

Euan Joly-Smith

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Education

- 2019-present **PhD. Biological Physics**, *University of Toronto, Advised by Andreas Hilfinger*
- 2018–2019 **MSc. Biological Physics**, *University of Toronto*
Thesis title: Characteristic variability of co-regulated genes
- 2012–2017 **BSc. Honours Physics and Mathematics**, *McGill University*

Positions

- 2018-present **PhD Candidate**, *Hilfinger Group at the University of Toronto*
Developing approaches to exploit naturally occurring fluctuations in cells to probe cellular systems. This entails developing *general* mathematical theories of stochastic processes, computational models with simulations, and experiments with techniques from molecular biology.
- 2021 - 2023 **Visiting Researcher**, *Centre for Applied Synthetic Biology at Concordia University*
Engineered and cloned many synthetic gene regulatory circuits in *E. coli*. Used microfluidic devices ([mother machine](#)) with time-lapse fluorescence microscopy to follow single cells. Adapted a machine learning image processing [pipeline](#) in order to segment cells in the mother machine using brightfield images. Developed a novel analysis pipeline for quantitative variability measurements from mother machine datasets.
- 2018-present **Teaching Assistant**, *University of Toronto*
For the following courses: Classical Mechanics, Electricity and Magnetism, Introduction to Biological Physics, and first year physics for engineers.
- 2018-2019 **Departmental Steward**, *Departmental Steward CUPE Local 3902*
Represented contract workers from the Department of Physics (i.e. teaching assistants, postdocs) at monthly steward council meetings, and kept the department up to date on the state of collective bargaining. This year was the start of the COVID19 pandemic: I hosted meetings with contract workers of the department and shared their concerns in meetings with the chairs of the department.
- 2018 **Research Fellow**, *University of Toronto Mississauga*
Pre-doctoral research fellowship in theoretical biophysics. Explored how stochastic fluctuations are propagated in Feed-Forward motifs in biochemical reaction networks.
- 2016 **Research Assistant**, *Kushner group at the University of Toronto*
Analyzed data generated from the Community Earth System Model (CESM) to explore how planetary waves and weather systems are affected by sea ice loss in the coupled climate system.
- 2015 **Summer Research Intern**, *National Research Council Canada*
Through the NRC summer employment program, I worked under the supervision of Dr. Khabat Heshami in the Quantum Photonics group. Theoretical development of novel multi-mode quantum memory scheme.
- 2015 **Research Assistant**, *McGill Quantum Defects Lab*
Development of compact diffraction laser wavemeter with sub-picometer accuracy and picowatt sensitivity. Developed a real-time interface for the wavemeter using python.
- 2015 - 2016 **Student Assistant**, *McGill University department of Mathematics and Statistics*
Graded assignments for courses: Introduction to Partial Differential Equations, Honours Advanced Calculus, and Honours Complex Variables.

Scholarly Works

Preprints

1. **Joly-Smith E**, Talpur MM, Allard P, Papazotos F, Potvin-Trottier L, and Hilfinger A. Exploiting fluctuations in gene expression to detect causal interactions between genes, *bioRxiv* (2023)

Publications

2. Jager K, Orozco-Hidalgo MT, Springstein BL, **Joly-Smith E**, Papazotos F, McDonough EK, Fleming E, McGallum G, Yuan AH, Hilfinger A, Hochschild A, and Potvin-Trottier L. Measuring prion propagation in single bacteria elucidates a mechanism of loss, *Proc. Natl. Acad. Sci. USA.* 120 (39) e2221539120 (2023)
3. **Joly-Smith E**, Wang ZJ, and Hilfinger A. Inferring gene regulation dynamics from static snapshots of gene expression variability, *Phys. Rev. E* 104, 044406 (2021)

Presentations

- 2023 **APS March Meeting**, Exploiting stochastic fluctuations in gene expression to infer interactions between genes. *Contributed talk.*
- 2022 **Biophysique Québec 2nd Annual Symposium**, Exploiting stochastic fluctuations in gene expression to infer interactions between genes. *Contributed talk.*
- 2022 **Canadian Association of Physicists Congress**, Inferring causality in gene regulation from static snapshots of gene expression variability. *Contributed talk.*
- 2022 **Annual Meeting of the Biophysical Society of Canada**, Inferring gene regulation dynamics from static snapshots of gene expression reporters. *Contributed poster presentation and talk at student symposium.*
- 2022 **Annual Conference on Quantitative Approaches in Biology at Northwestern University**, Fluorescence maturation time: a nuisance or a feature? *Contributed lightning talk and poster presentation.*
- 2022 **APS March Meeting**, Inferring gene regulation from static snapshots of gene expression variability. *Contributed talk.*
- 2022 **Winter q-bio meeting**, Inferring gene regulation from static snapshots of gene expression variability. *Contributed talk.*
- 2021 **BiophysiQ Québec Molecular and Cellular Biophysics Virtual Mini-Symposium**, Fluorescent maturation time: is it a bug or a feature? *Contributed talk.*
- 2021 **BactoMontréal meeting**, Inferring gene regulation dynamics from static snapshots of gene expression variability. *Poster presentation.*
- 2021 **Presented for the Nancy Papalopulu Lab and the Cerys Manning Lab at the University of Manchester**, Inferring gene regulation dynamics from static snapshots of gene expression reporters. *Invited talk.*
- 2021 **EMBO workshop on Physics of Living Systems: From Molecules to Tissues**, Inferring gene regulation dynamics from static snapshots of gene expression reporters. *Contributed talk.*
- 2021 **Annual Meeting of the Biophysical Society of Canada**, Inferring gene regulation dynamics from static snapshots of gene expression variability. *Poster presentation.*
- 2021 **RIP Seminar in the CPS department at University of Toronto Mississauga**, Inferring gene regulation dynamics from static snapshots of gene expression reporters. *Invited talk.*
- 2020 **Canadian Association of Physicists Virtual Congress**, Characteristic variability of co-regulated genes. *Contributed talk.*
- 2019 **Annual Meeting of the Biophysical Society of Canada**, Characteristic variability of co-regulated genes. *Poster presentation.*

Coding & Tools

Python, C++, MATLAB, Mathematica, LaTeX, Fiji ImageJ, Snapgene, Linux.

Experience with training and applying machine learning models.

Experience with high performance computing and parallel programming.

Laboratory Skills

Standard techniques in molecular biology to build synthetic gene regulatory circuits in bacteria. This includes primer design, PCR, Gibson Assembly, making electro and chemical competent cells, heatshock and electroporation transformations, growing colonies on plates, etc.

General lab practices, like making media and plates, cleaning, autoclaving glassware, etc.

Making PDMS microfluidic chips.

Time-lapse fluorescence microscopy.

Awards & Grants

- 2023 **American Physical Society DBIO Travel Award.** An award intended to support travel to the APS March Meeting, see [here](#) for details.
- 2022 **CPS Graduate spotlight.** Featured on the University of Toronto department of Chemical and Physical Sciences website. See [here](#) for the interview.
- 2022 **Best poster award.** At the 7th Annual Biophysical Society of Canada Meeting. See [here](#) for the list of poster awardees.
- 2022 **Travel Grant from the University of Toronto Mississauga.**
- 2022 **Conference Grant.** From the University of Toronto School of Graduate Studies.
- 2022 **Conference Travel Grant.** From the department of Physics at the University of Toronto.
- 2021 **Travel Grant.** From the department of Chemical and Physical Sciences at the University of Toronto Mississauga.
- 2021 **CPS Graduate Research Visit Program.** A competitive program from the department of Chemical and Physical Sciences at the University of Toronto Mississauga.
- 2018 **Pre-doctoral Summer Research Fellowship.** Research stipend for the months leading up to graduate studies in the Department of Physics at the University of Toronto.
- 2015 **Richard and Mary Shaw Scholarship,** "Awarded to outstanding undergraduate students who have completed at least one year of a B.Sc. program on the basis of high academic standing".
- 2015 **Deans Honour List,** Awarded to top 10% of all undergraduate students based on cumulative GPA for two consecutive semesters.

Other Experience

- 2021 **Theoretical Biophysics Blog.** Co-creator of the following [blog](#). Contributed this [blog post](#).
- 2022 **Reviewer.** Peer review (with advisor) of manuscripts submitted for publication in PLOS Computational Biology.
- 2022-2023 **Mentored gifted undergraduate student.** Research project involving simulations of biochemical reaction networks in growing and dividing cells. Work submitted for publication.
- Fluent in French and English.