

Education

- 2020/22 **M.A.Sc., Mechanical Engineering**
University of Toronto
4.00/4.00, Canada Graduate Scholarship Recipient
Advisor: Prof. Benjamin Hatton (Materials Science and Engineering)
- 2016/20 **B.A., Architecture, Technology**
University of Toronto
3.95/4.00, High Distinction, Dean's List Scholar, University of Toronto Scholar
Governor General's Silver Medal Nominee
Top Graduate, Faculty of Architecture (Graduating rank: 1 of 250)

Awards, Scholarships, Fellowships, and Distinctions

- 2021 **Canada Graduate Scholarship (\$17 500)**
Awarded by the National Sciences and Engineering Research Council of Canada to support research efforts of the best graduate students in all disciplines of academic study within the country.
- 2021 **Ontario Graduate Scholarship (\$15 000, declined)**
Awarded by the Government of Ontario to the best graduate students in all disciplines of academic study within the province.
- 2021 **C.W. Bowman Graduate Scholarship in Energy Research (\$5 000)**
Awarded by the Centre for Global Engineering for innovative research on global energy systems relating to the environment and sustainability.
- 2021 **Bert Wasmund Graduate Fellowship in Sustainable Energy Research (\$1 150)**
Awarded by the Department of Mechanical Engineering for innovative research on the recovery and utilization of energy derived sustainably from the sun.
- 2020 **Governor General's Silver Medal Nominee**
Recognized by the University of Toronto as a top graduate in the undergraduate student body.
- 2020 **Top Graduating Student, Faculty of Architecture**
Recognized by the Daniels Faculty of Architecture as the top graduate of the Honours Bachelor of Arts program in 2020. Graduating rank: 1/250.
- 2020 **University of Toronto Academic Merit Award (\$500)**
Awarded by the Daniels Faculty of Architecture to graduating undergraduate students with a cumulative grade point average of 3.8 or higher (3.95).
- 2020 **NSERC Undergraduate Student Research Award (\$6 500)**
Awarded one of the few departmental placements by the Department of Materials Science and Engineering to carry out a proposed research study under the supervision of a faculty member.
- 2020 **University of Toronto Dean's List Scholar**
Recognized by the University of Toronto for achieving a cumulative grade point average of 3.5 or higher (Final CGPA: 3.95).
- 2019 **Oxford Rhodes Scholarship Finalist**
Selected by the Ontario Rhodes Scholarship Selection Committee, chaired by the Honourable Dennis O'Connor, as one of 13 provincial finalists for the scholarship from a pool of over 100 000 students.

- 2019 **Oxford Rhodes Scholarship Nominee**
Selected by the University of Toronto as one of six graduating students, from a pool of over 15 000, to be presidentially endorsed for the Oxford Rhodes Scholarship.
- 2019 **Leaders of Tomorrow Award (\$2 500)**
Awarded by the French engineering company, SOPREMA, to the professionals of tomorrow, researching new methods and ideas that will shape the buildings of the future.
- 2019 **University of Toronto Scholar (\$1 500)**
Awarded by the Daniels Faculty of Architecture to the most outstanding students who have completed the third year of an undergraduate program.
- 2019 **University of Toronto Dean's List Scholar**
Recognized by the University of Toronto for achieving a cumulative grade point average of 3.5 or higher (Final CGPA: 3.95).
- 2019 **NSERC Undergraduate Student Research Award (\$6 500)**
Awarded one of the few departmental placements by the Department of Materials Science and Engineering to carry out a proposed research study under the supervision of a faculty member.
- 2018 **University of Toronto Dean's List Scholar**
Recognized by the University of Toronto for achieving a cumulative grade point average of 3.5 or higher (Final CGPA: 3.95).
- 2018 **NSERC Undergraduate Student Research Award (\$6 500)**
Awarded one of the few departmental placements by the Department of Civil and Mineral Engineering to carry out a proposed research study under the supervision of a faculty member.
- 2017 **University of Toronto Dean's List Scholar**
Recognized by the University of Toronto for achieving a cumulative grade point average of 3.5 or higher (Final CGPA: 3.95).
- 2017 **Cansbridge Fellowship Finalist**
Selected as one of 30 finalists, from a pool of 360 applicants, for the National Cansbridge Fellowship to travel and work abroad.
- 2016 **DECA Provincial Finalist**
Recognized by the Distributive Education Clubs of America as a top-ten finalist in the annual regional case competition.
- 2016 **Lynn MacGillivray Memorial Scholarship (\$300)**
Awarded on the basis of scholarly achievement in Secondary School.
- 2016 **Rob Crombie Memorial Scholarship (\$2 000)**
Awarded on the basis of scholarly achievement in Secondary School.

Formal Research Activities

- 2020/20 **Functional and Adaptive Surfaces Group, Materials Science and Engineering**
NSERC Undergraduate Student Research Award, University of Toronto, Prof. Benjamin Hatton
Conceived and led project using instabilities between fluids to create conditions for reversible fluid pocket growth within building skins to regulate heat and light transmission.
- 2019/20 **Sustainable Built Environment Performance Assessment Group, School of the Environment**
Undergraduate Researcher, University of Toronto, Prof. John Robinson
Led project addressing the discrepancy between perceived indoor air quality and measured indoor air quality, and set best practices for alleviating this discrepancy.
- 2019/20 **Functional and Adaptive Surfaces Group, Materials Science and Engineering**
NSERC Undergraduate Student Research Award, University of Toronto, Prof. Benjamin Hatton
Led project designing, prototyping, and testing micro-fluidic window system, based on biological capillary temperature regulation.

- 2018/19 **Siegel Group, Indoor Air Quality, Civil and Mineral Engineering**
NSERC Undergraduate Student Research Award, University of Toronto, Prof. Jeffery Siegel
Led project comparing microbial research within lab setting to microbial growth in field setting. Conducted experiments investigating particulate matter emissions from indoor sources, and filter forensics experiments studying new means of collecting indoor air quality data.

Informal Research Activities

- 2019/20 **Self-Propelling Autonomous Robotic Locomotion**
University of Waterloo, University of Toronto, Prof. David Correa
Co-designed and fabricated (w/ Kevin Nitièma) self-propelling hygroscopic robot with capability to crawl without active energy.
- 2019/19 **Sustainable Design Team, Net Positive Data Centre**
Living Lab of Sustainability, University of Toronto, Prof. John Robinson
Provided design suggestions to the Managing Director of University of Toronto Planning for one of the first net-energy positive buildings in Toronto (course code: ENV461).

Employment

- 2019/19 **School of the Environment, University of Toronto, Toronto, Ontario**
Studied and quantified effect of psychosocial influences on indoor air quality measurement.
- 2017/18 **Founder, TAP Parking, Toronto, Ontario**
Co-founded a startup concept that connects drivers with empty driveways in areas where parking opportunities are scarce and expensive. Eventually met with leading competitor, Rover, to discuss ways to work together to solve ultimate goal of alleviating parking stress.

Volunteer Work

- 2017/17 **Volunteer, Public Architecture, San Francisco, California (remote work)**
Worked with leader in social-impact environmental design, specifically facilitating the connection between non-profit organizations and pro bono design work.

International Collaboration

- 2019 **Delft University of Technology, Certificate, Planning and Design with Water for Sustainability**
Chosen as one of three students to represent Canada in multinational water management program. Collaborated with students from 52 countries to engineer flood-protection solutions along coastlines.

Refereed Research Contributions

- 2020 First author. Kay, R., K. Nitièma, and D. Correa. **The bio-inspired design of a self-propelling robot driven by changes in humidity**, in *Proceedings of the 38th eCAADe Conference*, L. Werner and D. Koering, Editors. 2020: Berlin, Germany. p. 233-242. http://papers.cumincad.org/cgi-bin/works/Show?ecaade2020_195.
- 2021 First author. Kay, R., Mattacchione, A., Katrycz, C., and B. D. Hatton. **Stepwise slime mould growth as a template for urban design**, under review for *Scientific Reports*.
- 2021 First author. Kay, R., Katrycz, C., Heimlich, E., and B. D. Hatton. **Programmable Droplets: Leveraging digitally-responsive flow fields to tune liquid morphology**, under review for *Realignments ACADIA 2021*.

Working Refereed Research Contributions

- 2021 First author. Kay, R., Katrycz, C., Nitièma, K., and B. D. Hatton. **Self-organizing fluids for active building facades**, for submission to *Science*.
- 2021 First author. Kay, R., Jakubiec, J.A., Katrycz, C., and B. D. Hatton. **Active multilayered liquid chemistries for buildings**, for submission to *Nature Materials*.

- 2021 First author. Kay, R., Katrycz, C., Nitièma, K., and B. D. Hatton. **Self-assembling fluid bubbles for responsive building skins**, for submission to *International Journal of Architectural Computing*.
- 2021 First author. Kay, R., Katrycz, C., and B. D. Hatton. **Self-assembling fluidic apertures for tunable light transmission in buildings**, for submission to *Nature Materials* or *Advanced Materials*.
- 2021 First author. Kay, R., and B. D. Hatton. **Active bio-inspired skins for dynamic functionality in architecture**, for submission to *Advanced Materials (Review)*.
- 2021 Second author. Katrycz, C., Kay, R., Nitièma, K., and B. D. Hatton. **Functional nonlinear pattern dynamics**, undetermined destination.

Non-refereed Research Contributions

- 2020 Co-author. Kay, R., and K. Nitièma. **Bio-inspired fluid cell growth for adaptive optical transmission in buildings**. Undergraduate Thesis. Faculty of Architecture, University of Toronto.
- 2019 Co-author. Kay, R., Chakwera, A., Patrick, B., Vashisth, S., Trewern, N., and Y. Husodo. **Vision for a net-positive data sciences centre**: Report to the Department of Campus and Facilities Planning. University of Toronto.

Scholarly Conference Presentations

- 2021 **Slime mould networks as a template for the design of cities**, in *Sustainability and Water*, 2nd University of Toronto Engineering Research Conference 2021, University of Toronto (virtual). July 8, 2021.
- 2021 **Biological microfluidics for smart optical control in buildings**, in *Functional and Emerging Materials*, 32nd Canadian Materials Science Conference 2021, Queen's University (virtual). June 4, 2021.
- 2020 **From pinecones to robots**, in *Cognizant Architecture - What if Buildings Could Think?*, 38th eCAADe Conference, TU Berlin (virtual). September 14, 2020. <https://vimeo.com/452713318>.

Selected Academic Presentations

- 2020 **Hypothesized design of a contactless delivery robot for SARS-CoV-2 testing and administration**. Final presentation: Physical Computing course, University of Toronto. <https://vimeo.com/403169347>.

Awarded Features, Public Exhibitions, and Interviews

- 2020 **Molten Snowflakes**, selected as Research Revealed feature. <https://researchrevealed.utoronto.ca/shape-changing-apertures-that-control-how-much-light-or-heat-enters-a-building/>.
- 2020 **Check out the work of the Daniels Faculty's first-ever undergraduate thesis students**. <https://www.daniels.utoronto.ca/news/2020/05/11/check-out-work-daniels-facultys-first-ever-undergraduate-thesis-students/>.
- 2019 **A Graduate of the University of Toronto Faculty of Architecture Receives Soprema's Leaders of Tomorrow Award**. <https://www.soprema.ca/a-graduate-of-the-university-of-toronto-faculty-of-architecture-receives-sopremas-leaders-of-tomorrow-award/>.

Software and Fabrication Proficiency

Graphic Design, Video, and Communication: Adobe Creative Cloud (Photoshop, Illustrator, InDesign, Premier Pro, Acrobat Pro), Microsoft Office Suite (Excel, Word, PowerPoint)

3D Modeling: Rhinoceros, SketchUp, Autodesk Fusion 360

Computational Design and Electronics: Processing, Grasshopper (GH), GHPython (GH), Kangaroo (GH), Arduino

Programming, Statistical Analysis, and Geographical Analysis: Python, R Studio, MATLAB, ArcGIS/ArcMap

Computational Fluid Dynamics: ANSYS Fluent, RhinoCFD (GH)

Computational Thermodynamics: ANSYS Steady/Transient State Thermal FEA, THERM

Computational Energy Analysis: Climate Studio (GH), Ladybug (GH), HoneyBee/Energy+ (GH), DesignBuilder, Climate Consultant

Computational Structural Analysis: Karamba3D (GH)

Digital Fabrication: CNC Milling (RhinoCAM), Laser Cutting, 3D Printing

Audited/Online Coursework (*not on transcript*)

2021	Engineering Chemistry and Materials Science (audited, University of Toronto)
2021	Multivariable Calculus , <i>in progress</i> (Khan Academy)
2021	Learn to Program , python language (Coursera, University of Toronto)
2020	Introduction to Materials Science (audited, University of Toronto)
2020	Fluid Mechanics I (audited, University of Toronto)
2020	Introductory Physics II (audited, University of Toronto)
2019	Physical Chemistry (audited, University of Toronto)

Non-academic Leadership Activities and Achievements

2018/20	Intramural Basketball, Dodgeball Captain , University of Toronto
2019/19	Orientation Leader , University of Toronto Faculty of Architecture
2017/18	Head of Recruitment , Alpha Epsilon Pi, Tau Omega Chapter
2008/16	Provincial Club Basketball Player , Ontario Basketball Association
2016/16	Culture Club President , North Toronto Collegiate Institute
2016/16	Volunteer House League Basketball Head Coach , North Toronto Basketball Association
2015/17	Senior Basketball Camp Coach and Counsellor , Upper Canada College Summer Camps
2015/16	Co-captain , North Toronto Collegiate Institute senior basketball team
2013/14	Captain , North Toronto Collegiate Institute junior basketball team
2013/14	Most Valuable Player , North Toronto Collegiate Institute junior basketball team

July 2021