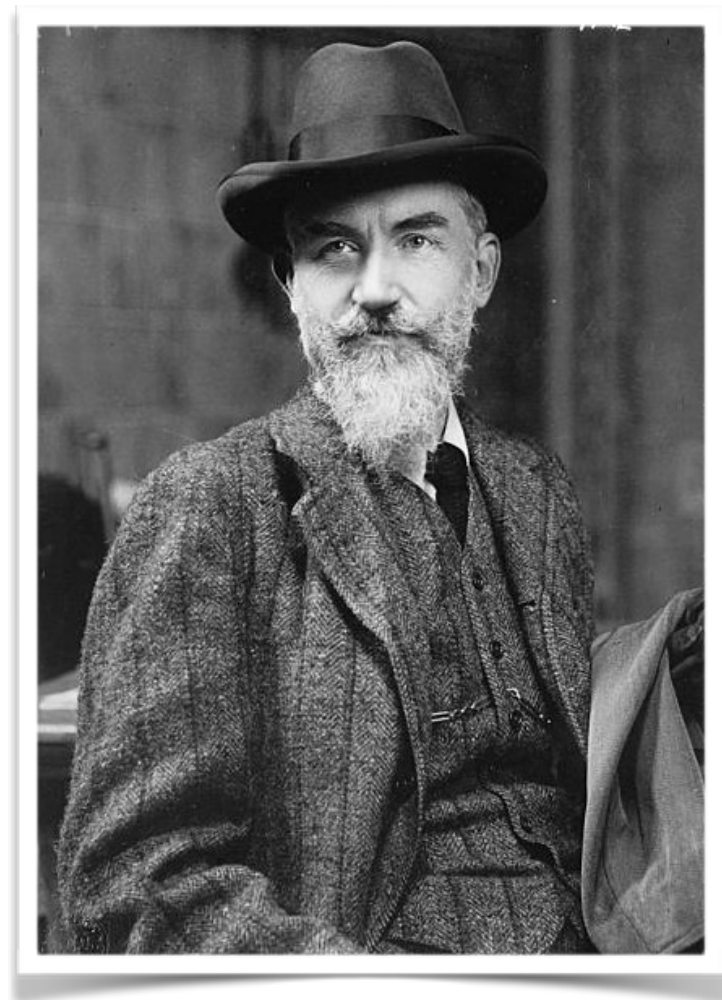


**Think of the fierce energy concentrated in an acorn!  
You bury it in the ground, and it explodes into an oak!**

**George Bernard Shaw**



**Arizona State University**  
**SES 194**

# **Energy in Everyday Life**

## **TemperatureTech: Infrared & Light**

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# 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?**



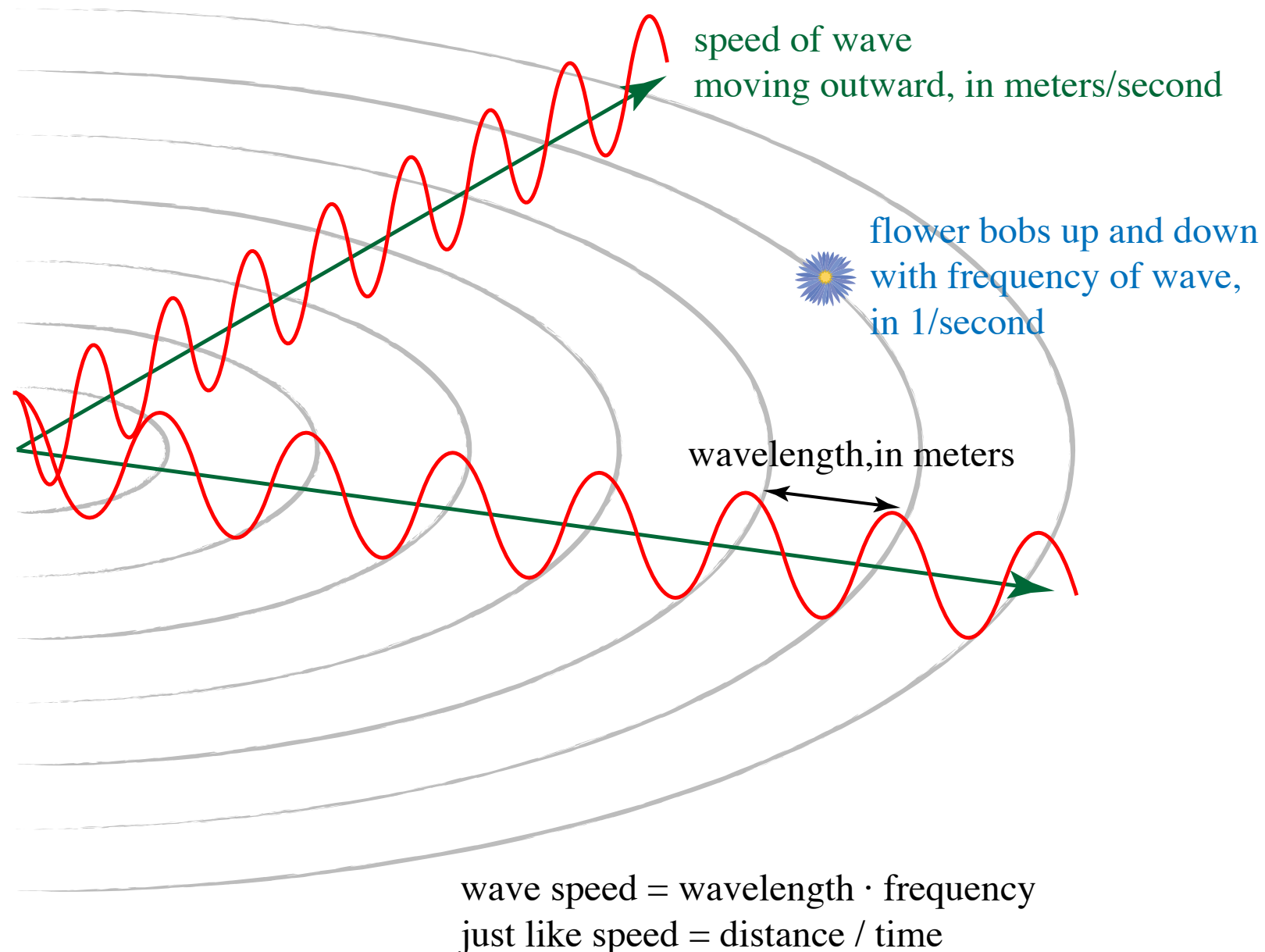
**The infrared thermometer has a lens that focuses the IR energy into a detector, which measures the IR intensity and converts that reading to temperature.**



**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.**

$$\text{wavelength} \times \text{frequency} = c$$



**The energy of a photon is determined by its frequency:**

$$\text{Energy} = \text{Planck's constant} \times \text{frequency} = h \times f$$



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



# The Electromagnetic Spectrum

