



Astro 358/Spring 2006
(48915)



Galaxies and the Universe

Instructor: Professor Shardha Jogee

TA: Ben Holder

Figures/Images

Lecture 2: Th Jan 19

Announcements

1. Check class website regularly

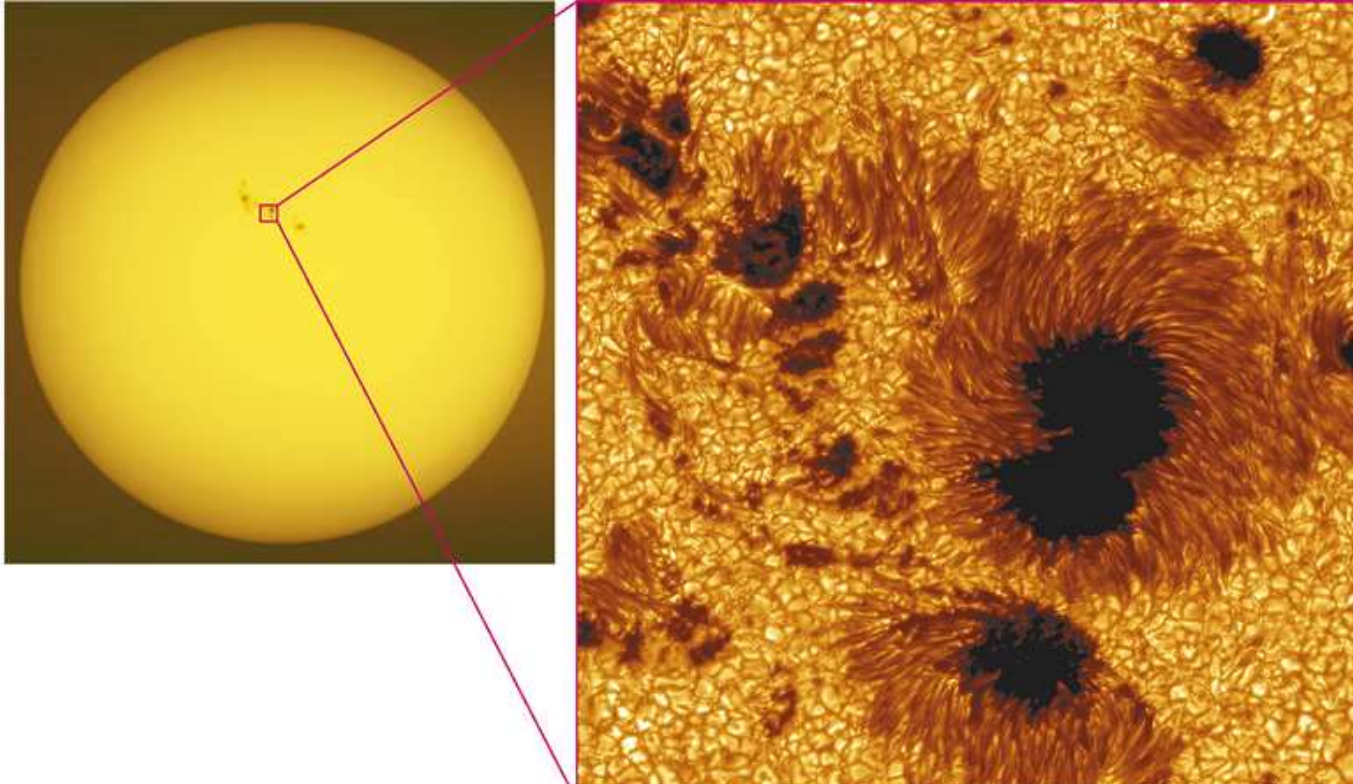
<http://www.as.utexas.edu/~sj/a358-sp06>

- .2 Sign in on attendance sheet

- .3. New office hours

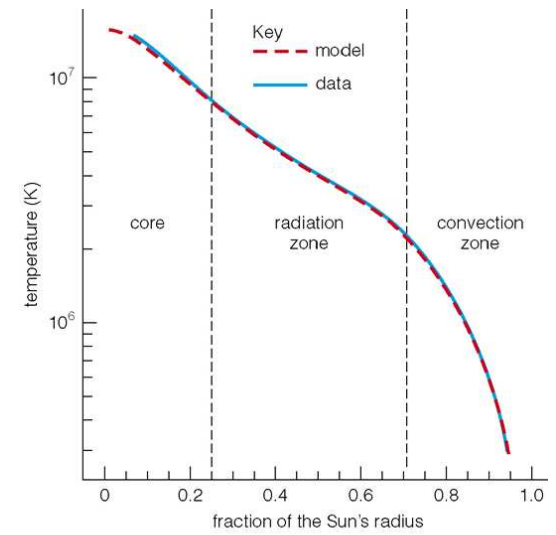
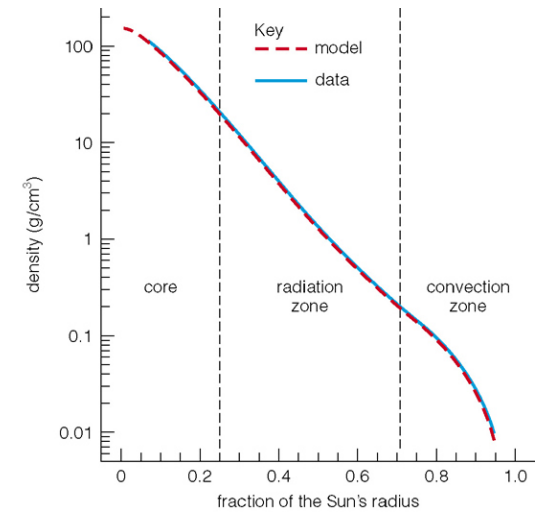
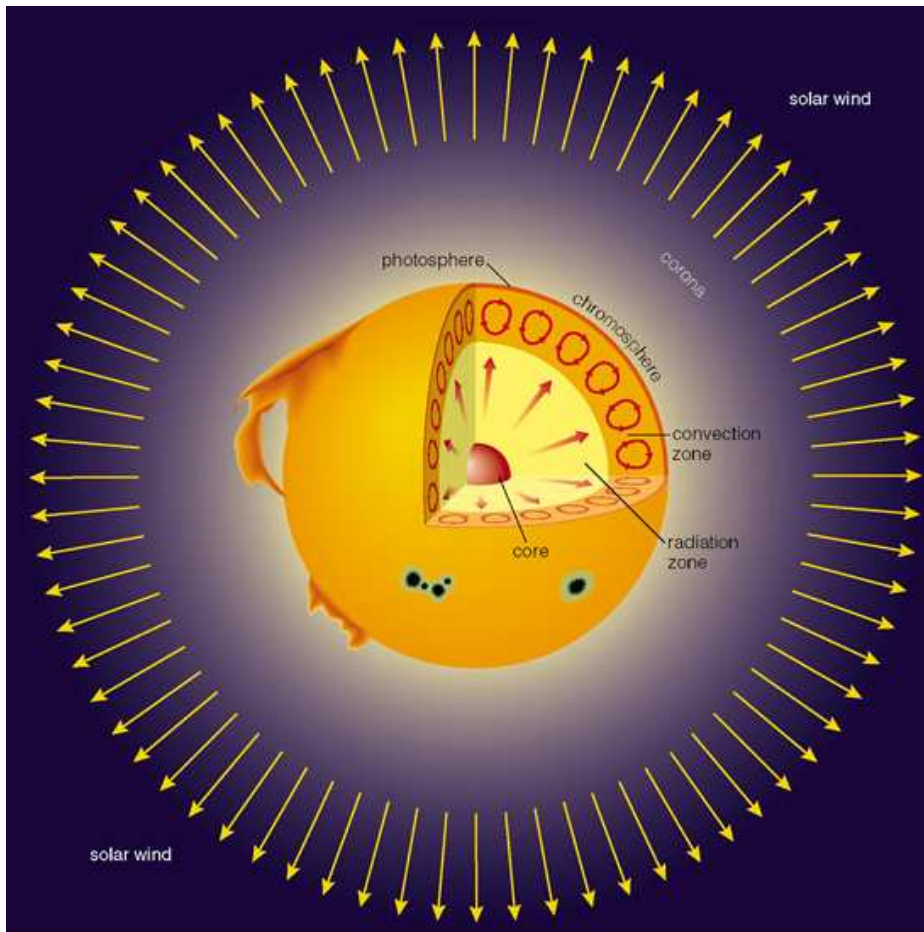
Review of Basic Concepts for Stars

Ou Sun



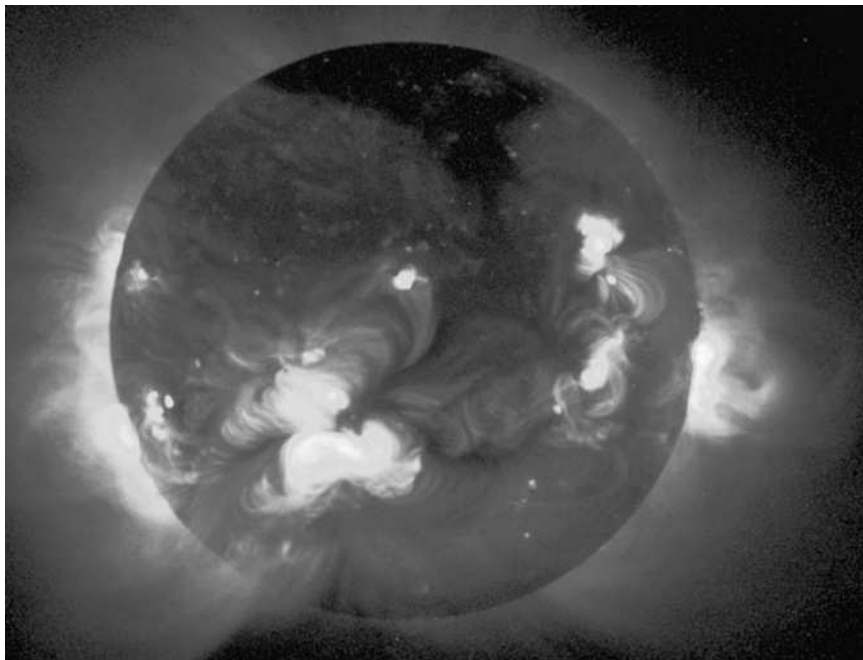
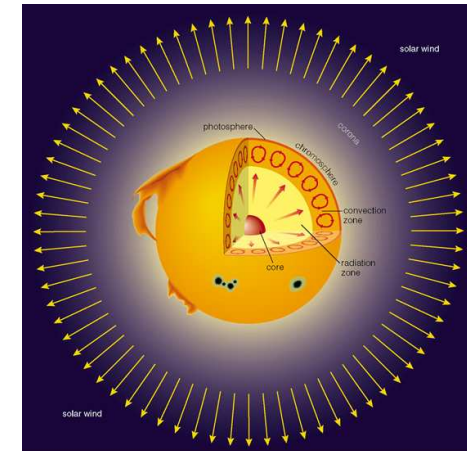
Our Sun

Structure of a star like the Sun

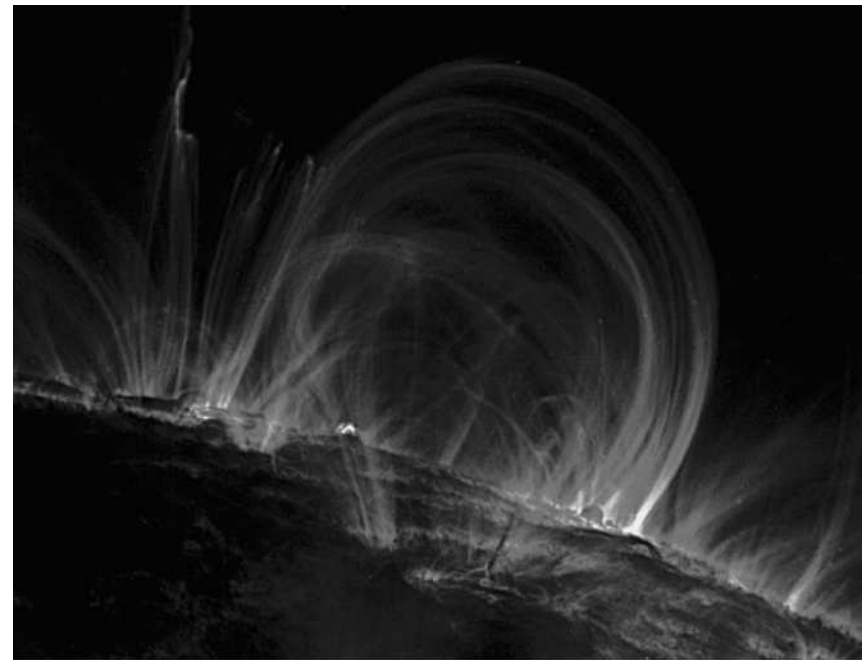


Corona of the Sun

As we move away from the photosphere (solar surface) temperature suddenly start to go up again....
Corona at $T=10^6$ K emits most of Sun's X-rays

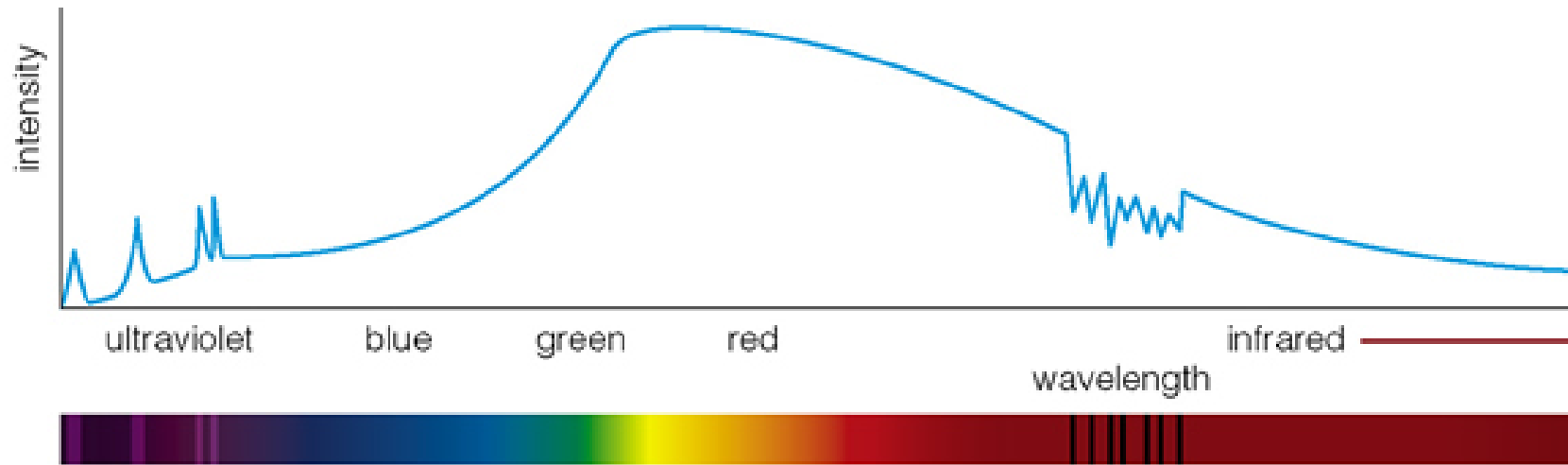


X-ray image (Yonkoh Space Observatory)
Hot million-degree gas in Solar corona



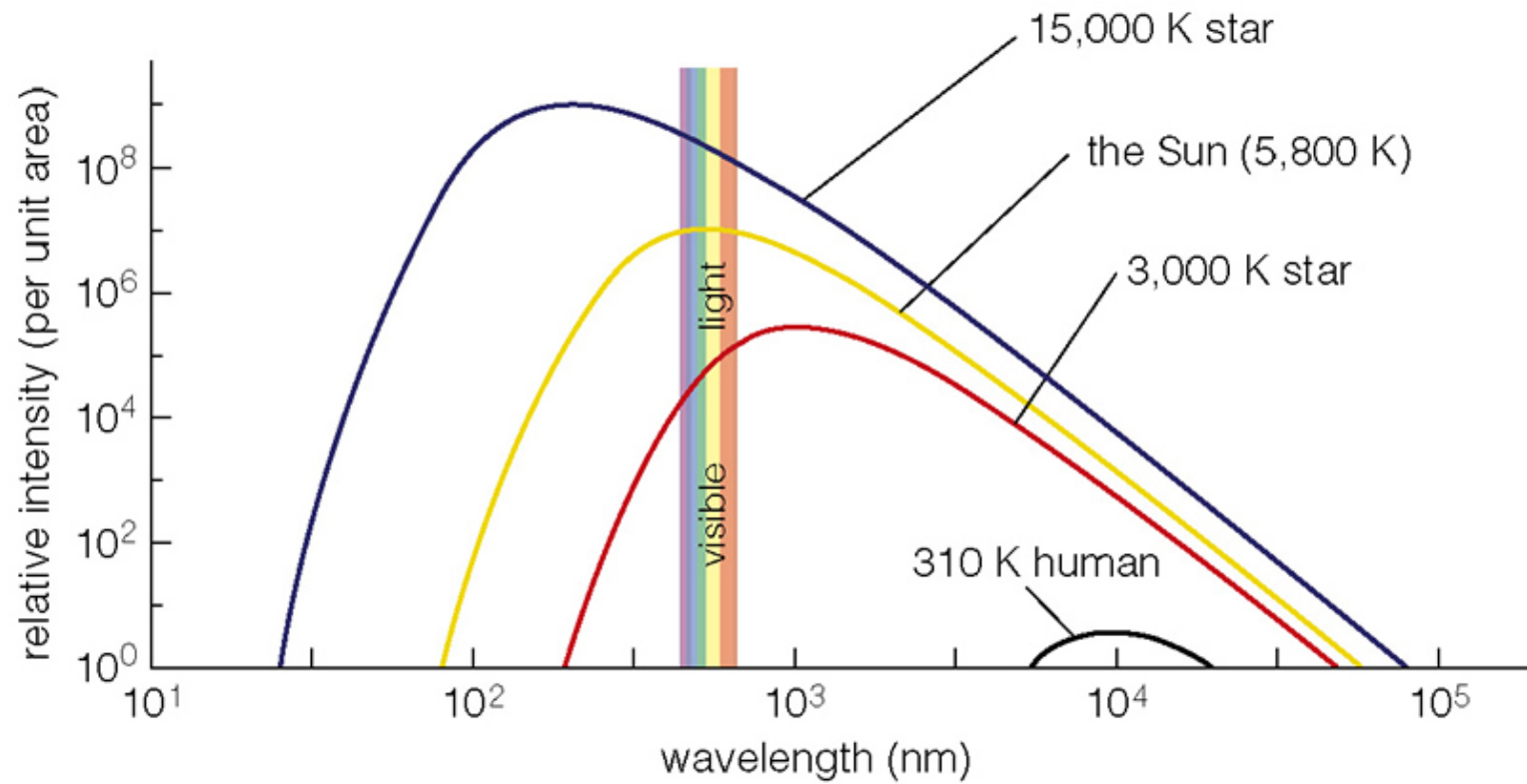
X-ray image (NASA's TRACE mission): hot million degree gas trapped in magnetic field

A Spectrum



- 1) The spectrum of a star or galaxy has 3 types of features:
continuum emission (~black body spectrum), emission lines, absorption lines.
- 2) These can reveal
 - à its temperature, its total flux
 - à its chemical composition, (like a DNA genetic code)
 - à its recession speed, its distance

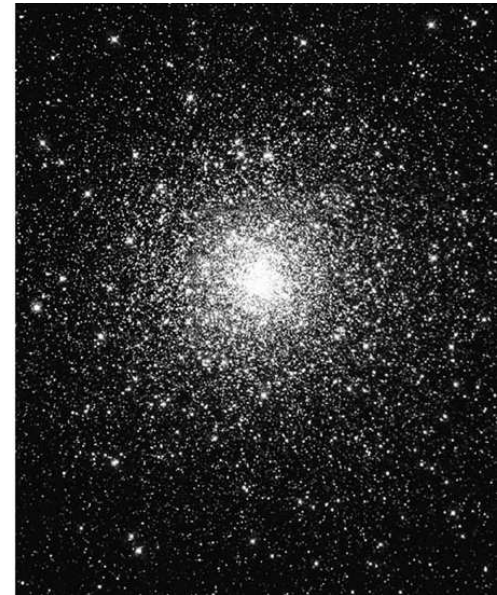
Wien's Law & Stefan Boltzmann Law for a Blackbody



Temperature and Color of Stars:



Center of M Way (HST)



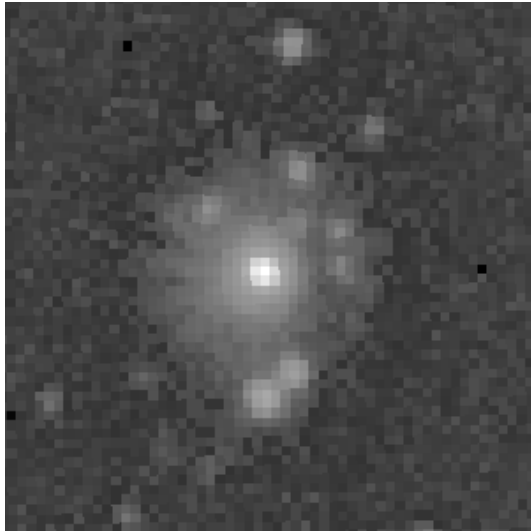
M80 globular cluster (HST)

- à Apply Wien's law: blue stars are hotter while red stars are cooler
- à BUT sometimes dust can cause an intrinsically hot blue star to look red by scattering its light,

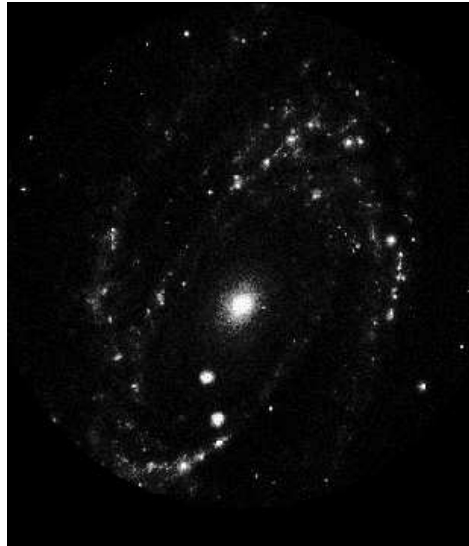


Pleiades

Multi-Wavelength view of M81..



X-ray/ROSAT



Ultraviolet/ASTRO-1



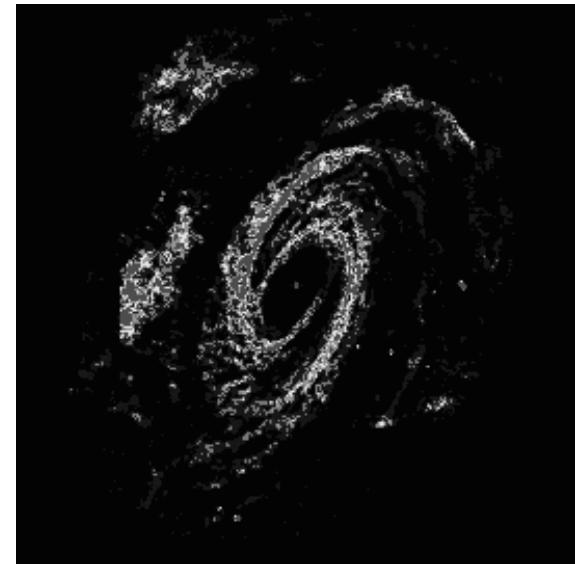
Visible light



Near infrared/Spitzer

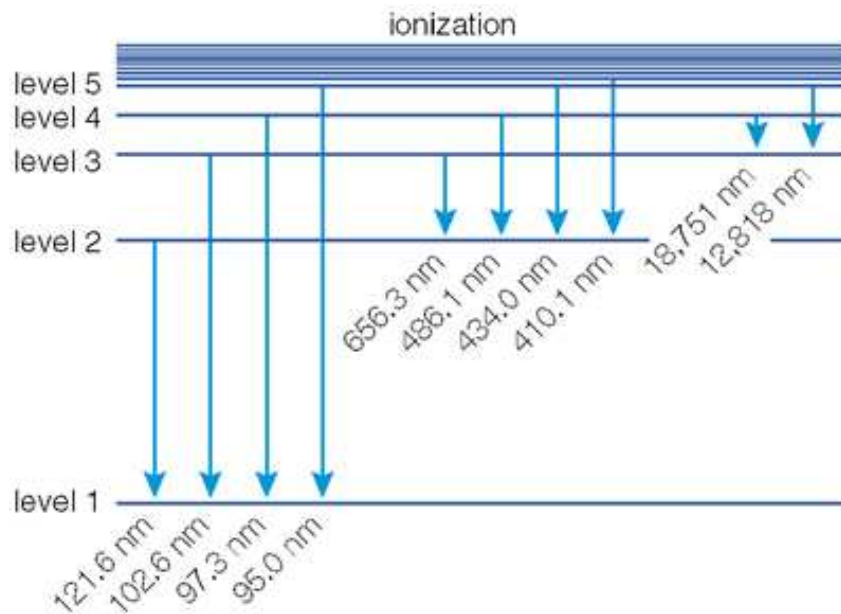


Far-infrared/Spitzer



Radio 21cm/VLA

Emission and Absorption Lines: Trace chemical composition

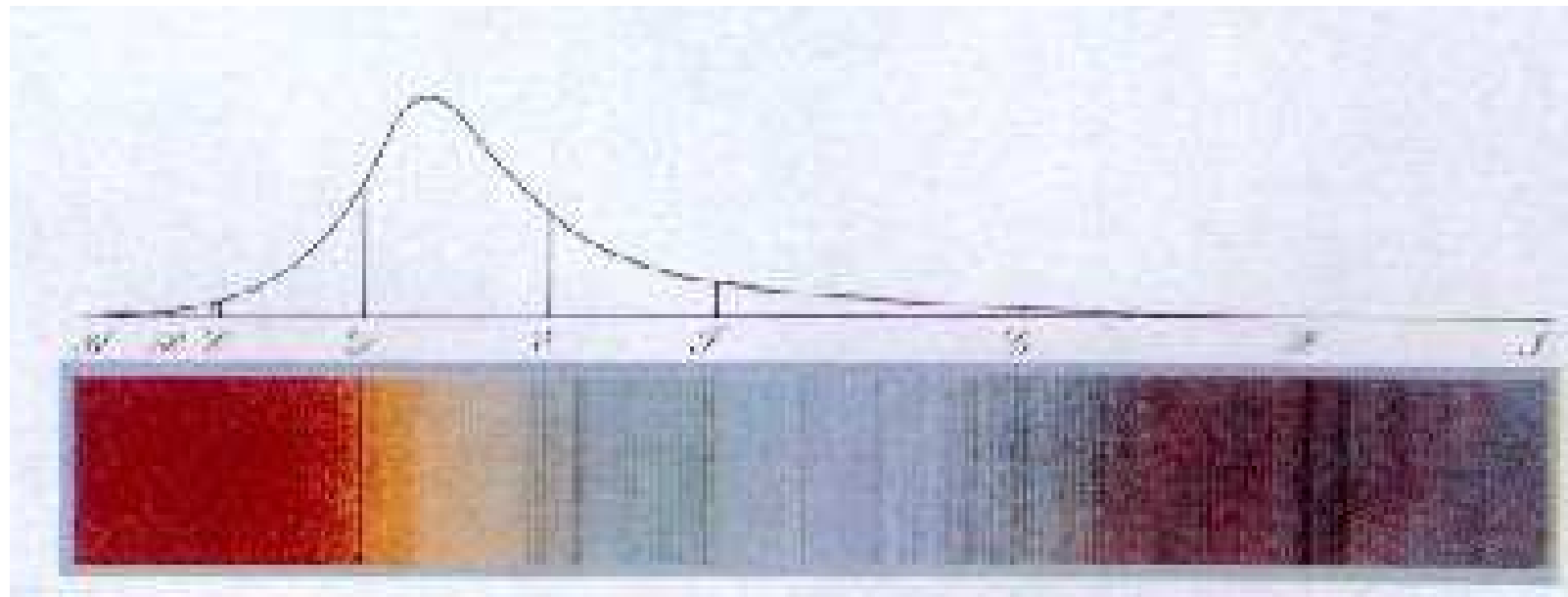
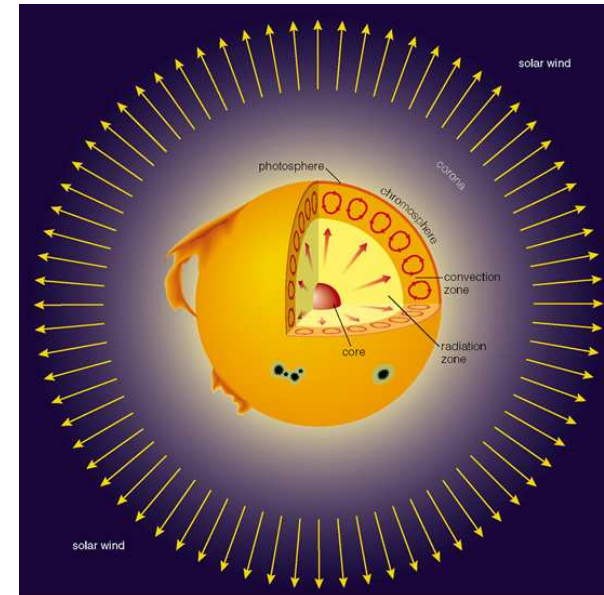


- Electrons only move between discrete energy levels
- So only photons of specific energies (i.e. wavelengths) are emitted or absorbed by a given atom

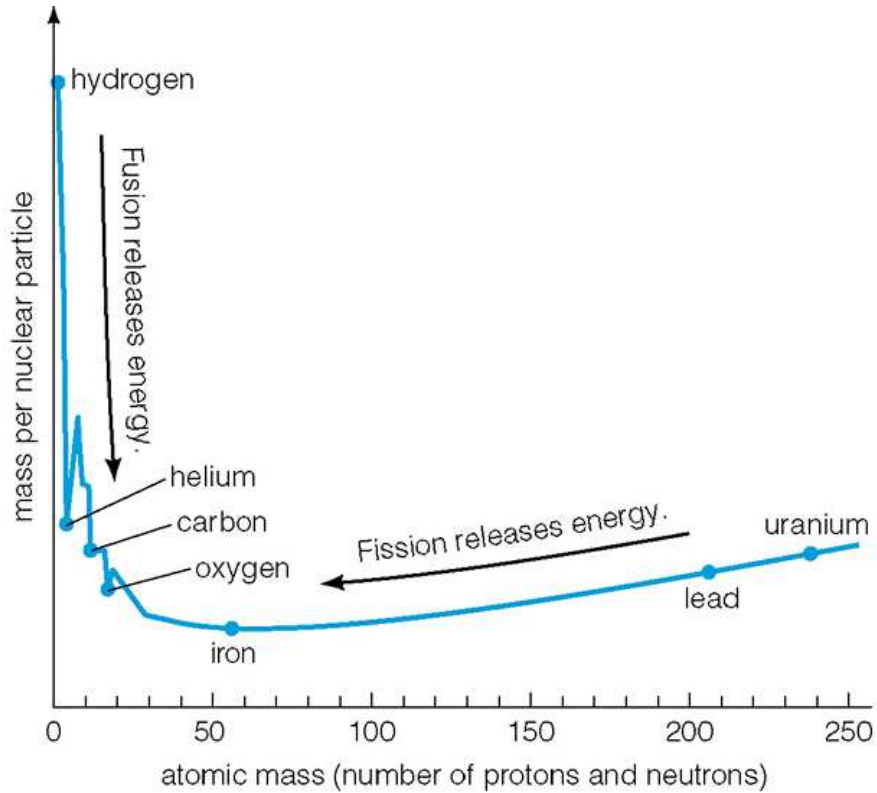


Spectrum of the Sun

Fraunhofer in 1814 already observed absorption lines (from H and Sodium) in solar spectrum



Energy generation by fusion and fission of elements heavier than H



Hertzsprung-Russell (H-R) diagram

