Physics Summer Research Awards

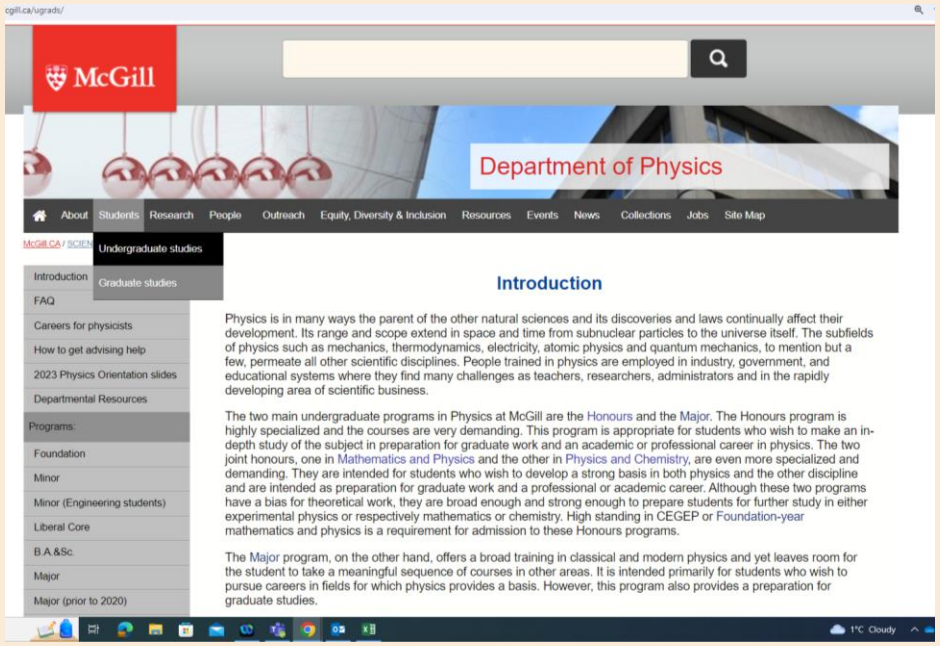
For Summer 2024

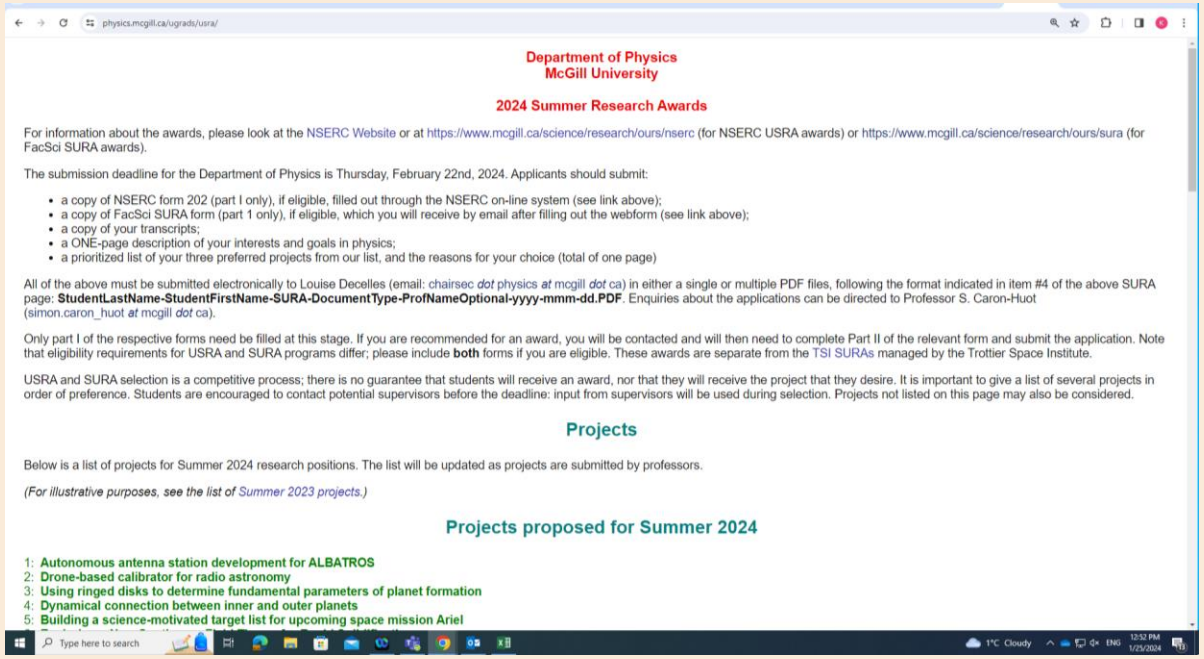
Awards we are talking about today:

- NSERC USRA (Undergrad Summer Research Award)
- McGill Science SURA (Science Undergrad Research Award)
- TSI Undergrad Research Award

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. Some profs may post a project if they know someone wants to work with them.

Who can apply?

NSERC USRA ($8700 min):

- Canadian and permanent resident students studying at Canadian universities
- Eligible Black and Indigenous students are encouraged to apply

McGill SURA ($8700 min):

- International students + Canadian and PR resident students
- B.Sc or B.A&B.Sc

TSI Undergrad Award ($8300):

- All students

NOTE: A student would submit two sets of applications at most: one for TSI and a second for USRA+SURA. There are separate forms for the USRA and SURA applications (for Canadian/PR students), but they are submitted at the same time, and what differs is only a basic form. The rest of the application is the same).

Application (NSERC USRA + McGill SURA)

Who do you want to work with?
- Research interesting professors
- Prep CV, get transcript handy

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Contact professors
- Attach CV and transcript
- Ask to meet

Canadian/PR students*

↓

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

Submit to NSERC AND
Louise at chairsec.physics@mcgill.ca

Canadian/PR students*
International students

↓

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

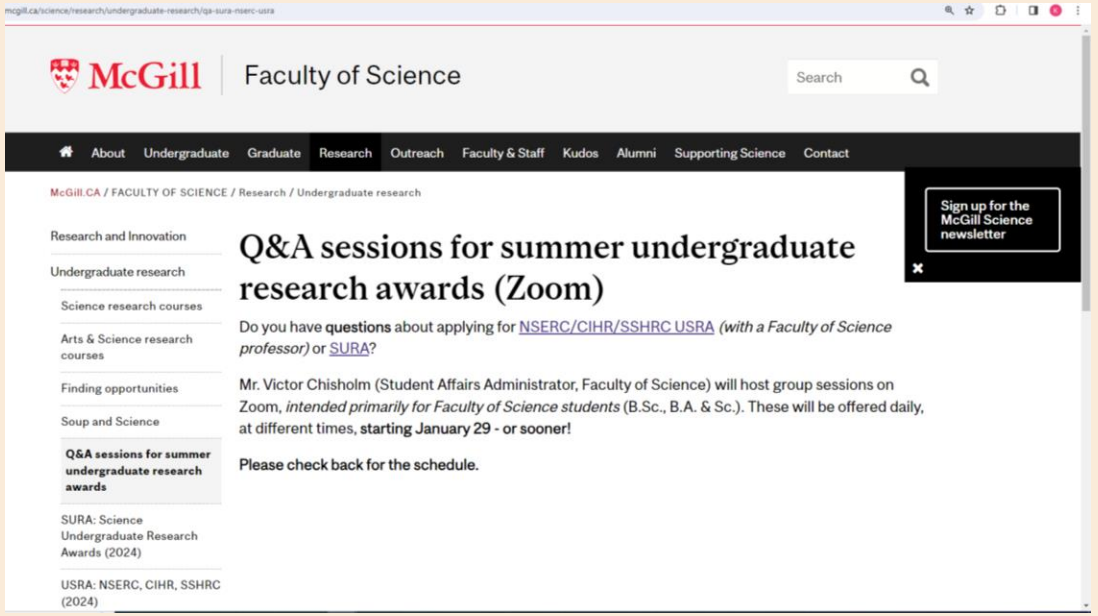
Submit SURA form AND documents to
Louise at chairsec.physics@mcgill.ca

Deadline: Feb 22, 2024. Contact person, Prof. Simon Caron-Huot
***Canadian/PR students submit USRA + SURA forms at the same time.**

More info:

- More info (besides Prof. Caron-Huot)
  - Please read the McGill websites for the NSERC USRA and McGill SURA carefully

- McGill – Faculty of Science – Undergrad research Drop-in Zoom Q&A schedule dates are available for 2024



USRA + SURA Selection Criteria:

- Academic excellence
- Research potential
- Expected quality of the training and mentorship

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.

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?

- ✓ Put some thought and effort into writing this.
- ✗ Please do not say anything like, "Ever since I was a child, I dreamed of..."
- You don't need this completed when you first approach profs. It is submitted as part of your application, after you have talked to profs and are ready to apply.

What if you don't get an award?

- There is a finite number of awards; lots of students will not get one. It's OK.
- 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 research statement and CV already prepared that you can edit/update.

- Also see the Faculty of Science Undergraduate Research page for other potential opportunities:

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.

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, since you need university transcripts. For SURA, it *might* be an option to apply if you started in the winter if the application is really strong. Please check the McGill SURA website and confirm this at the Q&A sessions.

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 important, but only one criteria and there is no official GPA cut-off.
- If a professor agrees to supervise you, you can work together to write a strong statement, which could help if your GPA is not as high as other students'.
- What matters in addition to GPA is: 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 a TSI, and for USRA and/or SURA (Canadian/PR students applying for USRA will submit a SURA application at the same time). These don't include summer jobs at other places.

FAQs:

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

Yes.

- Check the relevant department for application details and deadlines.
- 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?

- Technically, yes.
- In reality, be mindful that in other departments, profs make a commitment when the application is submitted, vs a ranked list then some match-making process.
- You would fill out one USRA application or two SURAs.

FAQs:

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

Yes.

- You would apply for the award through that school.
- Talk to the relevant profs and follow that school/department's application deadlines and procedures.

FAQs:

Do I really have to talk to profs?

- You should at least try.

➢ You *can* just make your preferred projects/professors list without having talked with any of the professors. Some profs will post a project on the website and then never reply to emails.

➢ At some point, professors will get a list of students that listed them on their preference sheets and will have to rank the options. Will they recognize your name (from a class or meeting)?

FAQs:

Argh! Fine! I'll talk to profs! How do I do that?

1) Check out listed projects, look up what profs do
   - Does the lab do Biophysics? Astrophysics? In-lab experiments? Theory? Simulations? Instrumentation design/building? What combinations of these?

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 ALBATROS
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 stellar mass black hole binaries in our Galaxy
9. Constraining star formation rates in elliptical galaxies with SITELLE and MUSE
10. Blazar 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 /sky/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 Penticton, 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 Kaspi (vkaspi *at* physics *dot* mcgill *dot* ca).

Posted on 2023/01/12

Proj. 2: Drone-based calibrator for radio astronomy

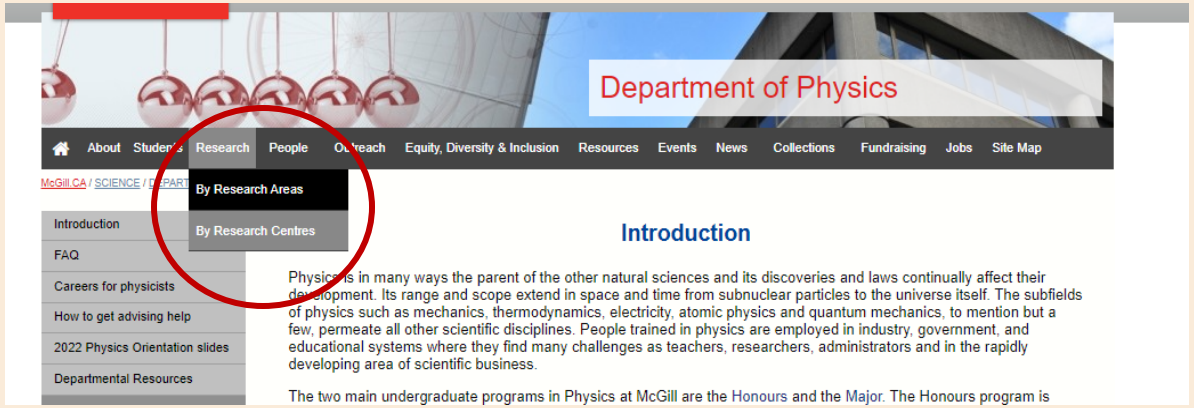
This project will focus on the development of a flexible drone-based calibrator that will be used for characterizing radio astronomy instruments. Many radio astronomy experiments employ stationary telescopes (dishes or antennas) that are sited in remote locations. One of the most important aspects of radio telescope characterization is the measurement of the spatial response on the sky, or the "beam pattern." Because stationary telescopes are unable to actively repoint 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 antenna. 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., Ukpiskha Station and DRAO).

For more information contact: Cynthia Chiang (chiang *at* physics *dot* mcgill *dot* ca).

Posted on 2023/01/16

Proj. 3: Autonomous antenna station development for ALBATROS



FAQs:

Argh! Fine! I'll talk to profs! How do I do that?

2) Prep your CV to highlight relevant skills

- Keep CV well-organized and clean.
- Don't have relevant research experience? You may have other good qualities or skills.
  - Do any hobbies apply (e.g. mechanical skills or problem solving)? Courses you did well in? Previous jobs or experience that required initiative and/or leadership are good, as is anything demonstrating that you can finish or make progress on something you started.

FAQs:

Argh! Fine! I'll talk to profs! How do I do that?

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

- The email is succinct: brief introduction, why you would like to work with them in the summer, that you'll apply for an award, would they be willing to meet with you, see attached transcripts + CV.
- If you think you have a super relevant skill/experience, you can mention it briefly in the email, refer to CV.
- Subject line is clear.
- You **don't** need the Interest Statement prepared at this time.
- You can also approach profs after class or during their office hours – it depends on the prof.

FAQs:

Talking to profs:

Similar process to a job interview. Seem engaged and interested. Maybe think of some questions. These could include things you don't understand but are curious about.

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