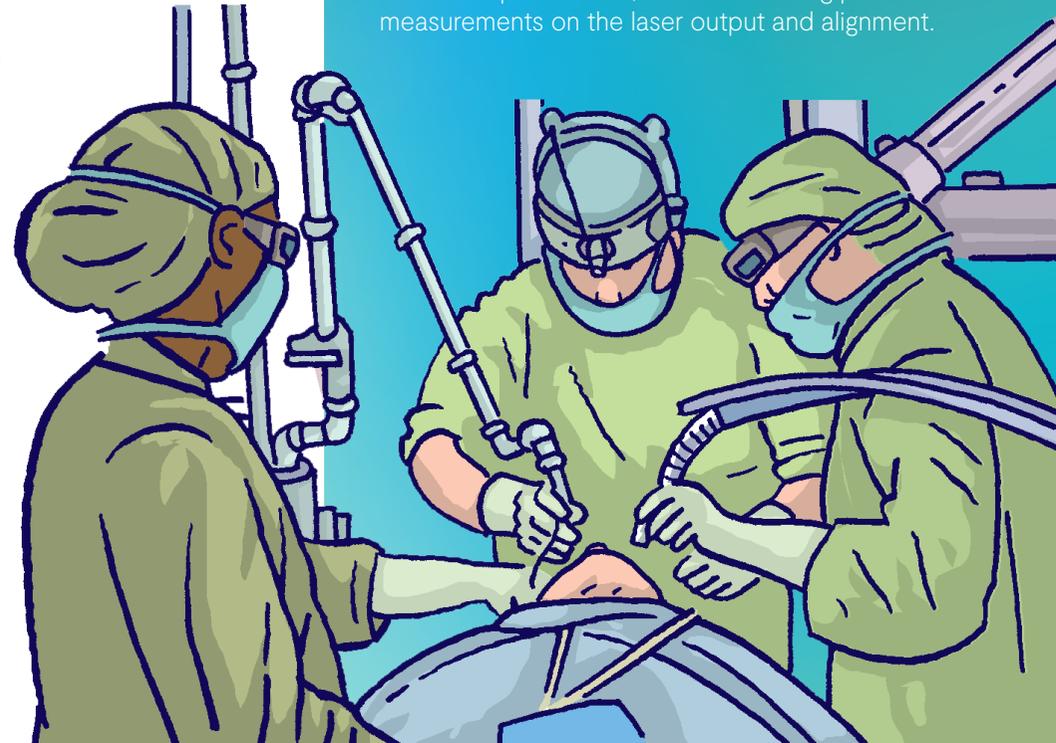
Mitochondrial stimulation, wound healing

Photodynamic Therapy (PDT)

Lasers can play a role in activating light sensitive medicine to destroy abnormal cells

**Plus many more –
new applications are being
developed all the time!**

A laser being used during a surgical procedure



The Scientists

Clinical Scientists play an important role in delivering laser treatments and investigations. They help to ensure lasers are used correctly and safely, which includes inspecting operating theatres and procedure rooms to make certain they are suitable for laser use and ensuring all controls are in place so that any harmful laser radiation is contained within the theatre.

They check that staff in other areas where lasers are used, such as urology or dermatology procedure rooms, are adequately protected and systems are in place to restrict access when the laser is operating. They also ensure suitable controls are available and will advise on the purchase of personal protective equipment (PPE) and check adequate systems are in place to prevent other problems such as surgical fires and smoke plume issues.

Clinical Scientists are also involved in writing administrative controls and protocols to inform the users of the procedures they must follow for safe and correct operation of the laser. Training users in aspects of the safe use of lasers is an important part of their responsibilities, as is undertaking practical measurements on the laser output and alignment.