

Aidan I. Brown

Assistant Professor

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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: 22 / first author: 16

- 23 [DOI](#) **AI Brown**, and EF Koslover. “Design principles for the glycoprotein quality control pathway.” *PLoS. Comput. Biol.* **17**: e1008654 (2021)
- 22 [DOI](#) SS Mogre, **AI Brown**, and EF Koslover. “Getting around the cell: physical transport in the intracellular world.” *Phys. Biol.* **17**: 061003 (2020)
- 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).

Advising and Mentoring Experience

Undergraduate researchers, Ryerson University

2020 – Jamal Faraj. “Protein distribution in mitochondrial networks.”

2020 – Robert Kalisky. “Protein quality control effects on protein production efficiency.”

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 Zoghailb. “Fixed nitrogen storage models with filamentous cyanobacteria”

Teaching Experience

- WINTER 2021 **Course Instructor**, Ryerson University, PCS 350: *Computational Methods in Medical Physics*.
- 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

- MAR 2021 Biophys TO seminar, Department of Physics, University of Toronto. *Invited*.
- MAR 2021 March Meeting of the American Physical Society (virtual session).
- FEB 2021 Colloquium, Department of Mathematics, Ryerson University. *Invited*.
- JAN 2021 Quantitative Biology in Canada seminar, Virtual. *Invited*.
- 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

- 2020–2021 Undergraduate Scholarships and Awards Committee, Dept. of Physics, Ryerson University
- 2019 Physics outreach, Young Scientists Club at Carmel Creek Elementary in San Diego, outreach for students in grades one to three
- 2019 Physics outreach, [Tech Trek](#) summer camp at UC San Diego 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](#), middle and high school students at Dalhousie University
- 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