Chapin S. **Korosec**

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Academic Work Experience

Adjunct Professor — *University of Guelph, Guelph, ON, CA*

Mathematics and Statistics — *July 2025 - Present*

- Instructor for third- and fourth-year undergraduate courses in Operations Research, including Linear Programming and Nonlinear Programming.
- Responsibilities include lecturing, designing problem sets and exams, and mentoring students, and developing my research program in mathematical biology and applying for external funding to support independent research and student training.

Postdoctoral researcher: Statistical analysis, within-host mathematical modelling, and machine learning — *York University, Toronto, ON, CA*

Mathematics and Statistics Department, supervisor: Jane M. Heffernan — *April 2021 - July 2025*

- My research focuses on immunogenicity of COVID-19 infection and vaccination.
- NSERC postdoc award winner and University of Toronto 'Artificial Intelligence for Public Health' fellow.
- Authored successful $30,000 COVID-19 Immunity Task Force grant.
- First Canadian to be Awarded the 2024 Michelson Postdoctoral Prized Lectureship in its 27 year history.

Program Manager, Modeling and Economics Research Network (ModERN) — *York University, Toronto, ON, CA*

Canadian Immunization Research Network (CIRN) — *Nov 2023 - July 2025*

- The focus of (ModERN) is to conduct epidemiological analyses, mathematical modeling, and economic analyses to study the cost-effectiveness and population-level effectiveness of public health interventions.
- Contribute to management of seminars and annual budget and writings of grants and research proposals.
- Component of my post doc appointment.

Undergraduate researcher: Crystal growth and magnetic properties of $Pr_{1-x}La_xAlO_3$ — *McMaster University, Hamilton, O.N., Canada*

Physics Department, supervisor: Bruce Gaulin — *May 2013 - May 2015*

- Summer student employment from May 2013 to May 2015.
- Research focused on the crystal growth and characterization of a family of perovskite crystals.

Education

Ph.D., Physics — *Burnaby, B.C., Canada*

Simon Fraser University (SFU) — *Sept. 2015 - April 2021*

- Thesis, "Modelling and engineering artificial burnt-bridge ratchet molecular motors", supervisor: Nancy R. Forde, committee: Martin J. Zuckermann & David A. Sivak.
- NSERC PGS-D and Steel Memorial award winner.

B.Sc. (hons), Physics — *Hamilton, O.N., Canada*

McMaster University — *Sept. 2011 - April 2015*

- Thesis, "Kinetics of Lamellar Formation on Chevron Directing Fields", supervisor: An-Chang Shi.

Teaching Experience

Lecturer

Fall 2025	**Math 3240: Operations Research, and Math 4240: Advanced Topics in Modelling**, Course Instructor	*U. of Guelph*
Fall 2021	**Math 1013: Applied Calculus I**, Delivered weekly live lectures (via Zoom) to 198 students. Prepared lectures, assignments, and exam questions. Developed 'asynchronous' videos of course content.	*York University*
Summer 2019	**Kasper Education Enrichment Program**, Co-developed and lectured introductory Python course to 12 secondary school students. Our course was 5 days long for 5 hours per day.	*Coquitlam, B.C.*

Teaching Assistant Experience

Fall 2019	**Physics 101: Physics for the Life Sciences**, tutorial instructor and marker.	*SFU*
Spr. 2017	**Physics 121: Optics, Electricity and Magnetism**, tutorial instructor and marker.	*SFU*
Fall 2016	**Physics 120: Mechanics and Modern Physics**, tutorial instructor and marker.	*SFU*
Fall 2015	**Physics 231: Physics Laboratory II**, laboratory instructor and marker.	*SFU*
Sum. 2015	**Physics 1B03: Mechanics and Waves**, laboratory instructor and marker	*McMaster University*

Publications

First author: 10 || Collaborating author: 9 || Senior author: 2 || † Corresponding author||ORCID || Google Scholar

21. P. Samaan, **C.S. Korosec**, P. Budylowski, S. Chau, A. Pascalescu, F. Qi, M. Delgado-Brand, T. Tursun, G. Mailhot, R. M. Dayum, A. Patel, K.Q. de Launay, J. Boyd, A. Takaoka, K. Colwill, A. McGeer, S. Straus, A.C. Gingras, J.M. Heffernen, M. Ostrowski (2025), "mRNA Vaccine-Induced Spike-Specific IFN-ɣ and IL-2 T-cell Responses are Predictive of Serological Neutralization up to 6-months Post-Second Dose and are Transiently Enhanced by Pre-Existing Cross-Reactive Immunity to SARS-CoV-2" *Journal of Virology*, 99(3). DOI

20. P. Nilsson , A. Zink , O.M.C. Laprévote , N.Gustafsson , N.O. Robertson , **C.S. Korosec**, N.R. Forde , B. Hocker, P.M.G. Curmi, H. Linke (2024), "Walking by design: how to build artificial molecular motors made of proteins" *Nano Futures*, 8(4). DOI
- Invited Contribution.

19. **C.S. Korosec** †, D.W. Dick, I.R. Moyles, J. Watmough (2024), "SARS-CoV-2 booster vaccine dose significantly extends humoral immune response half-life beyond the primary series", *Scientific Reports*, 14(1). DOI. **Media Coverage:** York University News, CTV News, Science Daily

18. **C.S. Korosec**†, L.M. Wahl, J.M. Heffernan (2024), "Within-host evolution of SARS-CoV-2: how often are *de novo* mutations transmitted from symptomatic infections?", *Virus Evolution*, 10(1). DOI

17. **C.S. Korosec**†,I. Unksov, P. Surendiran, R. Lyttleton, P.M.G. Curmi, C.N. Angstmann, R. Eichhorn, H. Linke, N.R. Forde (2024), "The Lawnmower: an autonomous, protein-based artificial molecular motor", *Nature Communications*, 15(1511). DOI **Media coverage:** Discover magazine, APS News, SFU media, Physics Magazine, CBC, The Scientist, Science Daily

16. V.A. Matveev, E. Mihelic, E. Benko, S. Grocott, T. Lee, **C.S. Korosec**, K. Colwill, H. Stephenson, R. Law, L.A. Ward, S. Sheikh-Mohamed, G. Mailhot, M. Delgado-Brand, A. Pasculescu, J.H. Wang, F. Qi, T. Tursun, L. Kardava, S. Chau, P. Samaan, A. Imran, D.C. Copertino Jr., G. Chao, Y. Choi, R.J. Reinhard, R. Kaul, J.M. Heffernan, R.B. Jones, T. Chun, S. Moir, J. Singer, J. Gommerman, A. Gingras, C. Kovacs, M. Ostrowski (2023). "Immunogenicity of COVID-19 vaccines and their effect on HIV reservoir in older people with HIV", *iScience*, 26(10). DOI

15. M. Banuet-Martinez, Y. Yang, B. Jafari, A. Kaur, Z.A. Butt, H.H. Chen, S. Yanushkevich, I.R. Moyles, J.M. Heffernan, **C.S. Korosec**† (2023). "Monkeypox: A review of epidemiological modelling studies and how modelling has led to mechanistic insight", *Epidemiology and Infection*, 151. DOI

14. I.R. Moyles, **C.S. Korosec**, J.M. Heffernan (2023). "Determination of significant immunological timescales from mRNA-LNP-based vaccines in humans", *Journal of Mathematical Biology*, 86(86). DOI

13. **C.S. Korosec**†, M. I. Betti, D.W. Dick, H.K. Ooi, I.R. Moyles, L.M. Wahl, J.M. Heffernan (2023) "Multiple cohort study of hospitalized SARS-CoV-2 in-host infection dynamics: parameter estimates, sensitivity and the eclipse phase profile", *Journal of Theoretical Biology*, 564. DOI

12. S. Gholami, **C.S. Korosec**, S.F. Sardroodi, D.W. Dick, M. Craig, M.J. Ghaemi, H.K. Ooi, J.M. Heffernan (2023). "A Mathematical Model of Protein Subunits COVID-19 Vaccines", *Mathematical Biosciences*, 358. DOI

11. **C.S. Korosec**†, S.F. Sardroodi, D.W. Dick, S. Gholami, M.S Ghaemi, M. Craig, H.K. Ooi, J.M. Heffernan (2022). "Long-term durability of immune responses to the BNT162b2 and mRNA-1273 vaccines based on dosage, age and sex", *Scientific Reports*, 12(1).DOI **Media coverage:** The Medical News

10. J. Lin, R. Law, **C.S. Korosec**, C. Zhou, W.H. Koh, M.S. Ghaemi, P. Samaan, H.K. Ooi, V. Matveev, F. Yue, A. Gingras, A. Estacio, M. Buchholz, P.L. Cheatley, A. Mohammadi, R. Kaul, K. Pavinski, S. Mubareka, A.J. McGeer, J.A. Leis, J.M. Heffernan, Mario Ostrowski (2022). "Longitudinal Assessment of SARS-CoV-2 Specific T Cell Cytokine-Producing Responses for 1 Year Reveals Persistence of Multi-Cytokine Proliferative Responses, with Greater Immunity Associated with Disease Severity", *Journal of Virology*, 96(13). DOI, **Media coverage:** The Medical News

9. I. Unksov, **C.S. Korosec**, P. Surendiran, D. Verardo, R. Lyttleton, N.R. Forde, H. Linke (2022). "Through the eyes of creators: observing artificial molecular motors", *ACS Nanoscience Au*, 2(3). DOI

8. S.F. Sardroodi, **C.S. Korosec**, S. Gholami, M. Craig, I.R. Moyles, M.S. Ghaemi, H.K. Ooi, J.M. Heffernan (2021). "Analysis of Host Immunological Response of Adenovirus-Based COVID-19 Vaccines", *Vaccines*, 9(8). DOI

7. A. Kowalewski, N.R. Forde, **C.S. Korosec**† (2021). "Multivalent diffusive transport", *J. Phys. Chem. B*, 125(25). DOI

6. **C.S. Korosec**†, L. Jindal, M. Schneider, I.C. Barca, M.J. Zuckermann, N.R. Forde, and E. Emberly (2020). "Substrate elasticity tunes the dynamics of polyvalent rolling motors", *Soft Matter* 17(16). DOI
- Article selected for front cover.

5. **C.S. Korosec**†, D.A. Sivak, and N.R. Forde (2020). "Apparent superballistic dynamics in one-dimensional random walks with biased detachment" *Physical Review R*, 2(3). DOI

4. **C.S. Korosec**†, M.J. Zuckermann, and N.R. Forde (2018). "Dimensionality-dependent crossover in motility of polyvalent burnt-bridges ratchets" *Physical Review E*, 98(3). DOI

3. M.W.H. Kirkness, **C.S. Korosec**, and N.R. Forde (2018). "Modified Pluronic F127 Surface for Bioconjugation and Blocking Nonspecific Adsorption of Microspheres and Biomacromolecules" *Langmuir*, 34(45). DOI

2. **C.S. Korosec**, M. Tachibana, H. Dabkowska, B.D. Gaulin (2018). "Single crystal growth and variation of thermodynamic and magnetic properties of $\mathrm{Pr_{1-x}La_xAlO_3}$ (x = 0,0.8)." *Materials Research Bulletin*, 100. DOI

1. **C.S. Korosec**†, N.R. Forde (2017). "Engineering Nanoscale Biological Molecular Motors" *Physics in Canada*, 72 (2). arXiv DOI
- Article selected for front cover.

Publications Submitted Or Under Review

1. **C.S. Korosec**, J.M. Conway, V.A. Matveev, M. Ostrowski, J.M. Heffernan, M.S. Ghaemi (2025), "Machine Learning Reveals Distinct Immunogenic Signatures of Th1 Imprinting in ART-Treated Individuals with HIV Following Repeated SARS-CoV-2 Vaccination" *Patterns*, Under Review. bioRxiv DOI

Publications In Preparation

3. **C.S. Korosec** *et al.* (2025), "Using the Naive Bayes algorithm to generate probabilistic maps of SIV tissue spread in macaques" in prep.
2. **Qiuyi Su** *et al.* (2025), "A mathematical modelling method to quantify immunity gained from vaccination" in prep.
1. **S. Gholami** *et al.* (2025), "The TEAIV model: Extending the standard TEIV model to account for viral budding ramp up" in prep.

Reports

2. **C.S. Korosec** & J.M Heffernan, “VIDO-InterVac AS20-015 Modelling report #1”. Submitted Nov. 2022.
1. Z. S. Yu, **C.S. Korosec**, & J.M Heffernan, “VIDO-InterVac AS20-015 Modelling report #2”. Submitted July 2024.

Student Supervision

Sept 2025-Dec. 2025	**Lily McChesney-Knight**, I am supervising Lily’s 4th year epidemiological project for Math*4600.	*U. of Geulph*
Sept 2024-July 2025	**Zhe Si Yu (Jecy)**, PhD candidate in Jane Heffernan’s lab. I am mentoring and co-supervising the progress of multiple applied mathematical projects led by Jecy. Jecy has successfully submitted as first author VIDO-InterVac reports on her original analysis and modelling of their proprietary data.	*York University*
July 2022 - Nov. 2022	**OMNI-RÉUNIS Health-A-Thon group supervisor**, I supervised 5 researchers from across Canada towards the completion of the 2022 OMNI-RÉUNIS Health-A-Thon project competition. We elected to study the current monkeypox outbreak. Our work, for which I am the senior author, has culminated in an extensive review of monkeypox applied mathematical studies and has been published in *Epidemiology and Infection*. I held weekly meetings, delegated tasks, supervised 5 group members, and oversaw the completion of this project. Our group presented our findings as a talk for OMNI-RÉUNIS in September of 2022.	*York University*
Feb. 2022 - July 2022	**Indicium Undergraduate Research Mentor**, I supervised the research project of 5 York undergraduate students. The students reviewed historical SARS-CoV-2 public health policies for the UK and New Zealand throughout the course of the pandemic. I mentored and coached them to produce a professional science poster and deliver a professional talk summarizing their work. They presented their work at the University level where they won, as the only group from York U., the opportunity to present at the National level.	*York University*
Jan. 2018 - Apr. 2021	**Antonia Kowalewski**, Undergraduate student in Nancy Forde’s lab. I co-supervised Antonia for our project “Multivalent diffusive transport” that led to publication in *J.Phys.Chem* with myself as the senior author. I conceived the project, taught Antonia the project-relevant statistical mechanics, provided introductory lessons in Python as well as C++, and facilitated Antonia’s scientific progress. Antonia is currently a Biological and Biomedical Sciences PhD student at Harvard University	*SFU*

Selected Honors & Awards

AWARDS TOTALLING OVER $210,000 (CAD)
SFU = SIMON FRASER UNIVERSITY, BURNABY, BC
CWRU = CASE WESTERN RESERVE UNIVERSITY

2025	**CIHR Travel Award**, National, $1500 (declined)	*CIHR*
2025	**Michelson Postdoctoral Prized Lectureship**, International, $3000 (USD)	*CWRU*
2023	**Fields Institute MfPH travel award**, National, $500	*Fields Institute*
2023-2024	**AI4PH Postdoctoral Award**, National, $20000/yr	*York University*
2021-2023	**NSERC Postdoctoral Fellowship (PDF)**, National, $42000/yr	*York University*
2020	**APS DBIO Shirley Chan Student Travel Grant**, International, $500	*Virtual*
2020	**Canron Limited Sidney Hogg scholarship**, Departmental, $1000	*SFU*
2020	**Soft Matter Canada Symposium Short Talk Award**, National	*Virtual*
2020	**Bio4Comp Research Travel Award**, International, €5000 (declined due to COVID pandemic)	*Lund University*
2020	**Biophysical Society of Canada Travel Award**, National, $500	*SFU*
2019-2020	**Sulzer (Bingham) Pumps Inc. Graduate Scholarship**, University-wide, $2000/yr	*SFU*
2019	**William & Ada Isabelle Steel Memorial Scholarship**, University-wide, $17000	*SFU*
2019	**Second-place overall talk at Frontiers in Biophysics**, Regional, $50	*SFU*
2019-2021	**NSERC Postgraduate Scholarship-Doctoral (PGS-D)**, National, $21000/yr	*SFU*
2019	**SFU Physics Annual Poster Session Second-Place Overall Poster Award**, Departmental, $50	*SFU*
2017,2019	**Travel and Minor Research Award**, Departmental, $1000/yr	*SFU*
2017-2020	**Graduate Fellowship**, Departmental, $3250 (2017, 2019, 2020), $6500 (2018)	*SFU*
2018	**Biophysical Society of Canada poster award**, National, $100	*SFU*
2018	**CAP Professional physicist (P.Phys.) designation**, National	*SFU*
2016	**Graduate International Research Travel Award**, University-wide, $5000	*SFU*
2016	**Biophysical Journal award for outstanding student poster**, International, $ 100	*Vancouver, BC*
2015	**Special Graduate Entrance Scholarship**, Departmental, $6000	*SFU*

Selected Talks and Posters

July 2025	**Society of Mathematical Biology Annual Meeting**, Poster Presentation, Edmonton, AB
July 2025	**Society of Mathematical Biology Annual Meeting**, Talk, Edmonton, AB
July 2025	**Society of Mathematical Biology Annual Meeting**, Invited Talk, Edmonton, AB
April 2025	**University of British Columbia, Department of Mathematics**, Departmental Colloquium, UBC, Vancouver, BC
April 2025	**CWRU, Physics**, Departmental Colloquium - prize lecture, Case Western Reserve U., Cleveland, Ohio, USA
April 2025	**CWRU, Physics**, Award (technical) Talk # 2, Case Western Reserve U., Cleveland, Ohio, USA
April 2025	**CWRU, Physics**, Award (technical) Talk # 1, Case Western Reserve U., Cleveland, Ohio, USA
Feb 2025	**OMNI-RÉUNIS, National Super Spreader Seminar Series**, Invited Talk (virtual)
Oct 2024	**Penn. State University, Mathematics**, Departmental colloquium, Penn State University, Pennsylvania, USA
July 2024	**AI4PH Annual General Meeting**, Awards talk, University of Calgary, Calgary, AB
June 2024	**Society of Mathematical Biology Annual Meeting**, Invited talk, Seoul, South Korea
June 2024	**Canadian Applied and Industrial Mathematics Society Annual Meeting Annual Meeting**, Invited talk, Queens University, Kingston, ON
June 2024	**Society for Industrial and Applied Mathematics Annual Meeting**, Invited talk, Portland, OR
June 2024	**Western University, Physics and Astronomy**, Departmental Colloquium, London, ON
Feb. 2024	**University of Waterloo, Applied Mathematics**, Departmental Colloquium, Waterloo, ON
Sept. 2023	**T-6 seminar series**, Departmental Colloquium, Los Alamos National Lab, NM
July 2023	**Society of Mathematical Biology**, Invited Talk, Columbus, OH
June 2023	**Canadian Applied and Industrial Mathematics Society Annual Meeting**, Invited Talk, University of New Brunswick, Fredericton, NB
May 2023	**Computational and Mathematical Population Dynamics**, Invited Talk, University of Manitoba, Winnipeg, MB
Feb. 2023	**SMB Epi-PDEE Mini-Conference**, Contributed Talk, Virginia Tech, VA
Sep. 2022	**12th European Conference on Mathematical and Theoretical Biology**, Invited Talk, Heidelberg University, Heidelberg, Germany
Feb. 2022	**Society for Mathematical Biology Mid-Year Symposium**, Contributed Talk, Virtual
Nov. 2021	**Canadian Mathematical Society Winter Meeting**, Invited Talk, Virtual
Nov. 2021	**Fields Institute Workshop on Modelling Immunity, "Mathematics for public health"**, Talk, University of Toronto, Toronto, ON
Oct. 2021	**Fred Hutch 5th workshop on Virus Dynamics**, Poster, Seattle, WA
Sept. 2021	**Canadian In-host Modelling Group**, Talk, Virtual
Jan. 2021	**SFU biophysics/soft matter seminar series**, Talk, Virtual
Oct. 2020	**UBC MathBio weekly colloquium**, Departmental Colloquium, University of British Columbia, BC, Canada
June 2020	**Soft Matter Canada Symposium**, Talk (awarded 'Best short talk'), Virtual
Feb. 2020	**Biophysical Society Annual Meeting**, Poster, San Diego, CA
June 2019	**Frontiers in Biophysics**, Talk (awarded '2nd best overall talk'), Vancouver, BC
June 2019	**Canadian Association of Physics Annual Meeting**, Talk, SFU
Mar. 2019	**American Physical Society March Meeting**, Talk, Boston, MA
June 2019	**SFU Physics Departmental Poster Session**, Poster (awarded second-place overall), SFU
June 2019	**TRIUMF Saturday morning lecture**, Invited talk, University of British Columbia, BC

Selected Talks and Posters Cont.

May 2018 **Biophysical Society of Canada Motors Meeting**, Talk, Vancouver, BC

Mar. 2018 **American Physical Society March Meeting**, Talk, Los Angeles, CA

Mar. 2018 **Three Minute Thesis Competition**, Talk, SFU

June 2016 **Biophysical Society Thematic Meeting: Engineering Approaches to Biomolecular Motors**, Poster (awarded 'Outstanding poster award'), Vancouver, BC

May 2016 **Micronano System Workshop**, Poster, Lund University, Lund, Sweden

Selected Outreach And Volunteering

Symposia Organizer
Fredericton, N.B.

Canadian Applied and Industrial Mathematics Society, 2023 — *March 2023*

- Organized symposia titled, "Within-host modelling: viral infection dynamics, bottlenecks, vaccines, and immunogencity"
- Featured 11 invited speakers

American Physical Society
Virtual

Participant in International Young Leaders Forum — *January 27-28, 2022*

- Invited to participate in the APS International Young Leaders Forum. From the invitation letter, I was anonymously nominated by a senior physicist who, "recognized your leadership, enthusiasm, and commitment to service-oriented activities beyond your physics research."

Seminar Series Chair
York, O.N.

York University Mathematics and Statistics — *Sept. 2021 - May 2022*

- Invited speakers to, and organized, monthly seminar series featuring Canadian and international speakers

Conference Chair
Vancouver, B.C.

2019 Frontiers in Biophysics — *Feb. 2017 - June. 2019*

- Successfully negotiated $6,500 in sponsorship from companies such as AbCellera, Evonik, Stemcell, as well as the Dean of Science and Office of Vice President Research, at SFU
- Managed a team of volunteers and the overall conference organization
- 28 presenters: target audience was HQPs in STEM
- Featured keynote Christopher Jarzynski, University of Maryland, College Park

Conference Chair
Vancouver, B.C.

Science Writers and Communicators of Canada, 2018, "On the edge", National Conference — *Feb. 2017 - Apr. 2018*

- Personally raised over $33,000 from sponsors such as MDA, PR Associates, SFU Faculty of Science, SFU Faculty of Applied sciences, & UBC Faculty of Science
- Managed a total budget of $ 65,000
- In the 47 year history of SWCC we had a record number of over 250 paying delegates, flew in highly esteemed keynotes, and SWC-Can2018 was the #1 most trending Canadian social media topic on April 13th, 2018
- Managed teams of volunteers as well as national conference committees and provided biweekly updates to organization executives
- Created and provided a budget breakdown and conference analysis for stakeholders

Conference Chair
Vancouver, B.C.

Physics Networking Conference — *Feb. 2017 - May 2017*

- Secured $3000 in funding from the office of Graduate Studies and Postdoctoral Fellows via their SCORE funding program. SCORE funding is competitive university-wide, is typically applied for by faculty members, and required a four-page written component and budget breakdown
- Curated a group of local industrial leaders such as MDA, Semios Technologies, D-Wave, Electronic Arts, Phase Tech., Novadaq Tech., and Lumerical Solutions, to speak on behalf of opportunities in their companies for physics graduate students

Physics Graduate Caucus President
Simon Fraser University

Represented the concerns of the physics graduate student body — *Sept. 2016 - Sept. 2017*

- Organized and chaired bi-weekly meetings.
- Managed a budget of $2,000/yr, used to run social activities for graduate physics students
- Acted as liaison between students and faculty
- Represented the graduate physics student body in SFU-wide graduate student society meetings

Let's Talk Science
Simon Fraser University

Volunteer — *Sept. 2016 - Sept. 2019*

- Wrote an article for Let's Talk Science's online publication CurioCity that was awarded article of the month for "an excellent job at making a complex topic accessible to teens"
- Delivered science presentations and workshops to primary and middle school students