

# Lindsey Daniels

## Curriculum Vitae

Department of Mathematics & Statistics  
McMaster University, Hamilton, ON, Canada  
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### Research Interests

- Mathematical Modelling
- Mathematical Education
- Mathematical Physics
- Nanotechnology
- Electrochemistry
- Stochastic Processes

### Education

- Jan 2016–Aug 2019 **Ph.D.**, *Department of Applied Mathematics, Faculty of Mathematics, University of Waterloo*, Waterloo, ON, Canada, Supervisors: Zoran L. Mišković and Matthew Scott.  
Mathematics, Applied Mathematics (Mathematical Physics)
- Sept 2014–Jan 2016 **M. Math\***, *Department of Applied Mathematics, Faculty of Mathematics, University of Waterloo*, Waterloo, ON, Canada, Supervisors: Zoran L. Mišković and Matthew Scott.  
Mathematics, Applied Mathematics (Mathematical Physics)  
\*Granted transfer to PhD
- Sept 2010–April 2014 **Honours B.Sc.**, *Faculty of Science, Lakehead University*, Thunder Bay, ON, Canada.  
Major: Mathematics, Minor: Physics

### Certificates

- Feb 2019 **Certificate of University Teaching**, Centre for Teaching Excellence, University of Waterloo
- Aug 2017 **Fundamentals of University Teaching**, Centre for Teaching Excellence, University of Waterloo

### Teaching Experience

- INSTRUCTOR **Department of Mathematics & Statistics, McMaster University, Hamilton, ON, Canada.**
- STATS 3A03: Applied Regression Analysis with SAS
  - MATH 1M03: Calculus for Business, Humanities, and the Social Sciences
  - MATH 1LS3: Calculus for Life Sciences 1
- Faculty of Mathematics, University of Waterloo, Waterloo, ON, Canada.**
- MATH 137: Calculus 1 for Honours Mathematics: Winter 2018

TEACHING ASSISTANT **Faculty of Mathematics, University of Waterloo, Waterloo, ON, Canada, Sept. 2014–Aug. 2019. \*Number of times indicated in brackets.**

- o Math 117: Calculus 1 for Engineers, (1)
- o Math 118: Calculus 2 for Engineers, (2)
- o Math 137: Calculus 1 for Honours Mathematics, (1)
- o Math 227: Calculus 3 for Honours Physics, (1)
- o Math 237: Calculus 3 for Honours Mathematics, (2)
- o Amath 231: Calculus 4 for Honours Mathematics, (1)
- o Amath 250: Introduction to Differential Equations, (2)
- o Amath 350: Differential Equations for Business and Economics, (1)
- o Amath 390: Math and Music, (1)
- o Amath 732: Asymptotics and Perturbation Theory, (1)
- o Amath 882: Mathematical Cell Biology, (1)

**Department of Mathematics, Lakehead University, Thunder Bay, ON, Canada, Sept 2013–July 2014.**

- o Math 0212: Qualitative Methods for Health Sciences, (1)
- o Math 4030: Probability & Statistics, (1)

REVIEWER **Centre for Education in Mathematics and Computing (CEMC), University of Waterloo, Waterloo, ON, Canada, Jan 2018–Present.**

- o MMT 699: Master of Mathematics for Teachers Capstone

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## Research Experience and Projects

### Research Positions

- Aug 2020–Present **Postdoctoral Fellow**, Department of Mathematics & Statistics.  
McMaster University, Hamilton, ON, Canada
- Sept 2019–Dec 2019 **Research Associate**, Department of Applied Mathematics.  
University of Waterloo, Waterloo, ON, Canada
- Sept 2014–Aug 2019 **Graduate Research Assistant**, Department of Applied Mathematics.  
University of Waterloo, Waterloo, ON, Canada

### Additional Projects

- May 2021–Oct 2021 **Hidden learning objectives in remote first year calculus.**  
This project analyzed student text responses through a support vector machine to identify non-mathematical learning outcomes students mastered during their first (remote) university calculus class. Several themes emerged and were analyzed as a whole, as well as split between fall and winter terms. These outcomes were leveraged to enhance teaching and support for the next cohort of students.
- May 2018–Jan 2019 **Math anxiety in the undergrad classroom.**  
This project identified and analyzed the causes and impacts of math anxiety in a university classroom. Strategies for mitigating sources of anxiety for students were discussed.

- Jan 2018–May 2018 **Charged ion distribution simulation.**  
This project used Derjaguin-Landau-Verwey-Overbeek (DLVO) theory and Brownian motion to simulate how charged ions move and disperse throughout different media. The interplay of these two effects under different temperatures, increasing number of ions in the media, and different dielectric permittivities were considered.
- Jan 2017–May 2017 **Electrical coupling of biological cells and graphene transistors.**  
This project used a Hodgkin-Huxley model to account for the flux of potassium ions into and out of the kidney cell, and included the closing of the potassium channels once the applied current was turned off.
- Jan 2015–July 2015 **Low-frequency noise in graphene transistors.**  
This project focused on the charge trapping and de-trapping by a random telegraph signal stochastic process. Both a uniform density of traps and an exponential distribution where traps were clustered at the graphene–oxide interface in the underlying oxide layer of a graphene transistor.

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## Publications

### Journal Papers (Published)

- 3 A. Shalabi, **L. Daniels**, M. Scott, and Z. L. Mišković, *Differential Capacitance of Ionic Liquid Interface with Graphene: The Effects of Correlation and Finite Size of Ions*, *Electrochimica Acta*, Vol 319, 423 – 434, 2019. DOI: doi.org/10.1016/j.electacta.2019.06.171
- 2 **L. Daniels**, M. Scott, and Z. L. Mišković. *The Effects of Dielectric Decrement and Finite Ion Size on Differential Capacitance of Electrolytically Gated Graphene*. *Chemical Physics Letters*, Vol. 701, 43 – 51, 2018. DOI: doi.org/10.1016/j.cplett.2018.04.030
- 1 **L. Daniels**, M. Scott, and Z. L. Mišković. *The Role of Stern Layer in the Interplay of Dielectric Saturation and Ion Steric Effects for the Capacitance of Graphene in Aqueous Electrolytes*. *Journal of Chemical Physics*, Vol. 146, 094101, 2017. DOI: doi.org/10.1063/1.4976991

### Conferences

- 7 **L. Daniels** and C. Junkins *Hidden Learning Outcomes in Virtual First Year Calculus*. Innovations in Education. McMaster University, Hamilton, ON, Canada. December 2021. (Upcoming Presentation)
- 6 **L. Daniels**, M. Scott, and Z. L. Mišković. *The Effects of Dielectric Decrement, Dielectric Saturation, and Finite Ion Size on Differential Capacitance of Electrolytically Gated Graphene*. *Applied Mathematics, Modeling and Computational Science (AMMCS)*. Wilfred Laurier University, Waterloo, ON, Canada. August 2019. (Presentation)

- 5 **L. Daniels**, M. Scott, and Z. L. Mišković. *Modeling Graphene Interactions with a Liquid Electrolyte*. International Symposium on Frontiers in Nanoscience and Nanotechnology - Smart and Functional Materials. Waterloo Institute for Nanotechnology (WIN), University of Waterloo, Waterloo, ON, Canada. June 2019. (Poster)
- 4 **L. Daniels**, M. Scott, and Z. L. Mišković. *Modeling the Interactions of Graphene with a Liquid Electrolyte*. Applied Mathematics, Modeling and Computational Science (AMMCS). Wilfred Laurier University, Waterloo, ON, Canada. August 2017. (Presentation)
- 3 **L. Daniels**, M. Scott, and Z. L. Mišković. *Role of Dielectric Saturation and Steric Effects in the Electrolyte Used for Gating a Graphene Layer*. Canadian Semiconductor Science and Technology Conference (CSSTC). University of Waterloo, Waterloo, ON, Canada. August 2017. (Presentation)
- 2 **L. Daniels**, M. Scott, and Z. L. Mišković. *Modeling the Interactions of Graphene with a Liquid Electrolyte*. Excellence and Quality in Academic Life in STEM Conference (EQuALS). University of Waterloo, Waterloo, ON, Canada. May 2017. (Poster)
- 1 **L. Daniels**, M. Scott, and Z. L. Mišković. *Random Telegraph Signal and  $1/f$  Noise in Graphene*. Applied Mathematics, Modeling and Computational Science (AMMCS) and Canadian Applied and Industrial Mathematics Society (CAIMS) Congress. Wilfred Laurier University, Waterloo, ON, Canada. June 2015. (Presentation)

### Theses

- 2 **Lindsey Daniels**, *The Interactions of Graphene with Ionic Solutions and Their Effects on the Differential Capacitance for Sensing Applications*, Ph.D. Thesis, Department of Applied Mathematics, Faculty of Mathematics, University of Waterloo, 2019.

SUPERVISORS Dr. Zoran L. Mišković and Dr. Matthew Scott

- 1 **Lindsey Daniels**, *Group Theory and the Rubik's Cube*, H.B.Sc. Research Project, Faculty of Science, Lakehead University, 2014.

SUPERVISORS Dr. Adam Van Tuyl and Dr. Gregory Lee

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### Invited Talks

March 2020 **L. Daniels**, *Mathematical Modelling of Electrochemical Systems*, International Women's Week Seminar Series, McMaster University, Hamilton, 2020.

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## Research Supervision

### Undergraduate Students

- May 2019–Aug 2019 **Jiangfeng Ding**, Project: Low potential limit of graphene–ionic liquid interface with boundary conditions arising from the Maxwell stress tensor. Joint supervision with Z. L. Mišković. Department of Applied Mathematics.  
University of Waterloo, Waterloo, ON, Canada
- Sept 2018–Dec 2018 **Ahmed Shalabi**, Project: Computational methods for graphene–electrolyte and graphene–ionic liquid interfaces. Joint supervision with Z. L. Mišković. Department of Applied Mathematics.  
University of Waterloo, Waterloo, ON, Canada
- Sept 2018–Dec 2018 **Kieana Fana**, Project: Analytic solutions to special cases of graphene–electrolyte and graphene–ionic liquid interfaces. Joint supervision with Z. L. Mišković. Department of Applied Mathematics.  
University of Waterloo, Waterloo, ON, Canada
- Sept 2017–April 2018 **Narsimha Chilkuri**, Project: Hamiltonian mechanics and consistency equations for graphene–electrolyte systems. Joint supervision with Z. L. Mišković. Department of Applied Mathematics.  
University of Waterloo, Waterloo, ON, Canada

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## Professional Activities

- CHAIR OF COUNCIL Graduate Student Association, University of Waterloo. May 2017–April 2018
- BOARD CHAIR Mathematics Graduate Student Association, University of Waterloo. Sept 2016–Oct 2017
- CO-FOUNDER Mathematics Graduate Student Association, University of Waterloo. Established June 2016.

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## Honours and Awards

- Aug 2016 **Outstanding Teaching Assistant**, Department of Applied Mathematics, University of Waterloo
- Sept 2014–Aug 2019 **Graduate Teaching Assistant and Research Assistant Scholarships**, Department of Applied Mathematics, University of Waterloo
- May 2014 **Dean Scholar Award for the Department of Mathematics**, Lakehead University
- April 2014 **Department of Mathematics Prize**, Lakehead University
- April 2012 **Department of Mathematics Prize**, Lakehead University
- Sept 2010–April 2014 **Academic Excellence Scholarship**, Lakehead University

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## Volunteer Experience

Oct 2021–Present	<b>Mentor</b> , Girls in Mathematical Science Program, Partnership between Centre for Education in Mathematics and Computing (CEMC) and the African Institute for Mathematical Sciences (AIMS-GMSP-Ghana)
Dec 2014–Present	<b>Math Contest Marker</b> , Centre for Education in Mathematics and Computing (CEMC), University of Waterloo.
Sept 2018–Aug 2019	<b>Graduate Student Committee Member</b> , Faculty Committee on Student Appeals (Mathematics), University of Waterloo
Oct 2017–Oct 2018	<b>Board Member</b> , Board of Governors, St. Paul's University College, University of Waterloo
Sept 2016–Aug 2019	<b>Graduate Student Committee Member</b> , University Committee on Student Appeals, University of Waterloo
Sept 2016–Aug 2017	<b>Applied Mathematics Departmental Director</b> , Mathematics Graduate Student Association, University of Waterloo
June 2016–April 2017	<b>Council Executive Committee Member</b> , Graduate Student Association, University of Waterloo
Jan 2016–Aug 2018	<b>Graduate Student Committee Member</b> , Women in Mathematics, University of Waterloo
Nov 2015–April 2017	<b>Applied Mathematics Councillor</b> , Graduate Student Association, University of Waterloo

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## Skills

MATH PROGRAMS	Maple, Mathematica, Matlab, $\LaTeX$ , SAS, Jupyter
CODING	Python
RESEARCH	Mathematical Education, Mathematical Physics, Electrochemistry, Nanotechnology, Ordinary Differential Equations, Partial Differential Equations, Optimization
PROFESSIONAL	Data Visualization, Communication, Presentation, and Organizational skills, Decision Making and Problem Solving, Teamwork