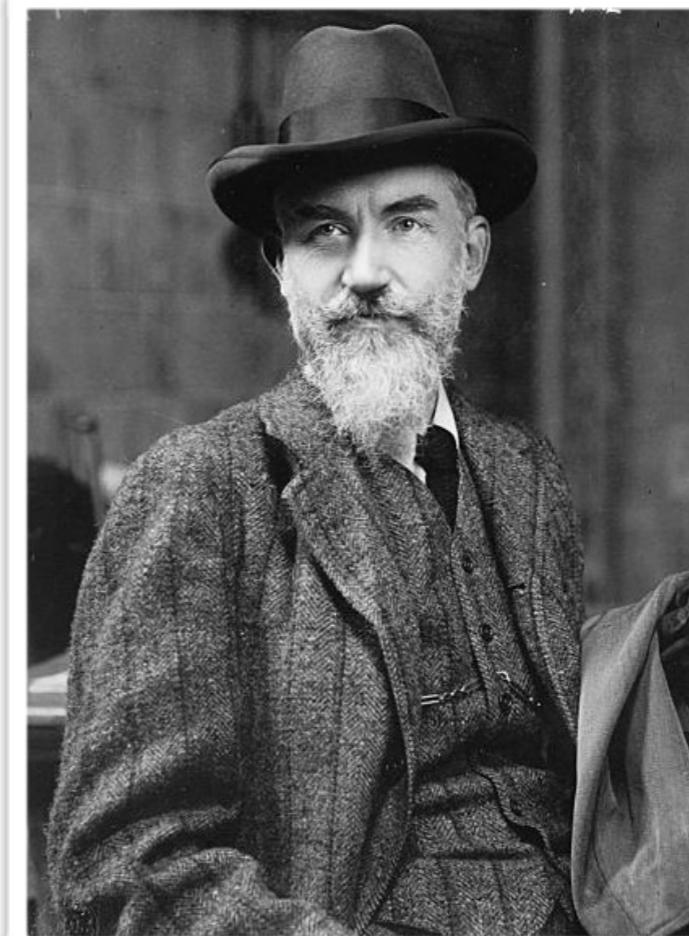


**Think of the fierce energy concentrated in an acorn!
You bury it in the ground, and it explodes into an oak!**

George Bernard Shaw



Arizona State University
SES 194

Energy in Everyday Life

TemperatureTech:
Infrared & Light

Frank Timmes

ftimmes@asu.edu

Infrared Thermometers

This handheld device is used by simply pushing a button as you point it toward an object. A digital readout tells you the temperature.



All objects above absolute zero are emitting infrared radiation (IR) - an invisible (to human eyes) form of electromagnetic energy. Say what?

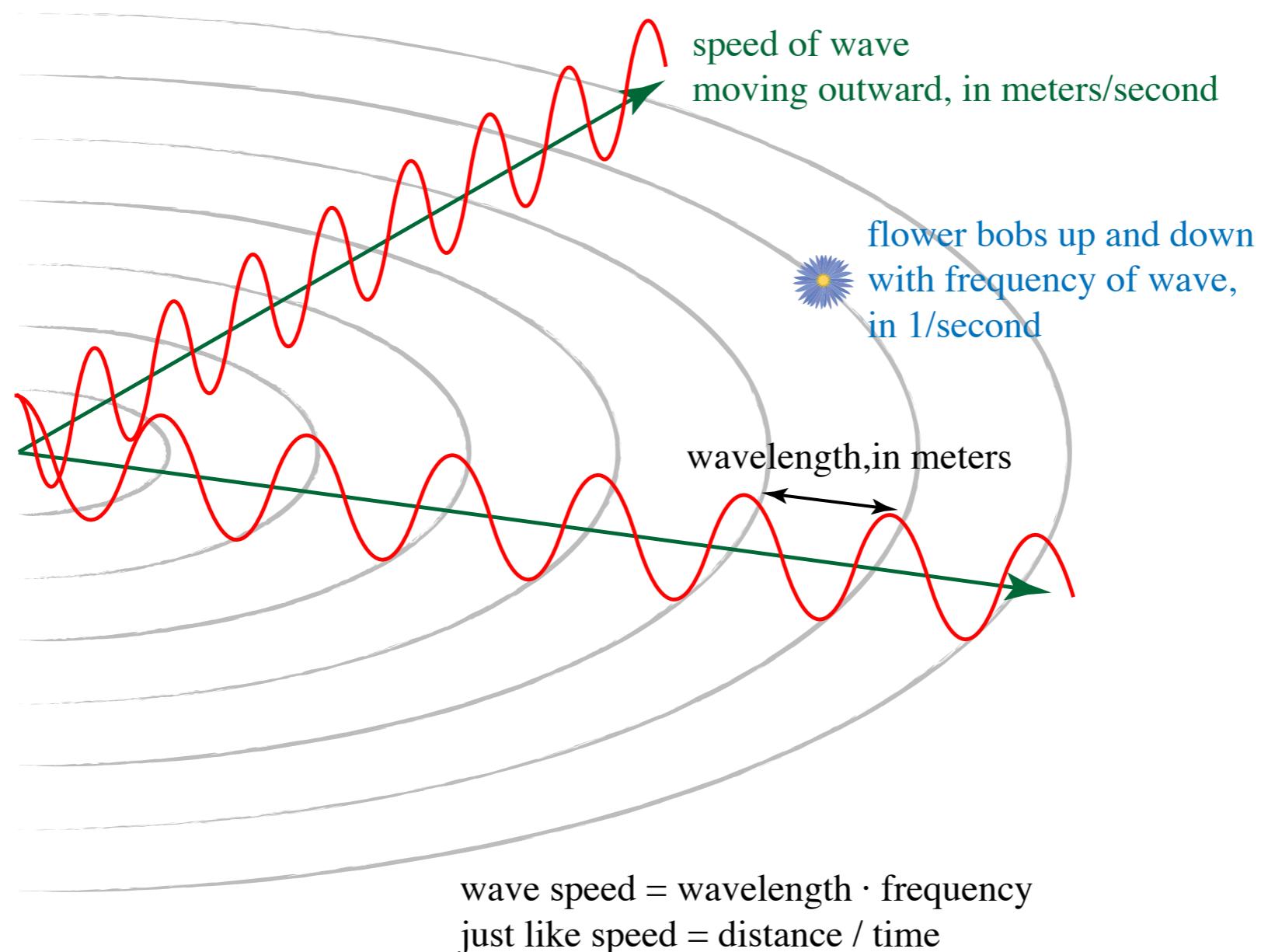
The infrared thermometer has a lens that focuses the IR energy into a detector, which measures the IR intensity and converts that reading to temperature.



IR thermometers are used by firefighters to detect hot spots in buildings, restaurants to ensure that served food is still hot, and wherever a quick surface temperature is needed.

What is light?

Light is an electromagnetic wave, but it also comes in individual “pieces” called photons. Each photon has a precise wavelength, frequency, and energy. The shorter the wavelength, the larger the frequency and energy.



Light is a special wave because it need no medium to propagate, and always travels at a constant speed of $c \sim 300,000$ km/s in a vacuum.

wavelength \times frequency = c



The energy of a photon is determined by its frequency:

Energy = Planck's constant × frequency = $h \times f$



Planck's constant in some sense sets the pixel size or graininess of nature.

The Electromagnetic Spectrum

