

Astronomy Town Hall Meeting

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Fall 2020

Topics of Discussion

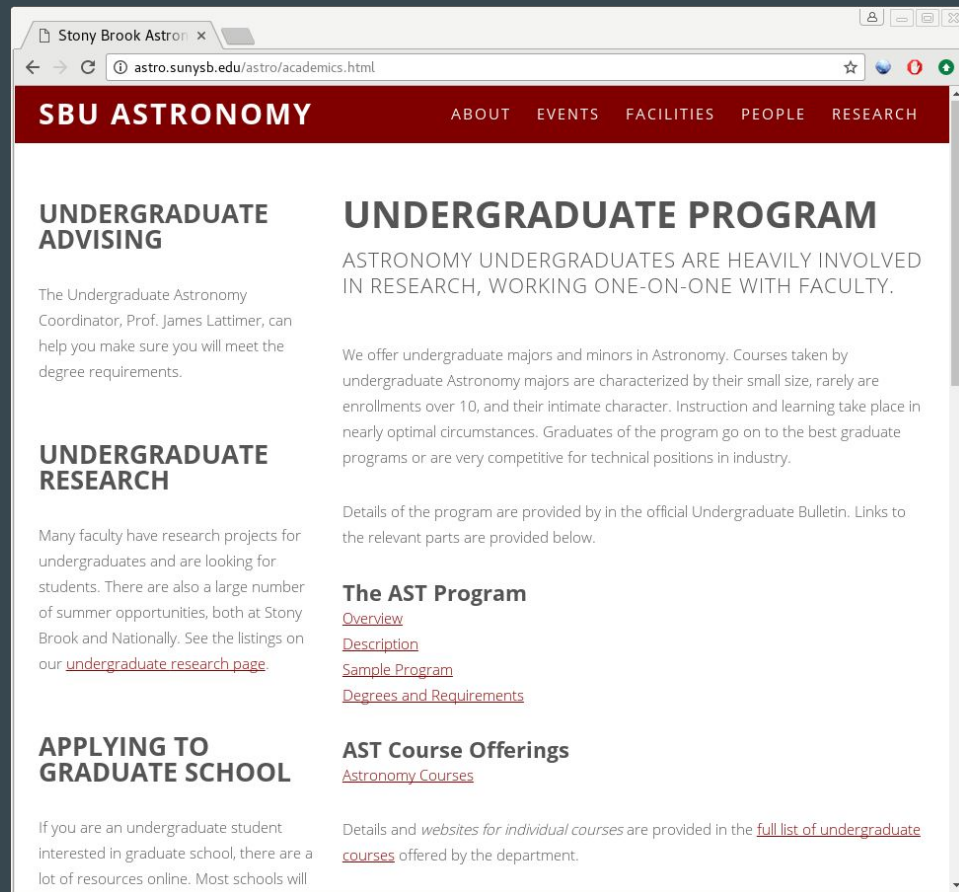
- Astronomy courses / degree requirements
- Research opportunities
- Astronomy club
- Graduate School
- Careers
- Whatever is on your mind

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



The screenshot shows a web browser window with the address bar displaying `astro.sunysb.edu/astro/academics.html`. The website has a dark red header with the text "SBU ASTRONOMY" and navigation links: "ABOUT", "EVENTS", "FACILITIES", "PEOPLE", and "RESEARCH".

UNDERGRADUATE ADVISING

The Undergraduate Astronomy Coordinator, Prof. James Lattimer, can help you make sure you will meet the degree requirements.

UNDERGRADUATE RESEARCH

Many faculty have research projects for undergraduates and are looking for students. There are also a large number of summer opportunities, both at Stony Brook and Nationally. See the listings on our [undergraduate research page](#).

UNDERGRADUATE PROGRAM

ASTRONOMY UNDERGRADUATES ARE HEAVILY INVOLVED IN RESEARCH, WORKING ONE-ON-ONE WITH FACULTY.

We offer undergraduate majors and minors in Astronomy. Courses taken by undergraduate Astronomy majors are characterized by their small size, rarely are enrollments over 10, and their intimate character. Instruction and learning take place in nearly optimal circumstances. Graduates of the program go on to the best graduate programs or are very competitive for technical positions in industry.

Details of the program are provided by in the official Undergraduate Bulletin. Links to the relevant parts are provided below.

The AST Program

- [Overview](#)
- [Description](#)
- [Sample Program](#)
- [Degrees and Requirements](#)

APPLYING TO GRADUATE SCHOOL

If you are an undergraduate student interested in graduate school, there are a lot of resources online. Most schools will

AST Course Offerings

[Astronomy Courses](#)

Details and *websites for individual courses* are provided in the [full list of undergraduate courses](#) offered by the department.

Astronomy Courses

- **AST 203** is now 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
 - 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 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 note: you need AST 203 by Spring of your sophomore year to finish in 4 years
- Plan ahead!
- Some recent changes:
 - AST 203 is offered every semester now
 - AST 205 is offered every year (instead of every 2 years)
 - PHY 251 (modern physics) will be offered over the summer
 - PHY 277 is a pre-req for AST 341
 - PHY 408 is offered every year (instead of every 2 years)
 - 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 2020
 - Fall 2022
- **AST 346:** Galaxies
 - Spring 2021
 - Spring 2023
- **AST 347:** Cosmology
 - Fall 2021
 - Fall 2023
- **AST 390:** special topics
 - Spring 2021: Compact Objects
 - Spring 2022
 - Spring 2024

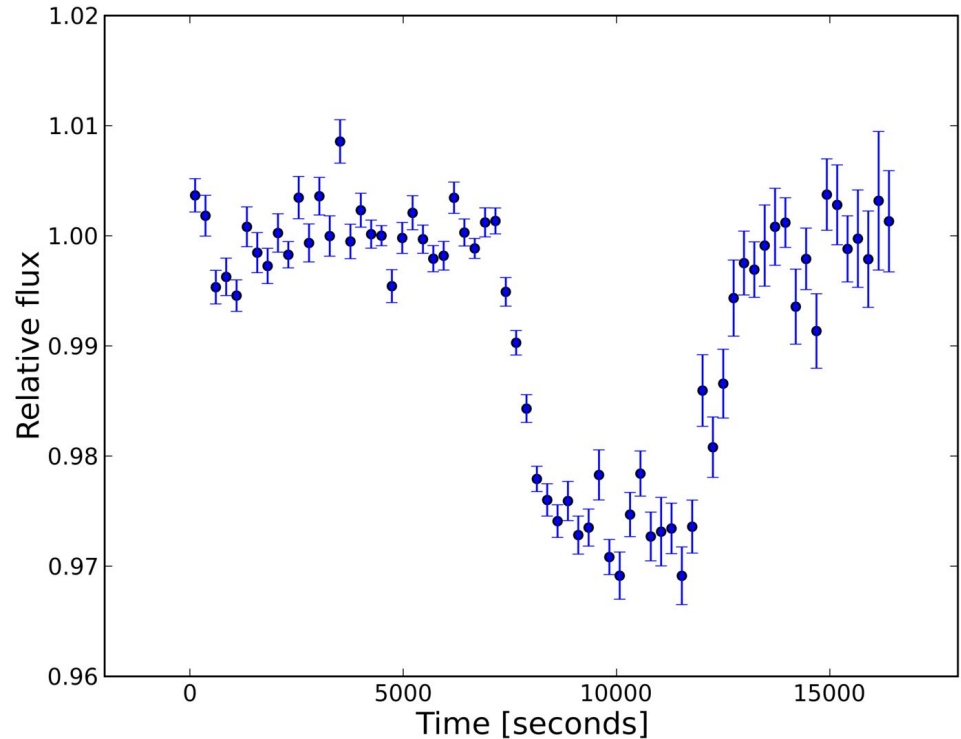
AST 390: Special Topics

- 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 2020: Exoplanets
 - Spring 2018: NHs, BHs, and Gravitational Waves
- 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

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 outside
- 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 (some students prefer PHY since it uses letter grading instead of S/U)

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 is at the end of the week
- 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.”

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”

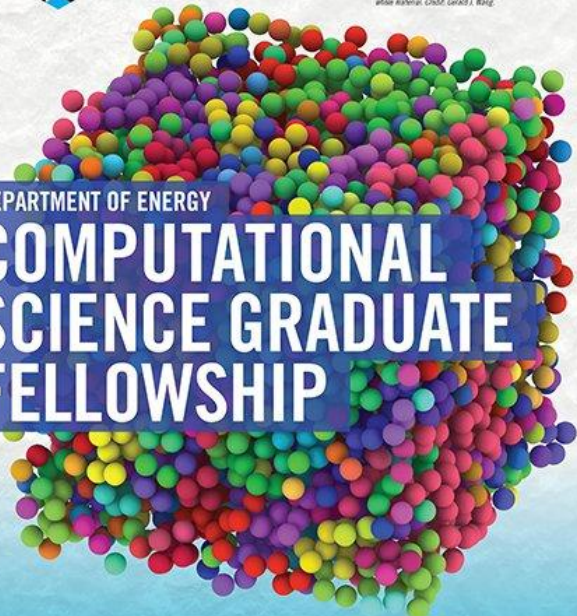
Graduate School

- 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



DOE CSGF

Closest packed particles in a colloidal suspension with friction, from a simulation by DOE CSGF Alumnus Gerald J. Wang of Carnegie Mellon University. The colors differentiate particle groups whose motions are particularly interrelated, affecting the stickiness of the whole material. Credit: Gerald J. Wang.



DEPARTMENT OF ENERGY
**COMPUTATIONAL
SCIENCE GRADUATE
FELLOWSHIP**

The Department of Energy Computational Science Graduate Fellowship (DOE CSGF) provides up to four years of financial support for students pursuing doctoral degrees in fields that use high-performance computing to solve complex problems in science and engineering.


The program also funds doctoral candidates in applied mathematics, statistics or computer science who undertake research that will contribute to more effective use of emerging high-performance systems. Complete details and a listing of applicable research areas can be found on the DOE CSGF website.

BENEFITS

- \$38,000 yearly stipend
- Payment of full tuition and required fees
- Yearly program review participation
- Annual professional development allowance
- 12-week research practicum experience
- Renewable up to four years


The DOE CSGF is open to senior undergraduates and students in their first year of doctoral study.
Applications Due 1.13.2021 ... www.krellinst.org/csgf

This award opportunity program is open to all qualified persons without regard to race, gender, ethnicity, age, physical disability or national origin.




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NNSA
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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/19UhYToXOPZkZ3CM469ru3Uwk4584CmzZyAVVwQJJcy/c/edit?usp=sharing>
- Talk to some seniors about the exam and how to prepare
- Practice tests can be found on the internet

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

Astronomy Group Events

- There are several weekly events:
 - *Astronomy seminars* on Mondays at 11:30am (virtually this year)
 - ~~Weekly coffee on Thursdays at 10:30 am in ESS 437~~
 - *Astro-ph discussions* on Fridays at 10:30 am (virtually this year)
- Other interesting events:
 - ~~Department colloquia on Tuesdays at 4:15pm in Harriman 137~~
 - IACS seminars (times vary)

Undergraduate Astronomy Club

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



M42: the Orion Nebula

