

Physics Summer Research Awards

For Summer 2025

Awards we are talking about today:

- NSERC USRA (Undergrad Summer Research Award)
 - Canada federal government
- McGill Science SURA (Science Undergrad Research Award)
 - McGill Faculty of Science
- TSI Undergrad Research Award
- Values vary, but minimum is \$8700 for the summer
 - (this number is not yet updated for 2025, but last year the amount was \$8700 and this year it will probably be a little more)

Other relevant sources:

- The Physics summer projects are here:
<https://www.physics.mcgill.ca/ugrads/usra/>
 - This page also contains links to the **NSERC website** and the **McGill pages for the USRA and the SURA**.
 - The projects will be updated in the coming weeks.
- Previous info session slides about the research courses cover approaching profs too:
<https://www.physics.mcgill.ca/ugrads/researchcourses.pdf>
 - (this info and more is on our undergrad webpages)

Who can apply?

NSERC USRA (\$8700 min):

- Canadian and permanent resident students studying at Canadian universities

McGill SURA (\$8700 min):

- International students
- B.Sc or B.A&B.Sc
- Canadian/permanent resident students are automatically considered

Application (NSERC USRA + McGill SURA)

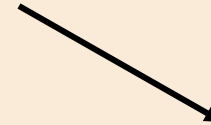
Who do you want to work with?

- Research interesting professors
- Prep CV, get unofficial transcript handy



Contact professors

- Attach CV and transcript
- Ask to meet



Canadian/PR students, NSERC USRA:

- Fill out NSERC form 202 (part 1 only)
- Include
 - Official transcript
 - Prioritized list of professors/projects
 - One-page statement

Submit to NSERC AND

Louise at chairsec.physics@mcgill.ca

Canadian and International students, McGill SURA:

- Fill out SURA form (part 1 -student only)
- Include
 - Official transcript
 - Prioritized list of professors/projects
 - One-page statement

Submit SURA form AND documents to

Louise at chairsec.physics@mcgill.ca

Step 1: Look up profs (to find out what they do).

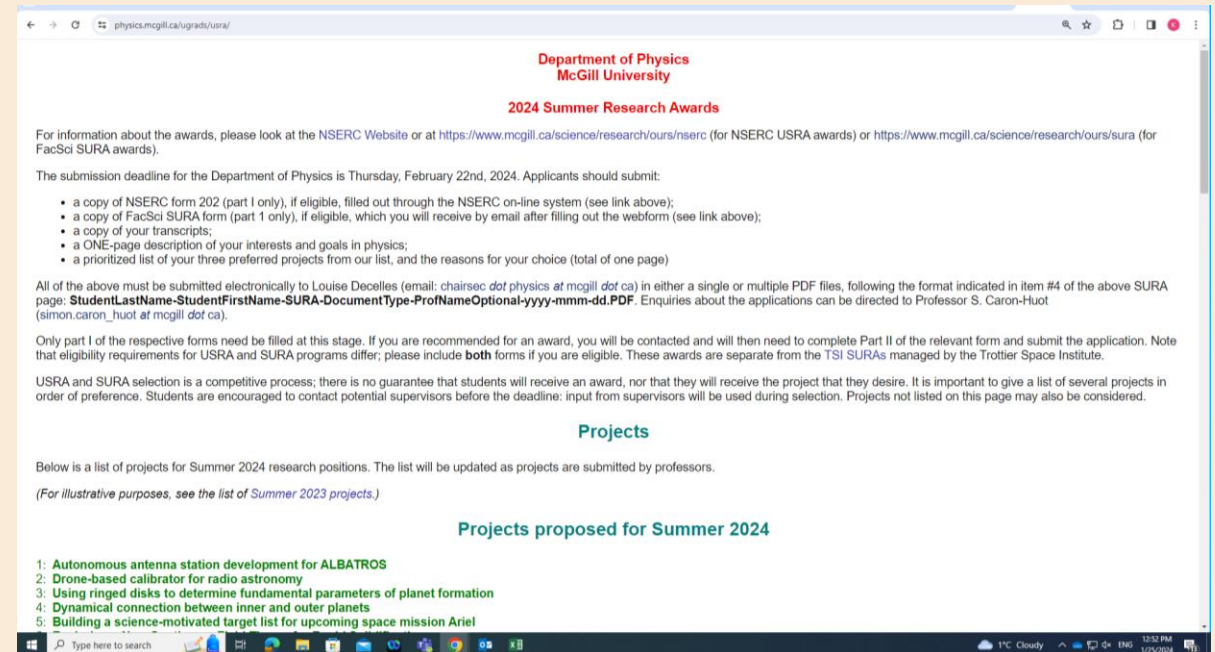
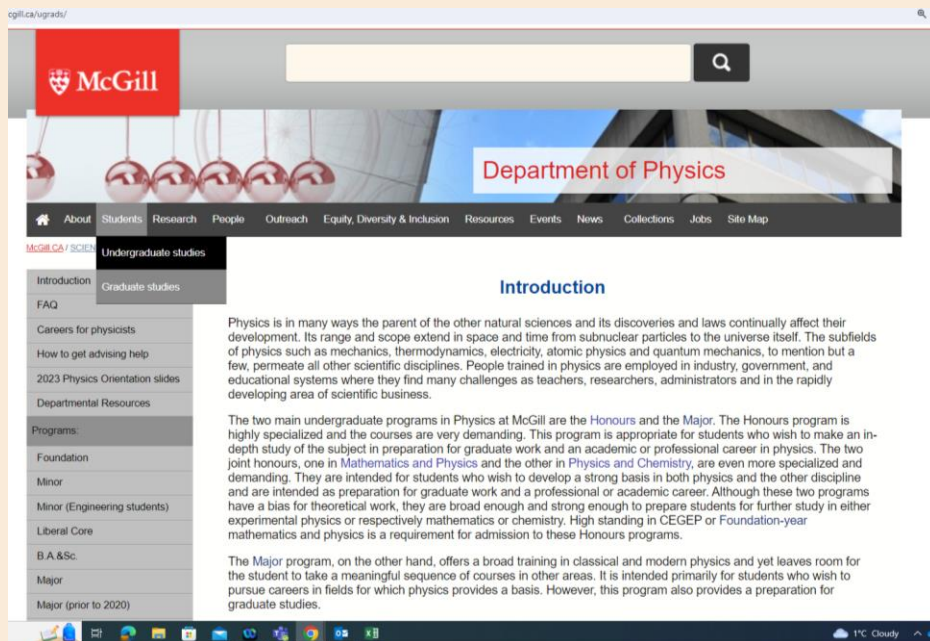
Step 2: Ask to meet/interview with profs (you are looking for projects that are a good fit for your interests and skills).

Step 3: Once you have some ideas, fill out forms, listing the projects and professors posted.

Deadline: Feb 21, 2025. Contact person, Prof. Walter Reisner

Where to find physics projects + application details:

- Physics webpage -> Students -> Undergraduate studies -> Summer Research Awards (on the left near the bottom)



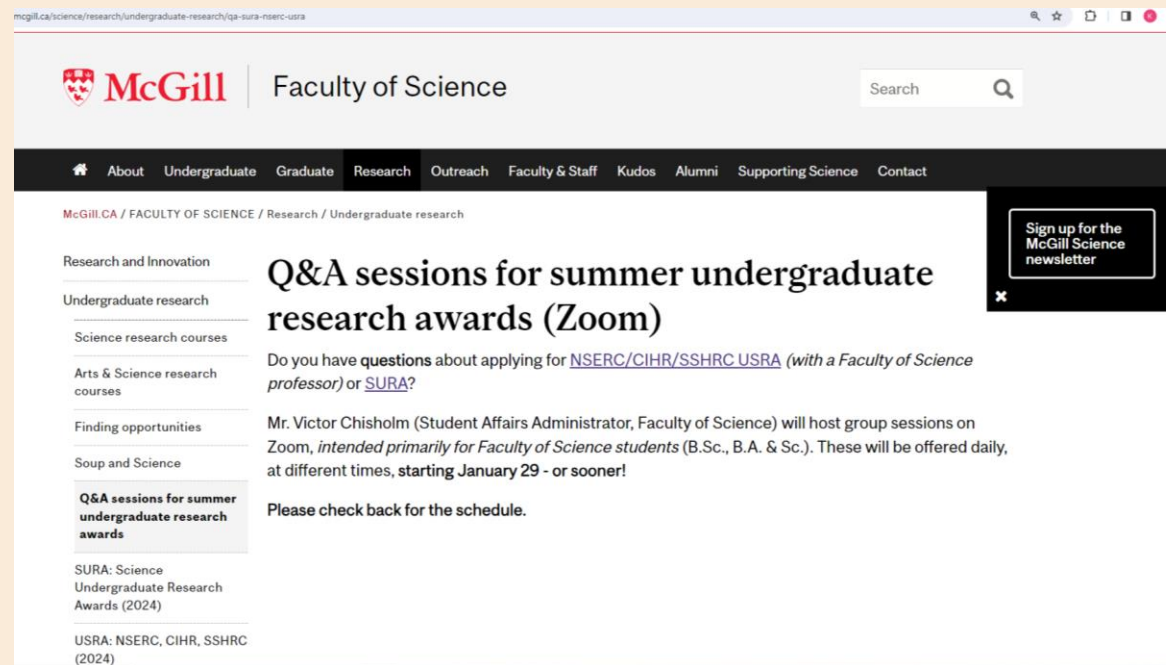
- Don't see the prof you want to work with? You can reach out to them anyway.

Applications:

- Once you have talked to profs and tried to figure out which project(s) might be the best fit for you, you can now write your interest statement accordingly and can list your preferred projects on the application.
- If there is a prof you are interested in working with but they didn't post a project (and they don't specifically say they're not taking students this summer), you can always reach out to them anyway and ask if they'd be willing to talk about a potential summer project.

More info:

- More info (besides Prof. Reisner)
 - Please read the McGill websites for the USRA and SURAs carefully
- McGill – Faculty of Science – Undergrad research. Menu at the side for Q&A sessions for summer undergrad research awards



USRA + SURA Selection Criteria:

- Academic excellence
 - (grades, mainly)
- Research potential
 - (relevant skills and experience, can include "non-physics" experience too)
- Expected quality of the training and mentorship

Interest Statement:

- One page max
 - Interests and research goals
 - What are you interested in learning more about? A particular field (astro, condensed matter?) or maybe in experimental work or theory?
 - If you're excited about something based on talking with a prof, that's the topic you'll mention.
 - How can you imagine that the working experience from the summer might affect any future science/research goals you might have?
 - Which profs are you interested in and why?
- ✓ Put some thought and effort into writing this.
- ✗ Please do not say, "Ever since I was a child, I dreamed of..."

Reference Letters:

- Not needed for the SURA/USRA application.
- Your CV will note any research or otherwise relevant experience and profs can follow up if they want.

A research project

- Usually considered full-time
- 15-16 weeks (depending on agreement with supervisor)
- Projects vary a lot
 - Who will you work most closely with?
 - What will be your contribution to a larger project?
 - You will **not** be left totally on your own.
 - You will need to find a balance between showing initiative/trying to solve problems and getting help when stuck.

What if you don't get an award?

- It does **not** mean that you have no hope as a researcher or physicist.
- A prof may still be able to pay you through research funds.
- You may open the door for a research project during the year.
- Apply again next year – you will have learned more in courses and be more prepared for the application process. You will also have a prepped research statement and CV that you can edit/update.
- Also see the Faculty of Science Undergraduate Research page for other potential opportunities:

<https://www.mcgill.ca/science/research/undergraduate-research>

FAQs:

Can U1's apply?

- Yes.
- You **cannot** use your CEGEP transcripts.
- For NSERC USRA, you need to have been enrolled at least since the fall term though, since you need university transcripts. *Maybe* for SURAs, it might be OK if you started this winter, but your application would have to be pretty strong.

FAQs:

Can U1's apply?

- Yes.

Should I bother if I don't have straight-A's? Not in an honours program?

- Yes. GPA is only one criteria and there is no official GPA cut-off
- Also important: are you a good fit for the project?
 - Relevant skills (programming, etc)
 - Interested and engaged
 - Research potential

FAQs:

Can U1's apply?

- Yes.

Should I bother if I don't have straight-A's? Not in an honours program?

- Yes. GPA is only one criteria and there is no official GPA cut-off

Can I apply for more than one?

- Yes. You can apply for TSI, and USRA and SURA (Canadian/PR students applying for USRA will automatically be considered for SURA but still have to fill out the SURA form). These don't include summer jobs at other places.

FAQs:

Can I apply to more than one school?

Yes.

- You must apply directly to the institution where you would like to hold the award. However, please note that it is the institution's choice whether to accept candidates from other institutions.
- Note that this applies to NSERC USRAs. SURAs are McGill-based.

FAQs:

Can I apply for a USRA or SURA in another department?

Yes.

- Check the relevant department for application details and deadlines. Many departments have earlier deadlines than Physics!
- Talk to professors – other departments often require a project description to be handed in with the application.

FAQs:

Can I apply for a USRA or SURA in another department?

Yes.

Can I apply for a project in physics *and* a project in another department at McGill?

- Technically, yes.
- Keep in mind that in other departments, profs make a commitment. You risk burning a bridge by turning someone down. (But you are not beholden to work with someone if you have a preferred offer somewhere else.)
- You would fill out one USRA application or two SURAs

FAQs:

Do I really have to talk to profs?

- Yes. But you can prepare!
- Check the websites of the profs with whom you are interested in working to see if they say how they prefer to handle these applications (and if they say if they are taking students).
- Generally, you should at least try.
 - You *can* just make your preferred projects/professors list without having talked with any of the professors.
 - At some point, professors will get a list of students that listed them on their preference sheets and will have to rank the options.

FAQs:

How do I approach profs about research?

1) Check out listed projects, look up what profs do

Projects proposed for Summer 2023

1. Observing Pulsars and Fast Radio Bursts with CHIME
2. Drone-based calibrator for radio astronomy
3. Autonomous antenna station development for ALBATROSS
4. Disorder-Averaged Conformal Field Theory and Quantum Gravity
5. Making Nanopores for Single Molecule Studies with Tip-Controlled Local Breakdown
6. DNA in a Box: Studying Interactions of Multiple Polymer Chains in a Nanocavity
7. Maximizing multi-messenger gravitational wave + light astrophysics with the Canada-France-Hawaii Telescope
8. Understanding the multi-wavelength emission mechanisms in submillimetre black hole binaries in our Galaxy
9. Constraining star formation rates in elliptical galaxies with SPT/LE and MUSE
10. Stellar Monitoring with CHIME
11. Calculating gate efficiency and gate capacitances in semiconductor quantum dots
12. Data analysis from the VERITAS Very High Energy Instrument using open source packages
13. Effective method for calculating electron-phonon scattering in nanostructures
14. Understanding the observed diversity in the atmospheric composition of Neptune-class planets

Project Descriptions

Proj 1: Observing Pulsars and Fast Radio Bursts with CHIME

Fast Radio Bursts are a new and mysterious astrophysical phenomenon in which short (few ms) radio bursts appear randomly in the sky. FRBs are thought to be extragalactic due to their dispersion measures that are far higher than the maximum amount available in our Milky Way. With FRB event rates of ~1000 rky/day, they raise an interesting puzzle regarding their origin, which lie at cosmological distances. Radio pulsars are rapidly rotating, highly magnetized neutron stars. As compact objects, they embody physical extremes of gravity, density and magnetic field. Thanks to their amazing clock-like properties, radio pulsars can be used as cosmic laboratories for a variety of experiments ranging from tests of relativistic gravity to studies of the interstellar medium.

The Canadian Hydrogen Intensity Mapping Experiment (CHIME) is a new radio telescope recently built in Perimeter, BC. CHIME's great sensitivity and large field-of-view (250 sq deg) enable the detection of many FRBs per day — in contrast to the fewer than 2 dozen discovered since 2007. CHIME is also an excellent pulsar observatory, able to detect hundreds of pulsars every day and enabling novel experiments using these high cadence observations.

Here are proposed several possible research projects involving data from CHIME. Possibilities include improving FRB characterization, studying repeating FRBs, localizing FRBs, monitoring radio pulsars, and developing software tools to search for pulsars with CHIME.

The student who should have experience and familiarity with programming in the Linux environment, will be given astrophysical data sets from CHIME to first familiarize themselves with source properties. Then, depending on exact interest, will analyze existing data obtained in order to understand FRBs or the radio pulsar population, or help develop and test new algorithms for our new pulsar searching pipeline.

For more information contact: Victoria Knapik (vknapik@physics.mcgill.ca)

Posted on 2023/01/12

Proj 2: Drone-based calibrator for radio astronomy

This project will focus on the development of a flexible drone-based calibrator that will be used for characterizing radio astronomy instruments. Many radio astronomy experiments employ stationary telescopes (dishes or antennas) that are sited in remote locations. One of the most important aspects of radio telescope characterization is the measurement of the spatial response on the sky, or the "beam pattern". Because stationary telescopes are unable to actively re-point and scan over celestial sources, the only way to obtain complete beam pattern information is to move a source relative to the telescope, scanning the full field of view. One solution to this problem is to use a drone that carries a transmitting source and antennas. By developing multiple transmitters and antennas, this calibration platform can service radio astronomy experiments operating over a wide range of frequencies.

The student who takes on this project will have the opportunity to work on a variety of tasks related to the development of drone-based calibrator. Possible areas of work include refining the construction of the custom-built drone (e.g., testing new flight controllers, implementing differential GPS), designing new antennas/transmitters for low-frequency operation, developing software tools for analyzing drone flight data, and participating in drone test flight campaigns both locally and at field sites (e.g., Uppstake Station and ORAO).

For more information contact: Cynthia Chiang (chiangc@physics.mcgill.ca)

Posted on 2023/01/16

Proj 3: Autonomous antenna station development for ALBATROSS

Department of Physics

McGill CA / SCIENCE / DEPT

By Research Areas

By Research Centres

Introduction

Physics is in many ways the parent of the other natural sciences and its discoveries and laws continually affect their development. Its range and scope extend in space and time from subnuclear particles to the universe itself. The subfields of physics such as mechanics, thermodynamics, electricity, atomic physics and quantum mechanics, to mention but a few, permeate all other scientific disciplines. People trained in physics are employed in industry, government, and educational systems where they find many challenges as teachers, researchers, administrators and in the rapidly developing area of scientific business.

The two main undergraduate programs in Physics at McGill are the Honours and the Major. The Honours program is

Does the lab do Biophysics? Astrophysics? In-lab experiments? Theory? Simulations? Instrumentation design/building? What combinations of these?

FAQs:

How do I approach profs about research?

2) Prep your CV to highlight relevant skills

- Don't have relevant research experience?
 - You may have relevant skills! Do any hobbies apply? Courses you did well in? Previous jobs or experience that required initiative and/or leadership and/or problem solving are good too.
 - For example, do you play a sport or musical instrument that you had to practice at to get better? Did you have a summer job working with kids or in retail (maybe that shows that you are responsible)?

FAQs:

How do I approach profs about research?

3) Send CV and transcripts to interesting profs, ask to arrange a meeting to talk about summer projects.

You can also approach profs after class or during their office hours – it depends on the prof.

FAQs:

Talking to profs:

Try to remember that profs are people too. Many like talking to students and like talking about their research. If they posted a project, they're hoping a student is interested in it.

Similar to a job interview: seem engaged and interested. Maybe think of some questions (questions do not have to be about specific things, like that variable in equation 3 in their paper. They can be general, like maybe what programs do they use for data analysis, etc).

You do **not** have to be an expert in the prof's work! They may require relevant background knowledge or skills, but it's important that you are a keen learner and demonstrate potential to be a good researcher.