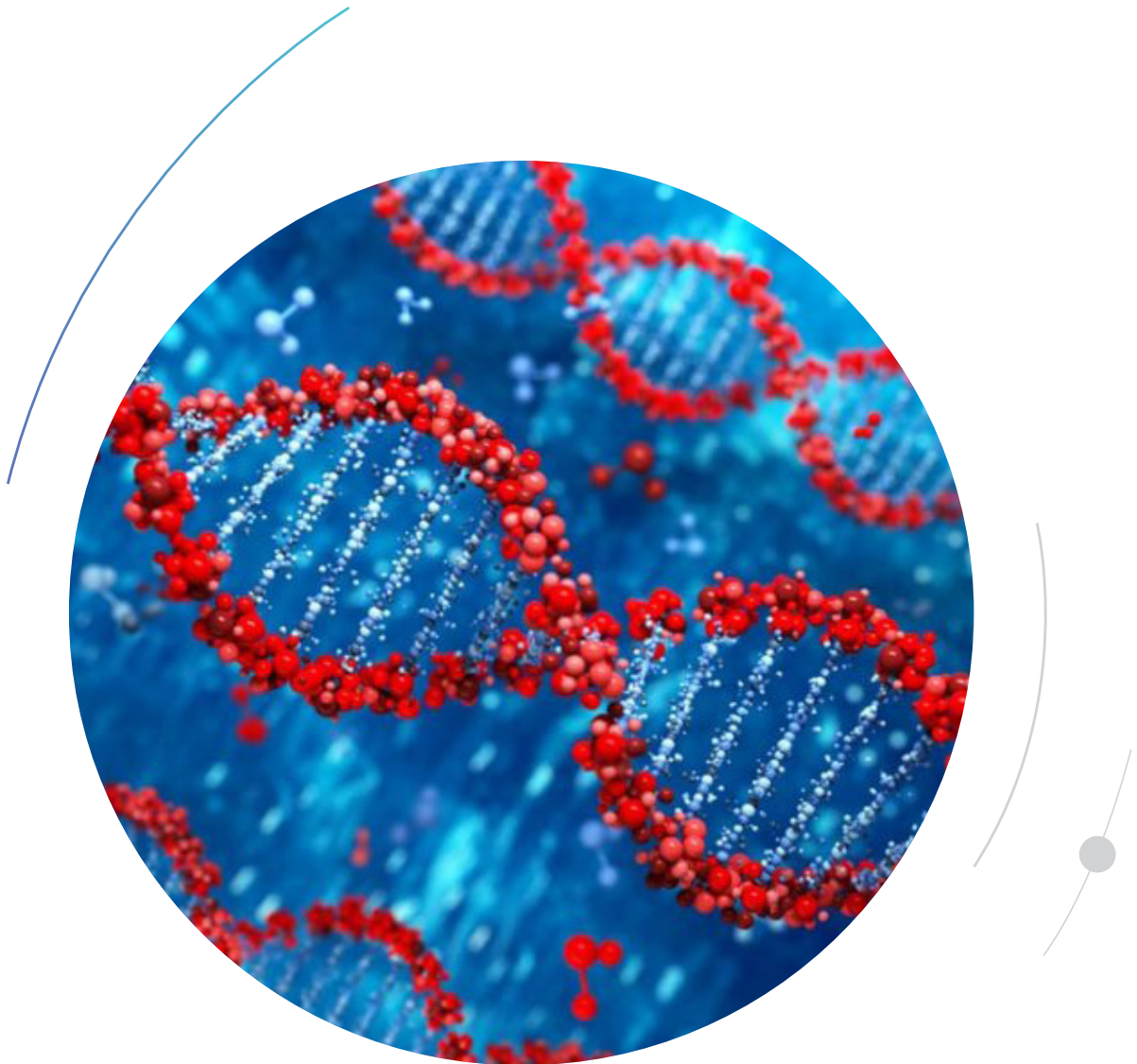
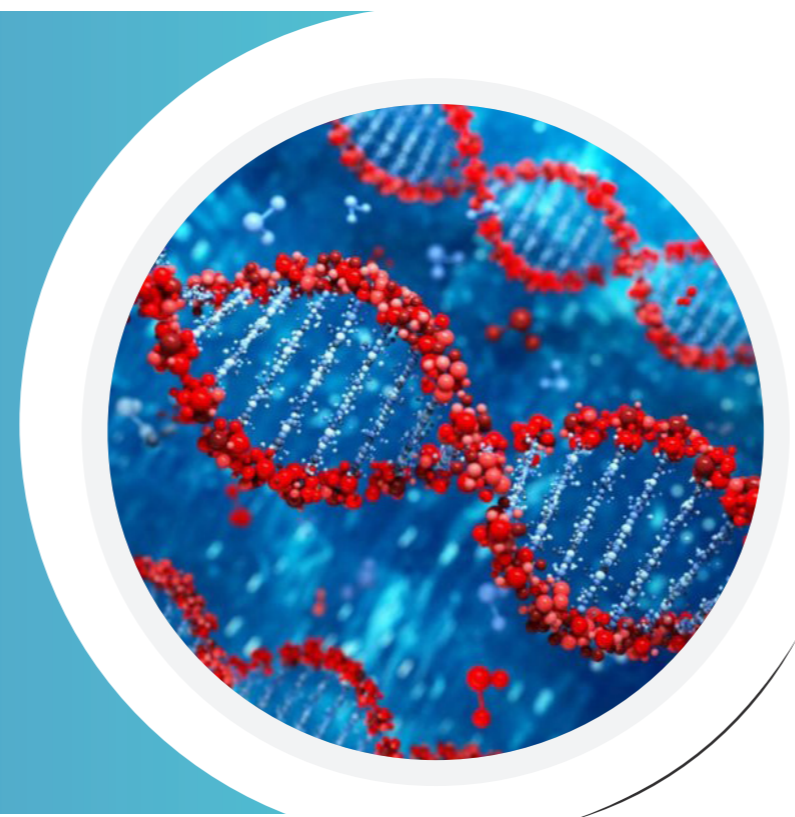


# iGEM CONCORDIA

ASTROYEAST 2020



BUILDING A BETTER WORLD  
WITH SYNTHETIC BIOLOGY



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2020 EDITION





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iGEMers are building a better world by solving problems with the help of synthetic biology. The iGEM Competition inspires thousands of students each year to work in teams to address unique challenges in their local communities.

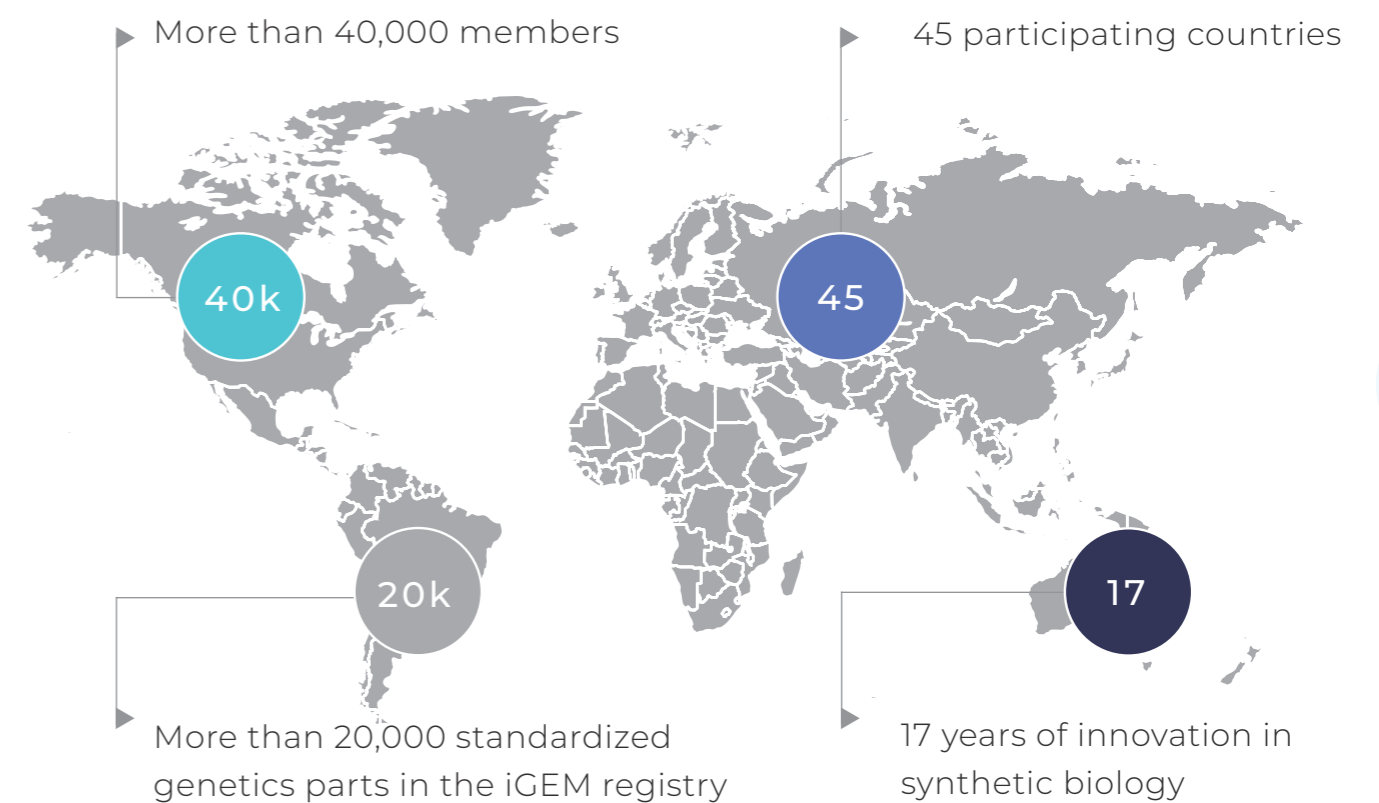
*iGEM Foundation*

## The International Genetically Engineered Machine Competition

The iGEM competition is a prestigious worldwide synthetic biology competition where teams of students from diverse fields work with mentors to build genetically engineered systems. Teams are given a kit of biological parts at the beginning of the summer from the Registry of Standard Biological Parts. Working at their own schools over the summer, they use these parts and new parts of their own design to build biological systems and operate them in

living cells. Teams are also encouraged to work outside the lab to engage with their communities, demystifying synthetic biology and demonstrating the exciting possibilities of their lab work.

In the fall, teams from around the world convene at an international conference hosted by MIT, where their projects are judged by a scientific jury.



## CONCORDIA'S iGEM

# 2020 TEAM

We are an interdisciplinary team of undergraduate and graduate students united by a passion for synthetic biology. Our members come from diverse academic and training backgrounds including biochemistry, cell and molecular biology, bioengineering, statistics and mathematics, computer science, behavioural neuroscience, and finance. Working within Canada's first and only synthetic biology research training center, our team has unique access to robotics and a large community of synthetic biologists. Our members benefit from Concordia University's state-of-the-art facilities and research environment, working with the Centre for Applied Synthetic Biology, Genome Foundry, and Center for Structural and Functional Genomics. Current members and alumni have access to Concordia's District 3 Innovation Center to explore entrepreneurship opportunities that arise from our iGEM projects. Our students also benefit from additional support through Concordia's SynBioApps NSERC-CREATE training grant.

For more information, visit our website:

[www.2020.igem.org/Team:Concordia-Montreal](http://www.2020.igem.org/Team:Concordia-Montreal)

### Selected iGEM projects:

- 2020 ASTROYEAST**  
Yeast strains that are resistant to microgravity-induced stress responses.
- 2019 QUANTIFEN**  
Fentanyl biosensor.
- 2016 COMBAT CELLS**  
Microgladiators equipped with nanoparticles.
- 2015 SCAFFOCOCCUS**  
A customizable extracellular platform that can harbour many enzymes.
- 2014 CLEAN GREEN LIPID MACHINES**  
A specialized toolkit of standardized biological parts for Microalgae.
- 2013 COMPUT-E.COLI**  
Computational cells generating biological cellular automata.

## A FOREWORD FROM

# Aashiq Kachroo Ph. D.



I am delighted to offer my strongest support for iGEM Concordia's 2020 project. I am an Assistant professor at the Center for Applied Synthetic Biology at Concordia University in Montreal, Canada. The focus of my research is to engineer complex biological systems from humans in yeast. I started my laboratory in August 2017. I hold a Tier 2 Canada Research Chair in Systems and Synthetic Biology in the Department of Biology at Concordia since 2018. I have authored many scientific papers in the fields of Systems and Synthetic biology, Genetics, Biochemistry, and Molecular evolution published in

journals such as Science, eLife, Nucleic Acids Research, Molecular Microbiology, Nature Biotechnology, PLoS Biology, Genetics etc. I support a research staff of about eight people, including undergraduate, graduate, and postdoctoral fellow students.

iGEM Concordia 2019 was a huge success. The team worked on engineering a sensor, Quantifen, for testing dangerously high doses of opioids in the human bloodstream. The team won Gold in the iGEM jamboree competition 2019 and earned a nomination for the best presentation. This year's iGEM team has already shown tremendous excitement and focus towards a new project, "AstroYeast" to study the impact of the lack of gravity in space on living cells. If successful, the endeavour will shed light on how to use the knowledge for future human missions in space, including "terraforming" in altered gravity environments like the Moon and Mars. We expect a better show at the 2020 iGEM competition. It is the efforts like these that we should encourage and reward.

**Aashiq Kachroo, Ph. D.**

Assistant professor

Centre for Applied Synthetic Biology

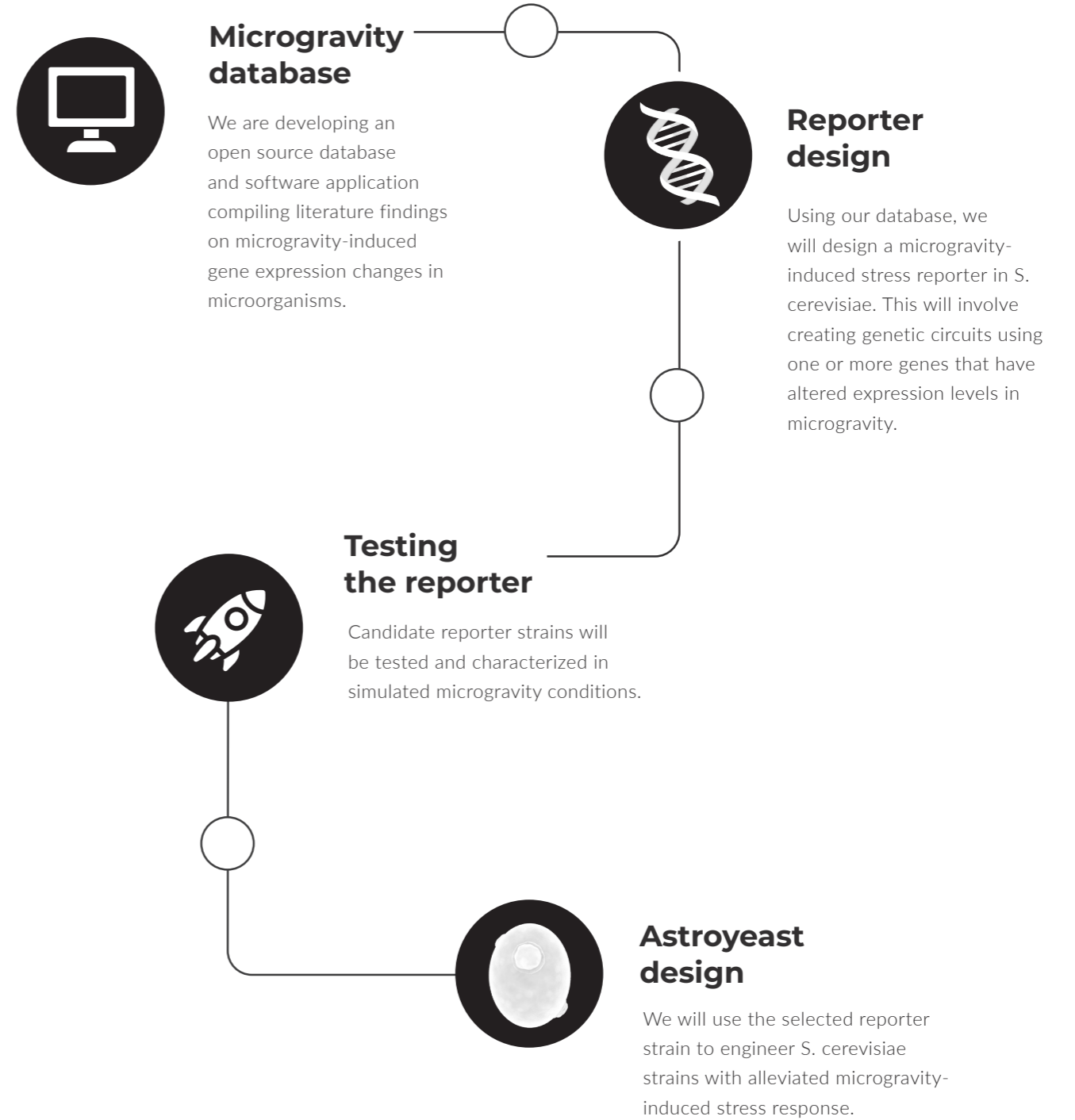
Concordia University





## Our 2020 iGEM Project

The biomanufacturing of food, drugs, and biomaterials in outer space is necessary for humans to venture into the cosmos and colonize extraterrestrial bodies. Advances in synthetic biology enable the sustainable production of these resources on earth. However, in-space bioproduction, for which maintaining cultures in bioreactors for extended periods is essential, has proved challenging. Microgravity induces global changes in gene expression profiles, triggering a stress response in cells. For example, *Saccharomyces cerevisiae*, a model organism and biomanufacturing chassis, exhibits a microgravity-induced stress response characterized by aberrant cell polarity, budding, and separation, which affects cell growth and productivity in space. To solve this problem, we are engineering a yeast strain that is resistant to the microgravity-induced stress response. We named it Astroyeast.



## AN INVITATION FOR COLLABORATION

The success of our iGEM project relies on our ability to identify local and global challenges that we can help solve in collaboration with others. Throughout the project's lifecycle, we will interview potential users, stakeholders, and other experts to inform our project design and execution. Stakeholder needs and concerns are documented and implemented into our project design, goals, execution, and communication.

We are looking forward to collaborating with you.

*Concordia's 2020 team*

In 2019, we  
won an iGEM  
GOLD Medal  
and we were  
nominated for  
the best  
presentation  
award.



## EVENTS AND PUBLIC ENGAGEMENT

### We are continuously involved in the synthetic biology community

This year we are organizing events intended for iGEM concordia members and alumni, national and international members of iGEM, and other individuals who are interested in synthetic biology.

- We are hosting the Canadian iGEM Mini Jamboree online in September 2020. Registered iGEM teams from other Canadian universities will be attending. Our virtual Mini Jamboree is open to the public.
- We participate in various synthetic biology events including iGEM conferences and workshops, July GEM hosted by UCalgary, cGEM hosted by participating Canadian universities, and BioTalks.
- We are building an educational curriculum on synthetic biology which includes instructional videos and do-it-yourself science experiments.
- We hold conferences on synthetic biology with Concordia's 4th Space.



Thank you  
for your consideration.

Together, we can build a better world with synthetic biology.

## CONTACT INFORMATION

@ igem.concordia@gmail.com

📍 7141 Sherbrooke St W, Montreal, QC H4B 2A7

🌐 [www.concordia.ca/research/casb/training/igem.html](http://www.concordia.ca/research/casb/training/igem.html)