Aidan I. Brown

Assistant Professor
Dept. of Physics, Ryerson University
350 Victoria St. Toronto, Ontario, M5B 2K3
aidan.brown@ryerson.ca — 619-549-7757 — aidanibrown.com

Research and Professional Experience

2020– **Assistant Professor**, *Dept. of Physics*, *Ryerson University*

2018–2020 **Postdoctoral Fellow**, *Dept. of Physics*, *University of California, San Diego*
Biological Physics and Nonequilibrium Statistical Mechanics of confined proteins with Prof. Elena Koslover.

2015–2018 **Postdoctoral Fellow**, *Dept. of Physics*, *Simon Fraser University*
Biological Physics and Nonequilibrium Statistical Mechanics of molecular machines with Prof. David Sivak.

Education

2012–2015 **Ph.D. in Physics**, *Dalhousie University*
Thesis: "Quantitative modelling of autophagy-related protein dynamics and clustering on peroxisome surfaces." Advisor: Prof. Andrew Rutenberg.

2010–2012 **M.Sc. in Physics**, *Dalhousie University*
Thesis: "Fixed nitrogen dynamics and heterocyst patterning in filamentous heterocystous cyanobacteria." Advisor: Prof. Andrew Rutenberg.

2006–2010 **B.Sc. Honours in Physics**, *University of Guelph*
Thesis: "Optical Conductivity of Graphene." Advisor: Prof. Elisabeth Nicol.
GPA: 94.5%. Governor General's Silver Medalist.
Summer research: biophysics and statistical mechanics theory with Profs. Rob Wickham and John Dutcher, condensed matter theory with Prof. Stefan Kycia.

Awards and Fellowships

2012-2015 **Canada Graduate Scholarship, Ph.D**, *Natural Sciences and Engineering Research Council of Canada (NSERC)*

2012-2014 **Killam Predoctoral Scholarship, Ph.D**, *Dalhousie University*

2012-2014 **Walter C Sumner Memorial Fellowship**, *Dalhousie University*

2010-2012 **Killam Predoctoral Scholarship, M.Sc**, *Dalhousie University*

2010-2011 **Canada Graduate Scholarship, M.Sc**, *NSERC*

2010 **Governor General's Silver Medal**, *University of Guelph*, awarded to the two graduating undergraduate students with highest GPAs across the university

Publications

peer-reviewed: 21 / first author: 15

22 DOI SS Mogre, **AI Brown**, and EF Koslover. "Getting around the cell: physical transport in the intracellular world." *Phys. Biol.* In press.

21 DOI **AI Brown**, LM Westrate, and EF Koslover. "Impact of global structure on diffusive exploration of organelle networks." *Sci. Rep.* **10**: 4984 (2020)

20 DOI MP Viana, **AI Brown**, IA Mueller, C Goul, EF Koslover, and SM Rafelski. "Mitochondrial Fission and fusion dynamics generate efficient, robust, and evenly distributed network topologies in budding yeast cells." *Cell Syst.* **10**: 287-297 (2020)

19 DOI **AI Brown** and DA Sivak. "Theory of nonequilibrium free energy transduction by molecular machines." *Chem. Rev.* **120** 434-459 (2020)

18 DOI **AI Brown** and EF Koslover. "Drive, filter, and stick: A protein sorting conspiracy in photoreceptors." *J. Cell Biol. (Spotlight article)* **218**, 3533-3534 (2019). ***Not peer reviewed***

17 DOI Z Chen, R Gabizon, **AI Brown**, A Lee, A Song, CD Celis, EF Koslover, T Yao, and C Bustamante. "High-resolution and high-accuracy topographic and transcriptional maps of the nucleosome barrier." *eLife.* **8**, e48281 (2019). Featured in *eLife Insight*.

16 DOI A Zarrin, DA Sivak, and **AI Brown**. "Breaking time-reversal symmetry for ratchet models of molecular machines." *Phys. Rev. E,* **99**, 062127 (2019).

15 DOI **AI Brown** and DA Sivak. "Pulling cargo increases the precision of molecular motor progress." *Europhys. Lett.,* **126**, 40004 (2019)

14 DOI **AI Brown** and DA Sivak. "Allocating and splitting free energy to maximize molecular machine flux." *J. Phys. Chem. B,* **122**, 1387-1393 (2018)

13 DOI **AI Brown** and DA Sivak. "Allocating dissipation across a molecular machine cycle to maximize flux." *Proc. Natl. Acad. Sci. USA,* **114**, 11057-11062 (2017).

12 arxiv PiC **AI Brown** and DA Sivak. "Toward the design principles of molecular machines." *Physics in Canada,* **73**, 61-66 (2017).

11 DOI **AI Brown** and AD Rutenberg. "A model of autophagy size selectivity by receptor clustering on peroxisomes." *Front. Phys.,* **5**, 14 (2017).

10 DOI **AI Brown** and DA Sivak. "Effective dissipation: breaking time-reversal symmetry in driven microscopic energy transmission." *Phys. Rev. E,* **94**, 032137 (2016).

9 DOI AD Rutenberg, **AI Brown**, and L Kreplak. "Uniform spatial distribution of collagen fibril radii within tendon implies local activation of pC-collagen at individual fibrils." *Phys. Biol.,* **13**, 046008 (2016).

8 DOI SG Farrell, **AI Brown**, and AD Rutenberg. "Single file diffusion into a semi-infinite tube." *Phys. Biol.,* **12**, 064001 (2015).

7 DOI **AI Brown** and AD Rutenberg. "Cluster coarsening on drops exhibits strong and sudden size-selectivity." *Soft Matter,* **11**, 3786-3793 (2015).

6 DOI **AI Brown**, L Kreplak, and AD Rutenberg. "An equilibrium double-twist model for the radial structure of collagen fibrils." *Soft Matter,* **10**, 8500-8511 (2014).

5 DOI CR Nayak, **AI Brown**, and AD Rutenberg. "Protein translocation without specific quality control in a computational model of the Tat system." *Phys. Biol.,* **11**, 056005 (2014).

4 DOI **AI Brown**, PK Kim, and AD Rutenberg. "PEX5 and ubiquitin dynamics on mammalian peroxisome membranes." *PLoS Comput. Biol.,* **10**, e1003426 (2014).

3 DOI **AI Brown** and AD Rutenberg. "A storage-based model of heterocyst commitment and patterning in cyanobacteria." *Phys. Biol.,* **11**, 016001 (2014).

2 DOI **AI Brown** and AD Rutenberg. "Heterocyst placement strategies to maximize the growth of cyanobacterial filaments." *Phys. Biol.,* **9**, 046002 (2012).

1 DOI **AI Brown** and AD Rutenberg. "Reconciling cyanobacterial fixed-nitrogen distribution and transport experiments with quantitative modelling." *Phys. Biol.,* **9**, 016007 (2012).

Manuscripts Under Review and In Revision

AI Brown, and EF Koslover. "Design principles for the glycoprotein quality control pathway." Under review.

Advising and Mentoring Experience

Graduate researchers, University of California, San Diego

2019 – 2020 Ximena Garcia-Arceo. "Quantitative modeling of mRNA translation and localization to mitochondria."

Undergraduate researchers, University of California, San Diego

2020 Rae Therese Fariolen. "Diffusive transport in organelles."

Undergraduate researchers, Simon Fraser University

2016 – 2018 Arshia Zarrin. "Dissipation and irreversibility in model molecular motors."

Undergraduate researchers, Dalhousie University

2014 – 2015 Spencer Farrell. "Single file diffusion into semi-infinite tubes"

2014 Will Musgrave. "Photobleaching fluctuations with rotational dynamics"

2012 Elias Zoghaib. "Fixed nitrogen storage models with filamentous cyanobacteria"

Teaching Experience

Fall 2020 **Course Instructor**, *Ryerson University, PCS 107: The Natural Context.* 126 students.

2015,2016, 2018 **Guest Lecturer**, *University of California, San Diego: Physics of the Cell. Simon Fraser University: Nonequilibrium Statistical Mechanics and Stochastic Processes; Thermodynamics; Soft Condensed Matter and Biological Physics.*

2018 **Research Facilitator**, *Marine Biological Laboratory, Physical Biology of the Cell course.* Supervised biology graduate students during research projects for intensive course on physical and computational modeling of cell biological processes.

2010 – 2012 **Teaching Assistant**, *Dalhousie University: Modern Physics, Electricity and Magnetism, Introduction to Numerical Programming, Statistical Mechanics.* Designed and ran tutorials, created solution keys, and graded problem sets.

2010 **Lab Instructor**, *Dalhousie University: Introduction to Physics.* Demonstrated experiments, assessed students orally, and supported students as they completed experiments.

Teaching Training

2016 **Instructional Skills Workshop**, *Simon Fraser University: Teaching and Learning Centre.* Three day intensive workshop focusing on lesson planning, participative and active learning techniques, and providing effective feedback.

Selected Talks

Apr 2020 Colloquium, Department of Physics and Energy Science, University of Colorado Colorado Springs. *Invited.*

Mar 2020 Department Seminar, Department of Biology, York University. *Invited.*

Mar 2020 Colloquium, Department of Physics, Ryerson University. *Invited.*

Mar 2020 American Physical Society March Meeting (virtual session).

Feb 2020 Colloquium, School of Physics and Astronomy, Rochester Institute of Technology. *Invited.*

Feb 2020 Colloquium, Department of Physics, University of Texas at Dallas. *Invited.*

Jan 2020 Colloquium, Department of Physics and Astronomy, Trent University. *Invited.*

May 2019 Biophysics and Systems Biology Seminar, University of California, Irvine. *Invited.*

Jan 2019 Colloquium, Department of Physics, University of Alberta. *Invited.*

June 2017 Frontiers in Biophysics, University of British Columbia.

Jan 2017 Mehta, Korolev, and Segrè Group Meeting, Boston University.

Mar 2016 Postdoc Research Day, Simon Fraser University.

Mar 2016 American Physical Society March Meeting.

Mar 2015 American Physical Society March Meeting.

Jan 2015 Biophysics/Soft Matter Seminar, Simon Fraser University.

Jun 2014 Canadian Mathematical Society Summer Meeting. *Invited.*

Apr 2014 Physics of Soft and Biological Matter Conference. *Selected for talk.*

Dec 2013 Waterloo Soft Matter Theory Conference.

Jun 2013 Canadian Mathematical Society Summer Meeting.

Mar 2013 American Physical Society March Meeting.

Mar 2011 American Physical Society March Meeting.

Mar 2010 American Physical Society March Meeting.

Selected Posters

Feb 2020 Annual Meeting of the Biophysical Society.

Jan 2019 Stochastic Physics in Biology Gordon Conference.

Dec 2018 American Society for Cell Biology Meeting.

Jan 2017 Berkeley Statistical Mechanics Meeting.

Jan 2017 Stochastic Physics in Biology Gordon Conference.

Jun 2016 Engineering Approaches to Biomolecular Motors. *Poster Prize.*

Apr 2013 Chemical Biophysics Symposium.

Apr 2012 Chemical Biophysics Symposium.

Jun 2011 7th International Conference on Biological Physics.

Journal Peer-Review

Biophysical Journal, Physical Review E, Physical Review X, Physical Review Letters, MDPI Life

Other University Activities

2019 Physics outreach, Young Scientists Club, outreach for students in grades one to three

2019 Physics outreach, Tech Trek summer camp for middle school girls

2015 – 2018 Co-organizer, Simon Fraser University Biophysics / Soft Matter seminar series

2011 – 2013 President, Dalhousie Graduate Physics Society

2011 Physics outreach, Discovery Days for middle and high school students

2009 – 2010 Physics Representative to College Council, College of Physical and Engineering Science, University of Guelph

2009 – 2010 Executive Member, Physics Club, University of Guelph

2008 – 2010 Undergraduate Representative, Dept. of Physics Curriculum Committee, University of Guelph