INNOVATION CHALLENGE

Program Overview: The Innovation Challenge (IC) is a unique and competitive program open to all undergraduate Concordia students. It is designed to foster innovation, creativity, and collaboration as students tackle a real-world contemporary question of importance to neuroscience and related areas, and work together to develop a novel hypothesis and research proposal toward finding new solutions. You do not need to be a neuroscience, or even science, major to participate.

As a participant of the Innovation Challenge, you will gain invaluable research experience, sharpen your problem-solving skills, harness your creativity, and further develop your ability to work as a team. The program begins in October and finishes in March, giving you the flexibility to develop a schedule that works best for your team. This research you conduct can also be used toward an URSCA PEAK.

Who is eligible? Any undergraduate Concordia student – any major, any year. We encourage you to build teams that leverage complementary strengths and experiences so you can develop your research proposal with the advantage of multiple viewpoints, perspectives, and ideas.

What are the benefits of accepting the challenge?

- Demonstrate your ability to carry out research in a small team setting with significant independence.
- Work as a diverse team on a real-world research question.
- Build your resume or CV with a distinctive research experience that you can boast about when applying to jobs, grad schools, or health professions programs.
- Earn a PEAK!
- Compete to receive $1000 as a team at the end of the competition.
- Enjoy a unique creative research endeavor!

Which resources may be used? Participants will be driven by their own motivation to complete the challenge. Teams may use any resources they wish as they conduct their research, including faculty/staff and other subject matter experts, textbooks, scholarly journals, AI, etc.

Do I need to work in a Team? Yes! Teams must consist of at least two students with a maximum of four students per team. There is no limit to the number of teams that can participate. Should someone from your team decide to drop out, you may replace them with another team member. This is only necessary, however, if a team of two becomes one person.

Expectations and Logistics:

- Students will register in teams of two, three, or four students.
- There is no limit to how many teams can register.
- Students must be undergraduate Concordia students (part-time or full-time) during the entire academic year.
- Each team will select one of the questions provided or propose their own question.
- Multiple teams may select the same question.
- Teams will:
    - conduct a review of the scholarly literature relevant to the research question
    - develop a novel testable hypothesis that could be used to answer the question they choose
    - write a research proposal that describes the problem, states a novel hypothesis, and details a research plan for testing the hypothesis (teams will not be expected to carry out the research plan)
    - properly cite all sources consulted that support the research
    - give an oral presentation to neuroscience faculty and invited guests, presenting their research proposal (only if selected at the last checkpoint)
- There are four checkpoints for the program (see timeline) where you will receive feedback and direction on your progress. Passing each checkpoint allows teams to continue working toward the next checkpoint.
- After the third checkpoint, a maximum of three teams will be invited to give an oral presentation of their research proposal during Brain Awareness Week in mid-March. Presentations are the fourth checkpoint. A winner will be chosen from the presenting teams. If no teams pass the fourth checkpoint, the competition will end without a winner.
- The winning team will receive $1000 (shared amongst team members). This prize is made possible by the generosity of the Howard, Sonia, LaVern, and Lois Nornes families.
- If fewer than three teams register, we reserve the right to cancel the challenge.

Timeline & Checkpoints

23 October - 9 November: **Team registration**

To become registered, email or Teams DM Dr Strand (strand@cord.edu) with the names and email addresses of each team member. You will all be added to the Innovation Challenge 26-27 Microsoft Teams site. Your team will have a private channel for drafts, collecting information, and communicating. You will also be able to access the checkpoint assignments.

9 November: Checkpoint 1

One person from each team must submit the information below in a Word document into the Checkpoint 1 assignment on Teams:

1) 1) names, major(s)/minor(s), and anticipated graduation year of each team member

2) the question the team has selected or proposed*

*If the team proposes a question, this question will be reviewed and approval status will be communicated to the team within a few days.

3) an annotated list of references the team has found so far (need not be many)

4) a paragraph outlining the team's understanding, thus far, of the selected question

8 January: Checkpoint 2

See Checkpoint 2 template document in Teams. One person from each team must submit the information below in a Word document into the Checkpoint 2 assignment on Teams:

1) a working hypothesis
2) a working reference list (do not need annotations)
3) a draft of their research proposal (5 - 6 pages, not including references)

5 February: Checkpoint 3

One person from each team must submit the information below in a Word document into the Checkpoint 3 assignment on Teams:

1) final hypothesis
2) completed reference list (do not need annotations)
3) final research proposal (5 - 6 pages, not including references)
4) students completing checkpoint 3 are eligible to complete the URSCA PEAK (see Dr Strand for additional PEAK assignments)

24 February: Checkpoint 4

By 24 February, up to three teams will be invited to present their hypothesis and research proposal in the final competition during Brain Awareness Week. Invited teams will present their hypotheses and research proposals to an audience of neuroscience faculty, Concordia students, and invited guests during the week of 15 March. Dates and times for presentations will be announced later this fall or early spring semester.

2026-2027 Innovation Challenge Questions

Choose one question option for your team to investigate.

1. What roles do glial cell dysfunction and neuroinflammation play in adolescent onset of anxiety and depression, and how might glia-targeted therapies offer novel interventions?
2. What is the mechanistic link between the gut microbiome, neuroinflammation, and the development or progression of neurodegenerative disease?
3. How does dysfunction in the glymphatic system contribute to neurodegeneration, and what are the potential mechanisms involved, and implications for, developing therapeutic strategies targeting this system?
4. How can wearable EEG, fNIRS (or multimodal) devices and machine learning be used to predict early signs of cognitive fatigue or emotional dysregulation in everyday users?
5. How do environmental factors in urban ecosystems (noise, light pollution, air quality) affect neuroendocrine function and mental health across the lifespan, and where are key mechanistic gaps?
6. What molecular pathways mediate activity-dependent regeneration in the central nervous system, and how can we enhance or mimic these processes pharmacologically?
7. How can an integrated fungal-plant-fish ecosystem be used to influence circadian rhythms, neuroplasticity, and cognitive resilience during long-duration space habitation missions and/or in closed-loop Earth systems?
8. What are the neural consequences of long-term use of brain–computer interface (BCI) systems for motor assistance, and how does the brain adapt to machine-mediated movement?
9. What are the cognitive and neural costs of frequent interaction with AI systems, and how does this shape attention, agency, and mental effort over time?
10. Propose your own question. Proposed questions will be reviewed by the Neuroscience faculty and approval status communicated within a few days.