LIGHT

Light is a wave.

There are two types of wave:

Longitudinal Animation1 Animation2

Transverse Animation 1

Animation of both

Sound has a longitudinal wave.

What type of wave does light have? Can we prove it?

Demonstration

What Is Light Made Of?

It has been known for hundreds of years that electricity can make magnetism and magnetism can make electricity.
Demonstration.

Maybe electricity and magnetism are related.

James Clerk Maxwell was a Scottish physicist (Mr Dimbleby's hero) who, in 1864, published a scientific paper relating electric and magnetic fields.

He calculated the speed of light using equations. His calculated speed agreed with the measured speed of light:
just less than 300, 000, 000 metres per second; that's 7 ½ times round the earth in one second (quite slow).

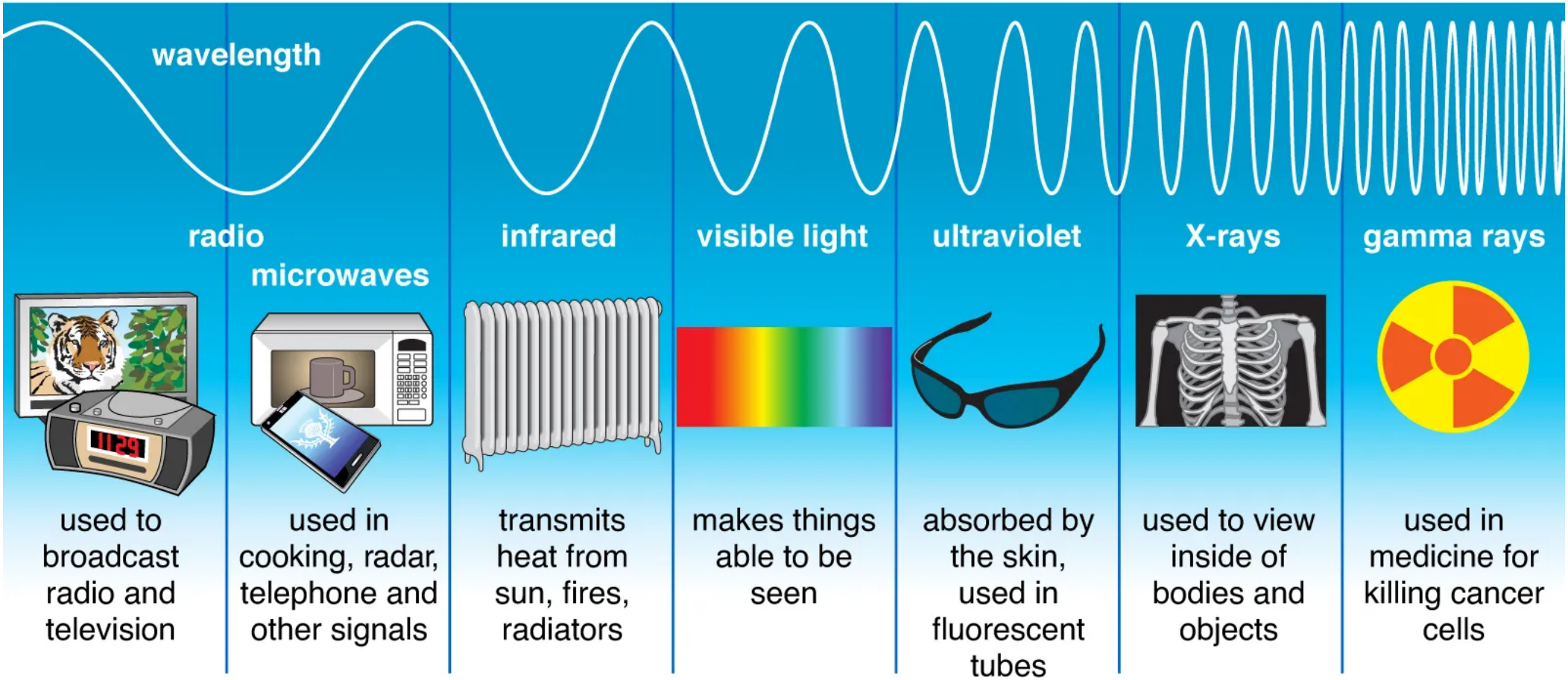
He realised that electricity, magnetism and light were all made of the same "stuff". The stuff became known as "electromagnetism".

Light is a part of the electromagnetic spectrum (E.M. spectrum).
A set of waves of different frequency.

What is special about light is that most animals and plants have sensors to detect light.
Us humans have eyes!

There are other types of E.M. waves.

Types of Electromagnetic Radiation



E.M. Propagation 1 E.M. Propagation 2

How did Maxwell's calculations work?

There are properties of the universe that control electromagnetism: Permittivity and permeability.

Permittivity determines how much electricity is stored on, for example, a balloon when you rub it and it sticks to a wall.

Permeability determines how strong is the magnetic effect of electricity going down a wire.

These have values even in the vacuum of space and their values can be measured.

So that scientists sound "cool" we use the terms:
"Epsilon zero" (ε_0) for the permittivity in a vacuum. Known as "vacuum permittivity".
"Mu zero" (μ_0) for the permeability in a vacuum. Known as "vacuum permeability".

Epsilon and Mu are Greek letters.

The speed of light is: $\mathbf{1/\sqrt{(\mu_0 \varepsilon_0)}}$

ε_0 is $8.8541878188 \times 10^{-12}$ F / m

μ_0 is $1.25663706 \times 10^{-6}$ H / m