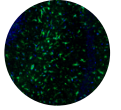


Read below to learn from student researchers about their experiences in research. These researchers have their work featured in our *Featured Research Images* segment.

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## Katherine Souter | 4<sup>th</sup> year, Neuroscience



“Research teaches us to think critically about a problem and adapt to failure, which is useful in any field.”

### **What projects have you worked on? Do you have any ongoing projects?**

Over the past year I have been working on my undergraduate honors thesis in neuroscience studying a genetic mouse model with a deletion of bone morphogenetic protein 7 (Bmp7) from the meninges. This mouse develops hydrocephalus, and we are trying to figure out why this occurs. This project emphasizes the importance of the meninges not just as a physical barrier for the central nervous system, but as a source of signalling factors during neurodevelopment. I am also working on a project investigating the roles of Bmp2 and Bmp7 in development of the cranial base, which is a collection of bones that sits beneath the brain. Formation of the cranial base is critical to support the brain and allow passage of blood vessels and cranial nerves.

### **What specific advice would you give to younger people who are interested in scientific research?**

Don't be afraid to give it a try! Everyone starts with no lab experience, and as long as you are in a supportive lab and work hard, you can succeed in research.

### **What would you change, if anything, about undergraduate research opportunities?**

I was very lucky to attend a lab tour during the first year of my degree which led me to joining my current lab. I feel that increasing accessibility of research to all students would be beneficial.

### **In regard to your research, who has influenced you the most?**

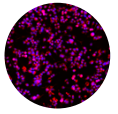
My supervisor Dr. Daniel Graf and my mentor Daniela Roth. Dr. Graf has consistently pushed me to become the best researcher I can be, and I have grown so much both as a scientist and as a person through his mentorship. Daniela has trained me in almost every lab skill I know and has become a lifelong friend. She inspires me to find the fun in science!

### **Do you believe all students can benefit from carrying out scientific research regardless of their educational backgrounds? If so, why?**

Definitely! Research teaches us to think critically about a problem and adapt to failure, which is useful in any field. Also, it is never too late to get involved with research.

### **Tell us about a moment that has stood out to you in your research career!**

Defending my honours neuroscience thesis was the culmination of years of training and many long days in the lab. It was exciting to share the results I worked so hard to collect.



“Science is not done by individuals,  
but collaborative teams.”

**Tell us about your research!**

My undergraduate research project focused on immunometabolism of microglial cells. Microglia are immune cells in the brain that are finely tuned to respond to pathogens and to maintain homeostasis. Microglia engulf microbes, apoptotic cells, debris, and harmful species like amyloid- $\beta$  plaques, preventing malformations in the brain. However, in neurodegenerative diseases chronic inflammation of microglia can threaten brain integrity. During the past year, I explored mechanisms controlling the switch from inflammatory to neuroprotective state in microglia. In particular, I found lactate and cannabidiol (CBD) to be putative anti-inflammatory compounds in microglial cell culture.

**What interests you about this field?**

Molecular biology has always fascinated me because of its complexity and how everything fits together as by design. This field explores the structure and interaction of cellular molecules, which is essential for understanding how life works on its most fundamental level. I am most interested in the role those molecules and pathways play

in pathogenesis and developing therapeutic strategies that interrupt those mechanisms.

**What have you learned from your research experience?**

When we learn content in classes, we often perceive it as static, imperishable knowledge. However, my research project taught me how fluid and ever-changing science is. I now know that the discoveries we learn about in class required efforts of countless scientists. We often want to celebrate a single researcher for a breakthrough, but the truth is that behind those inventions there have been tens of scientists. It is essential to remember that science is not done by individuals, but collaborative teams.

**In regard to your research, who has influenced you the most?**

During my undergraduate research, I had a privilege of being supervised by Dr. Matthew Churchward, a member of Faculty of Science in Concordia University of Edmonton. His expertise in Biochemistry and Neuroscience have been invaluable, and it was under his guidance that I learned how to critically compare study data with authors' conclusions. He has also emphasized the importance of visual science communication, often quoting “the picture is worth a thousand words”. Dr. Churchward has been nothing but supportive and helpful throughout my entire project, and I truly wish that everyone had a chance to work with such great mentor.



“In research, it is very common to  
make mistakes, but it allows us to  
better understand what to do and  
not to do.”

**Tell us about your research!**

My research is focused on agrivoltaics, a technology that involves installing solar panels above crop cultivation to allow for the simultaneous generation of electricity and crop production in the same location. This approach offers numerous benefits, including water savings, efficient land use, and addressing issues related to food security and climate change. For my research, I am

conducting an experiment to compare the performance of agrivoltaic systems using different types of solar panels and spinach crops. The objective is to evaluate whether agrivoltaic systems are more beneficial than separate solar and crop production and determine the most suitable type of solar panel for these systems. Ultimately, I aim to disseminate this research to both academic and non-academic audiences to increase awareness about agrivoltaics and encourage wider adoption of this sustainable practice in homes.

### **Have you made any interesting findings?**

My experiment is still ongoing, so I do not have final results yet. However, I have made some interesting findings so far. One of these is that agrivoltaic systems consume less water compared to growing crops without solar panels. This is an important advantage, as water scarcity is a global issue nowadays. Additionally, I have observed that the crop yield in agrivoltaic systems is very similar to that of conventional crop cultivation. As the experiment continues, I look forward to uncovering more insights that will further support the potential of agrivoltaics as a sustainable technology.

### **Why is your research important?**

My research is important as it aims to address two critical global issues: food security and climate change. Agrivoltaics can provide similar or even better crop yields and quality for certain crops, such as spinach, resulting in more efficient and productive crop yields. Additionally, by generating electricity from renewable sources, such as solar energy, agrivoltaic systems can contribute to mitigating climate change impacts. Therefore, this research will contribute to ensuring food security and combating climate change, which are essential for the well-being of present and future generations.

### **If you could have all the funding (grants) to carry out your research, what would you do?**

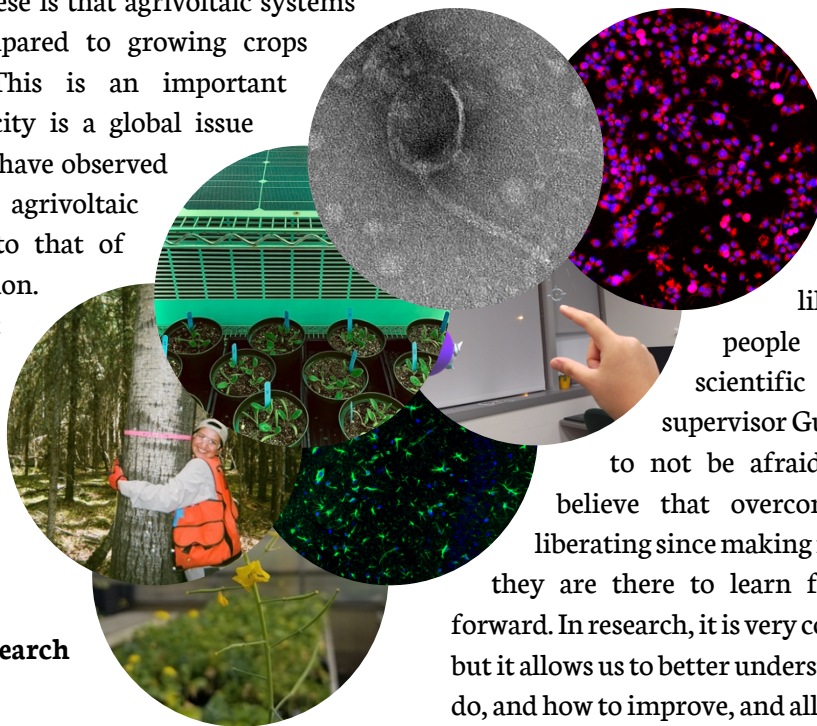
If I had all the funding to carry out my research, I would expand it to evaluate the performance of agrivoltaics with other crops that currently do not show adequate results. I believe that agrivoltaics is a new technology that will be necessary in the near future, so it is important to identify key factors that need to be changed to allow for the growth of various crops under these systems. This would involve conducting experiments to determine the optimal panel height, spacing, and shading strategies for different types of crops. By expanding the research in this way, we can further demonstrate the potential of agrivoltaics to contribute to a sustainable future.

### **What specific advice would you give to younger people who are interested in scientific research?**

The best advice I would like to give to younger people who are interested in scientific research is the one my supervisor Guillermo gave me, which is to not be afraid of making mistakes. I believe that overcoming this fear is very liberating since making mistakes is inevitable, and they are there to learn from, correct, and move forward. In research, it is very common to make mistakes, but it allows us to better understand what to do and not to do, and how to improve, and all of this is a lesson not only for the researcher but also for other future researchers.

### **What has been the most challenging part of your research career thus far?**

The most challenging part of my research career thus far has been traveling to a country as far away as Canada to conduct my research, as a Peruvian researcher. At the beginning, it was a big change for me as it was my first experience conducting research abroad, and I found myself in a culture that was different from my own. However, I have been amazed by the University of Alberta, its facilities, and the countless research opportunities here. I have met many professionals and



expanded my knowledge in research, but I also believe that this experience has allowed me to grow a lot as a person. I will always be grateful to the Emerging Leaders in the Americas Program (ELAP) and Professor Guillermo Hernandez Ramirez for providing me with this opportunity, and to the University of Alberta for being my host university for conducting this research.

### **What part of research do you enjoy most?**

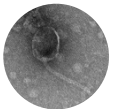
What I have enjoyed the most about this research is seeing the theory put into practice. I believe that what amazes a researcher the most is seeing their research come to life, and this is something that I have been able to achieve thanks to the support of Professor Guillermo Hernandez Ramirez and being a part of the Sustainable Land Ecosystems Research Group. I was provided with all the necessary tools and inputs to set up and install the experiment, which has allowed me to gain invaluable experience in conducting research and implementing agrivoltaic systems.

### **If you could work in any laboratory in the world, what would you choose? What field of research would you want to be involved in?**

I would love to work at The National Renewable Energy Laboratory (NREL) as it would be an honor to be part of the most prestigious renewable energy laboratory in the United States, given that renewable energy is my area of interest as an undergraduate energy engineering student. I am particularly fascinated by solar energy as a renewable source, and I am convinced that its potential is infinite. I have seen that NREL has worked on Food-Energy-Water Nexus research, and I would like to expand my agrivoltaic research in this laboratory. NREL's commitment to clean energy, innovative research, and cutting-edge technology is truly inspiring, and I would be thrilled to contribute to both their and my mission to accelerate the transition to a sustainable energy future.

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## **Ashlyn Waters | 4<sup>th</sup> year, Biology and Psychology**



**“Stay open to any opportunities that come your way, but also don’t be afraid to create them either.”**

### **Tell us about your research!**

My most recent research position was with Dr. Jonathan Dennis working with bacteriophages. I was a member of the lab for 8 months, first under an NSERC over the summer and then as a BIOL 498 student. One of my projects was finding and characterizing novel bacteriophages against phytopathogenic bacteria (specifically *Erwinia amylovora* and two *Xanthomonas* spp.) using soil screening. My second project was confirming the identity of the receptor for one of the lab’s pre-existing bacteriophages.

### **What projects have you worked on? Do you have any ongoing projects?**

I first got involved in research after my first year with a short, online volunteer position doing video transcriptions for the Gesture Language and Development lab. After my second year, I worked with Dr. John Vederas investigating the breakdown of potential COVID-19 antivirals and apelin analogues by gastrointestinal enzymes. It wasn’t until after my third year that I began working in my field with bacteriophages!

### **Have you made any interesting findings?**

In total, I found at least four potentially novel bacteriophages against phytopathogens, AW1 through AW4. Furthermore, AW1 showed cross-strain infectivity when it was able to infect strains of *Stenotrophomonas maltophilia*, a species that actually is pathogenic to humans. One of the other interesting findings was that

AW3 had a halo plaque morphology, indicating that it secreted a depolymerase.

### **Why is your research important?**

Phage therapy (or biocontrol in the context of plants) is the application of bacteriophages to treat bacterial infections, including those that are resistant to antibiotics. While bacteriophage research isn't a new field, it was largely abandoned with the discovery of antibiotics. However, bacteriophage research is experiencing a revival due to the recent rise of antibiotic resistance, which amplified our need for other methods against bacteria. My research ultimately contributes to the discovery and development of phages for potential use in biocontrol and phage therapy!

### **What specific advice would you give to younger people who are interested in scientific research?**

Stay open to any opportunities that come your way, but also don't be afraid to create them either. I wasn't initially going to pursue the opportunity with the Vederas lab, since I was intimidated to do research in chemistry. Even when I did, I didn't get the position after the interview, but only weeks later when reaching out to seek other opportunities ended up in a conditional offer. In the end, it was a great experience where I met some amazing people and worked on some really interesting research!

Overall, I'm grateful for my diverse research experiences, as they've given me a unique interdisciplinary perspective.

### **What has been the most challenging part of your research career thus far?**

I think this is relatable to most people in research, but definitely working a long time on a project without results. For example, in my project confirming a phage receptor, I spent months troubleshooting a straightforward cloning procedure that wasn't working, only to discover that one of the primers I was using had one nucleotide that was incorrect. It helps in these situations if you have another project you can work on, but you definitely need a level of persistence when faced with unsuccessful troubleshooting.

### **Tell us about a moment that has stood out to you in your research career!**

One of the moments that stood out to me was visualizing two bacteriophages I found, AW1 and AW3, under a transmission electron microscope. Lots of my research has relied on using certain data to infer underlying processes. However, with TEM, I was able to directly observe and analyze what I had spent so much time working on!

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## **Sabrina Strelkov | 4<sup>th</sup> year, Environmental and Conservation Sciences**



**“No experience is ever a waste of time and can instead show you different paths you never thought of before.”**

### **Tell us about your research!**

I'm a research assistant in agricultural research! A lot of the experiments I help with are on the canola plant- one of the main crops in Alberta.

### **What interests you about this field?**

I find crop research very interesting because I grew up in the prairie provinces, so I've seen fields of canola and other crops all my life. Agriculture is the foundation of our food systems, so it's really cool to be a part of that.

### **If you could have all the funding (grants) to carry out your research, what would you do?**

This differs a lot from what I've done as a research assistant, but I'd like to make a documentary that analyzes socio-political relations with environmental issues in Canada. I would especially like to research the capacity for different art forms to facilitate education



and conversations on issues like environmental degradation.

### **Do you have any words of wisdom for aspiring undergraduate researchers?**

You have to start somewhere, so be open to all kinds of opportunities! I believe that no experience is ever a waste of time and can instead show you different paths you never thought of before.

### **Do you believe all students can benefit from carrying out scientific research regardless of their educational backgrounds? If so, why?**

Absolutely! Scientific research is so broad, everyone can find a field that interests them. When you care about your research, the work can be very rewarding and fulfilling. Research is about contributing more knowledge to the greater world, there's a reason and a purpose for it. Different educational backgrounds will contribute to research differently, which I think strengthens it.

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## **Annie Wei | Year 5+, Kinesiology**



**“Embrace the ambiguous nature of research, trust that you have the skills to succeed, and reach out for help when you need it.”**

### **Tell us about your research!**

I help coordinate a pilot study investigating whether therapy using augmented reality (AR) technology could improve adherence for acquired brain injury (ABI) patients. Low therapy adherence is a prominent issue amongst the ABI population, and our research team (Cognitive Projections) from the Rehabilitation Robotics Lab created an ABI therapy application testing how gamifying therapy might enhance patient motivation and engagement. In collaboration with the Glenrose Hospital, we are running trials to implement the AR therapy in the clinic and obtaining feedback for refining the application. After this pilot, we plan to run larger-scaled trials in aims to integrate our therapy application into clinical practice.

### **Have you made any interesting findings?**

Our preliminary survey results show an upward trend in therapy engagement and patient motivation when using the AR therapy application. We also found a strong correlation between feelings of excitement for the AR treatment and motivation to complete at-home therapy,

suggesting that the AR therapy has the potential to further enhance adherence to at-home therapy activities.

### **Why is your research important?**

Adherence plays a significant role in ABI rehabilitation as the healing process is often long-term and strenuous. Low adherence delays the recovery process, produces poorer patient health outcomes and puts a burden on healthcare resources. Extended reality technology, with its interactive and dynamic nature, has the potential to facilitate therapy activities that are effective, safe and engaging for patients. Our study adds to the limited research on AR therapy for ABI patients and the wider digital health field of study that has been emerging.

### **Do you have any words of wisdom for aspiring undergraduate researchers?**

Embrace the ambiguous nature of research, trust that you have the skills to succeed, and reach out for help when you need it. You will likely be involved with a lot of things for the first time, which can be daunting sometimes yet are invaluable experiences for immense growth.

### **What part of research do you enjoy most?**

Interviewing participants and Occupational Therapists. I really enjoy getting to understand the lived experiences of each brain injury patient I work with, listening to their personal stories and exploring how extended reality technology could be used to enhance their rehabilitation experience.



“Don't be afraid to put  
yourself out there.”

**Tell us about your research!**

Last summer (the summer of 2022), I worked as an intern with the University of Alberta. I worked in a lab where we studied mixed stands and pure stands. Specifically aspen and spruce. The research focused on trying to see how beneficial mixed stands can be in the fight against climate change and drought.

**What interests you about this field?**

I have always been interested in science and have felt a connection to nature. I think my indigenous roots have a part to play in this connection and the more I learn about forestry and my culture the more interest I develop. I am very interested in how our eco-systems operate and I believe it is something important that we have to try and maintain.

**Do you have any words of wisdom for aspiring undergraduate researchers?**

Don't be afraid to put yourself out there. By talking to your professors and looking at the opportunities available, you might find a very fitting position for your research.

**What specific advice would you give to younger people who are interested in scientific research?**

A message that I want to communicate to the younger audience is don't be afraid to try new things. I find that it can be quite a hard time when entering a field you are new to or unfamiliar with but if I hadn't taken the opportunity to be a part of my lab team last year I would've never got to have such an amazing experience.

**In regard to your research, who has influenced you the most?**

My biggest influence in my research journey so far has been my supervisor that I had last summer. She was an amazing influence, both very educated and very inspirational. Seeing other women so high up in the STEM field is so important, especially to younger people like me.