

Matthew Leighton

Curriculum Vitae

Education

- 2020–Present **M.Sc. in Physics**, *Simon Fraser University*, Burnaby, Canada.
- 2016–2020 **B.Sc. Honours in Physics and Mathematics**, *Dalhousie University*, Halifax, Canada.
- **Honours Thesis:** *Modelling the Formation of Cross-Linked Collagen Fibrils*, supervised by Prof. Andrew Rutenberg.
 - Member of the Varsity Track Team (2016-2018)
 - Choral Scholar with the University of King's College Chapel Choir (2016-2020)
- 2019 **Exchange Program, Mathematics and Statistics**, *Chalmers University of Technology*, Göteborg, Sweden.

Experience

Research Experience

- 2020–Present **Graduate Researcher**, *Sivak Group*, Simon Fraser University.
- Working under the supervision of professor David Sivak, analyzing biological molecular machine systems using the theory of nonequilibrium statistical mechanics. Projects include exploring performance trade-offs in intracellular transport systems, and investigating information thermodynamics in multipartite stochastic systems.
- 2018–2020 **Undergraduate Researcher**, *Rutenberg Group*, Dalhousie University.
- Worked with professor Andrew Rutenberg on various research projects in theoretical biophysics using computational and mathematical methods. Projects included modelling stochastic effects in the process of host cell invasion by *S. Typhimurium* bacteria, developing a theoretical model for the thermodynamics of *in vivo* Collagen fibril growth, and studying the mechanics of double-twist liquid crystal elastomer systems under deformation.

Other Experience

- 2017–2018 **Business Analyst**, *Inetco Systems LTD*, Vancouver, Canada.
- Responsibilities included:
- Financial modelling and analysis,
 - Managing marketing campaigns, and
 - Communicating product requirements to the software development team.
- Started as a summer co-op student, and stayed on as a part time consultant over the next year.
- Summer **Science Outreach**, *Dalhousie University*, Halifax, Canada.
- 2018,2019 ○ Led interactive physics experiment demonstrations as part of the Discovery Days outreach program for elementary and high school students.
- Summer **Bicycle Instructor**, *Pedalheads*, Vancouver, Canada.
- 2015,2016 ○ Taught children aged 4-13 beginner to advanced biking skills.

Volunteer Coach.

- Head coach for a Vancouver Hawks youth field hockey team (Spring 2015/16/17)
- Assistant coach for Kitsilano Secondary School's junior ice hockey team (2015-2016)

Publications and Manuscripts

M.P. Leighton, L. Kreplak, and A.D. Rutenberg, "Nonequilibrium Growth and Twist of Cross-Linked Collagen Fibrils", *Soft Matter*, **17**:1415, 2021.

M.P. Leighton, L. Kreplak, and A.D. Rutenberg, "Chiral Phase-Coexistence in Compressed Double-Twist Elastomers", *Soft Matter*, **17**:5018, 2021.

Under Review

M.P. Leighton, A.D. Rutenberg, and L. Kreplak, "D-Band Strain Underestimates Collagen Fibril Strain", 2021.

M.P. Leighton, David A. Sivak, "Performance Scaling and Trade-offs in Collective Motor-Driven Transport", 2021.

Selected Talks and Posters

Talks

June 2021 **Scaling Laws and Performance Trade-offs for Collective Transport**, *Frontiers in Biophysics 2021*.

November 2020 **Structural Phase Transitions in Double-Twist Elastomers**, *Collagen Cafe II*.

July 2020 **Nonequilibrium Growth of Cross-Linked Collagen Fibrils**, *Collagen Cafe I*.

June 2020 **Elastomeric Properties of Double-Twist Collagen Fibrils**, *Soft Matter Canada Symposium*.

March 2020 **Modelling Cross-Linking in Collagen Fibrils**, *APS March Meeting (via DSOF Virtual Meeting)*.

January 2020 **Coarse-Grained Structure of Double-Twist Liquid Crystals**, *Atlantic Undergraduate Physics Conference*.

Selected for award – top theory talk.

November 2019 **Modelling Cross-Linking in Collagen Fibrils**, *Canadian Undergraduate Physics Conference*.

August 2018 **Stochastic Modelling of Cellular *Salmonella* Infection**, *Dalhousie Bioblast Symposium*.

Posters

May 2021 **Scaling Laws and Performance Trade-offs for Collective Transport**, *Biophysical Society of Canada Annual Meeting*.

Selected for poster award.

February 2021 **Performance Trade-offs in Cooperative Intracellular Transport**, *SFU Physics Department Poster Session*.

Awards

2021 **Kirk H. Michaelian Graduate Scholarship**, *Simon Fraser University*.

2021 **Poster Award**, *Canadian Biophysical Society*.

2020–2021 **NSERC CGS-M**, *Simon Fraser University*.

2020–2021 **BC Graduate Scholarship**, *Simon Fraser University*.
2020 **NSERC USRA**, *Dalhousie University*.
2020 **Top Theory Talk**, *Atlantic Undergraduate Physics Conference*.
2018 **NSERC USRA**, *Dalhousie University*.
2016–2020 **Chancellor's Scholarship**, *Dalhousie University*.
2016–2020 **Helen Roby Choral Scholarship**, *University of King's College*.
2017–2018 **USports Academic All-Canadian**, *Dalhousie University*.
2016–2017 **USports Academic All-Canadian**, *Dalhousie University*.
2017 **Archibald Physics Prize**, *Dalhousie University*.
2016–2020 **Dean's List**, *Dalhousie University*.

Miscellaneous Qualifications

Grade 8 Piano, Advanced Music Theory, *Royal Conservatory of Music*.
DELF B2, *French language Certification*.
CSIA Level 1 Ski Instructor, *Canadian Ski Instructors Alliance*.
AST 1 Avalanche Skills, *Avalanche Canada*.
Emergency First Aid, CPR-C, and Bronze Cross, *Canadian Lifesaving Society*.
Cansail 4, *Sail Canada*.

Languages and Technical Skills

- **Languages:** English (Native), French (Fluent)
- Extensive experience with scientific programming and numerical optimization in Python
- Experienced in the use of Compute Canada computing clusters
- Working knowledge of MATLAB, Mathematica, HTML, R, and C/C++