hi

Day 18, 26.03.2019

Quantum Mechanics 1

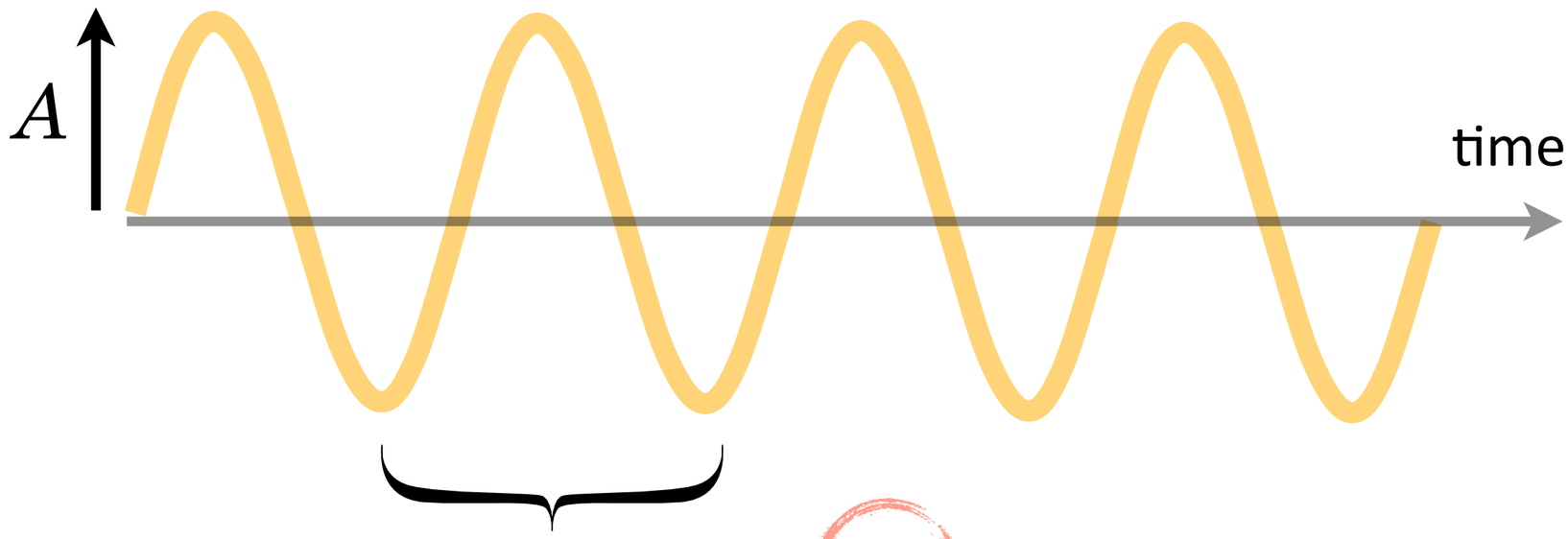
remember”

waves?

just some facts, Ma'am

maximum height of the disturbance: "Amplitude," A.

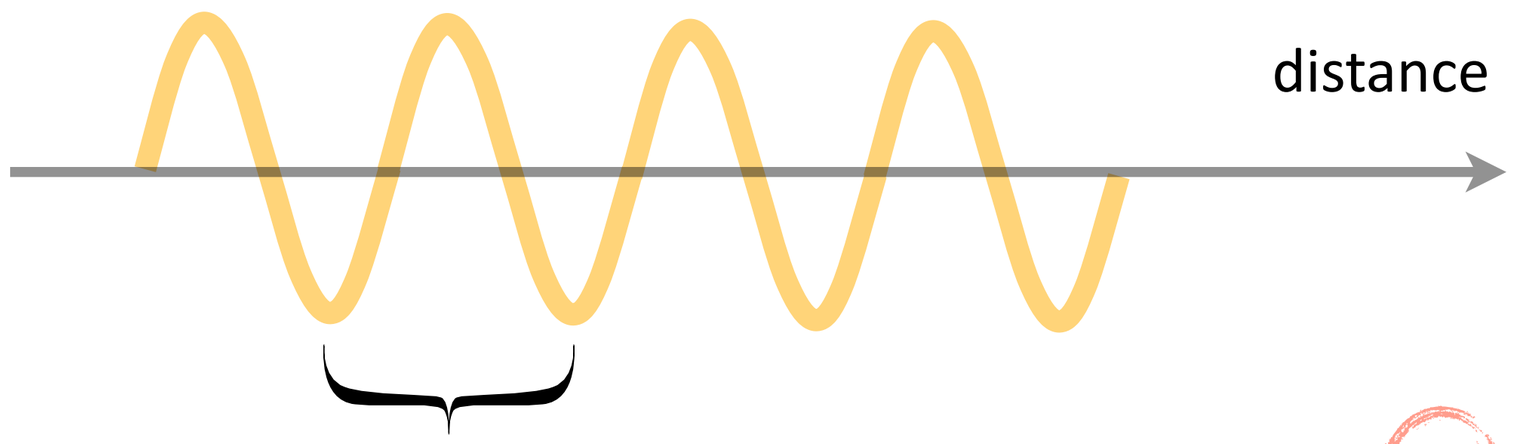
"Intensity" is ~ A^2



time to repeat: "Period," T. seconds

rate of repetition: "Frequency," f. (Hz)

$$f = \frac{1}{T}$$



distance through which it repeats: "Wavelength," λ m

$$v = \frac{\lambda}{T} \qquad v = \lambda f$$

relation alert: **speed of a wave**

refers to: $v = \lambda f$

example: middle C ~ 4 ft (=1.2 m) wavelength

f = 262 Hz, so speed of sound:

$$v = 1.2 \times 262 = 314 \text{ m/s}$$

what characterizes a wave?

different from a material body?

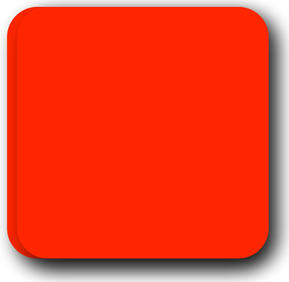
a material object is

here.

a wave is

everywhere.

a material bounces



doesn’t pass through.

?

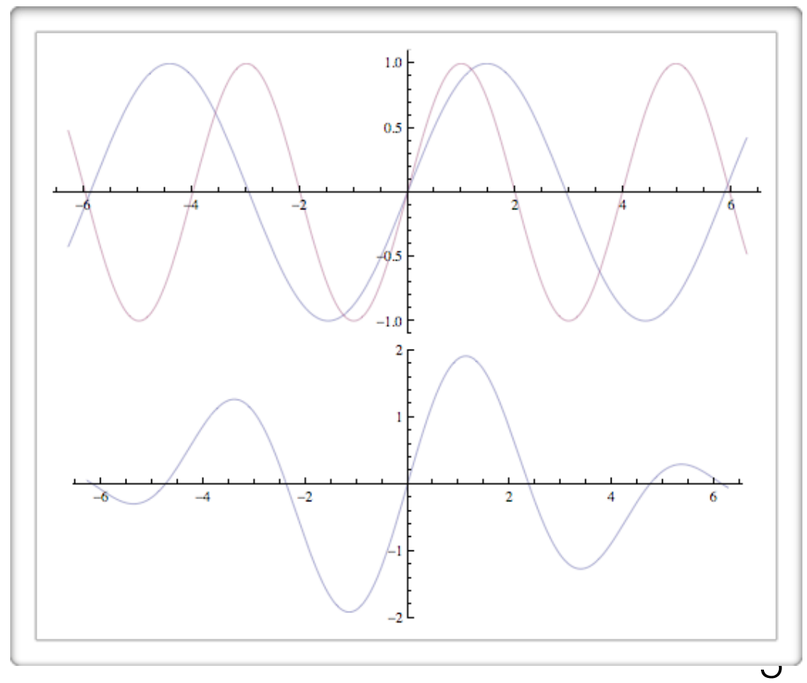
!

waves go right through

one another

blue or red

blue + red

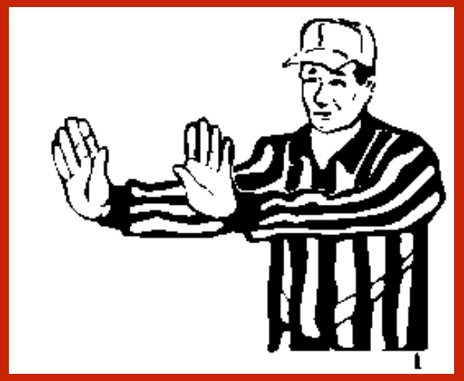


the

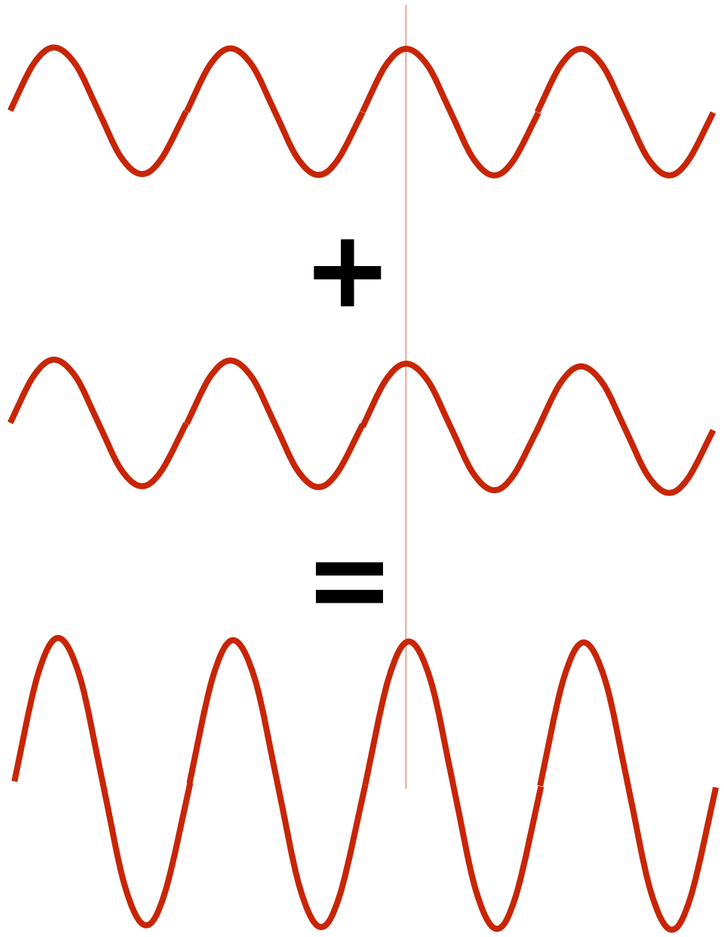
for waves?

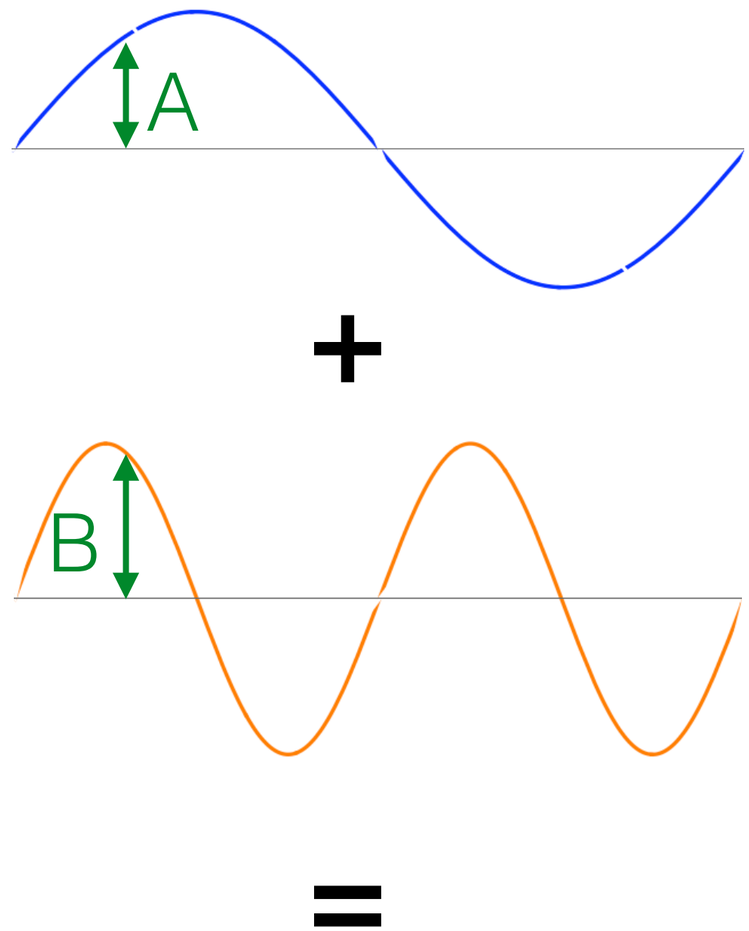
that's right

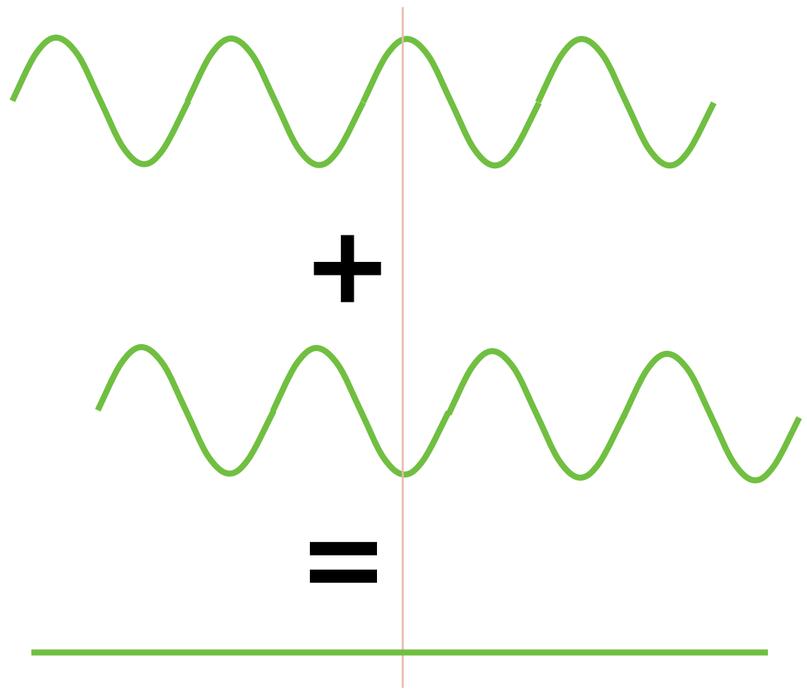
interference

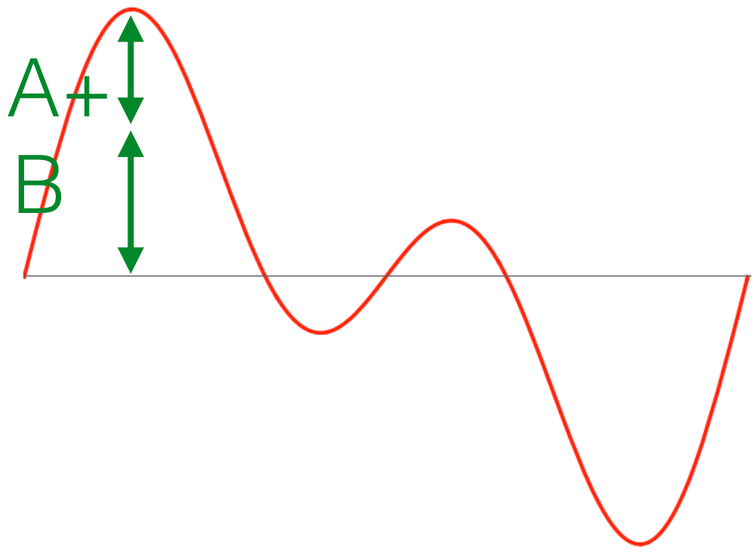


can always make a third wave out of the sum of two waves









for us, two kinds

traveling waves

the disturbance translates

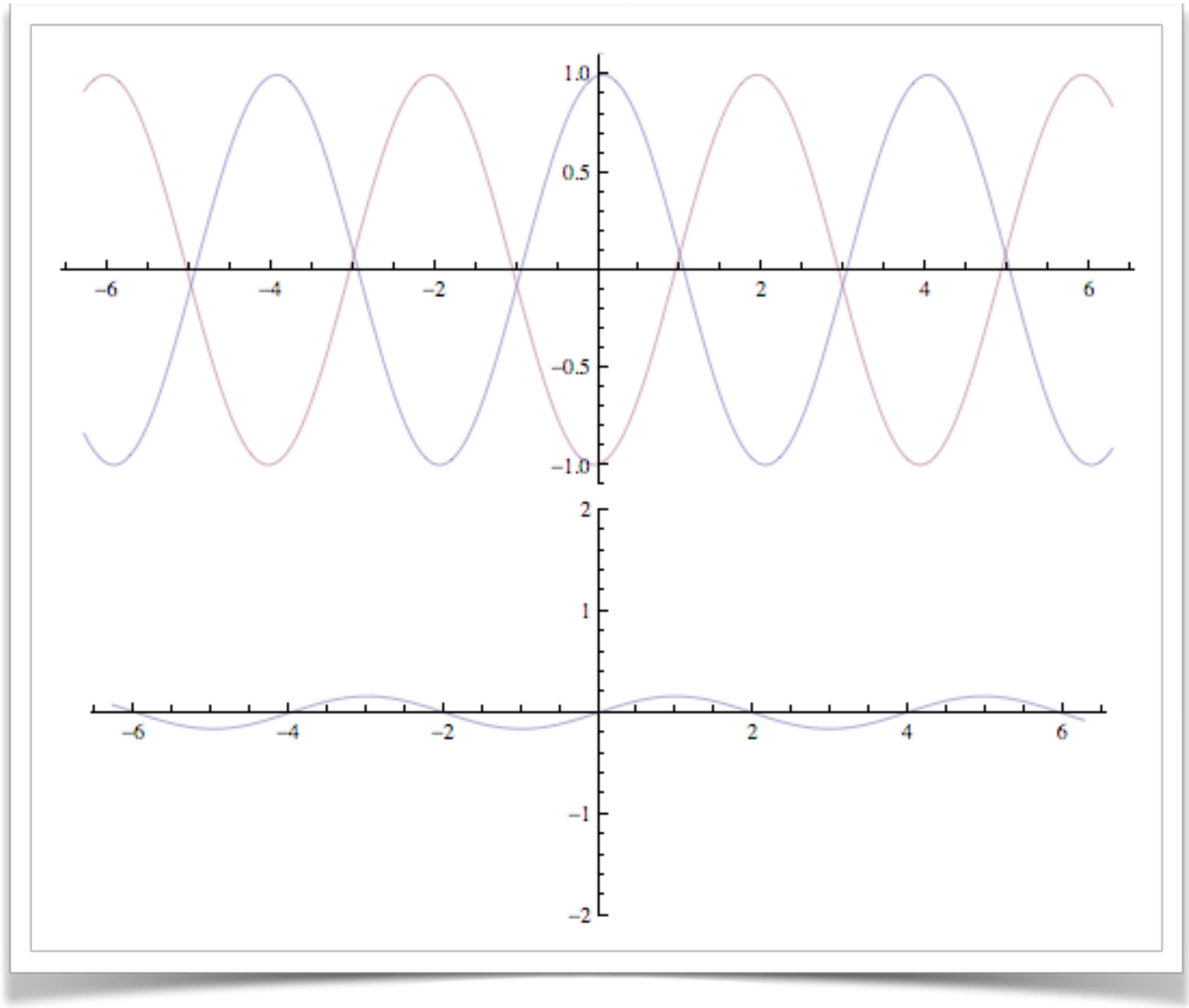
standing waves

the disturbance marches in place

Standing room only

"standing wave"

the sum of two traveling waves moving in opposite directions



Quantum Mechanics

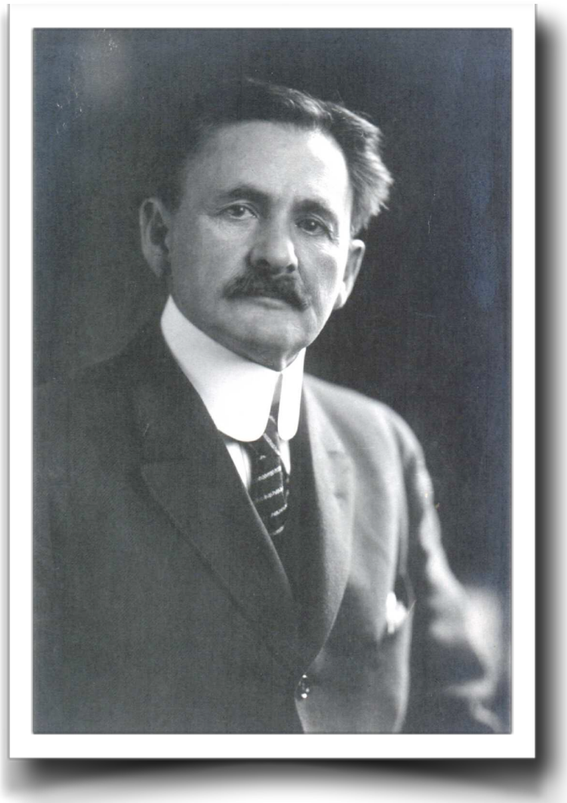
so...all tied up in a nice package, Mr Michelson?

notsomuch

we got matter falling apart in radioactivity

we got the Michelson Morley Experiment showing no Ether

we got Blackbody radiation all messed up



The more important fundamental laws and facts of physical science have all been discovered, and these are now so firmly established that the possibility of their ever being supplanted in consequence of new discoveries is exceedingly remote.

- A.A. Michelson
Light Waves and Their Uses (1903

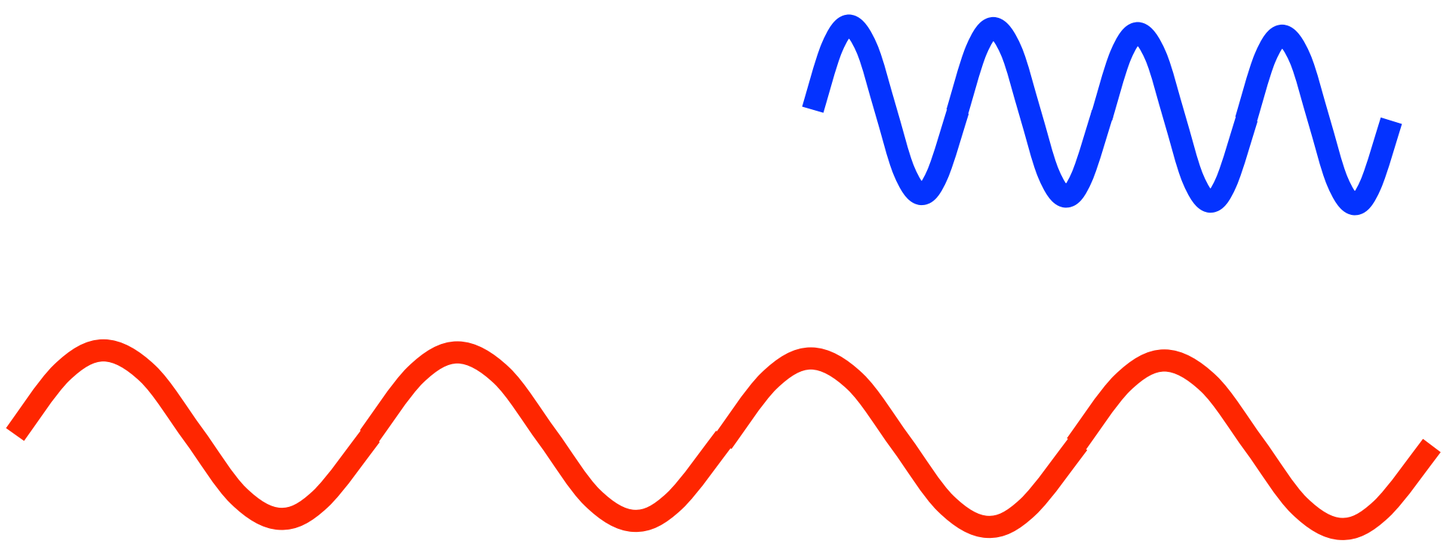
in the 1890's things were heating up

I mean, literally.

color = temperature

why?

Gassan Sadatoshi

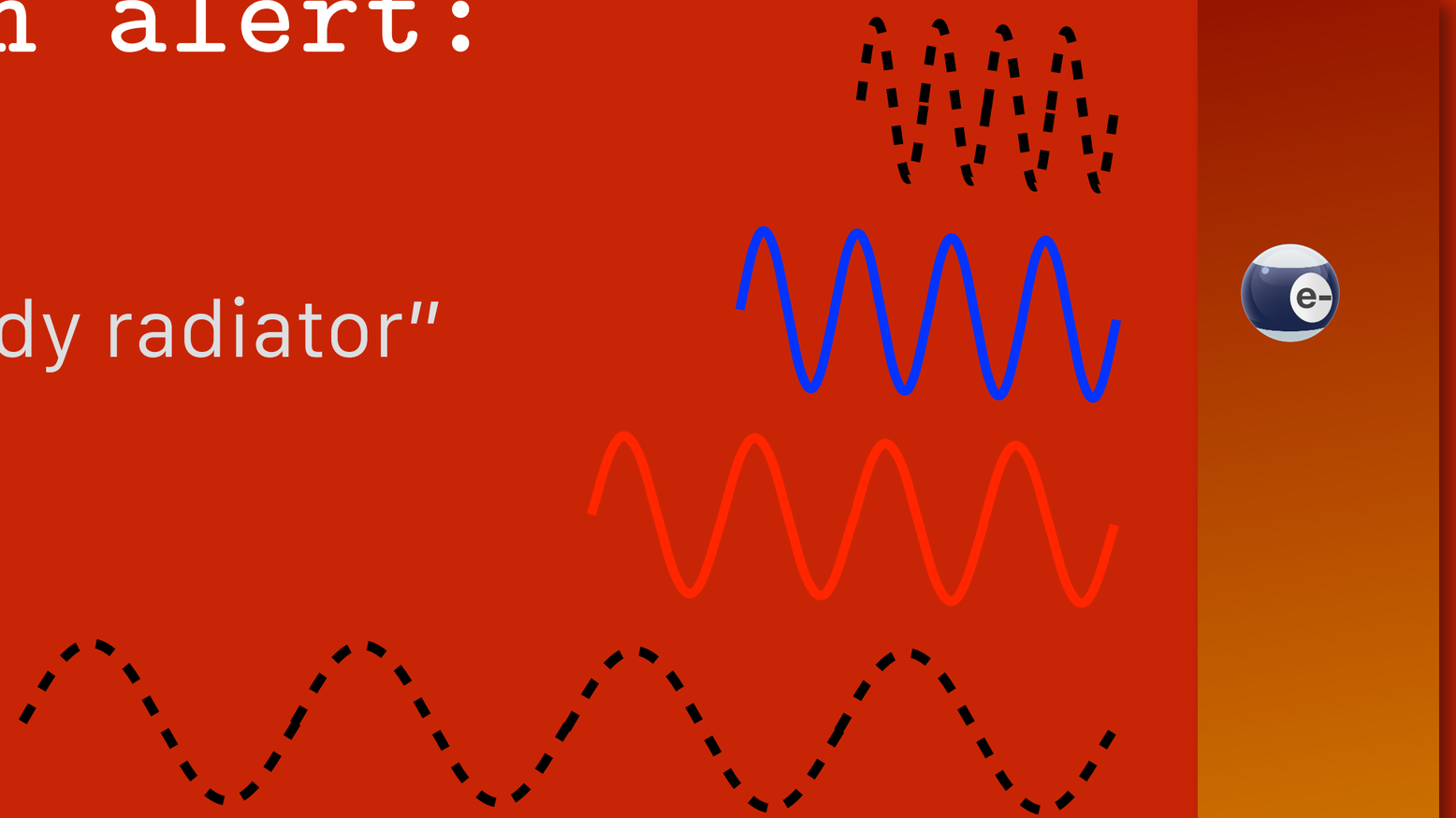


http://www.howstuffworks.com/sword-making.htm/printable

amount of each wavelength: depends **ONLY** on temperature

`jargon alert:`

"Blackbody radiator"



A little more complicated - glass, metals, soot...all behave differently

Basically think of a "Blackbody Radiator" as a perfectly absorbing, perfectly radiating substance.

jargon alert:

Black Body Radiation

refers to:

A thermal absorber that perfectly absorbs all wavelengths of EM radiation and emits according to its temperature

entomology:

“black” in the sense of a perfect absorber...no reflection

example:

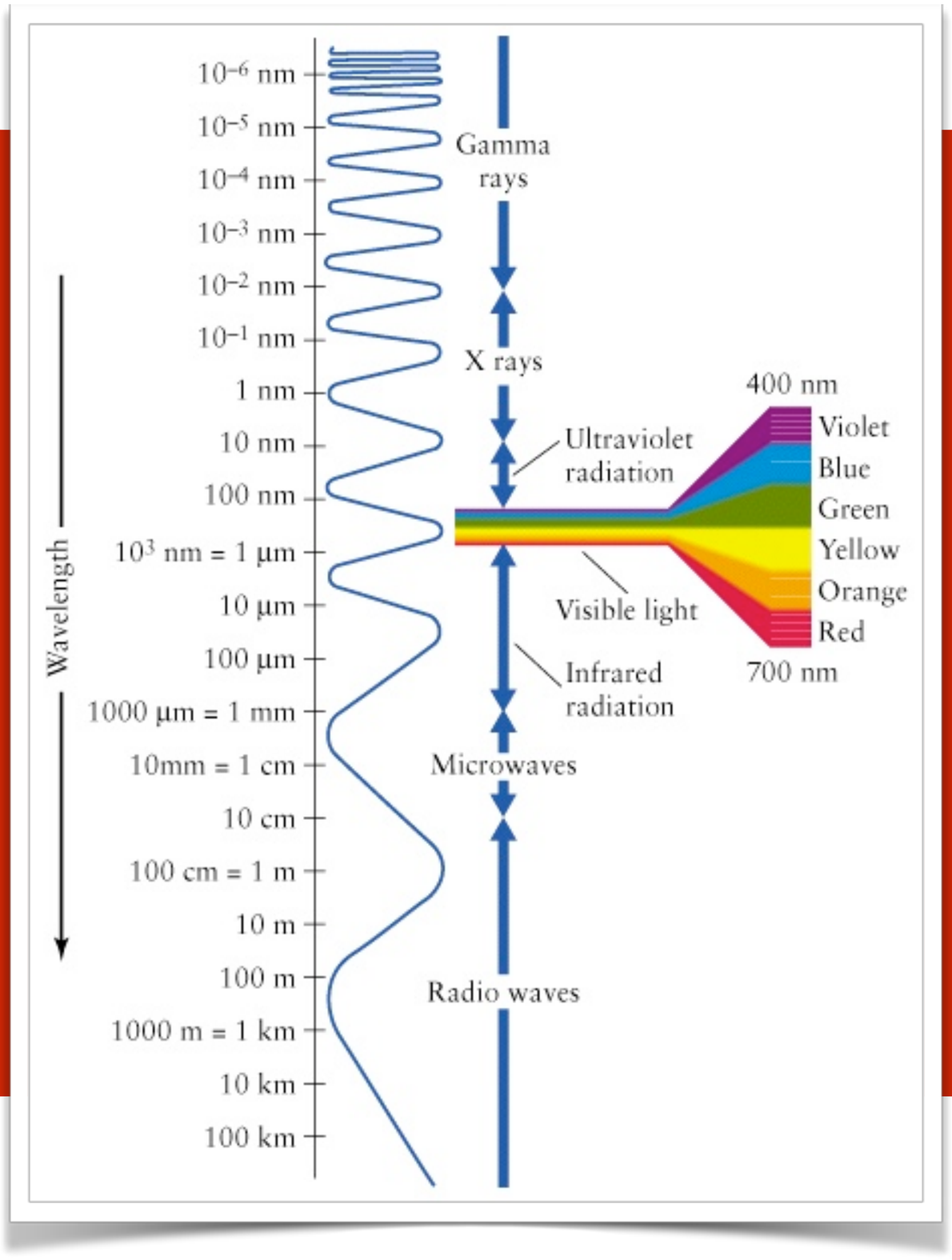
A cavity with a hole, a near-black object, a star...

everything radiates

everything.

Many objects approximate Blackbody radiators:

- stars
- you, me
- heated metal
- stuff...



temperature scales

water freezing - boiling - absolute zero

The US go-it-alone scale: Fahrenheit

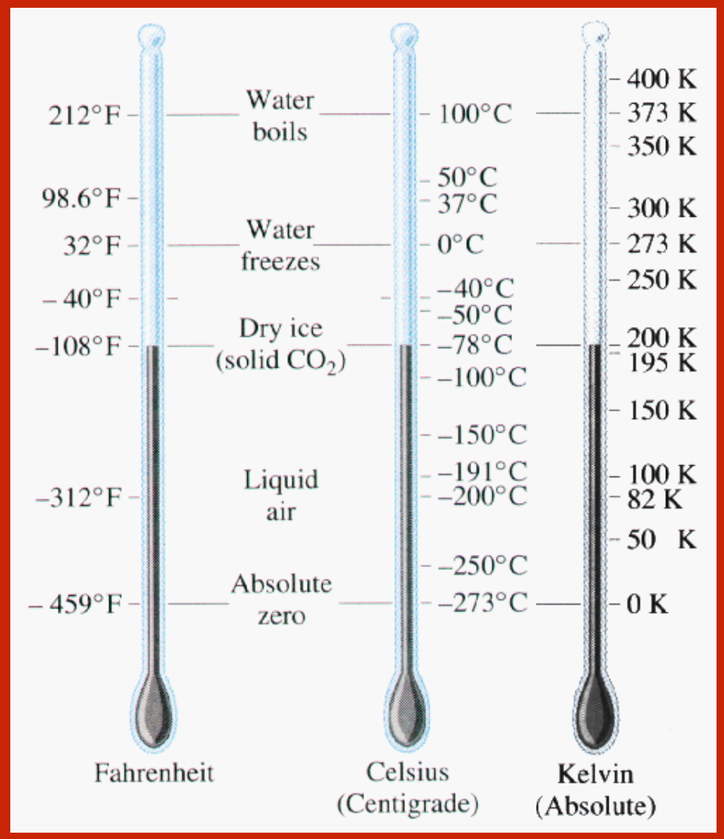
- (32°F - 212°F - –459°F)

The rest of the world: Celsius (or Centigrade)

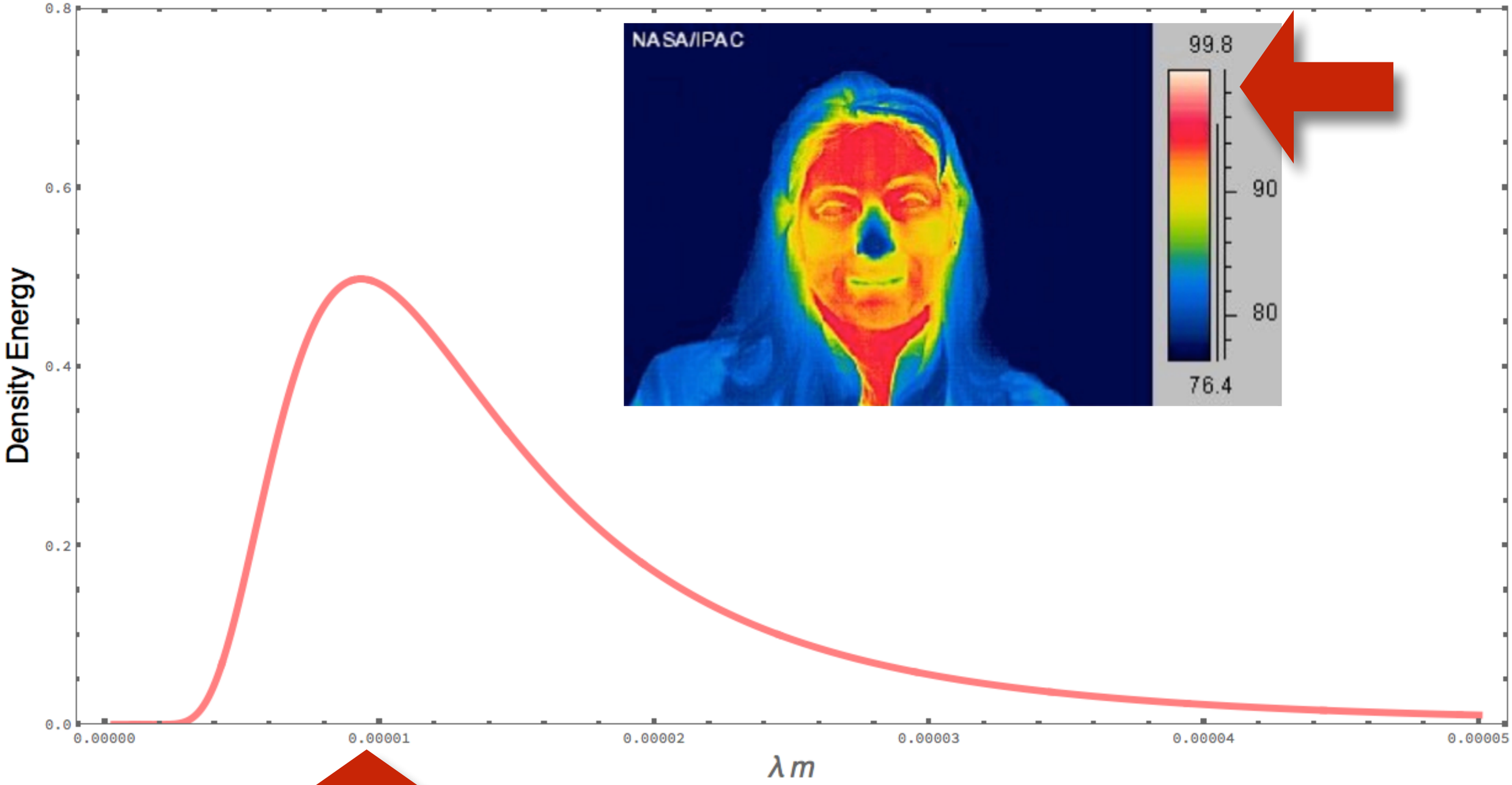
- (1°C - 100°C - –273°C)

The scientific community: Kelvin

- (273 K - 373 K - 0 K)

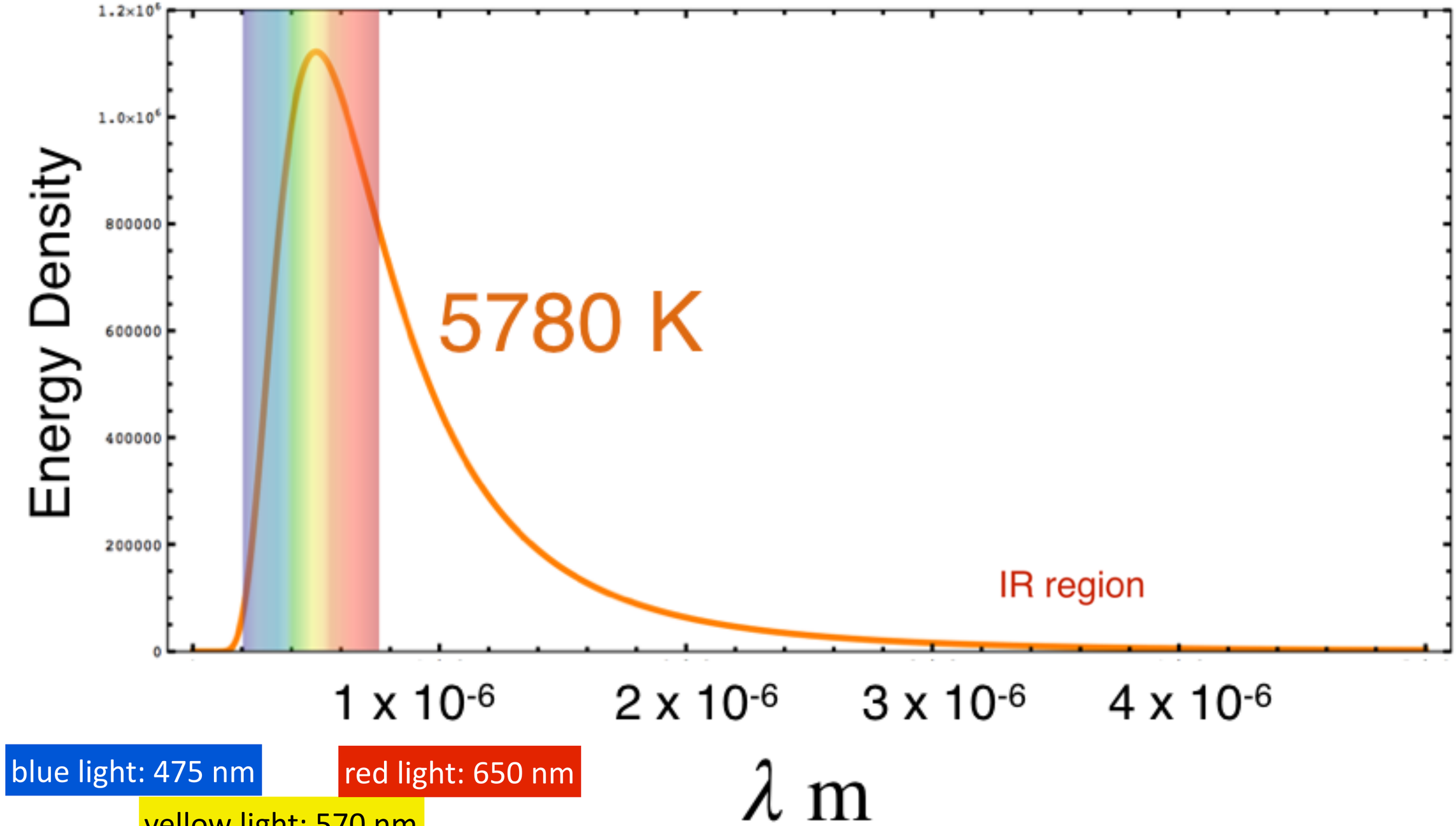


everything with a temperature radiates electromagnetic waves



about 1 x 10^{-5}m, 10 microns: infrared

sun

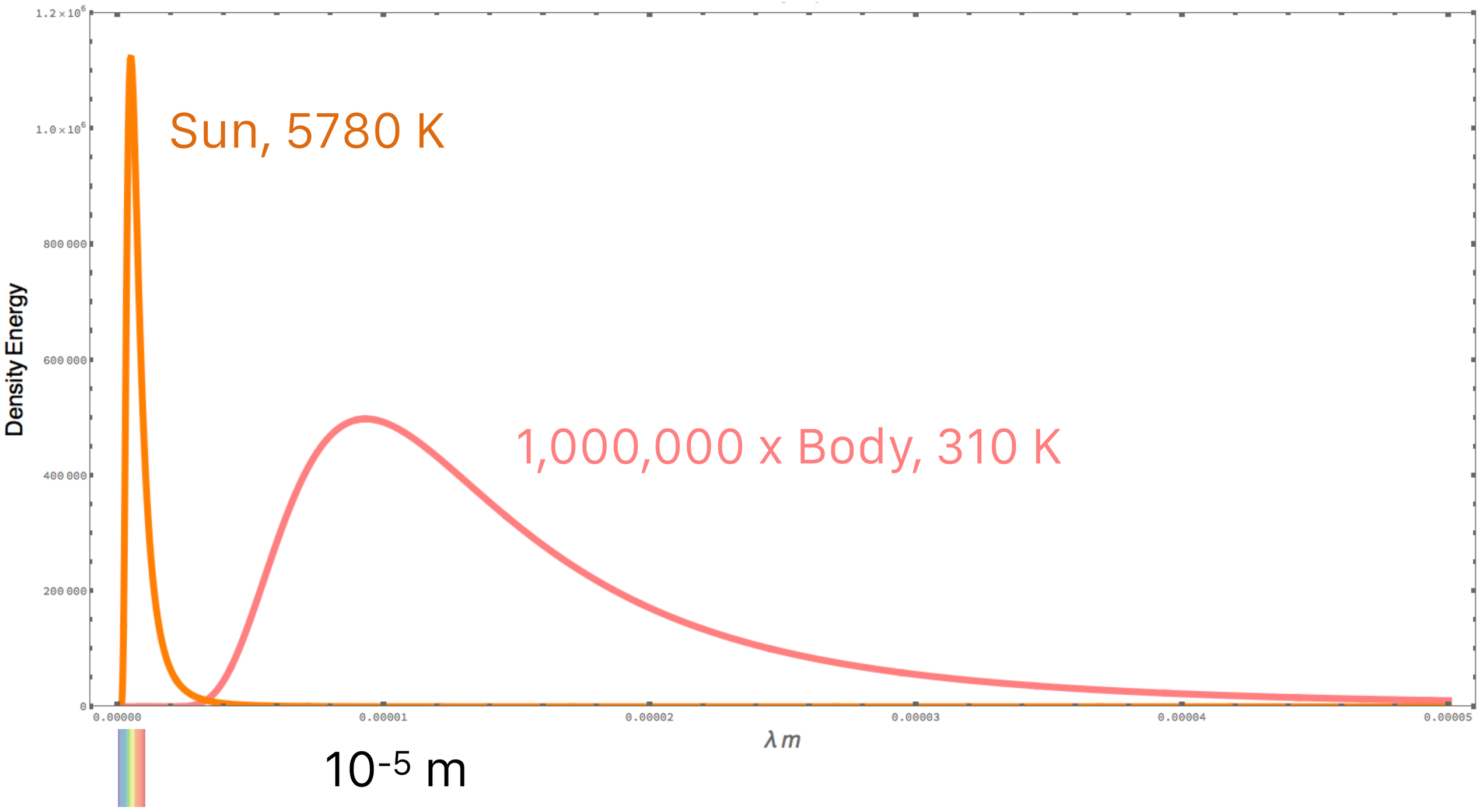


blue light: 475 nm

red light: 650 nm

yellow light: 570 nm

Sun’s warmth? notsomuch



10^{-5} m