



Additional logo area (NASA, SwRI,
etc)

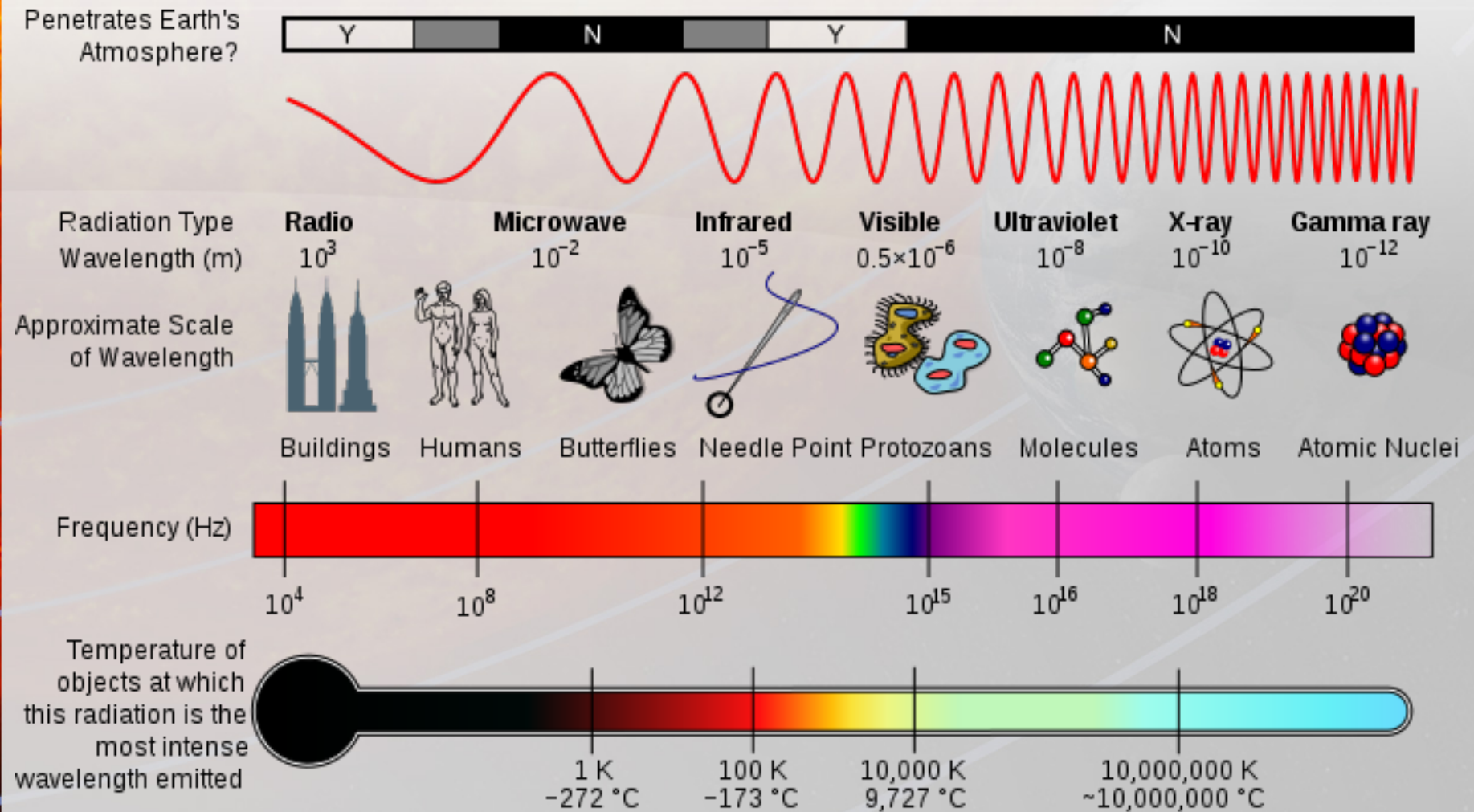
Laboratory for Atmospheric and Space Physics
University of Colorado **Boulder**

NASA's Project SPECTRA!

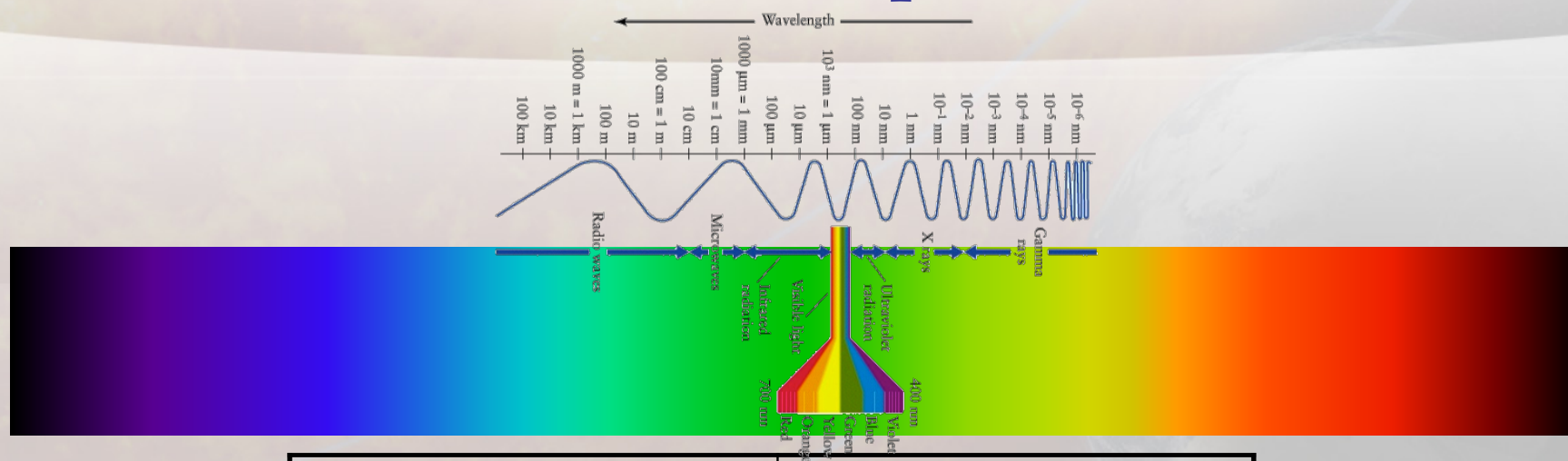
Spectroscopy, Astronomy, and Engineering

Erin Wood

Light, or the Electromagnetic Spectrum

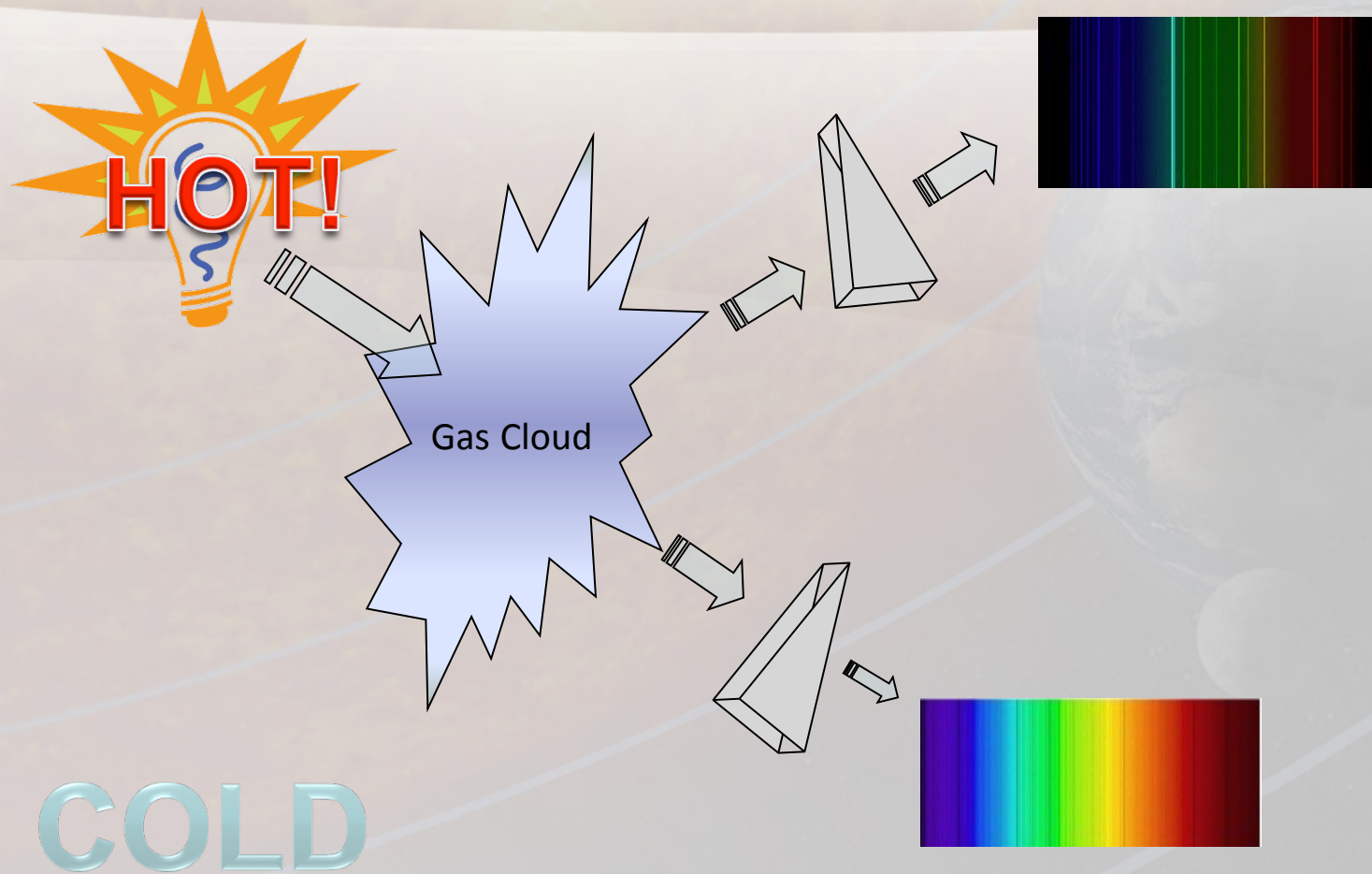


The Visible Spectrum



<u>red</u>	620-750 nm
<u>orange</u>	590-620 nm
<u>yellow</u>	570-590 nm
<u>green</u>	495-570 nm
<u>blue</u>	450-495 nm
<u>indigo</u>	420-450 nm
<u>violet</u>	380-420 nm

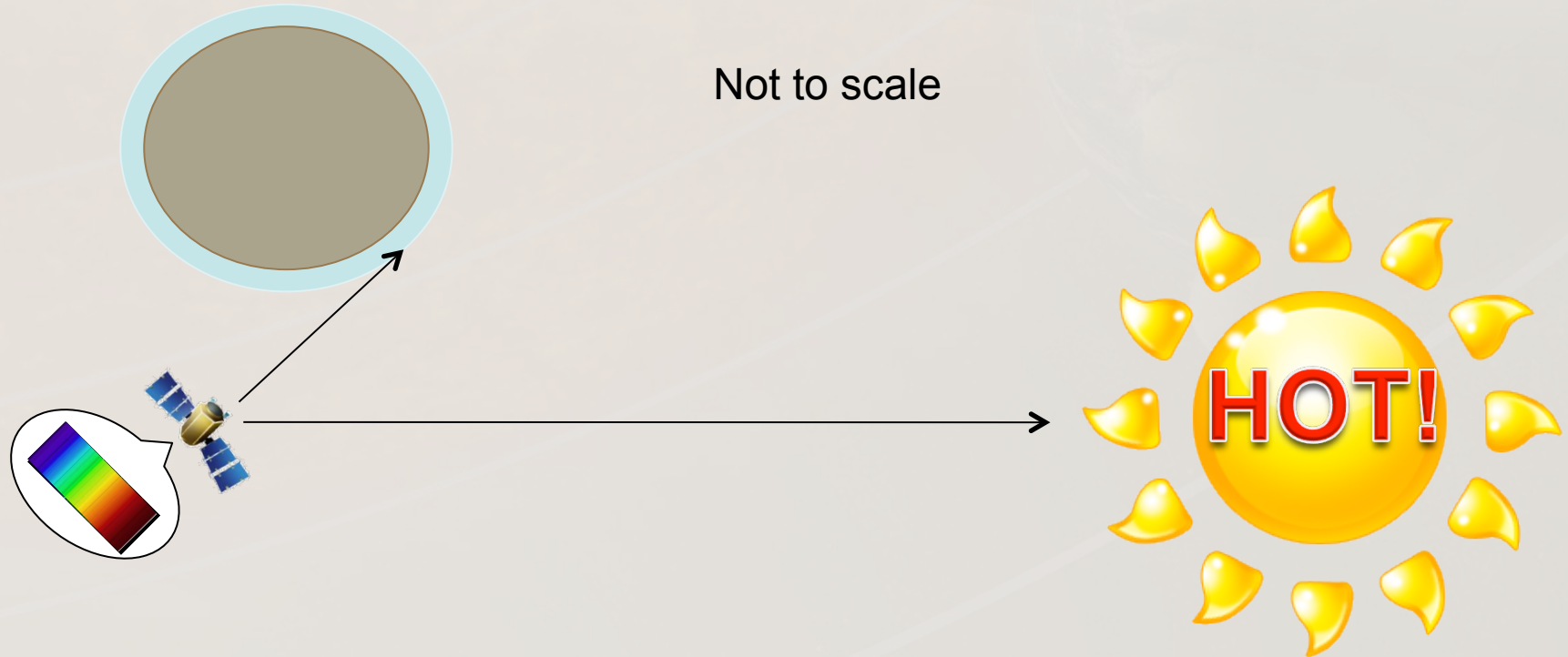
What is Spectroscopy?



Why is the Background Temp Relevant?

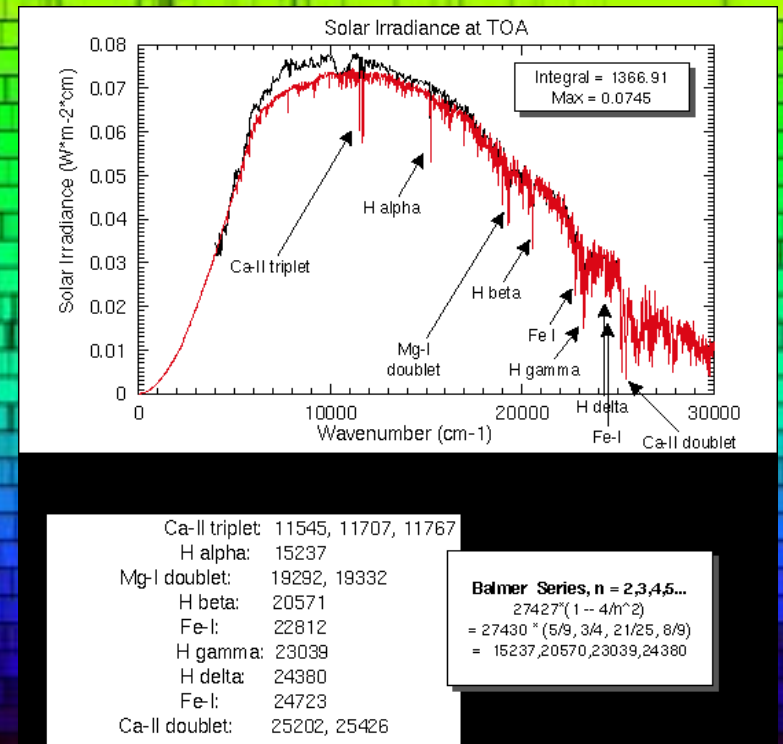
COLD

Not to scale



Fraunhofer and His Invention, the "Spectrometer"

Early 1800s, discovered numerous lines in the solar spectrum

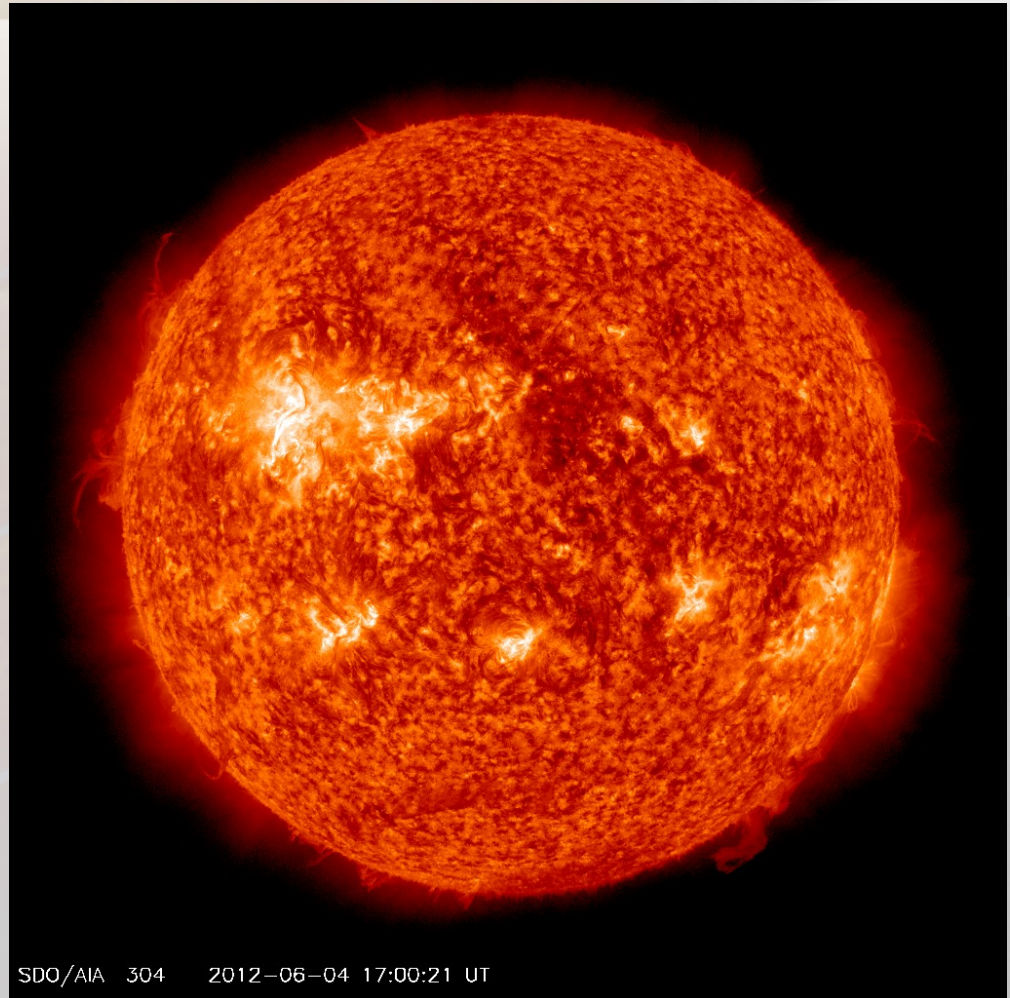


The Solar Dynamics Observatory: AIA (Atmospheric Imaging Assembly)



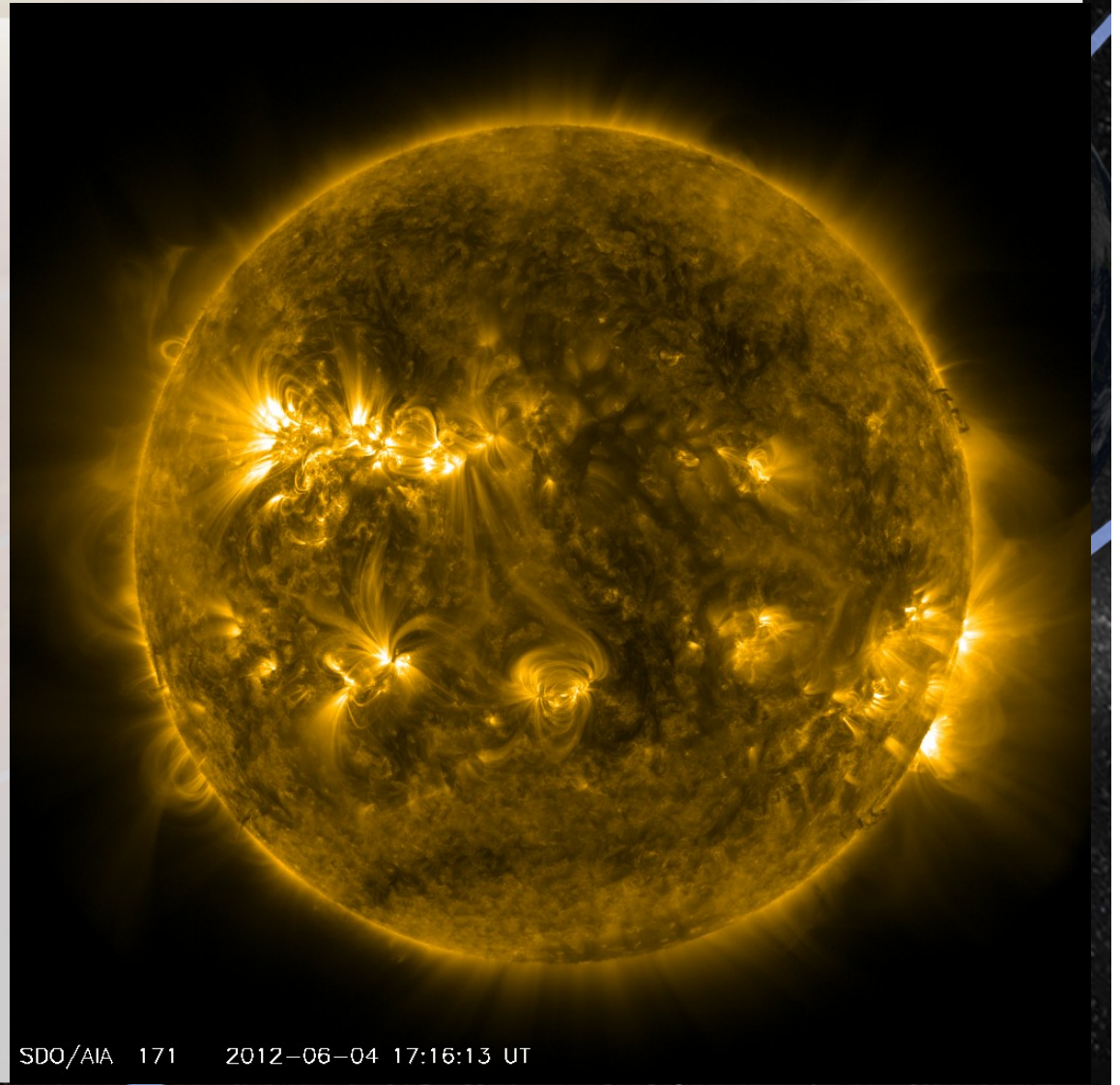
Solar Dynamics Observatory: AIA instrument

- AIA 304 Angstroms or 30.4 nm (Extreme UV)
- $T=50,000$ K (90,000 F)
- Emission of He II
- Upper chromosphere and lower transition region



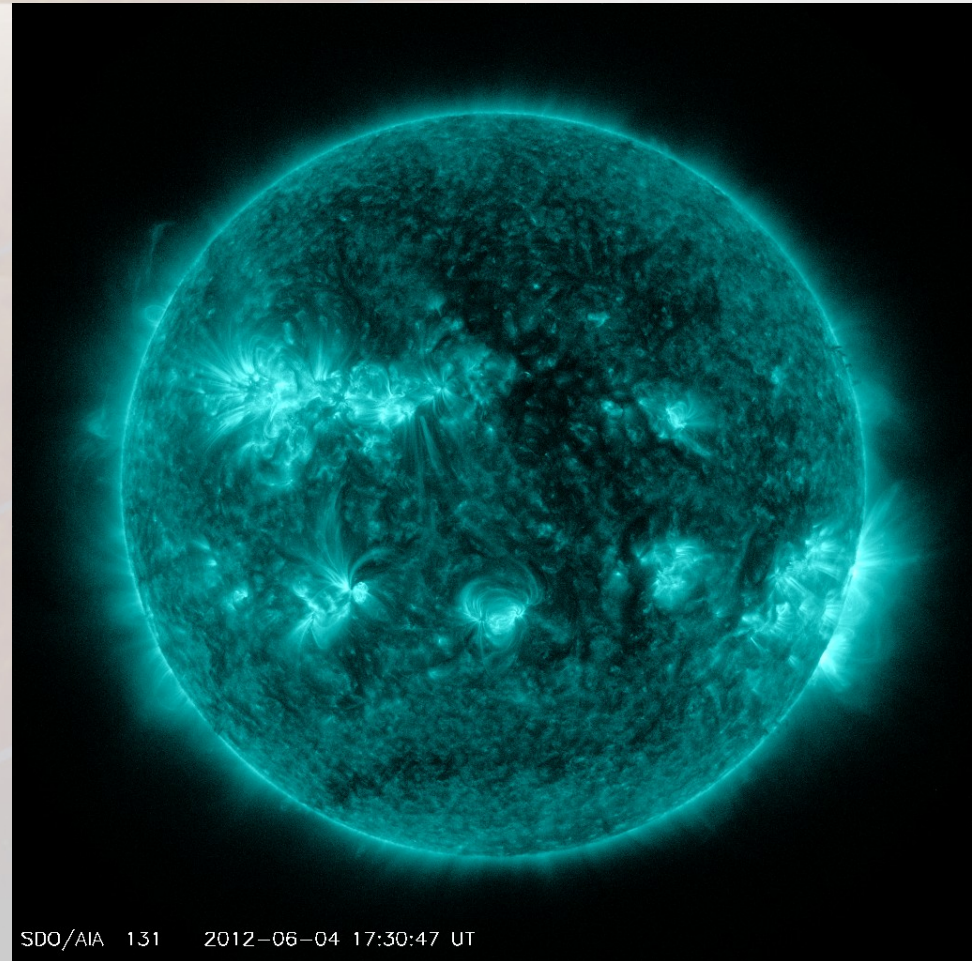
Solar Dynamics Observatory: AIA instrument

- AIA 171 Angstroms or 17.1 nm (Extreme UV)
- $T=1$ million K (1.8 million F)
- Emission of Fe IX
- Corona and upper transition region



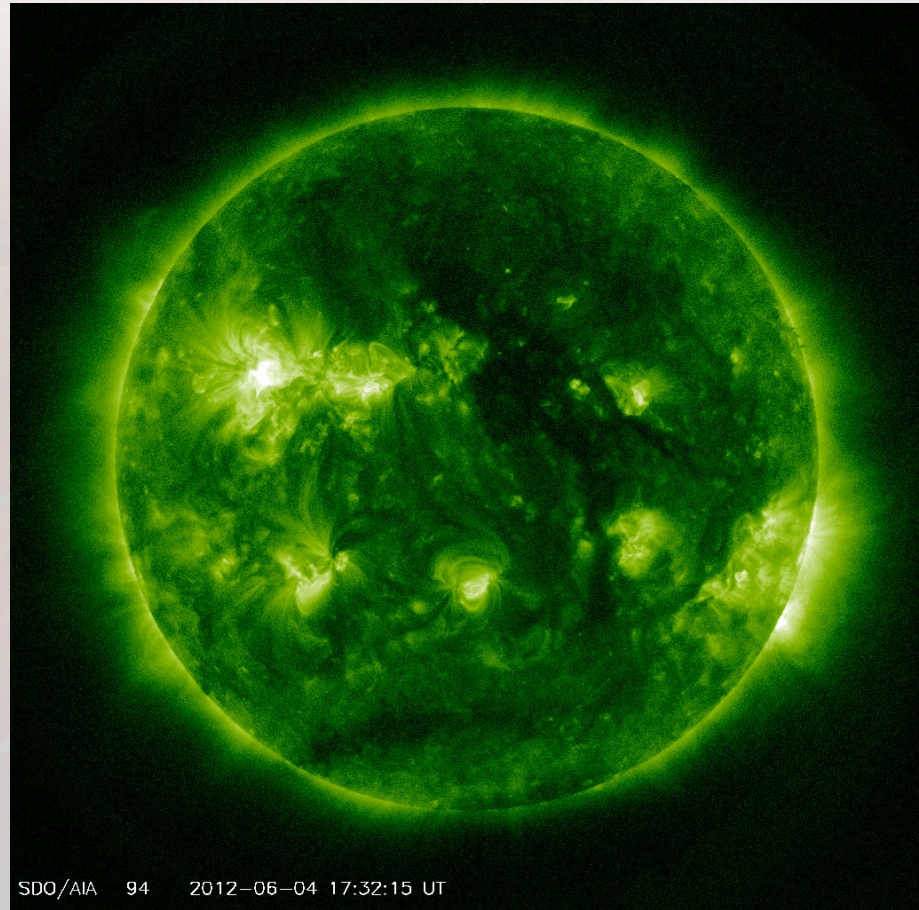
Solar Dynamics Observatory: AIA instrument

- AIA 131 Angstroms or 13.1 nm (Extreme UV)
- $T=10$ million K (18 million F)
- Emission of Fe VII, Fe XXI
- Corona



Solar Dynamics Observatory: AIA instrument

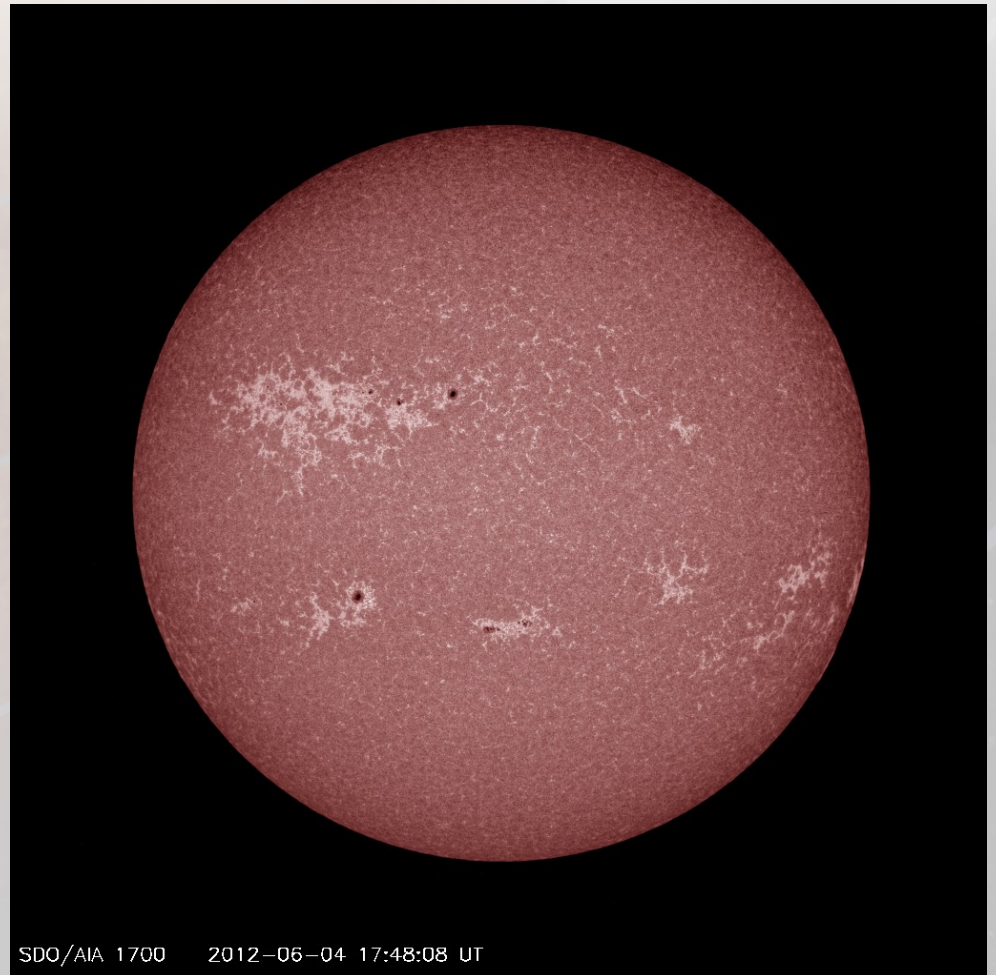
- AIA 94 Angstroms or 9.4 nm (Extreme UV/ soft X-rays)
- $T=6$ million K (10.8 million F)
- Emission of Fe XVIII
- Corona (Flaring regions)



SDO/AIA 94 2012-06-04 17:32:15 UT

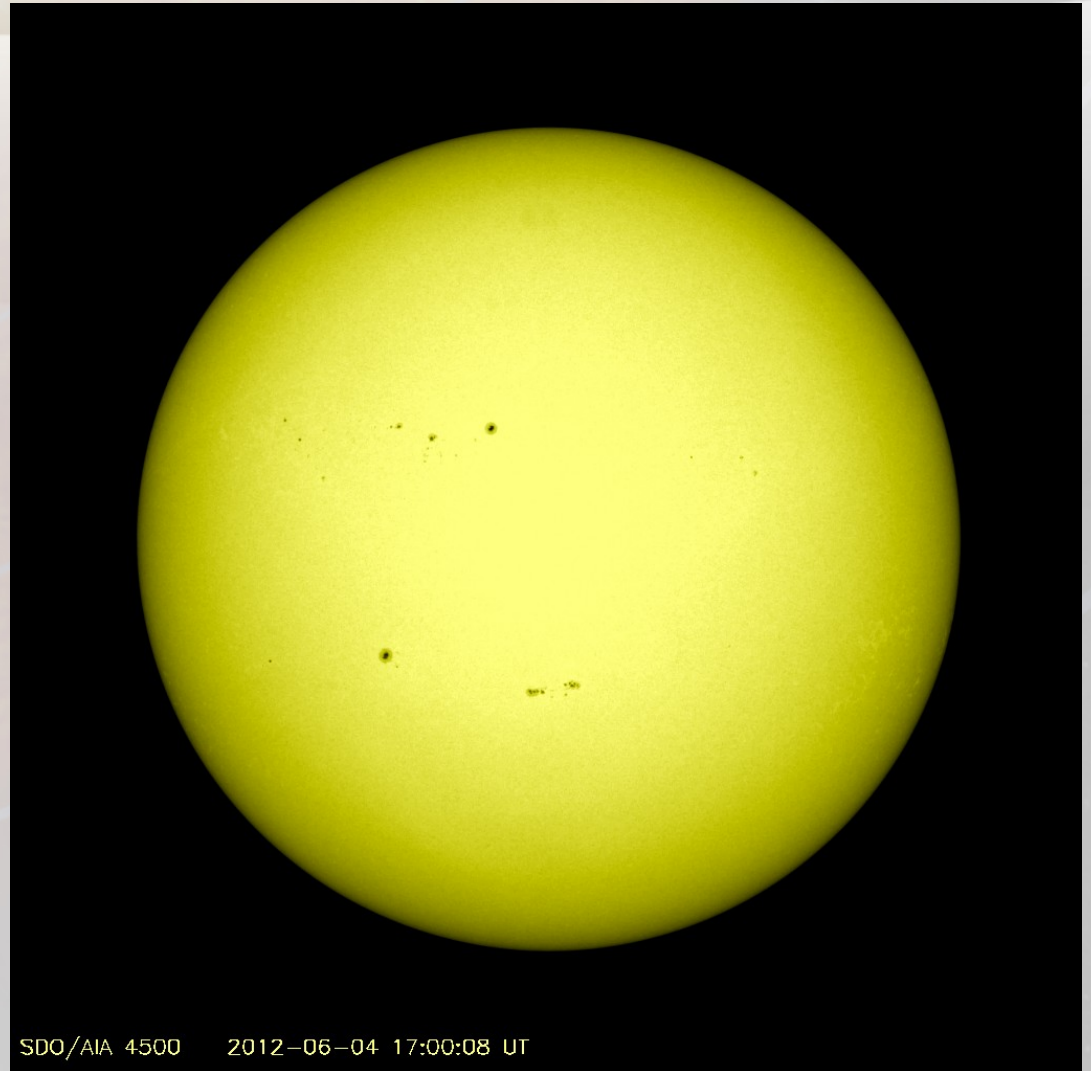
Solar Dynamics Observatory: AIA instrument

- AIA 1700 Angstroms or 170 nm (Far UV)
- $T=6,000$ K (11,000 F)
- Continuum
- Photosphere



Solar Dynamics Observatory: AIA instrument

- AIA 4500 Angstroms or 450 nm (Visible blue/violet)
- $T=6,000$ K (11,000 F)
- Continuum
- Photosphere
- The Sun's not yellow (it's chicken)



SDO/AIA 4500 2012-06-04 17:00:08 UT

Project SPECTRA!

Group work

Stations

Station 1

- ★ Building a Fancy Spectrograph
- ★ A spectral mystery

Station 2

- ★ Patterns and Fingerprints
- ★ Graphing the Rainbow

Station 3

- ★ Goldilocks and the 3 Planets

Station 4

- ★ Features of the Sun



Patterns

- What types of patterns occur in nature?
- What are patterns useful for?
- What ways can you create categories using patterns?
- What types of tools are available to observe patterns?
- Can patterns help you identify something very far away?

Engineering

- What could this be used for?
- What are the limitations of my design?
- What is the design process?
- How could I improve my design?
- How do we gain information about objects in space?
- What is the difference between a space based and ground based missions? Advantages to each?

Computer interactives

- How do we gain information about objects in space?
- What types of tools and measurements are necessary?
- How do we make inferences when looking at data?
- What are the limitations of data collection?
- What are the limitations of the tools used?

What to do

- Assign a “teacher” in your group
- Assign a recorder of ideas
- Do activity and focus on essential questions
- 20 minutes per station!