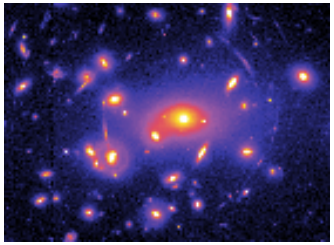
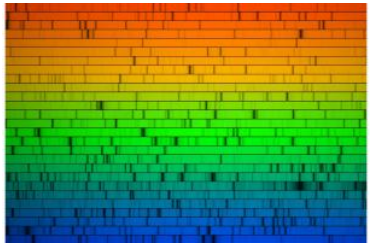
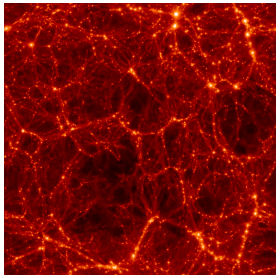
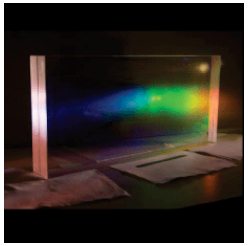
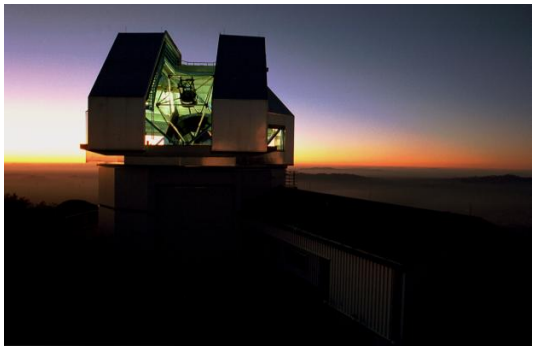
Graduate Program in Astronomy at Yale University





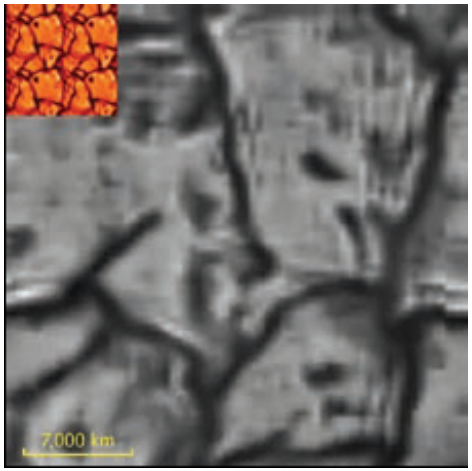


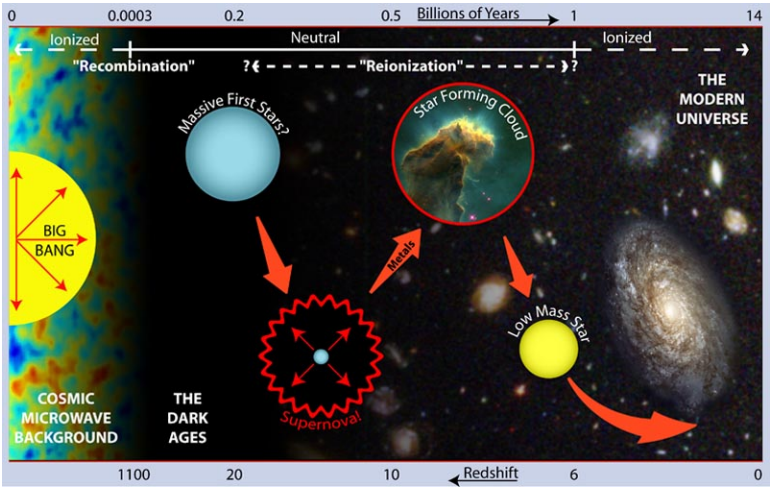


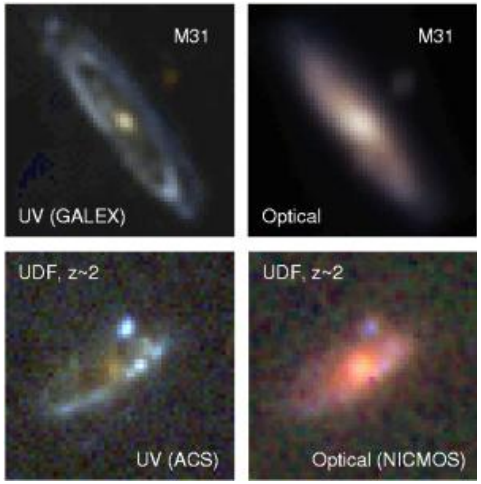


Organization of Astronomy at Yale

- Astronomy Dept (Gibbs 1st & 2nd floor)
- Physics Dept (Gibbs 4th & 5th floors, Sloan)
- Yale Center for Astronomy & Astrophysics (Gibbs 4th)
  -institute bridges activity between Astro + Phys depts
- Geology & Geophysics Dept (Kline Geology Lab)
  -interdisciplinary activity in planets and exoplanets







Research Areas of Yale Faculty

observer theorist instrumentalist ["retired"]

- Exoplanets Debra Fischer 
- Sun, Stellar Structure & Evolution
  Sarbani Basu  [Pierre Demarque] 
- Stellar Populations, Galactic Structure Bob Zinn 
- Galactic Structure, Astrometry [Bill van Altena] 
- Star Formation [Richard Larson]  Hector Arce 
- Black Holes & X-Ray Binaries Charles Bailyn 
- Galaxy Structure, Formation & Evolution Jeff Kenney  Marla Geha 
  Pieter van Dokkum  Frank van den Bosch 
- Active Galactic Nuclei Meg Urry  Paolo Coppi 
- Cosmology: Dark Matter, Lensing Priya Natarajan 
  Clusters Daisuke Nagai 
  Large-Scale Structure Nikhil Padmanabhan 
- Instrumentation Andy Szymkowiak 

Structure of the Graduate Program

First 2 years:
12 courses including 2 research projects (1 observing, 1 theory)
~3 semesters as Teaching Assistant (required)

PhD qualifying exam: end of 2nd year
1. Written exam on general knowledge
2. Oral exam on proposed PhD project

Years 3+
PhD research
1+ semester as Teaching Assistant (required)
Yearly *progress committee meetings*, dissertation progress reports

Goal for completing PhD: no more than 6 years

Fall 2014 Astronomy courses

Astro 500 The Physics of Astrophysics Priyamvada Natarajan (required)
Astro 520 Computational Methods Paolo Coppi (core)
Astro 555 Observational Astronomy Robert Zinn (core)
Astro 560 Interstellar Matter and Star Formation Hector Arce (core)

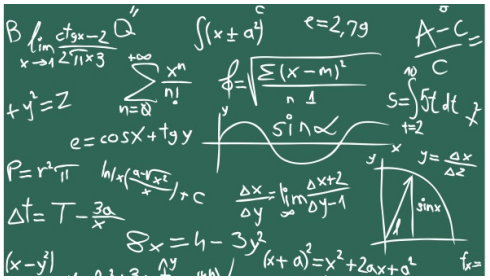
[Astro 580 Research] *1st year students generally don't take this for credit in 1st sem*
Astro 710 Professional Seminar Pieter van Dokkum

Spring 2015 Astronomy courses

Astro 550 Stellar Astrophysics Sarbani Basu (510 or 550 required)
Astro 600 Cosmology Priyamvada Natarajan
Astro 610 Theory of Galaxy Formation Frank van den Bosch
Astro 620 Advanced Programming Tutorial for Astronomy Paolo Coppi
Astro 666 Statistical Thermodynamics in Astrophysics John Wettlaufer

Astro 580 Research
Astro 710 Professional Seminar Pieter van Dokkum
Phys 590 Responsible Research by the Physical Scientist (Ethics)

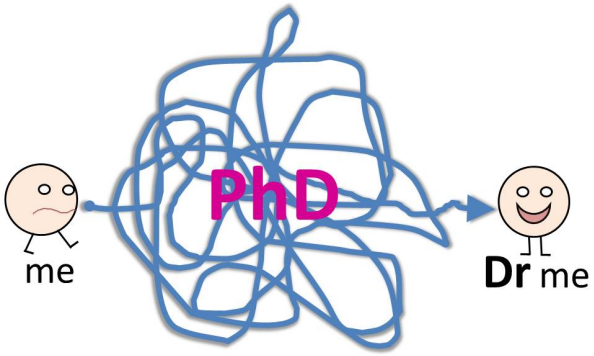
Research projects



- All students carry out 2 research projects in their first 2 years
- 1 observational, 1 theory
- Good plan:

for 1st project: start in 1st semester,
finish in 2nd semester or summer
(take for credit as A580 in 2nd semester);
for 2nd project start in summer or 3rd semester,
finish in 4th semester
(take for credit as A580 in 3rd or 4th semester)

PhD Qualifying exam



Taken at end of 2nd year (May)
Prepare during 4th semester
(no TA assignments)

2 parts:

1. Written exam on general knowledge (courses)
2. Oral exam on proposed PhD project (few weeks after #1)

Submit ***thesis prospectus*** by end of summer

If you don't pass one of the parts, faculty may choose to give you a second chance

Weekly Department Events

General:
YCAA seminar (external speaker) -- Tuesday afternoons
Astronomy Colloquium (external speaker) -- Thurs aft.
Professional Seminar (varies) -- Friday afternoons

Specific Fields:
Galaxy lunch (discussion of recent papers) -- Wed. noon
Stellar Tea – Monday afternoon?
Cosmology Seminar – (external speaker)(Friday afternoon)?

Other:
Public Night at LFOP (grad students can help/lead telescope or planetarium sessions) -- Tuesday evenings
Happy Hour (happy hour!) – late Friday afternoon

Expectations for astronomy grad students

pre-PhD students, years 1 & 2

attend the department colloquium plus occasionally other "talks" of interest (occasionally = less than once per week on average)

PhD students, years 3+

attend the department colloquium plus any talks in their general field of study, but at least 2 "talks" total each week

---

"talk" includes colloquia, seminars, lunch talks, astro-ph discussions etc, but not professional seminar or research group meetings

attend lunch or discussions with colloquium speaker (all students)

attend local workshops, meetings, or events (all students)

MUST attend professional seminar (all students)

GOALS FOR PUBLISHING PAPERS

-- at least 1 of the 2 research projects should result in a published paper

-- PhD students should have at least 1 published paper from the PhD research by end of 4th yr

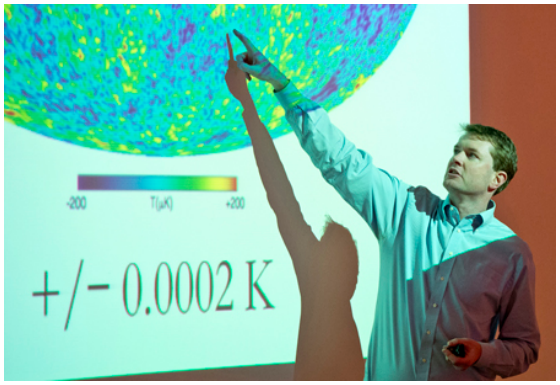
GOALS FOR GIVING TALKS

-- at least 1 research talk per year to dept (usually in Prof. Seminar)

"requirement" = must do
"expectation" = should do
"goal" = try to do if at all possible

Teaching Fellow Program

learning to teach is important part of graduate student training



teaching requirement:
9 TF units total (1 TF unit = 5 hrs/week)

During a semester a student may have a
TF1 (5 hrs), a TF2 (10 hrs), or a TF3 (15 hours)

usually done in 1st 3 semesters plus sometime in yr 3+
(4th semester -- *prepare for qualifying exams*)

Can do more than 9 TF units for extra money

Can do courses outside of Astronomy to meet requirement

Preliminary TA plan for Fall 2014

Astro110 (Edwards) 2 TF2 Maria Jose Maureira, Jesse Feddersen
Astro130 (Fischer) 2 TF2 Joey Schmitt, ** William Cramer
Astro155 (Faison) 1 TF2 Sarah Benjamin
Astro220 (Edwards) 1 TF2 Jeremy Bradford
Astro255 (Geha) 2 TF2 Angelo Ricarte, ** Ryan Blackman

** = assigned arbitrarily

where does $$ for your tuition & stipend come from?

Year 1&2 : from the graduate school
BUT no stipend for summer between yr 1 & 2 –
need to do research with faculty over summer (one of research projects)
(as part of this deal, you agree to be TA for 9 TF units)

Year 3+ : from research grant of PhD faculty advisor
must cover 1/2 tuition for years 3 & 4 (grad school covers half)
must cover stipend for years 3+

if advisor can't cover you:
dept has LIMITED emergency funds
(grad school can cover, but then we must accept fewer new students)

where does $$ for observing trips, meetings, publication costs come from?

- From research advisor
- From your own graduate student research funds (initially $2K, there may be ways to supplement by doing outreach)
- Tinsley award (for best student paper)

Success of Yale Astronomy PhDs

96% of PhDs 1996-2008 got postdoctoral (84%) or teaching position (12%) right after PhD

87% of PhDs 1996-2008 still in Astronomy

68% of PhDs have tenure track position after 6+ yrs

Astronomy Department Computer System

A 4-tier system

- Laptop/Desktop
- Group computers
- Departmental computers
- Yale HPC computers

A few General things

- For NetID activation go to **www.yale.edu/netid** if you have not already done so.

- Always use "YaleSecure" wireless connection. Go to **wifi.yale.edu** to learn about wifi and also how to register your laptop for both wireless and ethernet connections (in case this sounds like a catch-22 situation, you can in the meanwhile use the "yale guest" connection).

- Yale provides centralized support for students, go to **http://its.yale.edu/centers/student-technology-collaborative/getting-help-stc**

- If this does not work, contact Craig Henry and/or Andrew Stemmer at help-astro@yale.edu

Laptop

- Talk to Craig Henry before buying one for allowed specs. Don't be in a hurry to buy one if you already have one. Take your time to figure out what you need.

- You are allowed macs and windows-based laptops.

- Backing up your laptop is YOUR responsibility.

- If you are going to use something like time-capsule to backup, talk to Craig/Andrew to ensure that it is set up properly and that it does not hamper network traffic Iwe have had that happen before!).

- Yale provides subsidized software. Go to

http://its.yale.edu/ > Software & Technology > Software Library
The CAS login forwards your NetID to parse the product available for your role (faculty, staff, student).

- Any computer funded by the dept must include warranty of at least 3 years. Warranty and peripherals cost counts toward total available funds.

- For those using windows systems, make you you have an ssh client and an X-windows server. You will need that.

- Laptops are NOT meant for heavy duty calculations. You can use the department compute nodes for that (more about that later).

- There is a set of computer-related wiki pages
  http://copernicus.astro.yale.edu/computerwiki
  These pages will tell you how to configure your laptops so that use the departmental printers (ricoh, HP-Color).

- Ssh into the compute nodes to log into the departmental computers.

- If you would rather use a desktop for your day-to-day work, use the desktops in the library till we install one on your desk.
  - Talk to Craig
  - Note that desktops are linux based

- TO GET AN ACCOUNT ON THE DEPARTMENT's COMPUTE NODES (and desktops), CONTACT help-astro@yale.edu
  The disks of all departmental computers are shared. You will be able to access your files from all computers.

Departmental Computers

- The department has a number of shared compute nodes:
  - esca.astro.yale.edu
  - rgot
  - turtle
  - tortoise
  - terrapin

- You can ssh into these from your laptops or desktops.

- These nodes have most relevant astro software (compilers, IDL, python, etc.). See the computer wiki for more.

- You need to be within the Yale network to access these machines. Use VPN if you need to access these from outside Yale. HGS dorms and Yale grad student apartments are considered to be inside Yale.

Yale HPC

- Intensive computing
- Need to be associated with a faculty member
- Used only in queue mode
- Not worth the trouble for short computing