

ASTR 1040: Stars & Galaxies
Lensing: Abell 2218



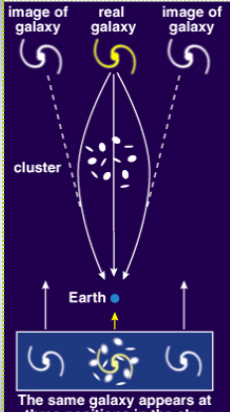
Prof. Juri Toomre TAs: Piyush Agrawal, Connor Bice
 Lecture 26 Thur 20 Apr 2017
zeus.colorado.edu/astr1040-toomre

Our Schedule & Next Topics

- **Third Mid-Term Exam** in class today (last 60 minutes)
- New Homework #13 out, HW #12 due
- **Observatory Night** next Tues (Apr 27)
- **Cosmology: models of the universe**
- Discovery of **cosmic microwave background** implies a big-bang beginning
- Focus on **22.2 Evidence for Big Bang**
- Complete overview read **Chap 23: Dark Matter, Dark Energy, Fate of Universe**

REVISIT

Gravitational lensing: very simplified



The same galaxy appears at three positions in the sky.


Bending of light by cluster Abell 2218



Lensing by massive galaxy cluster Abell 1689



Quasars acting as gravitational lenses (SDS + VLT)



Einstein Cross: gravitational lensing of (one) very distant quasar



"The Beast"

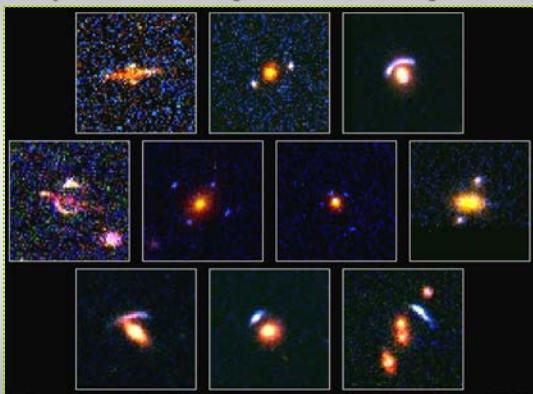
4 or 5 different galaxies!

Red arc at the bottom: Z = 4.8



Erica Ellingson -- HST

Medley of most distant gravitational lensing with HST



Gravitational lens drifts across your harbor view (Boston)



Effects of gravitational lensing on background galaxies



Third Mid-Term Exam

