

TIMESTEP

Applying for Research Opportunities


Wednesday, November 20, 2024
5:00 - 6:30 pm ★ Steward Observatory, N305



Please complete this
pre-meeting survey



Why research projects

- Fun
 - Grad school (more later)
 - Decide whether you want to continue in academia. **Figure out WHY you want to go to graduate school.**
 - Reference letters
 - Teach important skills for jobs inside+outside academia – apply your classroom knowledge
 - Become part of a larger team (sometimes even an international research collaboration)
 - Create connections to PhD students, PDs, faculty
 - Can play with cutting edge technology (HPCs, satellites)
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How to prepare for a Research Opportunity

- Learn to code:
 - Intro: CSC 110/ECE 175;
 - Soph: CSC 120/ECE 275;
 - Advanced: CSC335/337 SFWE 301,402
 - KEEP PRACTICING – e.g. Code Academy
 - Languages: Python, C++ are most useful
 - Learn to use the Command Line & Basic Unix commands
- Learn hardware skills (e.g. at CATalyst studios)
- Learn Version Control: e.g. Github <https://skills.github.com/>
- Write your CV: <https://timestep.arizona.edu/undergraduate-research>
- Learn how to write an email

Different types of research

- Theoretical
- Observational
- Experimental
- Instrumentation

All three areas will likely require coding (in the long run or immediately).



Different types of research opps

Least “Competitive”:

- Local Opportunities at UA Departments, TIMESTEP, NOIRLab
- Local Opportunities at institutions in your hometown (great for summer)

Medium “Competitive” : (strong GPA, some research experience)


- Local, across departments: UROC McNair Program or Summer Research Institute, Space Grant Fellowship

Most “Competitive”: (if you already have strong research experience)

- National Opportunities
 - Governmental Research Labs
 - NSF REU
 - NASA Internships
 - Institutional Research Programs (e.g. Caltech CRESST)
- International Opportunities



How to find them

- TIMESTEP collection <https://timestep.arizona.edu/undergraduate-research>
 - UA website <https://ur.arizona.edu/find/search-ua-researchers>
 - Browse research websites in the departments -> write people. TIP: writing to **postdocs** ([astronomy](#), [physics](#)) can be a good idea if you are interested in a group but the Prof is too busy.
 - Talk to your academic advisor, undergrad advisor, teacher in classes
 - You can ask Profs whether you can sit in a grad level course, as a research project
 - You can ask Profs whether you can join their research group meetings.
 - Just ask for a meeting to discuss their research to start
 - **Finding a research op is hard, you'll have to try often...**
- 


Different types of research ops

- Attend grad course
- Ask for special project in one of your undergrad classes (e.g., Term Project, write 4 page report)
- Read paper, summarize, present
- (Help) analyze data (details how you can help will come from mentor)
- (Help) build+test instrument (details how you can help will come from mentor)
- Run+test code, write report/documentation
- Build code or web-interfaces

Whatever you do, make sure it has a well-documented result/product that you can link. And that you have gotten some **credit hours and/or pay** for the research.



Types of Opportunities

1. Research with faculty or postdocs
 - a. [Astronomy Research Map](#) (for faculty in astronomy)
 - b. Departmental Websites - look up postdocs, grad students (astronomy, physics, planetary science, applied math)
 - c. [UR database](#) (has some flaws- relies on profs to update regularly)
 - d. Via a program:
 - i. [Arizona Space Grant Fellowship](#)- applications due around June 30 for the following school year
 - ii. <https://grad.arizona.edu/diversityprograms/uoc> (UROC) administered by the UA Graduate College, applications due Nov 1
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Don't give up!

- Follow up; there's no harm in sending several emails... what would the downside be?
- Try to get an introduction from your undergrad advisor, your class teacher or other mentor
- Don't write too long emails. Be
 - friendly (always),
 - short (say who you are and what you have done in the past and want to do in the future)
 - concise (what research experience exactly are you looking for)
 - attach CV with details (1-2 page is fine).
- Write to PDs or PhD students in the group. Ask what it's like and whether there are undergrad projects. Ask to meet and ask them about their research. PDs and PhDs have much, much, much more time... and get orders of magnitude fewer emails

Good Luck! Questions...



Making the most of your research opp.

- You may have a lot of different goals: learn what it means to do research in physics/astronomy, learn what it might mean to be a graduate student.
- Two practical goals:
 - Get a strong reference – this requires knowing the **expectations** of your advisor.
 - Get an experience you can list on a CV – this is stronger with a **research product**.



“Succeeding” in your research experience – start off with clear expectations.

- Meet with your advisor at the start to **establish expectations**. Do not wait for them to do this.

Ask:

- Meetings : how frequently? (get on their schedule!), what is their preferred format (zoom? In person?), are you expected to attend group meetings – what is the format? How do you cancel meetings if you have an exam, etc?
- If you have more urgent questions: who to ask (student/PD/them), what format (email/slack?), what do they expect you to have done before messaging them (google search an error message/contact grads)
- If they email you – how fast do they expect you to reply?
- How many hours do they expect you to work a week? What does that mean – what will they expect as “acceptable” work progress? When would they start to get concerned that you are not meeting obligations?

“Succeeding” in your research experience – maintaining good research progress and being prepared

Throughout:

- Come prepared to meetings – create a power point slide deck that lists what you did since you last met – e.g. read a paper (what did you find? what do you have questions about?) , debugged some code – (what did you try, where did you get stuck?), trouble shooting/talked to a PD/grad students, attended a talk, made a plot (!) -- date the slides “9/18/24 Meeting”
- “What did you do since you last met”/ “What are you going to do before the next meeting?” / “What is in your way?”
- Do not cancel meetings regularly. Write emails politely/formally. Stay in touch with your advisor – they need to get to know you to write a strong letter.
- Be a good community member – help your teammates, be respectful and humble.
- Push yourself to present updates in group meetings – get practice public speaking!

Types of Opportunities

2. Research Experiences for Undergraduates (REUs)

- a. NSF funds a large number of research opportunities for undergraduate students through its REU Sites program. An REU Site consists of a group of ten or so undergraduates who work in the research programs of the host institution. Each student is associated with a specific research project, where he/she works closely with the faculty and other researchers. Students are granted stipends and, in many cases, assistance with housing and travel. Undergraduate students supported with NSF funds must be citizens or permanent residents of the United States or its possessions. An REU Site may be at either a US or foreign location.
- b. [Refer to this spreadsheet](#) for listings of physics, astronomy, and STEM education REUs. Note the different tabs at the bottom of the spreadsheet.



REU: How to Pick a Program



- Astronomy: https://www.nsf.gov/crssprgm/reu/list_result.jsp?unitid=5045
- Physics: https://www.nsf.gov/crssprgm/reu/list_result.jsp?unitid=69

- Read about each program and ask yourself:
 - Do I want to live in this location all summer?
 - Does the research they offer interest me?

- If you answered yes to both questions, APPLY! It's free!

Types of Opportunities

3. Other Programs and Internships

- a. [Refer to this spreadsheet](#) for listings
 - i. National or International (select tabs at bottom of spreadsheet)
 - ii. Opportunities for international students or green card holders
 - iii. Opportunities for seniors and post-bac
- b. Industry internships- Raytheon, SpaceX



TIMESTEP Opportunities- open to international students

1. Research Apprenticeship

The program provides 2nd year U of A astronomy and physics majors a paid opportunity to build technical and professional skills that are transferable to both research and industry. Through weekly professional development workshops, along with skills-building projects in a lab overseen by a faculty advisor, the program teaches the necessary computing and hardware skills for students to land competitive positions.

Applications open in April for the next academic year.

2. Summer Tech Internship

These summer internships with local employers help U of A STEM majors make money doing work that is relevant to their studies and future careers, while aiding them in making informed decisions about their path after graduation.

Applications open in February for summer positions.

Juniors and advanced sophomores can apply.



Catch 22: To get a research position you often need to have a research position

- [TIMESTEP Research Apprenticeship](#)
- [CATalyst studios](#) - maker skills workshops (soldering, 3D printing, CNC)
- Faculty Group Meetings + reading project



Applying for Multiple Opportunities: Organization

- Create a spreadsheet with the following information
- As you *submit* things, change them to green; when fully done, ~~do this~~. Or, have two spreadsheets and delete finished items from one (keep other full to retain all information)

Program	Deadline	Personal Statement	Refs	Website	Other
Program 1	2/04/24	3 pages	Ref1, Ref2	Link 1	Full CV
Program 2	4/29/24	1 page	Ref1	Link 2	Supplemental Qs
Program 3	2/15/24	800 words	Ref1, Ref2, Ref3	Link 3	Supplemental Qs

Activity 1: Organization is key!

- Make a plan with timelines and requirements for the programs/faculty research groups you're interested in
- Create a system to keep track of applications and letters of reference/emails to faculty
- Using a Google Sheet will allow letter writers to mark when they have submitted your letters (still double check or follow up with a thank you email)
- Make a copy of [this spreadsheet](#) or make your own



Activity 2:

Work on CV

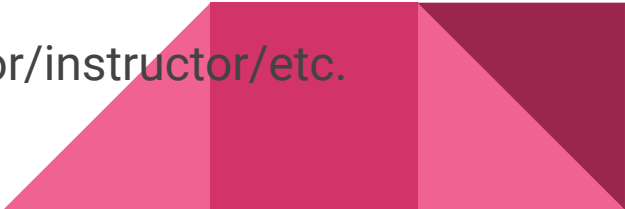
Work on Email Requests to Reference Letter Writers

Work on Research Statement (if needed)

Work on Email Requests to Faculty/Postdocs for Research



Email Etiquette

- Be specific and look into the person's research – don't send a generic email that could be sent to anyone.
 - Include honorifics in the greetings -> Hello Dr. Or Hello Prof.
 - Check your spelling !!
 - Don't write an essay.
 - Write to PDs or PhD students in the group. Ask how it's like and whether there are undergrad projects. Ask to meet and ask them about their research. PDs and PhDs have much, much, much more time... and get orders of magnitude fewer emails
 - Try to get an introduction from your academic advisor/instructor/etc.
- 

Email to professor- interest in research

- Include:
 - Who you are- year, major(s), any previous research
 - Your interest- Why this person? What do you find interesting about the research?
 - The request- to set up a meeting to learn more about their research, and ask if there is any opportunity to work with their research group or attend group meetings
 - Attach CV and transcript
- Possible responses
 - You can come to the group meetings to learn more
 - Let's get together to talk about my research
 - I have research opportunities I can discuss with you
 - I don't have time to consider this
 - No response
 - send 1 follow up email 1 week later, then let it go until next semester
 - If they have office hours, you could catch them then

Hi Dr. Besla,

An example

My name is XX, a freshman in Astronomy at the U of A. You **might remember me from** one of the TIMESTEP meetings and some of my e-mails in which I also asked about TIMESTEP.

Recently, I was **browsing through the faculty list** when I came across your and Nico's research paper about the Large Magellanic Cloud and its influence on the Milky Way. Though I could understand no more than 5% of the paper, I liked the ideas behind it, especially the part about galactic tides, **which reminds me of the articles on galactic tides that I read for my final project last semester**. I **reached out to Nico** and had a conversation with him this afternoon, where he **told me about stellar streams and the planes of satellite galaxies problem**, both of which were fascinating. Given that your areas of interest include galaxy formation, I **wonder if you tend to focus on topics like the one in the above-mentioned paper or the ones as told by Nico, and if yes, might there be any part of your research that I can take part in next semester as a sophomore?**

Admittedly, I am not well-versed in galactic archaeology at all; I am simply writing this out of a pure fascination for your group's research paper. Still, **I would love to discuss this topic with you sometime and see if it might be possible to work in your group.**

Thank you so much for your time. I look forward to hearing from you soon!

Best regards,

XX



CV- Curriculum Vitae


- Education
 - Research Experience
 - Publications (if any)
 - Presentations (if any)
 - Honors and Achievements
 - Teaching Experiences
 - Employment History
 - Important Extracurriculars
(leadership positions)
- [LaTeX CV Template](#)
 - [Word CV Template](#)



References

- Can be professors, research advisors, supervisors, etc.
 - Be aware of what kind of program you're applying to!
- Contact them now!!!
 - "Dear Dr. XXX,
I am applying for ** program for summer 2024. Would you be able to write a strong letter of recommendation for me? The first deadline is XXX. I can send you my personal statement and CV for reference. Thank you.
Your name"
 - Provide a concise document of which programs you're applying to, including the deadline and how to submit the LOR (link to a form they'll fill out, or they may be sent an email with instructions)
- Give reminders
- Invite them to any presentations if possible
- Organizing [Template for letter writers](#)

Statements

- Introduce yourself
 - Research/related experience - explain that you will succeed because you have research skills
 - Should demonstrate intellectual merit and passion for astronomy/physics!
 - Who do you want to work with at a particular school/program? Why?
 - Use this [Research Statement Template](#)
 - Have others read your statements!
→ TIMESTEP's workshop in January - date TBD
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Work on one or more of these options

- Identify summer research opportunities- REUs, internships- you want to apply to
- Identify faculty you'd like to work with
- Work on CV
- Work on Email Requests to Reference Letter Writers
- Work on Email Requests to Faculty/Post docs for Research
- Work on Research Statement





Applying for Research Opportunities

Please complete this
post-meeting survey →

