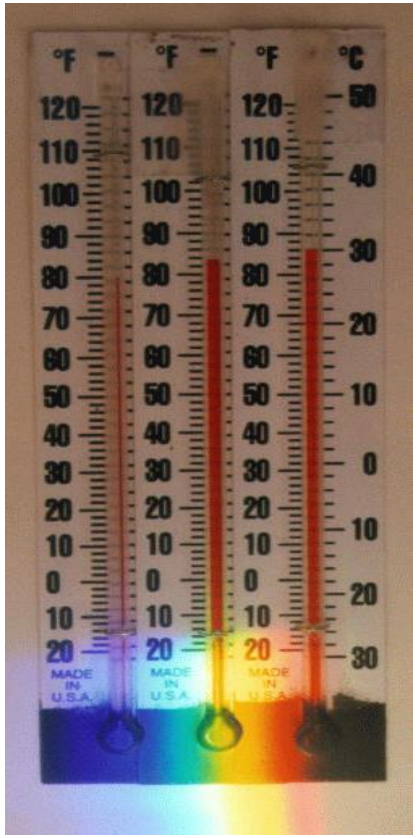
Earth Science Picture of the Day, March 25, 2016

https://epod.usra.edu/

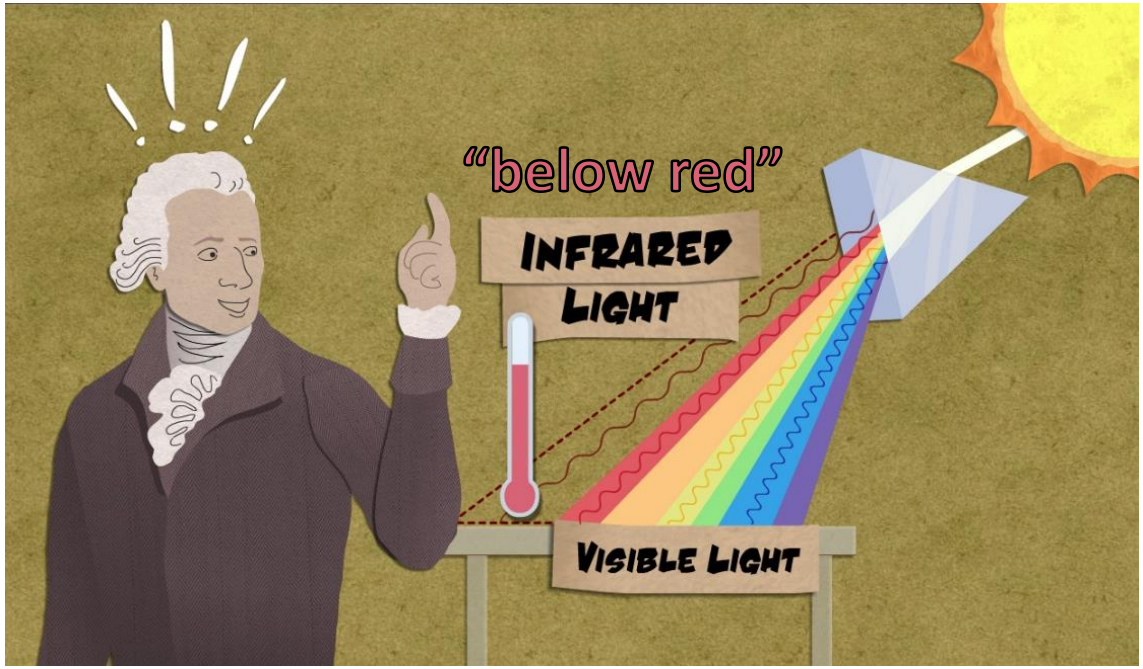


Infrared Light Discovery

Friedrich Herschel, 1800

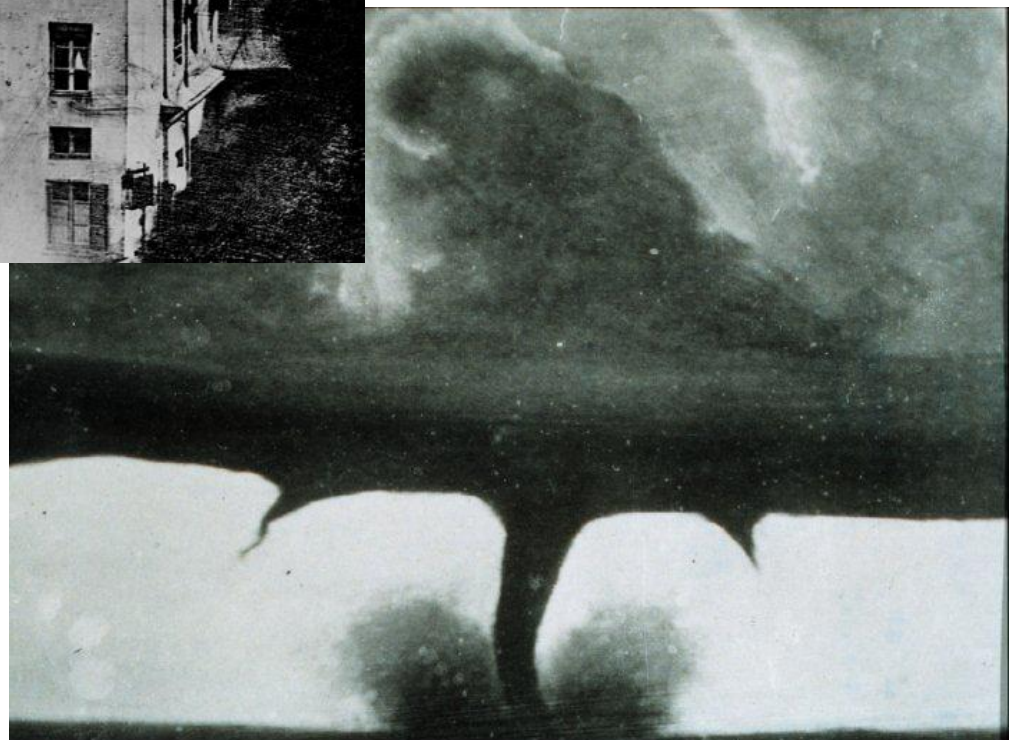
Measured <u>temperature</u> of different colors of sunlight.

Temperature increased as he moved the thermometer <u>from violet</u> through blue, green, yellow, and orange <u>to red</u> …and further increased just outside the red portion of the spectrum in an area that – to the human eye – contained no light at all!



- **First time anyone had demonstrated that there were "invisible rays", forms of radiation that humans could not see.**

First ever photograph of a *person*, 1838



First ever photograph of a *tornado*, 1884

Ultraviolet Light Discovery

Johann Ritter, 1801

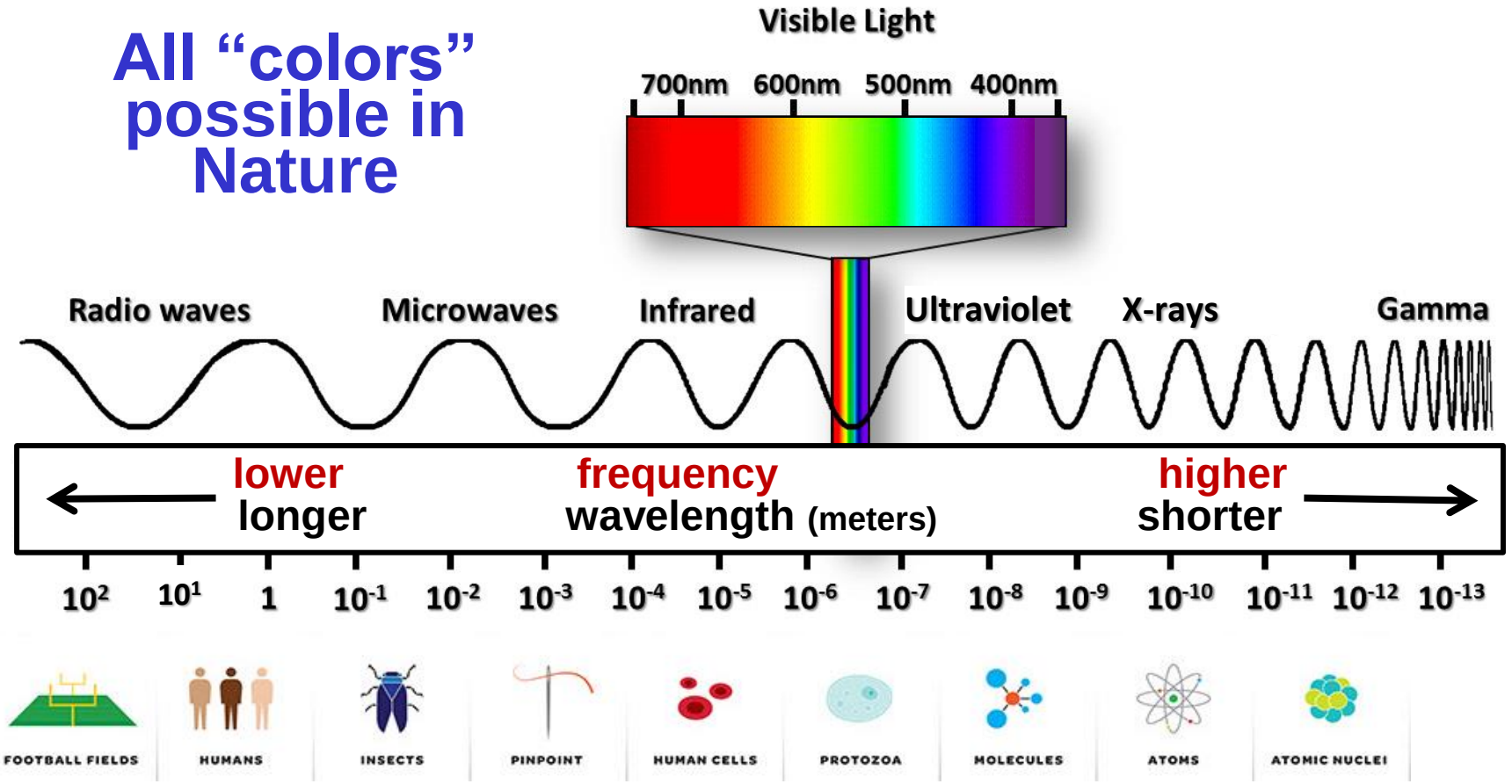
Measured the effect of different colors of light on a light-sensitive chemical, silver chloride.

- **In the red portion of the spectrum darkening of the chemical was relatively slow.**
- **Darkening grew faster through orange, yellow, green, blue, and violet…**

….and the greatest effect was observed just outside the violet portion of the spectrum in an area that – to the human eye – contained no light at all…

Electromagnetic Spectrum

All "colors" possible in Nature

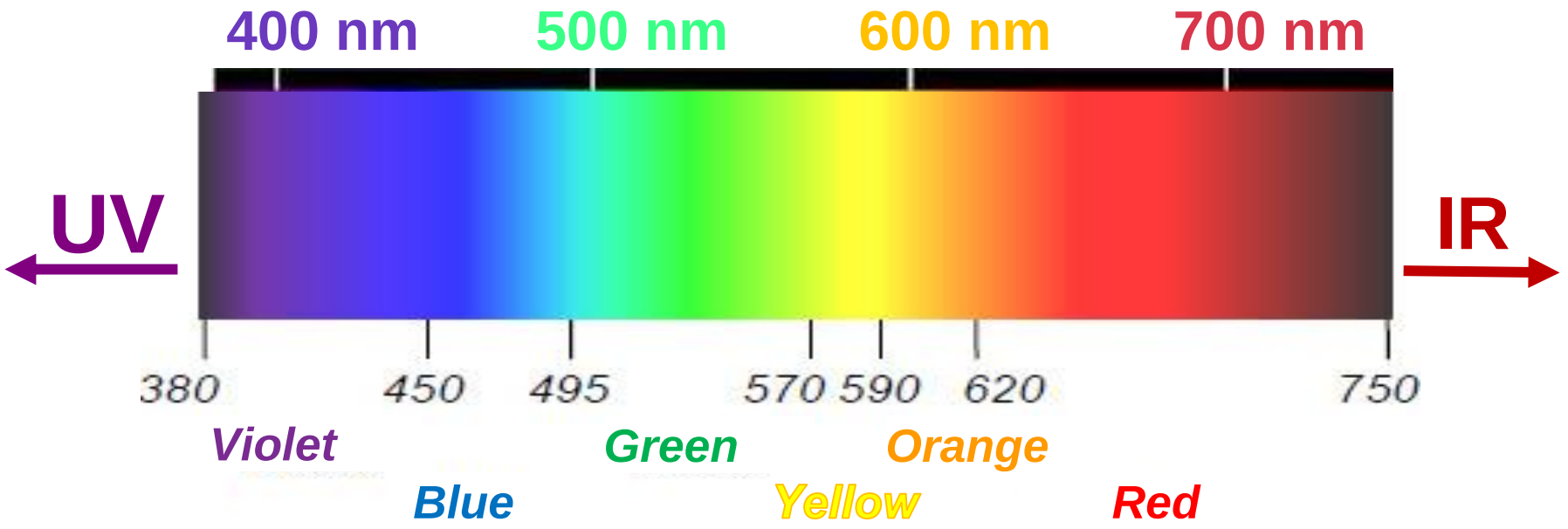


$$\text{Wavelength} = \frac{c}{\text{Frequency}}$$

where c is the speed of light

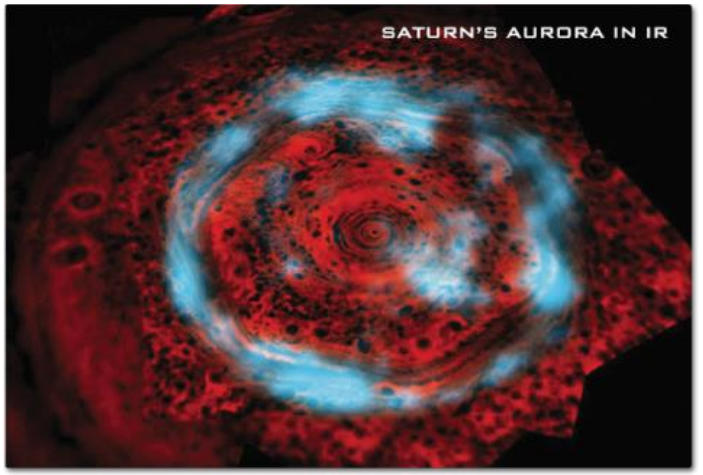
Visible Light

Only a small fraction of electromagnetic spectrum is visible to human eye.



A typical human eye will respond to wavelengths from about 380 to 750 nanometers.

“Seeing” the Invisible with Infrared

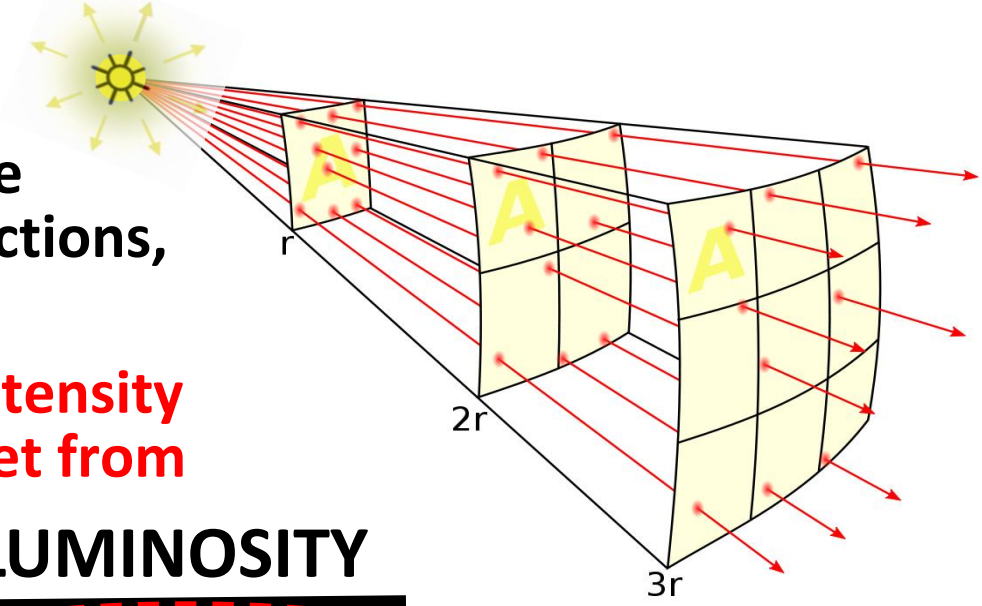


From elusive leopards…

…to hiding young stars!

Light Intensity – How Bright?

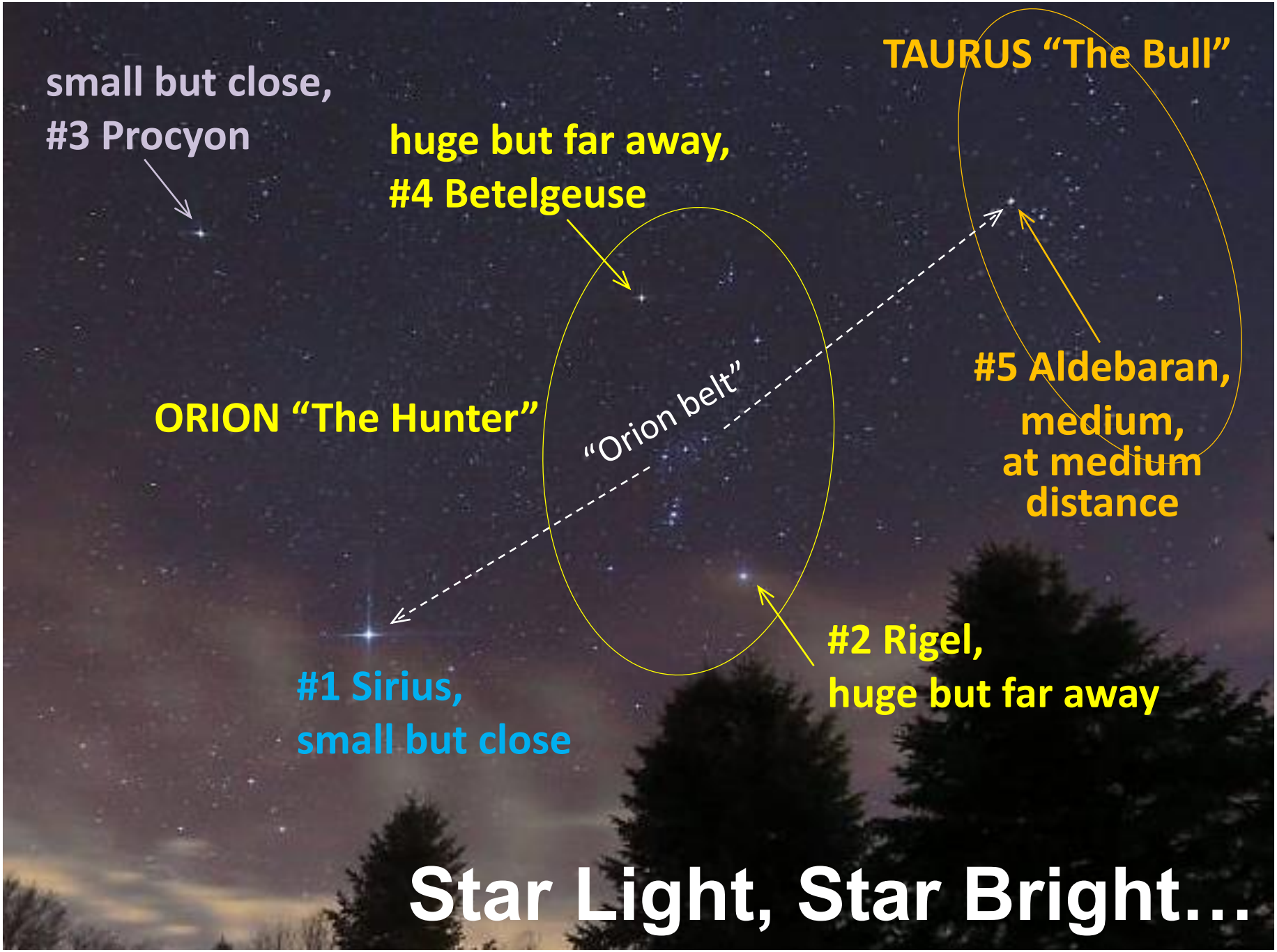
- The **total amount of light energy** a source radiates is called its **luminosity**.
- The **intensity** of light is the **amount of energy falling on a surface per a unit of time**.



- Most light sources distribute their light equally in all directions, making a **spherical** pattern.
- Light **spreads out** and the **intensity decreases the farther you get from the source**:

$$\text{INTENSITY} = \frac{\text{LUMINOSITY}}{4 \cdot \pi \cdot (\text{DISTANCE})^2}$$

area of a sphere


small but close,
#3 Procyon
huge but far away,
#4 Betelgeuse
TAURUS "The Bull"
ORION "The Hunter"
"Orion belt"
#5 Aldebaran,
medium,
at medium
distance
#1 Sirius,
small but close
#2 Rigel,
huge but far away
Star Light, Star Bright…