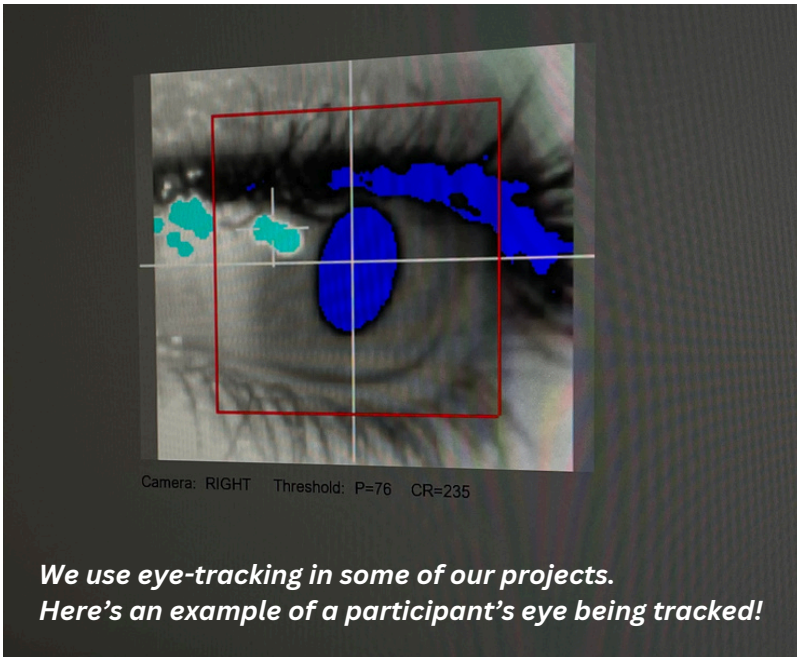
CHOW LAB

We are a psychology lab at St. Thomas University with a research focus on multisensory perception and cognition. Under the direction of Dr. Doris Chow, members in our lab conduct original experimental research to understand how human participants respond to, interpret, and remember information from their different senses. Such an understanding has the potential to improve health and education-related outcomes. Additionally, in our lab, we commit to supporting each other in expanding our horizons and developing life-long skills for research-oriented careers and beyond. Thanks to our participants and support from friends and funding sources, we have had some early successes! We hope you read on to learn about what we learned and accomplished last year!



We use eye-tracking in some of our projects. Here's an example of a participant's eye being tracked!

In this newsletter:

News & Achievements (2024-25)

Honours thesis students completed their theses!

- Sid d'Entremont 'Testing the Link Between Visual Imagery and the Tactile Bouba-Kiki Effect'
- Gavin Woodward 'Does the Auditory Blanking Effect Require Multisensory Integration?'

Lab members presented our work at various conferences!

- Flavia Orellana, Gavin Woodward and Sid d'Entremont presented at STU's Student Research Ideas Fair in March.
- Beatrix Culligan, Gavin Woodward and Sid d'Entremont presented at the Science Atlantic Psychology Undergraduate Conference in May.
- Sid d'Entremont, Gavin Woordward, and Dr. Chow presented at the Annual Meeting of Vision Sciences Society in May.

Lab members have been accepted into graduate programs (2025 Fall)!

- Gavin: The Max Planck School of Cognition, Doctoral Program
- Serena: University of Guelph, MA in Applied Social Psychology

Serena and Gavin (USRA recipients from last summer) drafted two stage-1 registered reports. These have been peer-reviewed and accepted *in principle,* and we can now begin collecting data. We also published a research study on infant rule learning in the *Journal of Experimental Child Psychology*.

Finally, Dr. Chow was awarded an NSERC Discovery Grant in the summer of 2024. We look forward to continuing our work in the next few years!

Questions, comments, or interested in being involved? Feel free to reach out Dr. Chow, hchow@stu.ca

Meet the Chow Lab members!

Dr. Doris Chow: Principal Investigator

Doris joined STU Psychology as a faculty member in 2022 with a PhD in developmental and brain sciences. Born and raised in Hong Kong, she travelled and lived in many places before calling Fredericton home. When not at work, she can be found reading, riding her bike, or experimenting with new recipes with her partner in their kitchen.

Gavin Woodward

Gavin is a recent graduate of STU who honoured in psychology and minored in philosophy. He has worked in the Chow Lab for nearly two years and will continue researching perception as a graduate student in the fall. Outside of the lab, Gavin can be found reading (science fiction and non-fiction are favourites!) and napping just about anywhere.

Sid D'Entremont

Sid is entering their fifth year at STU, having completed an honours in Psychology and will be double-minoring in English and Gerontology. They are from Pubnico, Nova Scotia. Sid, who hopes to pursue a career in speech-language pathology, decided to come to Fredericton after meeting a speech-language pathologist who had done their undergrad at STU. Beyond the lab, Sid can be found working at the Writing Centre, reading, playing Stardew Valley, and visiting the farmer's market.

Serena Bunin

Serena is a graduate of STU in 2024 with an Honours in Psychology and minors in Anthropology and Sociology. She has worked in the ChowLab for almost two years, during which she completed her honours thesis and a pre-registered report for publishing by Collabra: Psychology. Outside of the lab, Serena enjoys playing pickleball, spending time with friends and family, and hiking the trails of New Brunswick.

Beatrix Culligan

Beatrix is going into her fourth year and will be Honouring in Psychology. She is from Fredericton and is extremely passionate about Psychology, serving as the president of the Psychology Society in the fall. She hopes to further her education by pursuing graduate school after her time at STU. When she's not in the lab, she can be found hanging out with her dog, reading, or spending time with her friends!

Flavia Orellana

Flavia is a recent graduate from STU who completed a double-major in Psychology and History, a double-minor in Italian and Digital Media, and two certificates in Experiential Learning and Community Engagement and Digital and Media Literacy. She is from Guayaquil, Ecuador and discovered her love for psychology in high school. In her free time, she enjoys reading, writing, watching movies and TV shows, and spending time with her friends.

Woodward, G., & Chow, H.M. (2025). Does the auditory blanking effect require multisensory integration?

Our eyes are constantly moving, jumping from object to object in the environment that surrounds us. To keep up with our eyes' jerky movements (saccades), our brain compensates to make our perceptual experience stable. As if preoccupied by this compensation, though, we often fail to notice when objects are displaced (moved) during the saccade. This difficulty in detecting displacements is known as **saccadic suppression of displacement** and is studied in the lab by tracking a participant's eye while they make a saccade toward a visual target, and then moving the target once the saccade has been detected. Under ordinary circumstances, participants can barely report the direction of displacement. However, interestingly, if we present a sound alongside the saccade target, and stop the sound for a tenth of a second (100 ms) when the target is displaced, participants' accuracy in reporting the direction of displacement improves. This phenomenon is known as the **auditory blanking effect**.

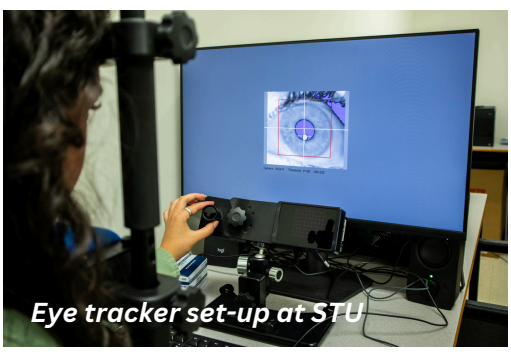
There are many possible explanations for the auditory blanking effect. Here, we are interested in whether this effect relies on **multisensory integration** – the binding of the visual saccade target and the sound into a single object. Multisensory integration is something we engage in frequently in our everyday lives, from reading lips while having a conversation to smelling food before tasting it. If multisensory integration is indeed an explanation for the auditory blanking effect, the auditory blanking effect would be broken (and thus, not occur) if we make it harder to integrate the visual saccade target and the sound. To test this hypothesis, we presented participants with a sound that was either in sync with a visual target, or presented 150 ms before the visual target, since multisensory integration is less likely to occur when they are separated in time.

Data from 20 participants showed that, like previous research on the auditory blanking effect, briefly stopping the sound made participants more accurate at reporting the direction of the target's displacement. However, whether the sound was in sync with the visual target or not did not affect the results. The latter finding suggests that the auditory blanking effect may not rely on multisensory integration. Regardless of this null finding, this study expands our understanding of the importance of sounds in modulating visual perception during eye movements, which is a long-neglected topic.

We are just getting started in understanding other explanations of the auditory blanking effect, as multisensory integration may not be the mediating factor – a lot of exciting work remains to be done!

Eye tracker set-up at Tohoku

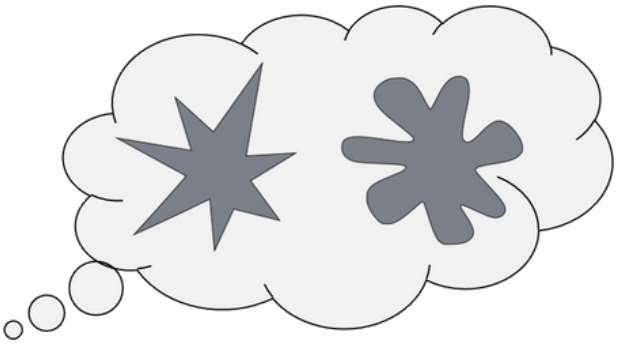
Background:
The auditory blanking effect was discovered by Dr. Chow and collaborators at Tohoku University, Sendai, Japan (Drs. Chia-huei Tseng & Satoshi Shioiri). This collaboration began in July of 2022 when Dr. Chow started working at STU. In May of 2023, she visited Japan to help set up this study at Tohoku University (see above). With the help of Master's student Jialiang Ma, we conducted crucial experiments to demonstrate auditory blanking effect and its characteristics. 2 years later, and with Gavin's help, we set up an eye-tracker at STU (see below) to replicate and extend this effect with a different sample and apparatus set-up. What this project shows is that to investigate a new phenomenon thoroughly, it takes **team work** and **patience** (considering it takes at least a few years to set up the lab properly). Fun fact: Dr. Chia-huei Tseng was Dr. Chow's supervisor when she did her undergraduate Honour's thesis!

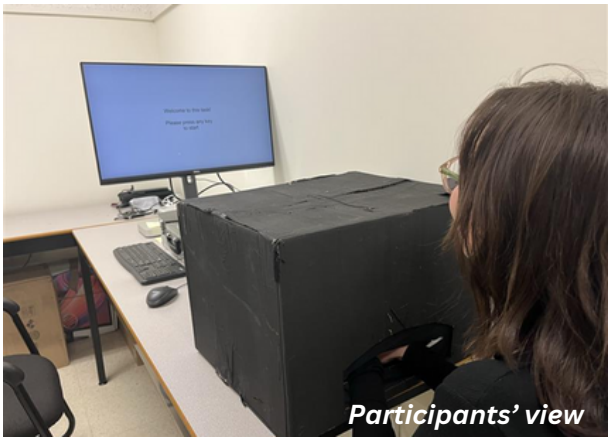


Eye tracker set-up at STU

D'Entremont, S., & Chow, H.M. (2025). Testing the link between visual imagery and the tactile Bouba-Kiki effect

What shape do you think matches "bouba"?





Participants' view

3D printed shapes used in the study

Background:
Did you know that Dr. Chow used to study the Bouba-Kiki effect in children and adults during her PhD? As part of her dissertation, she visited the Museum of Science in Boston to collect data from children, families, and adult visitors, to understand how these associations between shapes and sounds change with age. We used to make shapes with clay, but they broke too easily due to the children's enthusiastic handling. That's why we started using 3D-printed shapes. Here at STU, with Sid's help, we printed a new set of abstract shapes at UNB's Fabrication Lab this year, and we look forward to printing more unique designs as we continue to explore this area.

The **tactile Bouba-Kiki (BK) effect** refers to a non-arbitrary mental association between tactile sensations (e.g., shape with rounded edges) and other stimuli such as nonsense words (e.g., bouba). It has been reported that individuals with congenital blindness and young children exhibit weaker tactile BK effects. One possible explanation is that these populations may also have weaker **visual imagery** for abstract shapes, suggesting a link between visual imagery and the tactile BK effect.

To test this link directly, we evaluated whether the strength of the tactile BK effect was related to self-reported visual imagery abilities. To measure participants' visual imagery, we used the Vividness of Visual Imagery Questionnaire (VVIQ, Marks, 1973). Questions involve visualizing familiar images and rating their mental vividness. To measure the strength of the tactile BK effect, we asked 30 participants to perform an audio-tactile task in which they blindly felt some spiky and some round 3D-printed shapes, listened to recordings of nonsense words, then how well the sound of the word matched the feeling of the shape on a scale from 1 to 7.

Data from our participants showed the typical tactile BK effect: nonsense words containing back vowels (e.g., /a/, /o/, /u/) and bilabial consonants (e.g., /b/, /p/, /m/) were associated with felt round shapes, whereas nonsense words containing voiceless stop consonant (e.g., /t/, /k/) were associated with felt spiky shapes, in alignment with our hypotheses. However, weaker visualizers (participants with lower VVIQ scores) did not exhibit different audio-tactile associations compared to stronger visualizers (those with higher VVIQ scores), suggesting that voluntary visual imagery might not mediate these associations. As it stands, it is premature to make a definitive conclusion. We look forward to recruiting more participants and studying individuals with aphantasia (those who lack visual imagery) in the near future.

Bunin, S. S., & Chow, H.M. (2025) Cognitive modulation of fast oculomotor inhibition via working memory load

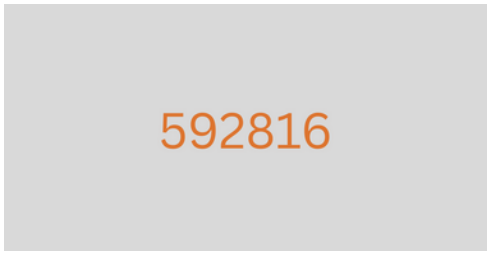
Many everyday activities, such as driving, require an observer's ability to process distractors and respond to unexpected stimuli accordingly. **Pursuit inhibition**, a temporary slowing of smooth eye movement while tracking a moving object, induced by a brief event, has been shown to correlate with bottom-up factors of distractor processing (for example, how bright or how loud a distractor is). However, little is known about how pursuit inhibition is affected by top-down factors of distractor processing (for example, how many things are already on someone's mind).

In this study, we manipulated **working memory load** by asking participants to remember either the order of a 6-digit sequence (more difficult, high load) or its colour (easier, low load). At the same time, participants engaged in a smooth pursuit tracking task, during which a visual distractor was presented at random to induce pursuit inhibition. Participants' eye movement was tracked during the study to see how distraction might interfere differently depending on an observer's concurrent cognitive load.

We hypothesized that the timing and intensity of smooth pursuit eye movements would be affected by the visual distractor, replicating pursuit inhibition observed in prior studies. This replication is supported by data from two pilot experiments at STU since 2024 summer. Furthermore, we hypothesized that the influence of the visual distractor on pursuit dynamics would be stronger for participants in the high load condition, extending the Cognitive Load Theory, as humans are more susceptible to distraction when cognitive resources are depleted. Our pilot data did not support this account, suggesting that these fast modulations of pursuit eye movements might be immune to limitations imposed by cognitive processing capacities.

Overall, the findings from this study will serve to shed light on whether smooth pursuit eye movement can be used as an effective measure of cognitive capacities. We look forward to launching this study officially this summer, as the study protocol has been accepted *in-principle* by *Collabra: Psychology*.

"remember the order"



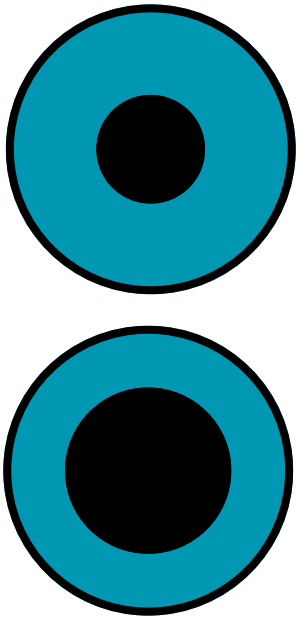
"remember the colour"

Serena and Gavin inspecting pilot data in the summer of 2024

Background:
In addition to extending Dr. Chow's earlier research, this study is unique in one very important way: *before* data collection, we spent an entire summer developing the study protocol, conducting a pilot study, analyzing the pilot data (see above), and writing a manuscript (including the abstract, introduction, methods, and results of the pilot data). This manuscript is a **Stage-1 registered report** that has been reviewed by experts in the field of eye movement, who provided invaluable feedback in shaping our experimental design. Serena even collected another round of pilot data based on the reviewers' feedback to improve the validity of our study! This process differs from the typical publication process, where the research team typically does not share the study protocol until after data collection is completed. Here we engage in current open science practices by leaning into the scientific community early on and registering our hypotheses openly.

Culligan, B., & Chow, H.M. (2025). Investigating pupil dilation and cognitive fatigue in a visual search task

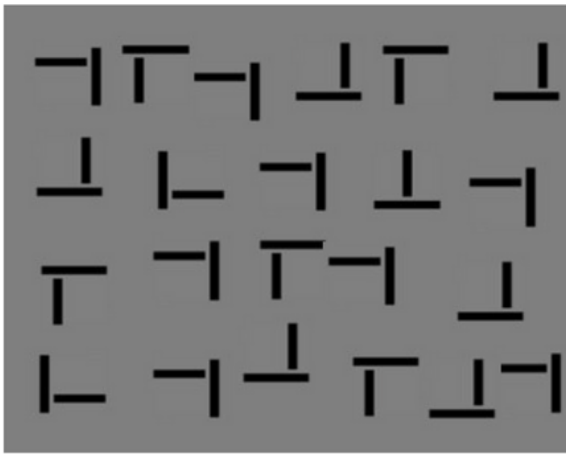
The notion that our pupils change size when we are looking at someone we are attracted to is widely known and commonly accepted. While this phenomenon is backed by evidence, it has been shown that pupil size can reflect much more than emotional connection! In the past, there was a misconception that pupil size was a simple response to bodily changes, such as exposure to bright light or the use of drugs. More recently, however, scientists have discovered that **pupil dilation** is also indicative of ongoing cognitive processes, such as **cognitive load**—the effort required to complete a task.



Dilated pupil (bottom) is often associated with arousal and effort.

This link between pupil dilation and cognitive load can be explained by the involvement of the locus coeruleus (LC). The LC is the primary source of the neurotransmitter norepinephrine (NE) to the brain, which is released during situations of stress or danger. NE helps induce various physiological fight-or-flight changes in the face of threat (real or perceived), such as increasing heart rate, regulating blood pressure, and, of course, increasing pupil size. The LC can be stimulated through various means, including electrical stimulation or engaging in a challenging task. When the LC is stimulated, NE is released and causes high levels of arousal and an increase in pupil dilation. This is often referred to as the LC-NE system. Due to the wide range of activities that stimulate the LC and increase pupil size, it is often said that pupil size is indicative of cognitive load.

The search display used in Beatrix's study:



Can you spot the perfect "T"?
Hint: it is upside down in this display.

Based on this knowledge, we conducted pilot experiments this year to examine whether pupil size is indicative of other cognitive processing, such as **cognitive fatigue**. Many occupations require constant vigilance and attention, and being able to objectively and effectively monitor cognitive fatigue might help improve human performance and reduce accidents. To explore this topic, we asked participants to complete an extensive visual search task for over an hour to induce cognitive fatigue. While they completed this task, their reaction time, accuracy, and pupil size were measured. We expected that participants would make more errors over time, but this was not what we found: participants performed better (with fewer errors and faster reaction times) over time, suggesting a practice effect. This finding aligns with previous literature, which suggests that performance is not a reliable measure of cognitive fatigue. We are now in the process of analyzing pupil data to understand how pupil dilation changes with time on task. This was a promising start!

Conference Attendance: Highlights & Lessons Learned Part I

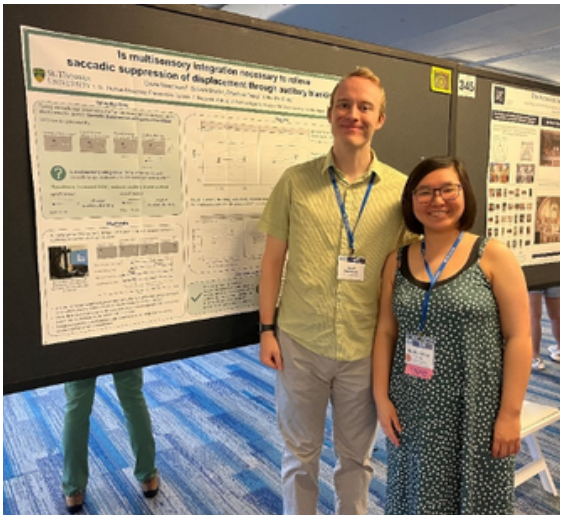
As researchers, we attend and present at academic conferences for various reasons, including sharing our research, gathering feedback, and seeking new ideas and connections. This year, our lab members presented their work in the Chow Lab with different audiences. Here we reflect on what we learned and on our suggestions for future researchers!

Vision Sciences Society (VSS)

St. Pete Beach, USA; May 2025

VSS is the flagship conference for vision sciences, and also the academic home of Dr. Chow (she has gone to this conference since she was a graduate student in 2013)! VSS spans across 5 days and is an excellent conference for learning about all kinds of vision sciences, including eye movements and optical illusions. Outside the conference venue, the beach offers a place for reflection, nature, and people-watching! VSS was especially exciting this year, because it was Dr. Chow's first time bringing STUdents to attend this conference. Gavin and Sid both presented their thesis work as part of the 'Undergraduate-Just-In-Time session.'

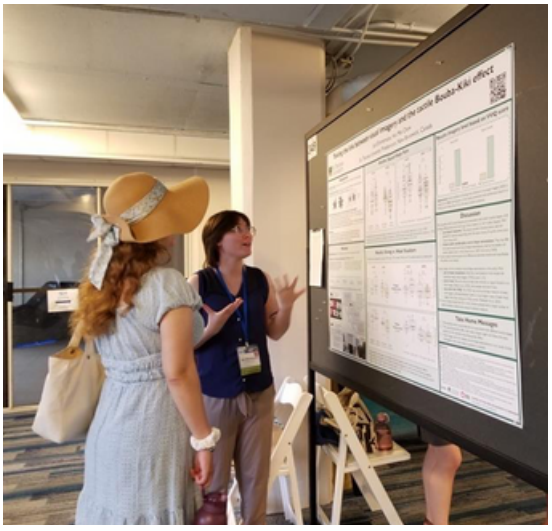
Sunset on St. Pete Beach



Gavin and Dr. Chow with their poster

Gavin: I had a total blast at the Meeting of the Vision Sciences Society this May! Dr. Chow, Sid, and I made the trip to St Pete's Beach in Florida where we joined hundreds of vision researchers from around the world for a five-day conference. We presented research of our own and visited more oral presentations and posters than I can count. It was my first time attending a major academic conference, and it proved to be a great opportunity to attend talks given by influential researchers, and to meet students that share my interests. In addition to fostering an environment of scientific discussion and dissemination, the conference served as an opportunity to connect with other researchers. The social environment felt welcoming, and I could see years of friendship between researchers playing out in front of me.

Sid: Before going to VSS I didn't know what to expect. Looking back on it, I can say that I'm glad I went. I attended many talks and poster presentations from which I gathered knowledge that I would not have known otherwise. I also learned a lot about myself. I have always been somewhat introverted, but with the heat, the new environment, and 2000 other attendees, I found myself tiring out more quickly than expected. I needed to take breaks, and I made sure to always carry noise-cancelling earbuds, snacks, and water in my bag. It was also helpful to save my energy for the events and sessions I was most excited about. I also pushed myself out of my comfort zone to meet new people early in the week so that there would always be a familiar face wherever I was. Finally, I took advantage of the opportunity to see St. Pete's while I was there. I visited a seafood restaurant and an IHOP (with broken air conditioning), went to the beach, and read outside in the shade.



Sid presenting their poster

Conference Attendance: Highlights & Lessons Learned Part II

Gavin's tips for attending an academic conference:

- **Be proactive** in identifying which talks and poster sessions you're interested in. Try to stick to your schedule, but take breaks when you feel tired. Don't overload yourself with information, but take advantage of the opportunity to learn from the leaders in our field.
- **Visit the poster sessions!** Don't be afraid of telling someone you know nothing about their topic – they will probably be thrilled to share the background information needed to understand their research.
- **Attend the social and networking sessions** relevant to you. Some conferences may offer social events specifically for undergraduates, first-time attendees, or those based on affinity groups. That way, you get to meet interesting new people who work in similar fields.
- **Look for cool things to do outside the conference!** It can be hard to find time in a busy schedule, but attending a conference is a great opportunity to explore a new place.

Dr. Chow, Gavin, and Sid at Illusion Demo Night. Can you guess why Gavin looks so small in this picture?

Sid's tips for attending an academic conference:

- **Pace yourself.** Don't try to do everything.
- **Bring comfort items, food, and hydration;** preparation is key.
- **Meet people early on and find friendly faces.**
- **Give yourself time to explore, relax, and have fun.**

VSS's Club Vision!

Sid enjoying a sunset on the beach!

Conference Attendance: Highlights & Lessons Learned Part III

Science Atlantic Psychology Undergraduate Conference

St. Thomas University; May 2025

The Science Atlantic Psychology Undergraduate Conference is a unique opportunity for undergraduate students from the Atlantic provinces to gather and showcase their research. This year it was held at STU! Beatrix, Gavin, and Sid all presented their research at this May's Conference.

It is quite rare for a third-year student to have substantial research experience and present at Science Atlantic, so we asked Beatrix to share her thoughts and advice as she reflects on her experience at the conference (see column on the right).

We would also like to congratulate Gavin for winning the Undergraduate Research Award (Oral) based on his thesis work!

Beatrix: It was an amazing opportunity to meet many students from other schools around Atlantic Canada. I learned so much from going to different presentations and looking at other students' posters. Science Atlantic was my first presentation at an undergraduate conference, and I feel extremely lucky that I was able to present at an event like this in my third year!

If I were to give some advice to other students who are attending their first conference, I would tell them to go to as many of the workshops and presentations as you can. It is a bit overwhelming at first, but you will meet a lot of interesting people and learn about different topics that may be new to you. This is also a great chance to network, because you can meet professors and students from other schools you may be considering applying to, and you will get to learn about a variety of jobs in the field. Another piece of advice is to prepare well for your presentation, but don't stress too much! I know it's easier said than done, but people are there to learn about your project, not to judge you on your speaking ability. Use this as a time to work on your presentation skills and remember that all the other presenters are in the same position as you. Overall, I had a wonderful experience, and am already looking forward to next year!

Student Research Ideas Fair

St. Thomas University; March 2025

This year, lab members (Flavia, Sid, & Gavin) also presented at STU's Student Research Ideas Fair, which is an annual event for STUdents to share their research with other students and faculty members at STU. This is our lab's first year participating in the Student Research Ideas Fair. We are happy to support Flavia in presenting follow-up research conducted in 2023-24, which began with Danyelle Fields (former lab member, 2022-23) on the topic of hand gestures and learning. Read last year's newsletter for more.

Flavia: It was an incredible and fun experience, not just to be able to present and bring closure to a study that Danyelle [former lab member] had been working on, but also to learn about what other students had been researching throughout the year.

Flavia's advice is "to not hesitate to ask for guidance from your supervisor. They are there to support you throughout the process and to help answer questions". She also suggests talking about and practicing your presentation with your peers. To this point, she says: "Whether they are in the same department or not, listening to them practice their presentation, and then practicing presenting to them helps with calming any nerves and figuring out the best way to get your point across".

Graduate School Applications: Experience & Advice

Serena applied for graduate school last fall and is excited to share that she will be starting her Master's in Applied Social Psychology this September at the University of Guelph in Ontario. She will be working under the supervision of Dr. Kieran O'Doherty in the Discourse, Science, and Publics lab on his research concerning microbiome stewardship. Her advice for students who are interested in pursuing research/thesis-based graduate studies is:

- **Identify your interests!** It is helpful to identify topics and methods that interest you before you begin investigating graduate schools. The sheer number of graduate schools and program options is overwhelming, so it can be helpful to know what kinds of research are exciting to you. I was interested in conducting critical qualitative research, so I began my search there–by asking which supervisors specialize in qualitative methodologies and identifying those who were accepting students. It is also important to consider your skillsets. What sets you apart? What training can you carry forward from your undergraduate experience?
- **Start early!** I recommend that you start researching potential graduate schools and programs of interest in the summer before you intend to apply. Most application deadlines are in the first week of December, which coincides with the beginning of exam season. To avoid a stressful end-of-semester, it is a good idea to get as much of your application done before then. Starting the process early will help you get a head start.

Gavin also successfully applied for graduate school and will be starting in the fall! In August, he will move to Berlin, where he will begin his time at the Max Planck School of Cognition! He will study perception and motor control while making the most of the opportunity to experience a different part of the world. He lists advice for research/thesis-based graduate studies below:

- **Create a timeline for your graduate applications early** (in the summer before fall applications). Identify dates by which you will have (i) determined programs/supervisors of interest, (ii) reached out to potential supervisors, (iii) contacted references, (iv) completed a CV/letter of intent, etc. Run this schedule by a faculty member and try to follow it as closely as possible. The most stressful part of applying was feeling like I was always falling behind, so it can be helpful to keep (and stick to) a schedule to remind yourself that you are on track.
- **If you need to interview for graduate school, practice as much as possible**. Be capable of talking about your research at ease, but with enthusiasm. Potential supervisors are evaluating you, yes, but they are not outright testing you! I think that showing your curiosity and ability to reason scientifically is one of the most important things you can do!
- **Try not to let applying for and thinking about graduate school consume you**. It's just like applying for a job, but with a few more steps. Take it one step at a time and no matter the outcome, know that you will walk away with a much better understanding of your interests and goals for the future.