Examples

- Stellar atmospheres
- Stellar structure & radiative diffusion
- X-ray emission
- Interstellar medium emission
- Dust
- Synchrotron

Radiative Processes

- What is it good for?
- Much of astrophysics involves interaction btw radiation & matter. In some sense this is very simple & regulated by the physics of scattering (E&M, quantum), energy levels in atoms & molecules (quantum), and statistical mechanics. BUT putting this together is both a bit nontrivial but also approached in a standard way. We should learn it!

- Applications range across all parts of astro
  - ↳ stellar structure determined by opacity in stellar material
  - ↳ emergent stellar spectra depends on radiative xfer more generally (lines & their properties)
  - ↳ interstellar medium emission depends on ionization, recombination, heating, cooling, etc.
  - ↳ emergent spectra of galaxies affected by dust scattering, absorption, reemission

↳ ISM & IGM emits in synchrotron → SFRs

↳ brehmstrahlung is a key probe of group & cluster gas → temperatures, heating, mass

↳ Compton scattering important in AGN disk emission, SZ effect on the CMB

↳ Masers are an interesting probe, use ful for understanding gas structures, galactic dynamics, Hubble Constant

- What are we going to?

- A few weeks of real basics - some of this you'll have seen in E&M, but the RP perspective (& language) is different and allows clearer perspective.

- Then emission process → bremsstrahlung, synchrotron - some of you have seen this from Grazinov in E&M - how many?

- We'll move on to some other topics of astrophysics interest

  - Compton scattering
  - Plasmas & radiation
  - Atomic & molecular lines
  - Masers
  - Dust
  - other?

- Not sure about the pace! First time I've taught this course. Also on some topics so of you all will be more expert than I. Finally, if we do have time near end of course we should discuss what topics to cover.

Finally:

My lectures are based on Rybicki & Lightman

Other good books: Shu, Physics of Astro, Vol. 1

Draine's ISM book

I'll assign a weekly exercise — mostly to keep you on your toes.