Astronomy Town Hall Meeting

Fall 2022

Topics of Discussion

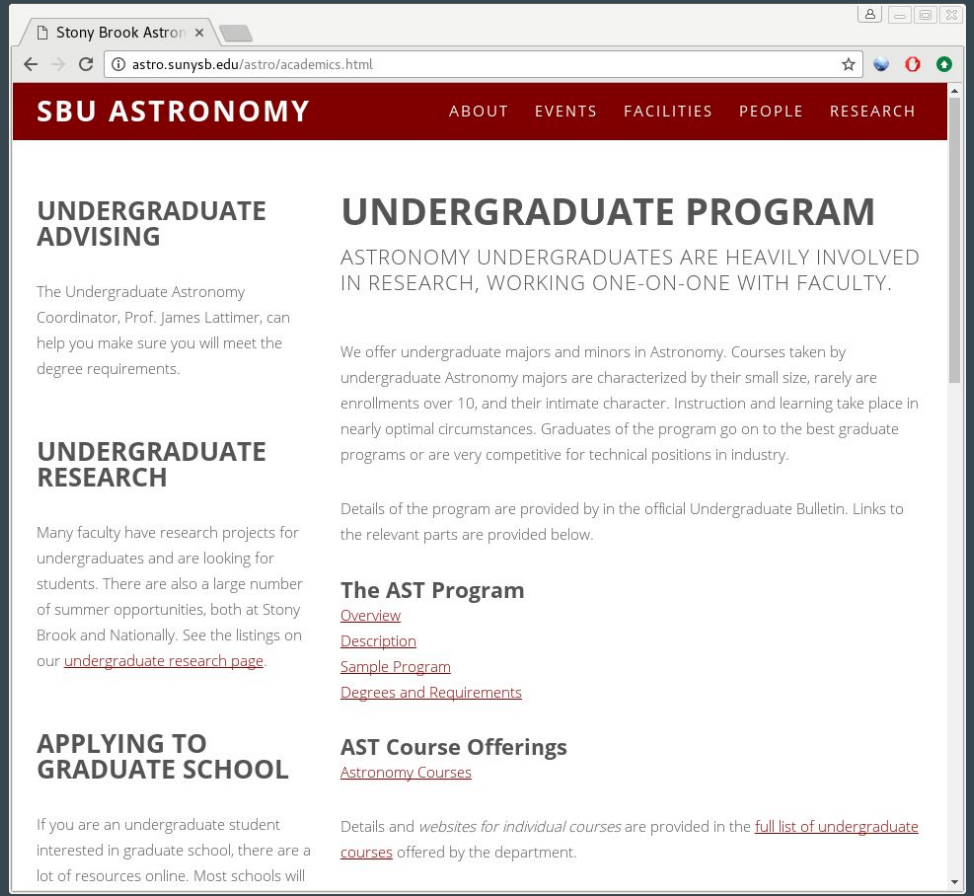
- Astronomy courses / degree requirements
- Research opportunities
- Graduate School
- Careers
- Astronomy club
- Whatever is on your mind

Introduction

The Astronomy group has 12 regular faculty and a number of active research and emeritus faculty, several postdocs, many graduate students, and many undergraduates active in research.

UG Astro Program

- Links to the UG bulletin with degree requirements
- Links to research opportunities
- Information about graduate school



Astronomy Courses

- AST 203 is offered every semester
- AST 205 is offered every Fall (order with AST 203 doesn't matter)
- AST 34x-level classes are offered on a 2 year cycle—plan ahead
- Many students take AST 443 (observational techniques) to satisfy major requirements
  - Currently offered 3 out of every 4 semesters
  - Can be used in place of senior physics lab (PHY 445) for double majors
  - Note: if you plan to do MAT in physics later, you should take PHY 445
- Many students also do research or reading classes to satisfy major requirements
  - You need to find an advisor willing to mentor you
  - You may not find someone willing to do 3 credits in one semester
- Physics and Astronomy majors are closely related—many students double major

Astronomy Degree Requirements

- AST 203
- Three of: AST 341 (stars & radiation); AST 346 (galaxies); AST 347 (cosmology); AST 390 (special topics)
- Six credits from AST 205 of higher
  - Except: AST 248, AST 301, AST 389, AST 475
  - Any combination of:
    - AST 205 (planetary science)
    - AST 443 (observational techniques)
    - the 4th of the AST 3xx series
    - PHY 408 (general relativity)
    - independent research (up to 3 credits)
- PHY intro sequence
- Other physics
  - PHY 251/2 (modern physics)
  - PHY 277 (introduction to computation)
  - PHY 300 (waves)
  - PHY 306 (thermal physics)
  - Eight credits from advanced physics or related courses
- Math
  - MAT 131 and 132 or similar sequence
  - MAT 203 or 205 or 307 or AMS 261 (calc III)
  - MAT 303 or 305 or 308 or AMS 361 (calc IV)
  - new requirement: MAT 211 or AMS 210 or both MAT 307 + MAT 308 (linear algebra)

Astronomy Degree Requirements

- Note: no more than 3 classes with a grade of C- may be applied to the major
- Practical notes:
  - you need AST 203 by Spring of your sophomore year to finish in 4 years
  - you should take PHY 277 in your first two years as well
- Plan ahead!
- Some recent changes:
  - Upper level writing requirement clarifications
  - PHY 277 is a pre-req for AST 341
  - linear algebra requirement

Astronomy Degree Requirements

- Other popular classes:
  - PHY 153: python and statistics
  - Complex analysis
  - AMS 326: Numerical Analysis

AST 3xx Sequence

- AST 341: Stars and Radiation (note: prereq of PHY 277)
  - Fall 2022 (now)
  - Fall 2024
- AST 346: Galaxies
  - Spring 2023
  - Spring 2025
- AST 347: Cosmology
  - Fall 2023
  - Fall 2025
- AST 390: special topics
  - Spring 2023 (Computational Astrophysics)
  - Spring 2024

Next Semester (Spring 2023)

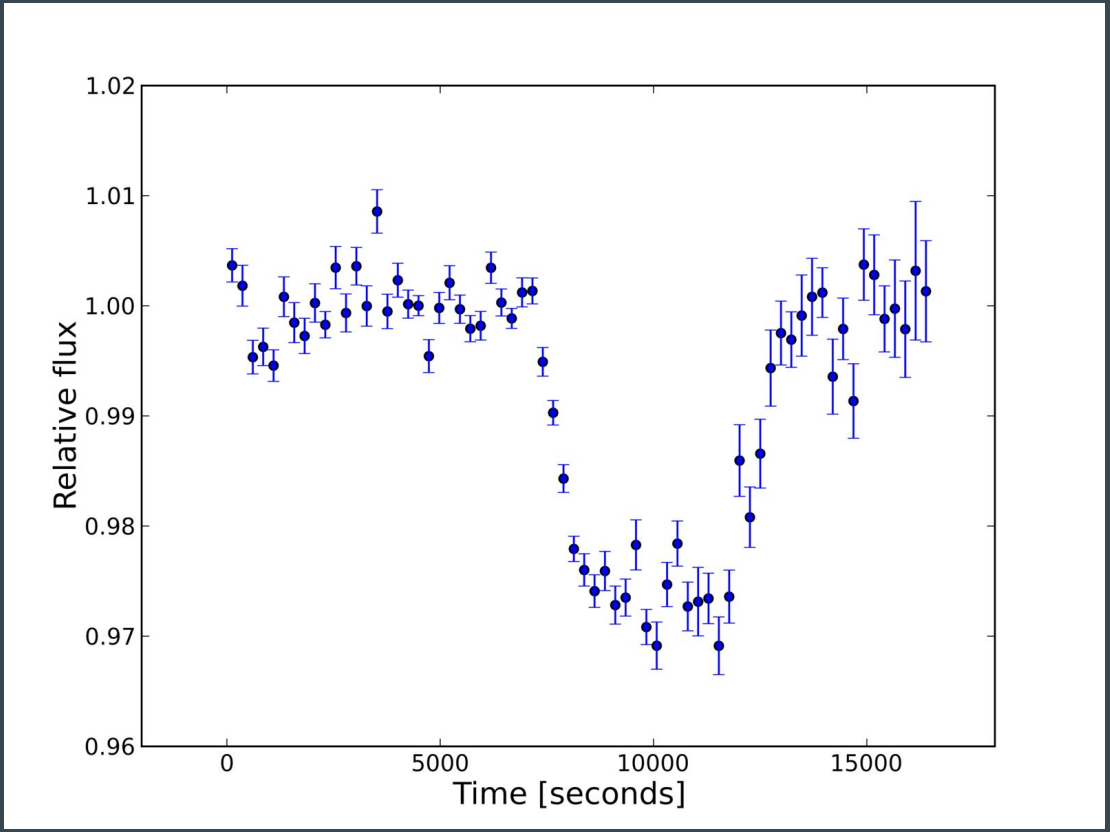
- AST 203: Astronomy (Calder)
- AST 346: Galaxies (Lanzetta)
- AST 390: Computational Astrophysics (Zingale)
  - note: schedule conflict with PHY 306 – you can defer that until your senior year or take over the summer
- PHY 408: Relativity
- PHY 546: Python for Scientific Computing (w/ permission from Zingale)

AST 390: Special Topics

- This course could substitute one of the other AST 34x courses
- Potential topics
  - Black holes, neutron stars, and gravitational waves
  - Computational astrophysics (follow-on to PHY 277)
  - Exoplanets
  - Radio astronomy
  - ...
- Past offerings
  - Spring 2018, 2021: NHs, BHs, and Gravitational Waves
  - Spring 2020, 2022: Exoplanets
- Upcoming:
  - Spring 2023: Computational Astrophysics
- Currently requires permission of the instructor

AST 443: Observational Techniques

Lightcurve of transiting exoplanet around HD189733—data taken by students in AST 443 from our rooftop telescope!



Upper-Level Writing Requirement

Students are certified as satisfying the upper-division writing requirement by registering for the 0-credit AST 459 and completing writing projects within their major. All students majoring in Astronomy/ Planetary Sciences must submit two papers (term papers or independent research papers) to the Astronomy coordinator for Department evaluation by the end of the junior year. If this evaluation is satisfactory, the student will have fulfilled the upper- division writing requirement. Papers should be written in the form of a journal article. All papers must consist of an abstract, introduction, main content, and references. References should be cited throughout the text. Any figures should be numbered and have an appropriate caption. If you are using a lab report for the basis of this requirement, you should expand upon the introduction and describe the connection to topical scientific research.

A typical length should be 10 pages (double spaced, 11-point font) plus references, preferably written in LaTeX.

Students should consult with the department advisor to ensure that their plan for completing the Upper Division Writing Requirement is consistent with university graduation requirements for General Education. Students completing the Stony Brook Curriculum (SBC) must complete a course that satisfies the *Write Effectively within One's Discipline* (WRTD) learning objective to graduate. The Upper Division Writing Requirement is consistent in most cases with the SBC learning outcomes for WRTD.

You should hand in your papers by the end of your Junior year

Upper-Level Writing Requirement

Submission policy:

Due to the increasing number of late upper-division writing requirement submissions, there is now a mandatory submission date of OCTOBER 31.

This means your paper has to be completed, approved by your advisor, and submitted with a signed cover page by October 31 to Prof. Lattimer.

(Expect a similar date for the Spring)

Lab report policy:

The standard ("canned") AST 443 labs cannot be used for the upper level writing requirement, since the background work is already done for you.

However, in that class you also have the opportunity to write your own observing proposal, with is an independent creative work, and if selected, do the lab on this. We will accept an expanded version of that lab for consideration of the upper level writing requirement -- but only for the individual who wrote the original proposal.

Upper-Level Writing Requirement

- Other ways to satisfy
  - Use a research paper from another AST class
  - Write up a summer of research you have been doing with faculty on campus
  - Pick a topic of interest to you, research it, and write up a paper describing the state of that field

SBC Requirements

- We require 2 upper-level writing papers. To get credit you must register for AST 459
  - AST major: register for AST 459 *after* you completed the first paper.
  - PHY+AST double majors should take for AST 459 for one paper and PHY 459 for the other (doesn't have to be at the same time)
  - This ensures all University requirements (WRTD) are fulfilled
- You should complete these *before* your senior year
  - Often changes are requested to the papers
  - Waiting until the last minute can put your graduation in jeopardy
- SPK requirement
  - You can take the 1-credit AST 100 to satisfy the SPK requirement
  - AST 443 (Observational Techniques) also satisfies the SPK requirement

Science Writing and Speaking

- Students wanting extra instruction on speaking and writing should look at:
  - JRN 365: Talking Science: highly recommended by your peers
  - WRT 380: Advanced Research Writing

Honors

- In your Junior year, you can apply to become a candidate for Departmental honors
  - Need to complete a thesis as part of your research
  - Need to register for AST 447 or AST 487
    - You will want to have a faculty mentor lined up at this point
  - Need a GPA of 3.3 or higher in math/natural sciences
- You need to form a committee of 3 faculty: 2 from astro + 1 from physics
- The thesis needs to be approved before you are cleared for graduation
- Note:
  - PHY major honors does not require a thesis, so you can do both AST and PHY honors with only a single thesis.
  - Thesis does not automatically count as part of your upper level writing requirement.

Research Opportunities

- AST 200 (Current Astronomical Research) is a good way to see what research is taking place
- PHY 277 (Computation for Physics and Astronomy) provides a good basis for the tools you'll need
- Local opportunities
  - Knock on doors
  - Talk to fellow students
  - Look at the UG section of the Astro Group webpage
- Most groups have weekly meetings that UGs can sit in on and participate
- UG student office (back of ESS 437) available
- Course credit:
  - AST 287: Introductory Research
  - AST 345: Undergraduate Research
  - AST 447: Senior Tutorial
  - AST 475: Teaching Practicum (not for major credit)
  - AST 487: Senior Research
- Note: you can also take the PHY course equivalents

External Research Opportunities

- NSF REU program
  - https://www.nsf.gov/crssprgm/reu/list_result.jsp?unitid=5045
  - Provides stipend and travel expenses for ~10 week research experience at a University in the US
  - Previous SBU students went to Hawaii, Harvard, Texas, SF, ...
  - Highly competitive
  - Applications due in toward end of Jan. (but start looking in Dec.)
- URECA can provide money for summer research on campus
  - https://www.stonybrook.edu/commcms/ureca/summer/urecasummer.php
- Many other summer opportunities exist—look at the UG webpage
  - http://www.astro.sunysb.edu/astro/undergrad_research.html
- Typically application requires: transcript, 2 - 3 letters of recommendation, statement of interest

CUWiP

Conferences for Undergraduate Women in Physics

- Virtual this year
- deadline was in late summer this year
- Apply: https://www.aps.org/programs/women/cuwip/

"The goal of APS CUWiP is to help undergraduate women continue in physics by providing them with the opportunity to experience a professional conference, information about graduate school and professions in physics, and access to other women in physics of all ages with whom they can share experiences, advice, and ideas. The national and local organizing committees of APS CUWiP strive to create a welcoming environment for all, including undergraduate women and gender minorities."

"A typical program will include research talks by faculty, panel discussions about graduate school and careers in physics, presentations and discussions about women in physics, laboratory tours, student research talks, a student poster session, and several meals during which presenters and students interact with each other."

Careers

- Not all career paths require graduate school!
- Astronomy research provides students with the skills to do data analysis, software / algorithm design, and problem solving
- Career paths:
  - High school teaching (consider SBU MAT program)
  - Industry
    - Astro related
    - Software / Data science
    - Financial
    - ...
  - National observatories and laboratories
  - Museums / planetariums
  - Science journalism

Post-Bacc's

- Still interested in research, but not sure about grad school?
  - Consider a post-bacc
- AstroBetter maintains a list:
  - *Tips for Landing a Post-Baccalaureate Research Experience*
  - https://docs.google.com/document/d/1yQFGidu6PL_Oif5jYfK4p1Xx7jXq96QYSccjdI8zGV8/edit#

Graduate School

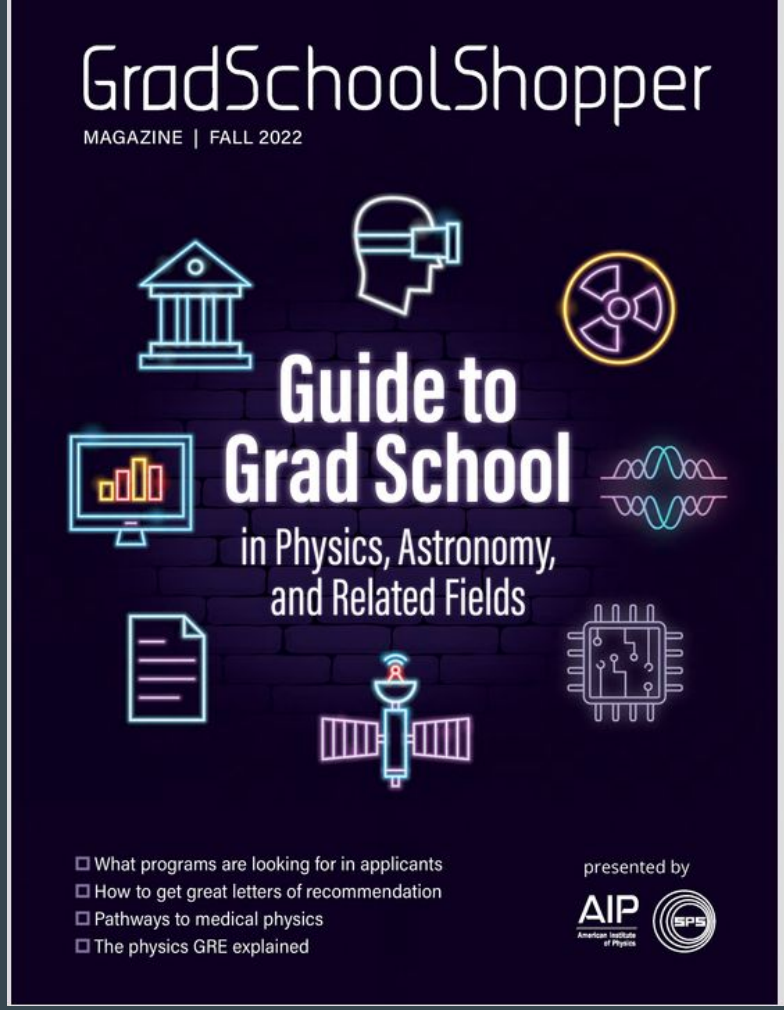
- Apply during the senior year
- Both Physics and Astronomy programs and Astronomy/Astrophysics programs
- Strong application:
  - Letters of reference
  - Personal statement
  - Research experience
  - GPA
  - possibly GREs (note: many programs are dropping this requirement)
- PhD graduate students are fully supported
  - Teaching / research assistant with annual stipend (~$30,000) + tuition waiver
- ~ 4 - 6 years to get degree (sometimes shorter, sometimes longer)

Graduate School

- Why consider graduate school?
  - Interested in doing astronomy research professionally
  - Want to learn research skills that you can transfer to industry
  - Important to realize that # of PhD grads each year $\gg$ # of academic positions available each year
- Interested in graduate school?
  - Talk to some of our grad students
  - Reach out to students at prospective schools via social media
- Advice from former students:
  - “choose a program for the advisors not for the program”

Graduate School

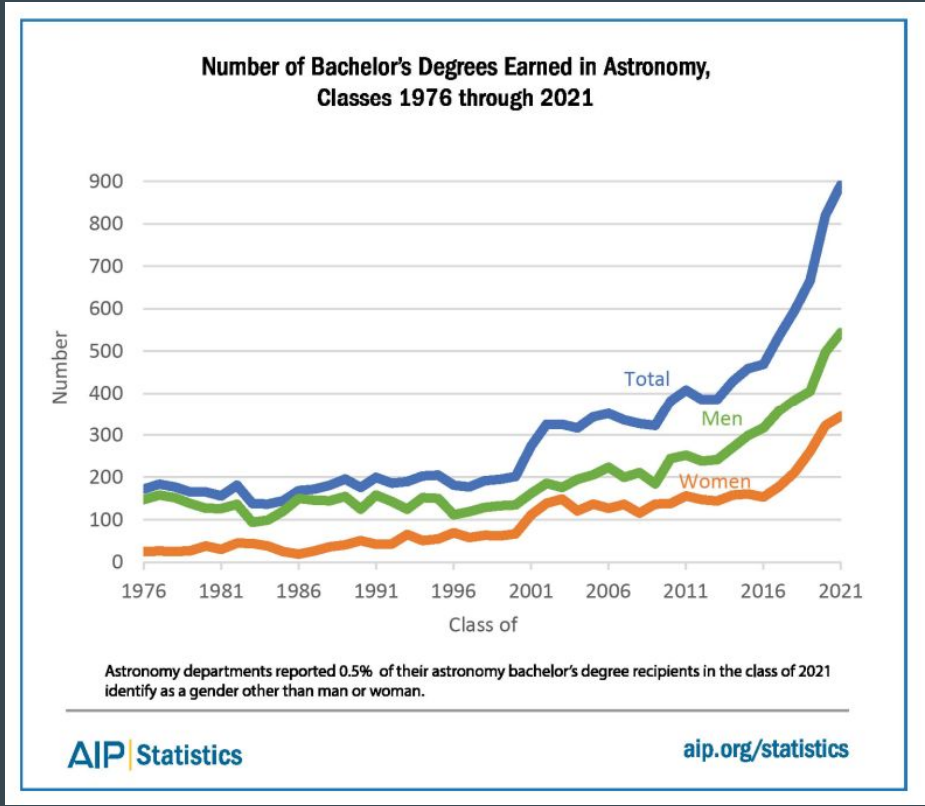
Grad School Shopper can help identify programs



https://digital.physicstoday.org/physicstoday/gradschoolshopper_magazine_2022/

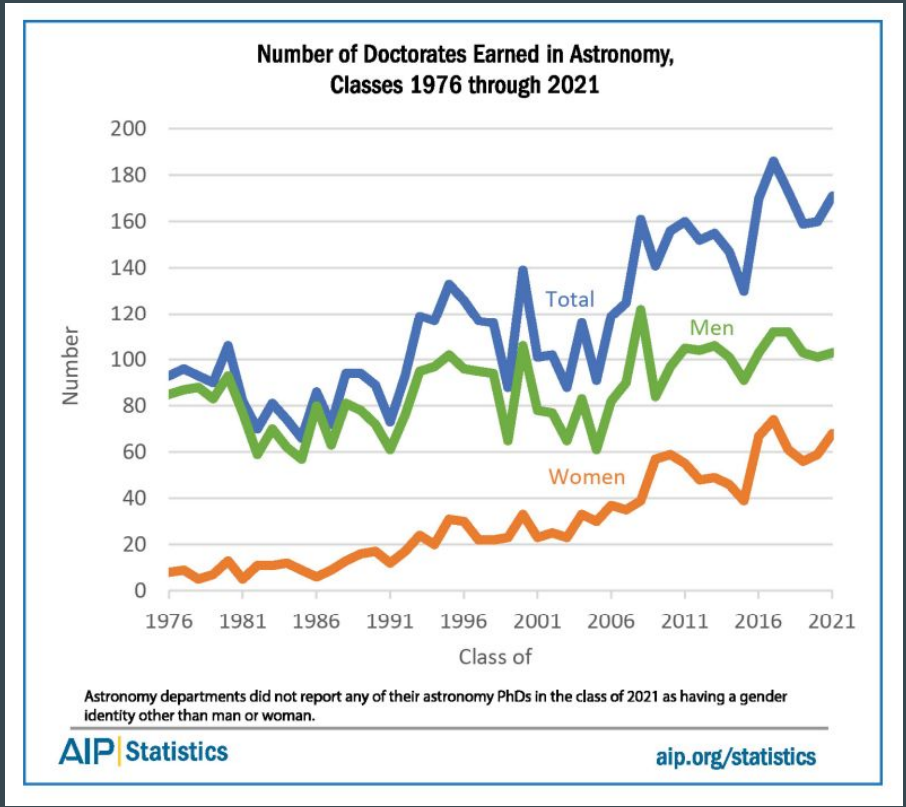
Graduate School

- As the number of Astronomy Bachelor's degrees have increased, grad school admissions have gotten very selective



Graduate School

- PhDs in Astronomy have also greatly increased



Graduate School

- There are fellowships available that you can apply for during your senior year
  - These will give you independence in your studies
- NSF GRFP
  - https://www.nsfgrfp.org/
  - 3 yrs of support ($34k stipend + $12k to institution)
  - note this year they are emphasizing: Artificial Intelligence, Quantum Information Science, and Computationally Intensive Research
- DOE CSGF
  - https://www.krellinst.org/csgf/
  - 4 yrs of support ($38k + $1k prof development)
  - 12 week practicum at DOE national lab

Graduate School

- Applying is expensive
  - Many schools have fee waivers—ask your prospective schools if you qualify
  - Consider schools that don't require GREs
- Have someone read your personal statement
  - Ask a fellow student or research mentor for feedback
  - If there are particular faculty you are interested in working with, list them here
  - If there are hardships or reasons why your GPA doesn't accurately reflect your potential, discuss it here
- Consider contacting faculty at schools you are interested in
  - Ask if they will be taking students in the near future
  - Ask about any fellowship opportunities you might be eligible for

Graduate School

- For Astronomy programs, incoming class sizes can be small (~4-8)
  - Top schools are very competitive
  - Admission committee might be targeting some subfield, etc., so there is an element of chance
  - Apply to a range of programs, not just the “elite” schools
- Beware of masters-only admission
  - You will need to pay your own way and there is no guarantee that you will be admitted into the PhD program
  - These are an increasing trend nationally

Physics GREs

- Many programs no longer require the PGRE
  - https://docs.google.com/spreadsheets/d/19UhYToXOPZkZ3CM469ru3Uwk4584CmzZyAVVwQJJcyc/edit?usp=sharing
- Talk to some seniors about the exam and how to prepare
- Practice tests can be found on the internet

Astronomy Group Events

- There are several weekly events:
  - *Astronomy seminars* on Mondays at noon (hybrid)
  - *Weekly coffee* on Thursdays at 10:30 am in ESS 437
- Other interesting events:
  - Department colloquia on Tuesdays at 4:30pm in Harriman 137
  - IACS seminars (times vary)
  - Astronomy Open Nights (usually the first Friday of each month)

Undergraduate Astronomy Club

- Active since 2010
- Run observing sessions, annual AstroFest, excursions
- Help with open night
- Use our telescopes

M42: the Orion Nebula