TEAM SPECTRA

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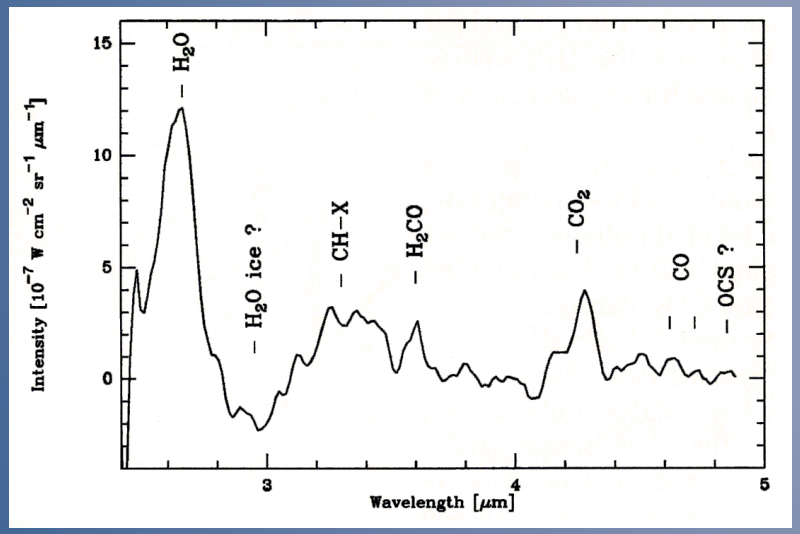
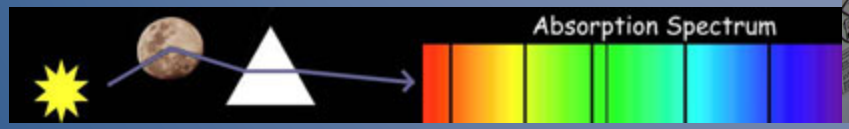
TEAM GOALS

- Build a spectroscope- Our Set-up

- Observe how different light sources affect how we perceive color

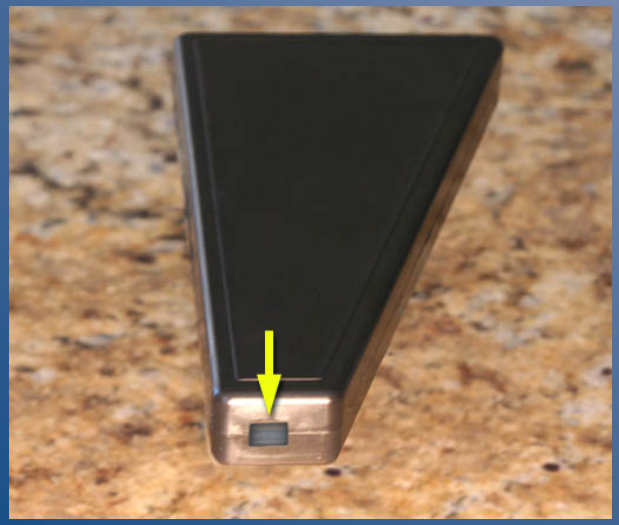
WHY DO WE CARE?

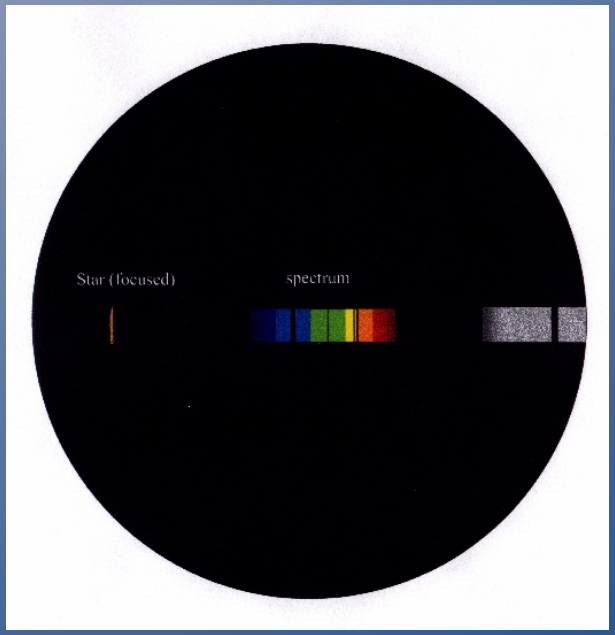




WHAT IS A SPECTROSCOPE?

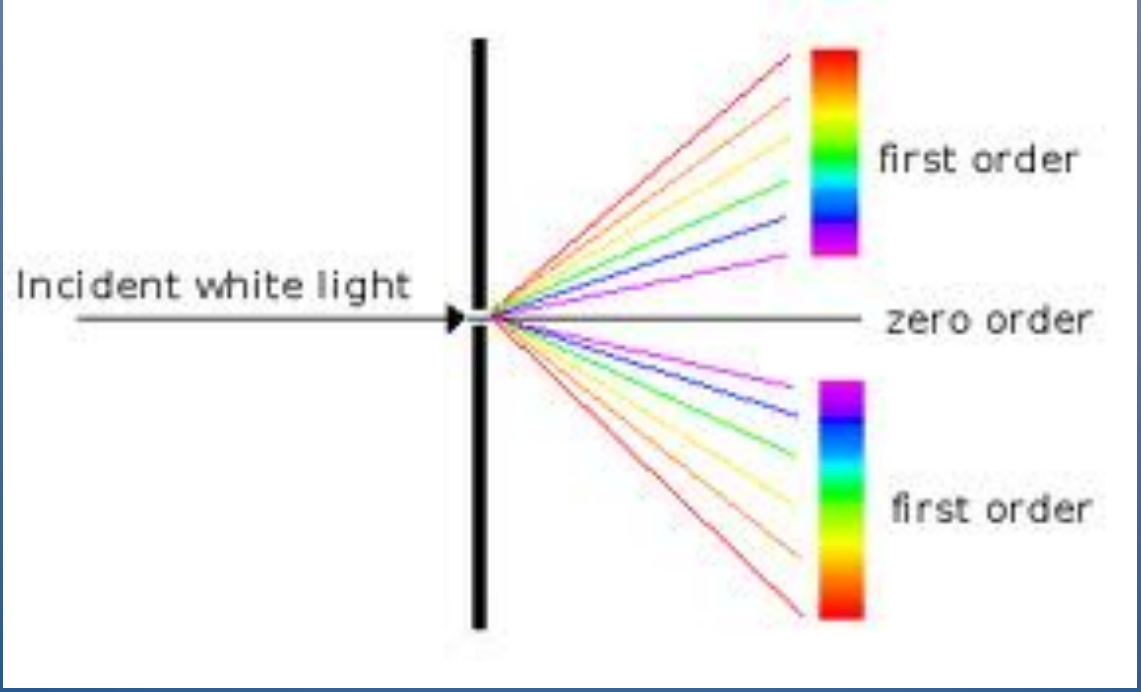
- *A spectroscope is a scientific instrument that is used to observe spectra or the energy emitted by a light source. We see spectra as colors.*



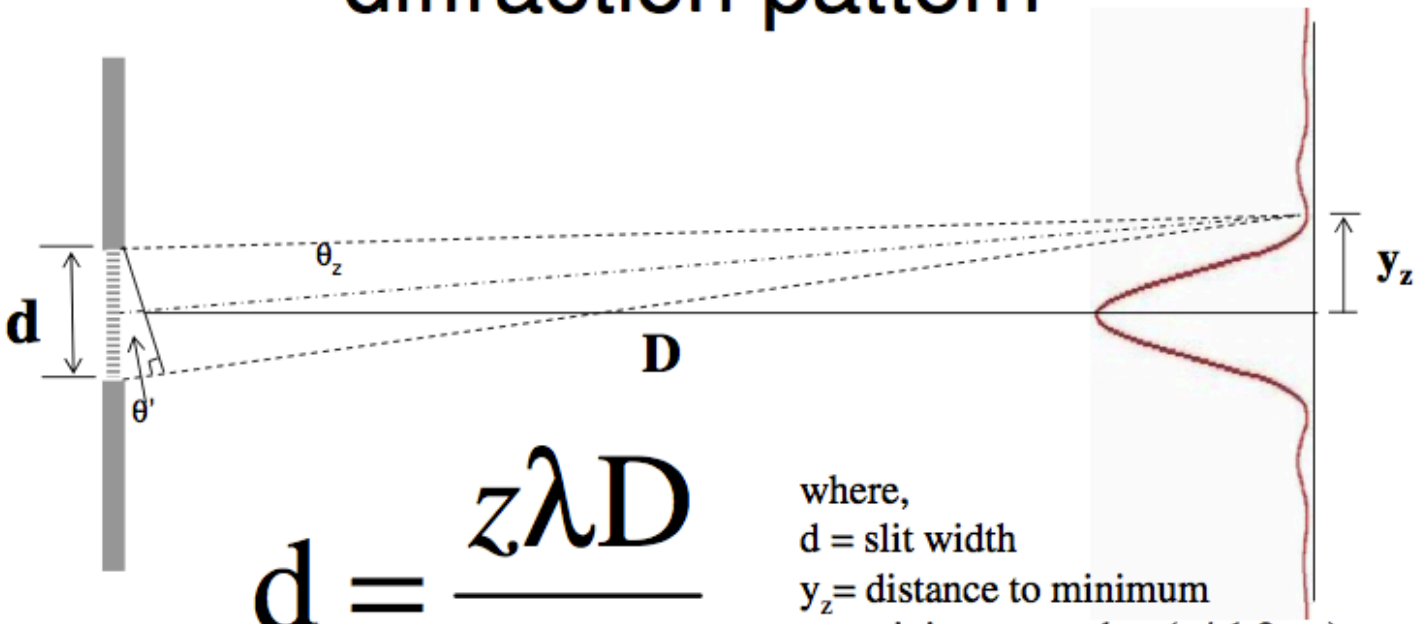


HOW DOES DIFFRACTION WORK?

Diffraction occurs when parallel light waves come in contact with a very small obstruction and spread around the edges. This causes a patter of dark and light fringes to appear.



Relationship between obstruction & diffraction pattern



$$d = \frac{z\lambda D}{y_z}$$

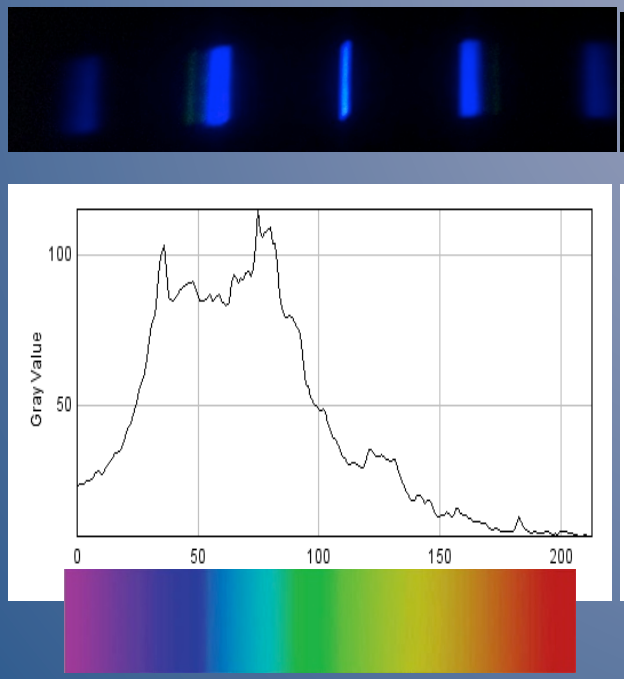
where,
d = slit width
y_z = distance to minimum
z = minimum number (+/-1,2,…)
λ = wavelength of laser

Mathematics

$$y_1 = \frac{\lambda D}{d}$$

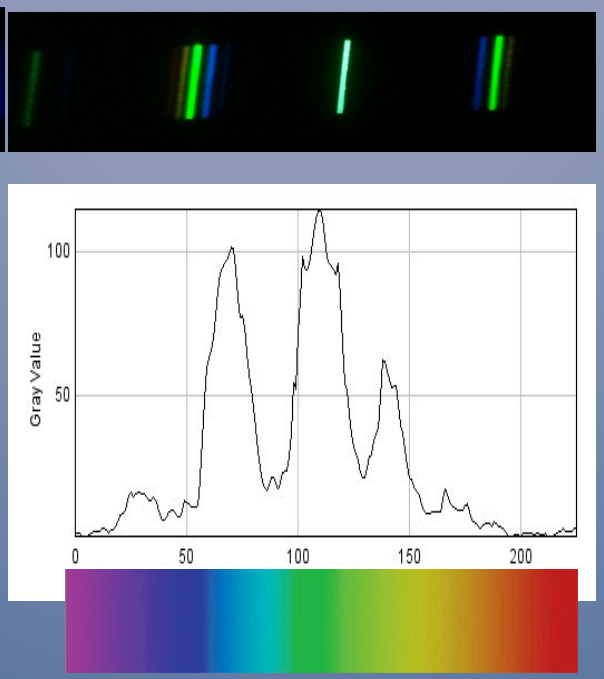
Where z = 1 for the first order of a laser

COLORS DIFFRACTION PATTERNS AND PLOTS



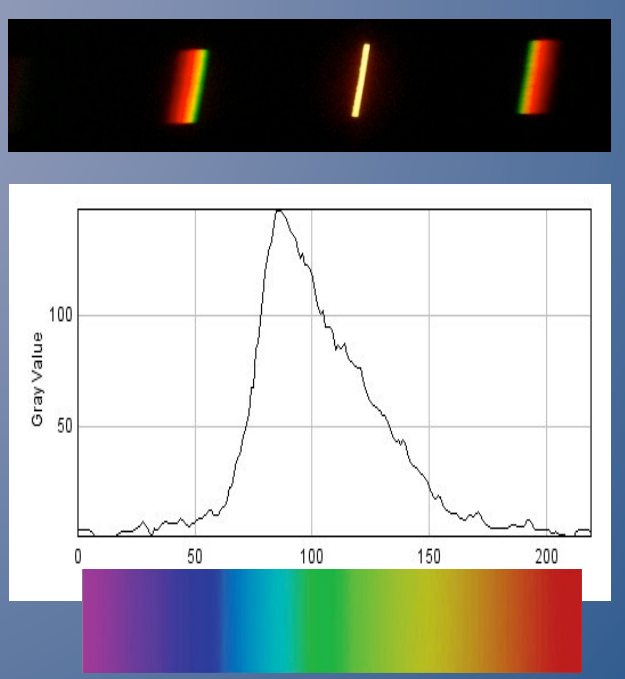
Wavelength (nm)

Blue



Wavelength (nm)

Green



Wavelength (nm)

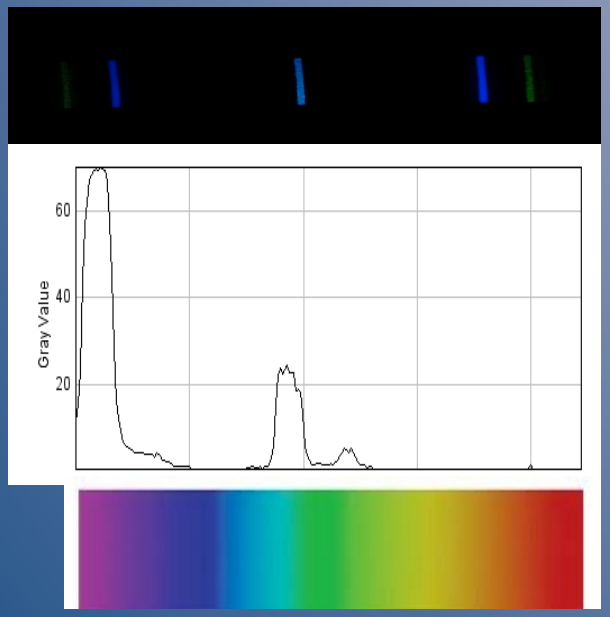
Orange

Note: for y-axis gray value equals intensity of color.
Used ImageJ software to create spectral plots

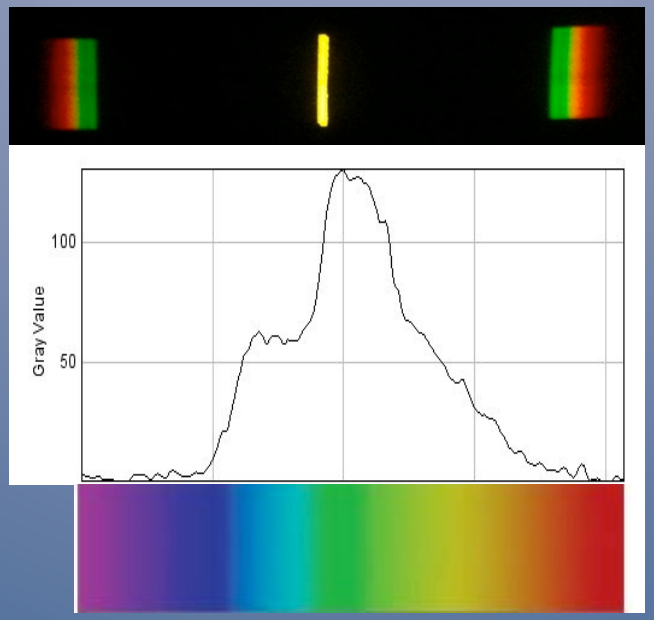
COLORS

Light Source Diffraction Plots

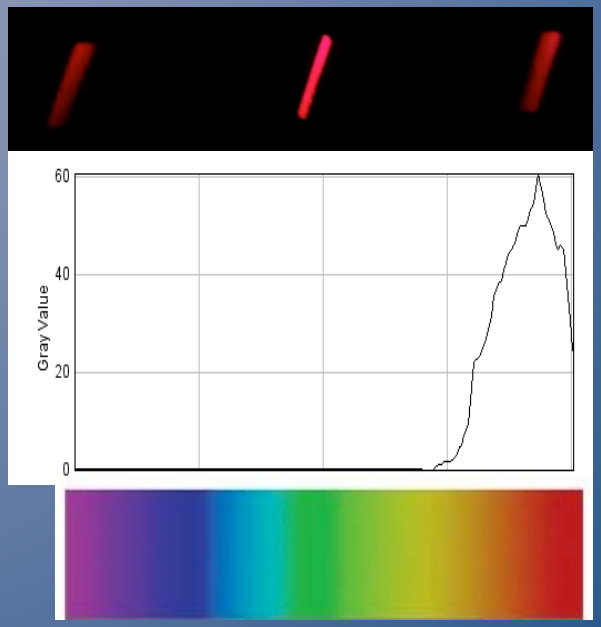
Black



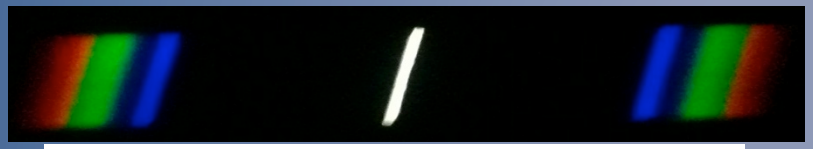
Yellow

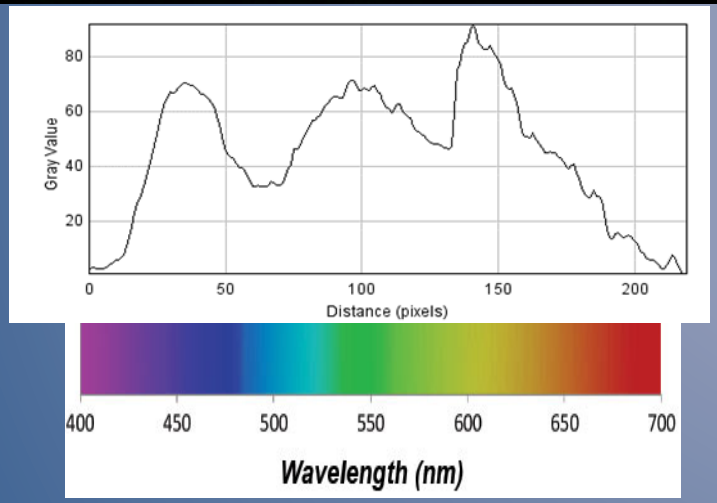


Red



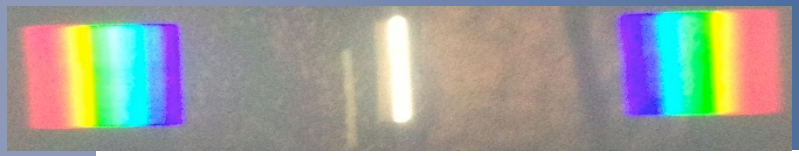
WHITE LIGHT COLOR PLOTS

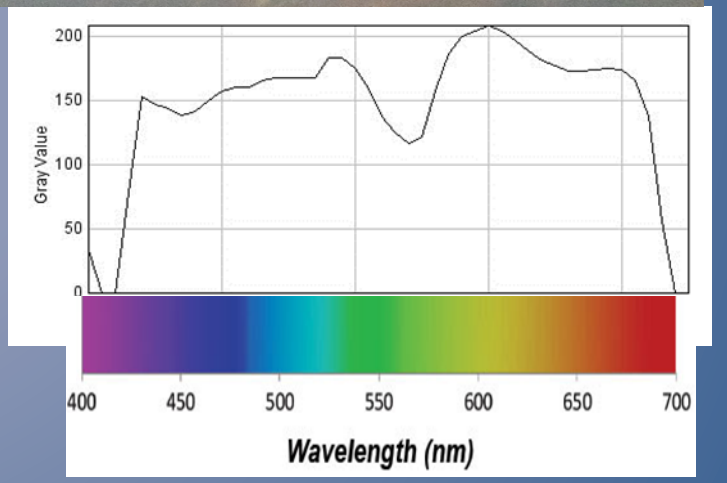




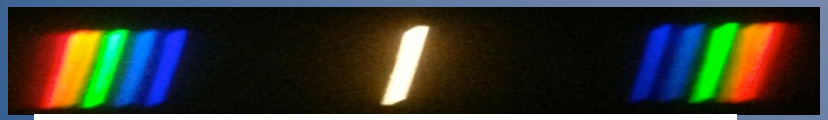
LED

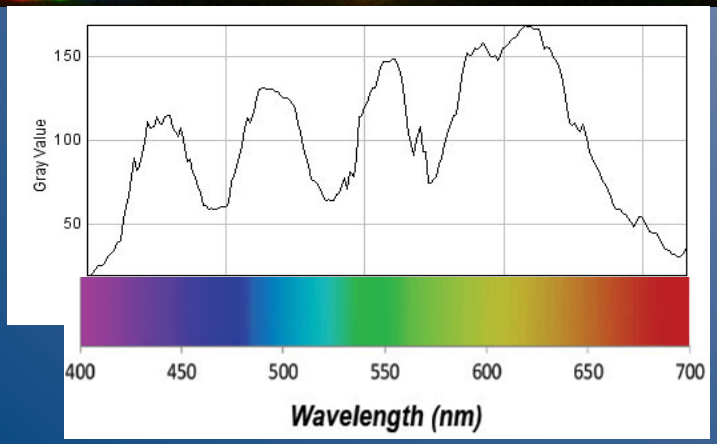
Daylight



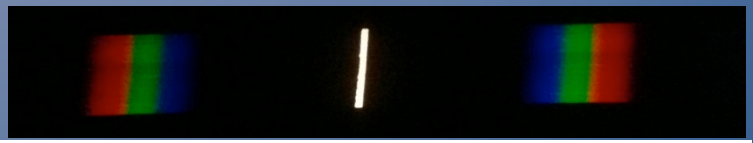


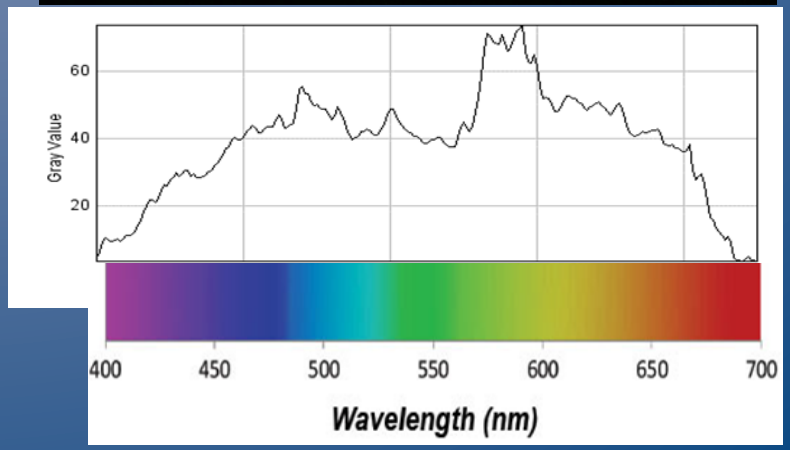
Compact Fluorescent



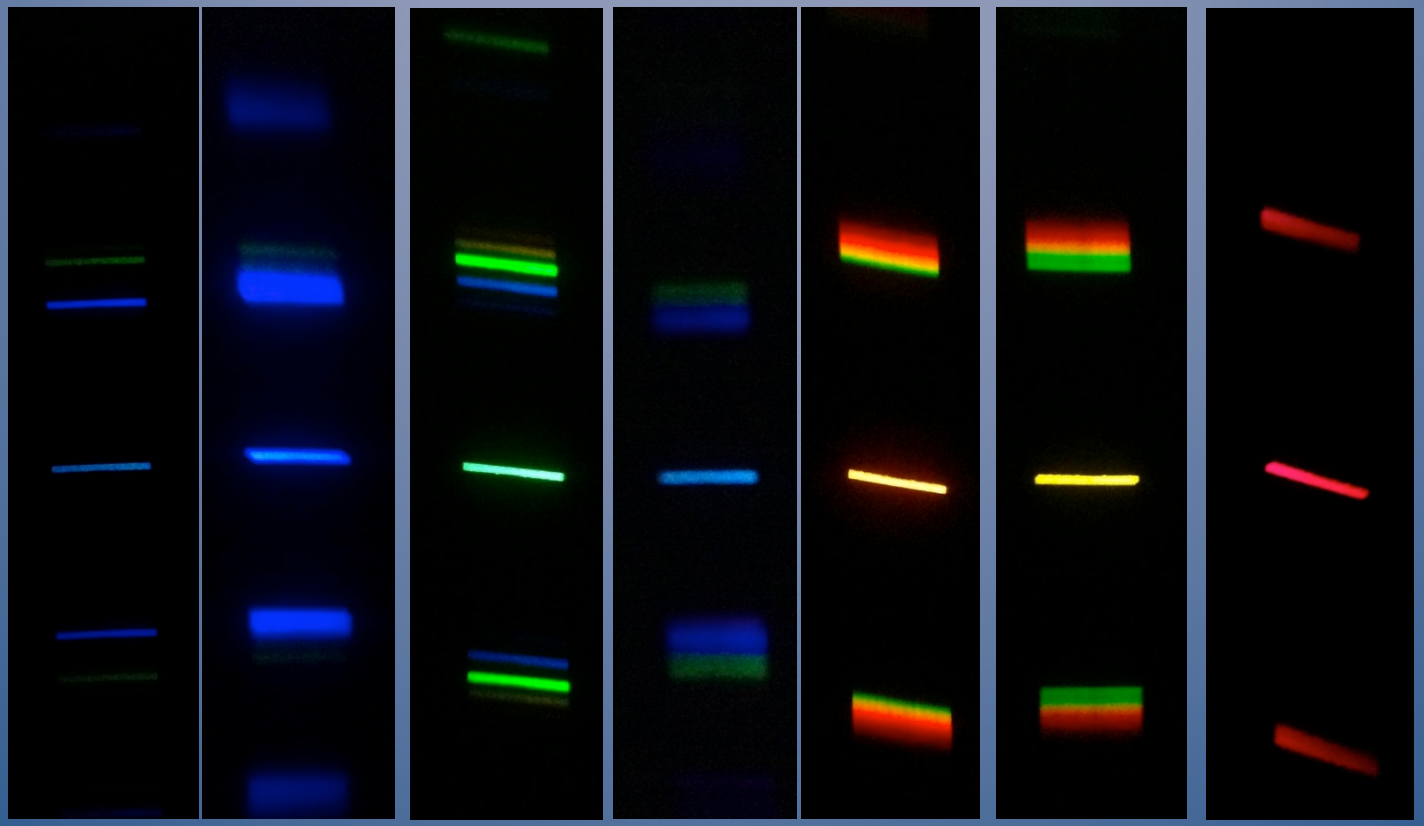


Incandescent





COLORED LIGHT SOURCE DIFFRACTION PATTERNS



Black Blue Green B/G Laser Orange Yellow Red

$$y_1 = \frac{\lambda D}{d}$$

Where z = 1 for the first order of a laser

RESULTS- COLOR CHECKER

Incandescent Light

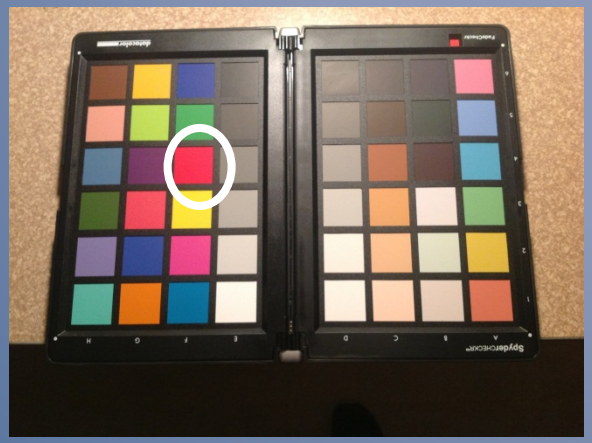
LED Light

Fluorescent Light

Daylight

RESULTS- COLOR CHECKER

Incandescent Light



LED Light

Fluorescent Light

Daylight

COLOR CHECKER COLORED LIGHTS COMPARISONS

Red

Orange

Yellow

Green

Blue

Black

SUMMARY

- We successfully built a spectroscope.
- We successfully used ImageJ to create spectral plots
- Diffraction is another way of splitting light into its components.
- White light is composed of different colors and wavelengths
  - Different types of white light (LED, compact fluorescent) uses different amounts of colors or wavelengths to create white.

THANK YOU!