CHASE **ANNUAL REPORT** 2026

DALHOUSIE UNIVERSITY

DEPARTMENT OF MATHEMATICS AND STATISTICS

DALHOUSIE UNIVERSITY

Land Acknowledgement

The Department of Mathematics and Statistics, at Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples.

These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties.

Section 35 of the *Constitution Act, 1982* recognizes and affirms Aboriginal and Treaty rights in Canada.

African Nova Scotian Acknowledgement

We recognize that African Nova Scotians are a distinct people whose histories, legacies and contributions have enriched that part of Mi'kma'ki known as Nova Scotia for over 400 years.

Photo acknowledgements:

- **Front and Back cover; Inside Cover; Table of Contents:** Courtesy of NASA
- **Intervening Pages; Message from Chair; Logos:** Courtesy of Communications, Marketing, and Creative Studio – Dalhousie University
- **Second Annual Fall In-Program Awards:** Courtesy of Ann Bannon
- **Mathematics and Statistics Graduate Student Society:** Courtesy of Melanie Gauthier
- **Dalhousie Undergraduate Mathematics and Statistics Student Society:** Courtesy of Ana Mastnak
- **Gretchen Smith:** Courtesy of Karl Dilcher
- **Nova Scotia of Math Circles Visits:** Courtesy of the Math Circles Co-Managers (2026, May 1), via Google Maps
- **Science Atlantic:** Courtesy of Peter Selinger
- **23rd CAAC Conference:** Courtesy of Sara Faridi
- **Atlantic TQFT Spring School:** Courtesy of Theo Johnson-Freyd

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Message from the Department Chair

Congratulations to the 2026 graduates in Mathematics and Statistics!

Whether you spent countless hours in the Learning Centre of the Chase building, at a chalkboard in a quiet hallway, or in your own favourite study nook, we are so proud of the work you have put in and all your accomplishments.

You have chosen a discipline that at its core involves solving problems. We hope that you carry these skills forward and apply them to challenges and opportunities you encounter in the future.

Although your degree is complete, your learning need not end here. We encourage you to engage in a lifelong journey of discovery and curiosity.

Each of your journeys has been unique, and we celebrate the dedication that brought you to this remarkable milestone.

Well done and congratulations!

Sarah Chisholm, PhD
University Teaching Fellow
Learning Centre Coordinator
Department Chair

In Recognition

GRADUATES & NEWEST ALUMNI

Congratulations to all our graduates from the fall of 2025 and spring of 2026 terms!

We look forward to hearing from you. Please feel welcome to either drop us a line when you have a chance or stop in to say hello next time you are on campus. And here, we are pleased to present the names of each person who convocated this academic year, a total of eighty-nine (89).

Graduates, who are now members of our alumni family, are listed alphabetically by surname.

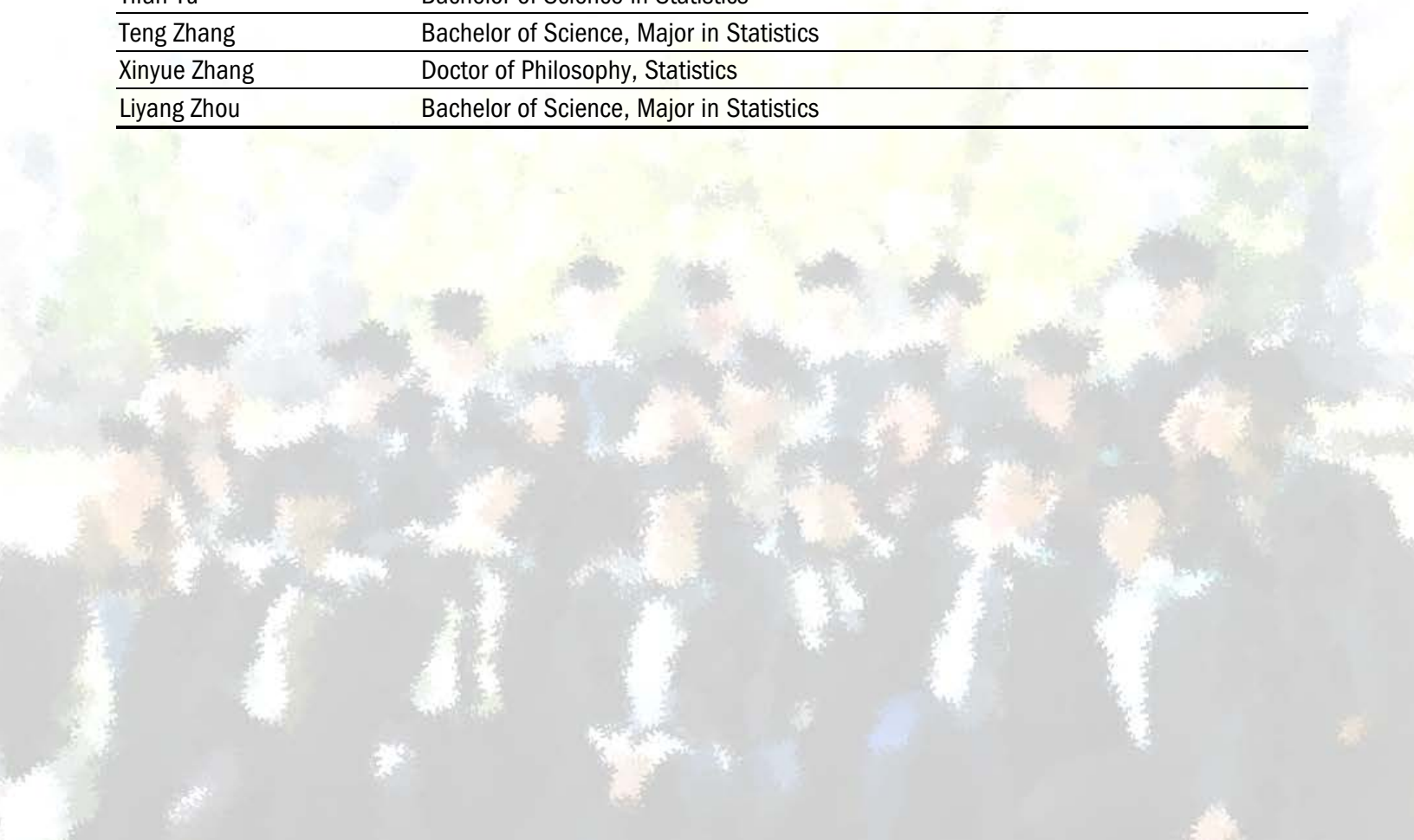
SPRING 2026

Name	Program(s)
Annamieka Aerts	Bachelor of Science Honours in Mathematics and History of Science and Technology
Jia Bao	Bachelor of Science Major in Statistics
Jonah Barrington	Bachelor of Science Honours in Mathematics
Liam Bennett	Bachelor of Science Honours Co-operative in Mathematics
Vedika Bhardwaj	Bachelor of Science Major in Statistics
Changan Bi	Bachelor of Science in Statistics
Xiaoyu Chen	Bachelor of Science Major in Statistics
Lingyun Cui	Bachelor of Science Major in Statistics
Jai Cunsolo Willox	Bachelor of Science Major in Physics and Mathematics
Reanne Curry	Bachelor of Science Major in Actuarial Science
Daniel Dahr	Bachelor of Science Major in Mathematics
Hoang Dao	Bachelor of Science Honours in Mathematics
Siheng Deng	Bachelor of Science Major in Statistics
Emily Dennis	Bachelor of Science Major in Mathematics and French
Yuqiao Du	Bachelor of Science Honours in Mathematics and Statistics
Shantel Dube	Bachelor of Science in Statistics
Thomas Duck	Bachelor of Science Honours in Statistics and Computer Science
Eslam Elrouby	Bachelor of Science Honours in Mathematics
Weixuan Feng	Bachelor of Science Major in Physics and Mathematics
Xiangtai Feng	Bachelor of Science Honours in Mathematics
Rebecca Fenner	Bachelor of Science Honours in Physics and Mathematics
Eden Hallal	Bachelor of Science Major in Actuarial Science and Statistics
Jeremiah Hockaday	Master of Science, Mathematics
Lyle Huth	Bachelor of Science Major in Statistics
Veronika Keras	Bachelor of Science Honours in Mathematics
Marek Khella	Bachelor of Science Major in Statistics and Psychology
Jiayi Li	Bachelor of Science Major in Statistics
Shanglun Li	Doctor of Philosophy, Statistics

Yuan Liu	Bachelor of Science Major in Statistics
Junhui Lu	Bachelor of Science Major in Statistics
Noah Lux	Bachelor of Science Major in Mathematics and Philosophy
Dana MacDonald	Bachelor of Science Major in Statistics
Annah-Benedicte Mbongo	Bachelor of Science Major in Statistics
Raphaël McDonald	Doctor of Philosophy, Statistics
Carys McNeil	Bachelor of Science Honours in Mathematics
Yoshi Moxey	Bachelor of Science Honours in Actuarial Science and Statistics
Thu Thi Nguyen	Master of Science, Statistics
Bram Ogus	Bachelor of Science Major in Mathematics
Sarah Organ	Doctor of Philosophy, Statistics
Aryan Patel	Bachelor of Science in Statistics
Shreya Piyushkumar Patel	Bachelor of Science in Statistics
Changjiayu Peng	Bachelor of Science Major in Statistics
Samantha Quinn	Bachelor of Science Major in Actuarial Science
Nicholas Reilly	Bachelor of Science Major in Mathematics
Oscar Rodney	Bachelor of Science Major Co-operative in Mathematics and Computer Science
Fatma Sarhan	Master of Science, Statistics
Xinyue Shen	Bachelor of Science Major in Statistics
Jinyan Shui	Bachelor of Science Major in Statistics
Marybeth Stewart	Bachelor of Science Major in Mathematics
Jiaqi Sun	Bachelor of Science Major in Statistics
Shawn Sun	Bachelor of Science Major in Statistics
Yixuan Tan	Bachelor of Science Major in Actuarial Science
Christina Thomas	Bachelor of Science Major in Mathematics and Statistics
Nicholas Todd	Bachelor of Science Honours in Physics and Mathematics
Rose Vafadar	Bachelor of Science Major in Mathematics
Ryan van de Wiel	Bachelor of Science Major in Mathematics
Bin Wang	Bachelor of Science in Statistics
Dylan Wood	Bachelor of Science Major in Mathematics
Jingyu Xiao	Bachelor of Science Major in Statistics
Miaoyu Yan	Bachelor of Science Major in Actuarial Science
David Zeidler	Master of Science, Mathematics
Hongbo Zhai	Bachelor of Science Major in Statistics
Xinyi Zhang	Bachelor of Science Major in Statistics
Anqi Zhen	Bachelor of Science Major in Statistics
Youran Zheng	Bachelor of Science Honours in Mathematics

FALL 2025

Name	Program(s)
Omar Alghamdi	Doctor of Philosophy, Statistics
Mohammad Amirianmatlob	Doctor of Philosophy, Statistics
Judith Asare	Master of Science, Mathematics
Heyuan Bai	Bachelor of Science, Major in Statistics
Zhirui Bi	Bachelor of Science, Major in Statistics
Luke Connors	Bachelor of Science, Major in Mathematics
Linh Dinh	Master of Science, Mathematics
Abdelaziz Elherbawy	Bachelor of Science, Honours in Mathematics and Economics
Ben Fish	Bachelor of Science, Major in Statistics
Ruize Lyu	Bachelor of Science, Major in Statistics
Lawrence Matsuoka	Bachelor of Science, Major in Mathematics
Aidan Meisner	Bachelor of Science, Major in Statistics
Callam Mistry	Bachelor of Science in Statistics
Ethan O'Connell	Master of Science, Statistics
Tom Potter	Doctor of Philosophy, Mathematics
Timothy Power	Master of Science, Mathematics
Anneke Rafuse	Bachelor of Science, Major in Mathematics and Computer Science
Ezra Sun	Bachelor of Science, Major in Actuarial Science
Yihua Sun	Bachelor of Science, Major in Statistics and Economics
Chenchao Xu	Bachelor of Science in Statistics
Yifan Yu	Bachelor of Science in Statistics
Teng Zhang	Bachelor of Science, Major in Statistics
Xinyue Zhang	Doctor of Philosophy, Statistics
Liyang Zhou	Bachelor of Science, Major in Statistics



DEPARTMENT AWARDS

This spring we have awarded several medals, scholarships, and a prize. Congratulations to our award earners! The names of this year's recipients are presented below along with a brief description of each award.

HELLER-SMITH FOUNDATION GRADUATE SCHOLARSHIP

This scholarship is awarded based on academic achievement. The scholarship was established to provide financial support and recognition to a graduate student. **Recipient – Rose Terner**

PROFESSOR MICHAEL EDELSTEIN MEMORIAL GRADUATE PRIZE

This prize is awarded to a graduate student who shows great promise in the mathematical sciences**. Recipient –Claire Cui**

SIR WILLIAM YOUNG GOLD MEDAL IN MATHEMATICS

This medal is awarded at convocation to the student who stands first among those taking First class honours in Mathematics. It is also known as the University Medal in Mathematics. **Recipient – Jonah Barrington**

UNIVERSITY MEDAL IN STATISTICS

This medal is awarded at convocation to the student who stands first among those taking First class honours in Statistics. **Recipient – Thomas Duck**

UNIVERSITY MEDAL IN ACTUARIAL SCIENCE

This medal is awarded at convocation to the student who stands first among those taking First class honours in Actuarial Science. **Recipient – Yoshi Moxey**

THE RALPH AND FRANCES LEWIS JEFFERY SCHOLARSHIP

This scholarship is awarded to two students who have each completed an honours degree in Mathematics, and who have maintained at least second class standing during the first three years. **Recipients – Jonah Barrington & Veronika Keras**

THE PETER AND ANNE-ELLEN FILLMORE SCHOLARSHIP

This scholarship is awarded to a graduating math honours or major student from the Maritimes who plans to become a high school math teacher. When there isn't a graduating student, students completing their third year in an honours or major program who have a demonstrated interest in math teaching may also be considered, especially if they have early admission to a math education program. The scholarship will be announced in the fall when a graduating student is not the winner. **The recipient will be announced in Fall 2026**

Second Annual Fall In-Program Awards

On Thursday, November 27, 2025, the Department held its Second Annual Fall Undergraduate In-Program Awards ceremony & reception. Faculty, staff, award winners, and their supporters filled the Colloquium Room to celebrate some of our top undergraduate students. This event is hosted annually on the last Thursday of November.

ARNOLD AND BEATRICE TINGLEY MEMORIAL SCHOLARSHIP

The Tingley Scholarship commemorates the lives of Arnold and Beatrice Tingley. The scholarship was established by their son Daryl and his family Maureen, Peter, and Martin. This scholarship is awarded to an undergraduate student from Atlantic Canada entering the third year of a four-year BA or BSc program. Candidates will have high academic standing and will have shown enthusiasm and talent for mathematics (by having taken at least five mathematics or statistics courses over their first two years of study and being enrolled in any mathematics program). **Recipient – Ryan van de Wiel**

BARRY WARD FAWCETT MEMORIAL PRIZE

This monetary award goes to the student who has achieved the highest grade in MATH/CSCI 2113 (Discrete Structures II). **Recipient – Courtney Lee**

BERNOULLI PRIZE

This monetary award goes to the student registered in the Co-op Mathematics Program who has the best cumulative academic record, subject to the restrictions that the prize can be awarded only once to a given individual, and that the winner must have performed acceptably in all work term assignments. **Recipient – Liam Bennett**

ERMA GEDDES FILLMORE MEMORIAL SCHOLARSHIP

This scholarship is in memory of Erma Geddes Fillmore (BA'24) and was established by her family. This scholarship is awarded in the fall term – to a full-time BSc undergraduate student with the highest grade-point average entering the second year of their degree with a declared major in either Mathematics or Statistics. **Recipient – Mohan Zhang**

FIELD PRIZE IN STATISTICS

This monetary prize is awarded to the student with the highest academic standing who has completed their third year of studies in Statistics. This award was endowed by Dr. Christopher Field and Mrs. Harriet Field. **Recipient – Kayla Smith**

JONATHAN BORWEIN MEMORIAL SCHOLARSHIP

This scholarship is in the memory of the late Jonathan (Jon) Borwein (1951—2016) who began his academic career as a post-doc in our department and then spent a substantial part of his career here at Dalhousie. This cash prize is awarded to a student who has shown promise, as demonstrated by academic achievement and/or successful involvement, in one or more of the following areas: experimental mathematics, optimization, classical number theory, special

functions, scientific computation, or in an area related to these, as determined by the Awards Committee. **Recipient – Hewson MacDonald**

KEN DUNN MEMORIAL PRIZE

This cash prize is awarded to a student who has completed the third year of an Honours program in Mathematics or Statistics, or a combined Honours program in Mathematics and Statistics. **Recipient – Veronika Keras**

R.P. & KAMLA GUPTA SCHOLARSHIP IN STATISTICS

This scholarship is to recognize excellence in Statistics by providing one or more scholarships to undergraduate students enrolled in Honours Statistics. **Recipient – Thomas Duck**

THE DR. EMIL AND MRS. STELLA BLUM PRIZE IN MATHEMATICS

This monetary prize is awarded to an Advanced Major or Honours Mathematics student who achieves the highest grade in second year Calculus. **Recipient – Moueen Issa**

THE ELLEN MCCAUGHIN MCFARLANE PRIZE

This award is in the memory of Ellen McCaughin McFarlane (BA or BSc'27) and goes to the student who has achieved the highest standing after completing year one of the honours program. This prize is a monetary award. **Recipient – Ana Mastnak**

THE KATHERINE M. BUTTENSHAW PRIZE

This monetary prize is awarded to the student standing highest in the advanced Mathematics courses. **Recipient – Hewson MacDonald**

WAVERLEY PRIZE

This award goes to the student with the highest standing in MATH 1010 (Differential and Integral Calculus II). **Recipient – Jane Maillet**

Mathematics Students Recognized for Teaching Excellence

Diego López Restrepo has been selected as this year's recipient of the **2026 President's Graduate/Undergraduate Student Teaching Award!** The award comes with a cash prize (honorarium) and will be in an article featured in the Dalhousie News as the Spring Convocation season draws to a close.

About the recipient: Diego Fernando López Restrepo is a Ph.D. candidate in Mathematics at Dalhousie University specializing in the geometrical aspects of theoretical physics. He has taught calculus, linear algebra, and engineering mathematics, earning recognition from students for his clarity, enthusiasm, and dedication to individual support. Known for going above and beyond to ensure every student understands the material, Diego emphasizes structured problem-solving and conceptual insight, helping students build both confidence and independence. Beyond the classroom, he contributes to mathematics outreach through the Senior Math Camp and volunteers as a tutor in the Halifax community. He is committed to fostering curiosity, resilience, and a strong foundation for academic success.

Dalhousie Math Alumni Reunite at CMESG Conference

A few Dal math alumni were together at the Canadian Math Education Study Group (CMESG) conference in Kingston, ON last week (week of June 1), and they decided to take a photo together for the Chase Report! 😊

From left to right are Shannon Ezzat (BSc ’05), Kieran Bhaskara (BSc ’21), Asmita Sodhi (PhD ’20), and Richard Hoshino (PhD ’07). Richard happened to have a Dalhousie clipboard handy as well!

In case you’d like to include it, their current roles are:

- Shannon: Associate Professor at Cape Breton University
- Kieran: PhD candidate at McMaster University
- Asmita: Assistant Teaching Professor at University of Victoria
- Richard: Teaching Professor at Northeastern University’s Vancouver campus

Reports and Notes

UNDERGRADUATE PROGRAMS

Honours Program

MATHEMATICS

- Annamieka Aerts. **Supervisor: Neil J. Ross.** ***Title: Proof and Context of the Universal Turing Machine***
- Jonah Barrington. **Supervisor: Karl Dilcher.** ***Title: Distinct Residues of the Gauss Factorial Modulo a Composite***
- Liam Bennett. **Supervisor: Jeannette Janssen.** ***Title: Rumour Spreading on Graphs and the Spatial Preferential Attachment (SPA) Model***
- Qixuan (Avery) Cao. **Supervisor: Jeannette Janssen.** ***Title: A Case Study: Spectral Embedding of Grid Graphs with Structural Perturbations***
- Hoang Dao. **Supervisor: Karl Dilcher.** ***Title: Infinite series involving zeta functions, Dirichlet L-functions, and Lucas sequences***
- Yuqiao Du. **Supervisor: Robert Milson.** ***Title: Hermite Polynomials and their Annihilator Algebras***
- Eslam Elrouby. **Supervisor: Roman Smirnov.** ***Title: Orthogonal Coordinate Systems: Harmonic Functions, Conformal Maps and Killing Tensors***
- Xiangtai Feng. **Supervisor: Jeannette Janssen.** ***Title: Systemic Risk in Multiplex Financial Networks: Centrality, Contagion, and Policy Intervention***
- Veronika Keras. **Supervisor: Peter Selinger.** ***Title: The Combinatorial Game Theory of Rex+***
- Carys McNeil. **Supervisor: Sarah Chisholm.** ***Title: Mathematics Education of Inverse Trigonometric Functions***
- Youran Zheng. **Supervisor: Theodore Kolokolnikov.** ***Title: Distribution of Recurrent Outbreaks in SIR Model with Noise***

STATISTICS

- Thomas Duck. **Supervisor: Andrew Irwin.** ***Title Predicting Coccolithophore Abundances Using Statistical Learning Methods***

ACTUARIAL SCIENCE

- Yoshi Moxi. **Supervisor: Orla Murphy.** ***Title "A Statistical Analysis of Atlantic Tropical Cyclone Frequency and Severity Trends Using Poisson and Extreme Value Models"***

Mathematics

Peter Selinger

For last year's Chase Report, I wrote my entire director's report without using the letter “E”. This year, I'm setting myself an easier goal. This report is written without the letter “X”.

Thanks for Roman Smirnov, who was the acting director while I was on sabbatical. Julien Ross continued his role as the math and honours advisor. Thanks to David Iron and Sara Faridi for looking after our graduate program. Rob Milson was the coop advisor. Roman Smirnov continued his important work as an Academic Integrity Officer for the Faculty of Science. Theo Kolokolnikov was the colloquium chair, and I am currently filling in for him while he is on sabbatical. Dorette Pronk ran the youth math clubs.

As you know, Sarah Chisholm is the new chair, and she is also still running the Learning Centre! During the summer, we had three math camps: the BEA camp was run by Nauzer Kalyaniwalla, the Indigenous math camp was run by Jason Brown with the significant help of Nauzer Kalyaniwalla, and I ran the AARMS-Dalhousie Senior Math Camp, with the help of Nick Layden. Thanks also to all faculty and students who lectured at the camps! And as always, nothing could get done in the division without the help of our amazing office staff. Many thanks to all of you!

Congratulations to our wonderful class of graduating students. All of you have worked hard on your classes and research, and I wish you much fun and productivity in your future endeavours, whether that be work, graduate school, or anything else you choose to do!

We are proud of you, and if you are leaving Dalhousie, we hope you come back some day to visit!

Statistics

Bruce Smith

Congratulations to Orla Murphy, who has been promoted to Associate Professor with tenure. Orla’s PhD student, Ethan O’Connell, received an NSERC PhD Scholarship. Congratulations, Ethan.

Philippe Fullsack has been appointed to a Continuing Instructor Position beginning September 1. Congratulations, Philippe.

Mike Dowd was part of the Dalhousie/Simon Fraser University research team that, in January 2026, was awarded a 2-year, $1 million research grant from the Digital Research Alliance of Canada (DRAC) entitled: Project CetAIceans: An AI Platform for Cetacean Conservation and Quieter Oceans. The funding comes through DRAC's Special Funding Opportunity for Research Software AI Enhancement, awarded to four national research projects to support research platforms and portals in adopting AI techniques and delivering AI-enabled services to their user communities. The research funding continues ongoing efforts to improve acoustic whale detection using deep learning and to advance the real-time whale tracking and forecasting system. Congratulations, Mike.

Joanna Mills Flemming and Aaron MacNeil (joint with Biology) have developed a new 16-month course based professional Master’s program in Fisheries Science. The program is enrolling in its first cohort in September 2026. An undergraduate degree in marine science, mathematics or statistics is required. Details of the program are available at

https://www.dal.ca/faculty/science/marine-affairs-program/program/master-of-fisheries-science.html Thank you Joanna and Aaron.

Hong Gu is overseeing the transition of our 2+2 program in Statistics with Shandong University of Finance and Economics to a 4+0 program, to begin in 2027. Details are included below. Thank you Hong.

There were twenty-seven students who graduated with a Bachelor's degree with a primary major in Statistics this year. Congratulations to all!

Congratulations to the following students who received graduate degrees in Statistics this year:

- Thu Thi Nguyen, MSc; **Supervisor: Lam Ho. *Thesis title: Random Feature Bayesian Lasso Takens Model for Time Series Forecasting***
- Fatma Sarhan, MSc; **Supervisors: Orla Murphy and Jonathan Jalbert. *Thesis title: Extreme Water Level Predictions on the Nova Scotian Coastline Using a Bayesian Hierarchical Model***
- Xinyue Zhang, PhD; **Supervisors: Hong Gu and Toby Kenney. *Thesis title: Latent structure identification and personalized variable selection.***
- Omar Alghamdi, PhD; **Supervisor: Ammar Sarhan. *Thesis title: A Time Segmentation Approach for Estimating Time-Varying Parameters in Northern Fur Seals.***
- Shanglun Li, PhD; **Supervisors: Hong Gu and Toby Kenney. *Thesis title: On Ornstein-Uhlenbeck State Space Models.***
- Raphaël McDonald, PhD; **Supervisors: Joanna Mills Flemming and David Keith. *Thesis title: Assessing the effects of sampling design and data integration in spatio-temporal fisheries models.***
- Sarah Organ, PhD; **Supervisors: Hong Gu and Toby Kenney. *Thesis title: Generalizing the Linear Step-up Procedure for False Discovery Rate Control with Applications to Setwise and High Dimensional Variable Selection.***

TRANSITION OF 2+2 JOINT PROGRAMS TO 4+0 JOINT DEGREE PROGRAMS IN STATISTICS

Hong Gu

The proposed transition of the Statistics joint program between Dalhousie University and the Shandong University of Finance and Economics (SDUFE) from a 2+2 model to a 4+0 model reflects an effort to adapt to recent changes and make the program more accessible for students. Since the program started in 2019, it has offered students the chance to study both in China and in Canada. However, in recent years, fewer students have been able to travel abroad due to higher costs, visa challenges, and changing national policies, which has reduced participation in the original model.

To address this, the two universities are proposing a 4+0 structure where students complete all four years of their studies at SDUFE while still earning degrees from both SDUFE and Dalhousie. This change aligns with updated requirements from China's Ministry of Education and also responds to student preferences, as many now prefer to complete their full degree in China while still gaining an international qualification.

Even with this change, maintaining academic quality remains a key focus. Courses provided by Dalhousie will continue to follow its curriculum and standards, with oversight to ensure

consistency and rigor. At the same time, SDUFE will continue delivering its own courses in line with national requirements. To further support student success, intensive English language training will be built into the program so that graduates achieve a level of English proficiency comparable to students who complete their degrees directly at Dalhousie.

On the financial side, discussions around a shared model begin with the 2025 cohort, which is expected to generate enough resources to support preparation for the new 4+0 program ahead of its planned launch in 2027. In addition, the Dean of the Faculty of Science has indicated that 75% of the final financial gains will be reinvested back into the relevant departments or divisions, helping to support teaching, program development, and future growth. Beyond funding, the program is also expected to create additional instructor positions within the Statistics division and strengthen collaboration between the two institutions, with more faculty traveling between SDUFE and Dalhousie to support teaching and program development.

The program is expected to keep its current intake of up to 100 students per year, with a phased transition leading up to the first 4+0 cohort in 2027. Overall, this transition represents a practical step to keep the Statistics program strong and sustainable, while continuing to offer students access to a high-quality, internationally recognized education.

Actuarial Science

Bruce Smith

There were graduates from the Actuarial Science program this year. There is continued interest in our program from local employers, with TELUS Health and Manulife once again providing student information sessions to recruit students from our program.

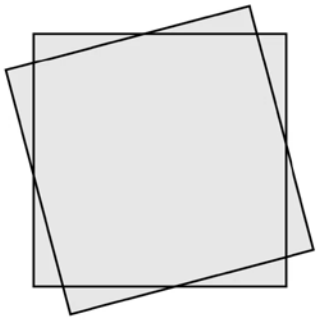
Philippe Fullsack taught the third- and fourth-year Life Contingencies courses for the first time this past year and will do so again next year. Toby Kenney returns from his sabbatical on July 1.

FUN MATH PROBLEMS

Submitted by the Math Challenge Club. Problem 17 is taken from the Purple Commit Math contest – 2025 Middle School Contest. The solution will appear on page 18. www.purplecomet.org

Problem 17

Let S be a square with side length 16. Let S' be S rotated around the center of S so that the region enclosed by the union of the two squares has area 288. The intersection of the insides of the two squares is an octagon. Find the perimeter of that octagon.



Mathematics and Statistics Graduate Student Society

Melanie Gauthier – Vice President External

The Dalhousie Mathematics and Statistics Graduate Student Society was busy this year, bringing graduate students together through a mix of professional development, academic, and social events. We hosted a Career Day, a Coffee Social, a Coffee Writing Workshop, weekly graduate seminars, and Pizza Parties throughout the year. We also had the pleasure of collaborating with the Dalhousie Undergraduate Mathematics and Statistics Society for Pi Day (March 14).

This year, we worked with the department regarding graduate student stipends, which will have a direct and meaningful impact on our community in the years to come. We remain committed to representing the interests of our members and will continue to advocate on their behalf.

Our next elections (and pizza party!) will be held in September, all graduate students are welcome and encouraged to get involved, whether by running for a position or simply showing up to support your peers.

We would like to sincerely thank every student and faculty member who supported us this year. We'd also like to thank the 2025-2026 executive team:

President – Daniel Teixeira; **Vice President External –** Melanie Gauthier; **Vice President Internal –** Rory Schepp; **Math Master's Representative –** Jeremiah Hockaday; **Math PhD Representative –** Timothy Power; **Stats Master's Representative –** Parker Wiseman; **Stats PhD Representative –** Ethan O'Connell.

Dalhousie Undergraduate Mathematics and Statistics Society

Ana Mastnak – President (Elect)

The Dalhousie Undergraduate Mathematics and Statistics Society successfully concluded another year under the leadership and guidance of its president Nicholas Riley.

Our fall AGM was Barbecue in front of the Chase building, starting off the year with food and fun in the sun. We also held many events through the course of the year such as board game nights, study sessions, a research mixer, a workshop on proofs and software in collaboration with shift key labs, and a Pi Day celebration.

At the end of the winter semester, the society also held an end of year gala in collaboration with the Dalhousie Undergraduate Physics Society at Casino Nova Scotia. The night involved speeches from the old and incoming presidents, a three-course meal, and dancing. The night was enjoyed by professors, graduate students, and undergraduate students alike.

Overall, we would like to thank all students and faculty that came to our events and especially our outgoing executive team that helped make our 2025-2026 year a success! Welcoming our new 2026-2027 executive team:

President - Ana Mastnak; **Vice President Internal** - Noah Wayne; **Co-Vice Presidents External** - Zach Fay and Nora Farrell; **Treasurer**- Sarah Finkle; **Social Media Coordinator** - Lauren Ortgiese

BOOKS WANTED FOR SALE

Karl Dilcher

As I mention every year in the Chase Report, I'm taking care of a large number of surplus books that have been donated over the years by current and retired faculty members, alumni and departing students. This time I want to thank in particular Kathy Baker, Ed Barbeau, Ilya Blum, the family of the late Karen Chandler, Keith Johnson, Michael Lamoureux, and Tom Potter, who since the summer of 2024 donated hundreds of high-quality books.

Over the last few years, altogether several thousand volumes were sold to mathematicians all across Canada and hundreds more around the world. Earlier this year I shipped a large number of books (at a steep discount) to Iraq, with another large order just in. Once a year I can donate the sizeable income from these sales in equal part to scholarship funds in our department and to the Canadian Math Society (CMS).

Countless volumes (perhaps some 1,500) still remain; they are catalogued at:

mathstat.dal.ca/~dilcher/oldbooks.html

As always, I welcome further donations of mathematics, statistics and related books, including textbooks of any kind. In my experience, eventually most of the books find a good home and as an extra bonus, two good causes will be supported. I thank all those who have donated their books.

A related initiative is what I informally call the Calculus Textbook Preservation Project. I'm keeping one copy of each edition of each calculus textbook that I can get my hands on; they are hidden in the basement. Quite surprisingly, without much effort on my part, this collection has grown to about 500 volumes. For this initiative too, I welcome further books. Duplicates are given away to students, along with other elementary mathematics and statistics textbooks.

FUN MATH PROBLEMS (SOLUTION)

From Page 15

Answer: 56

The figure is a square with side length 16 with four congruent right triangles attached. Suppose the right triangles each have legs with lengths x and y. Then $S \cup S'$ has area $288 = 16^2 + 4 \cdot \frac{xy}{2}$ and perimeter $8(x+y)$. Thus, $288 = 256 + 2xy$, so $xy = 16$. By the Pythagorean Theorem, a side of S is $16 = x + y + \sqrt{x^2+y^2}$. Solving for $\sqrt{x^2+y^2}$ and squaring yields

$$x^2 + y^2 = (16 - x - y)^2 = 256 + x^2 + y^2 - 32x - 32y + 2xy.$$

Substituting $xy = 16$ and simplifying gives $x + y = 9$. Then the hypotenuse of each of the right triangles is $\sqrt{x^2+y^2} = 16 - (x+y) = 7$. The requested perimeter is $8 \cdot 7 = 56$. The values of x and y are $\frac{9 \pm \sqrt{17}}{2}$.

We Remember

IN MEMORIAM: GRETCHEN SMITH

Karl Dilcher

One of the most remarkable and longest serving members of this department was **Gretchen Smith,** who passed away on September 29, 2025, at the age of 79.

Gretchen started her long career with our department even before the first PhD in Mathematics or Statistics was granted. Her first day on the job as a young secretary was her 23rd birthday, June 2nd, 1969. She had been recommended by the department's librarian to the then Department Head, the late Arnold Tingley. Gretchen later became Department Administrator, and as such she oversaw every aspect of the Department's operations, except for academic matters.

In addition to several moves of the department to different buildings early in her career, Gretchen looked after some large renovation projects after the department's move to the Chase Building in 1985. For instance, the whole building required re-scaling, which was done in at least three stages and involved replacing all windows throughout the building. Gretchen also oversaw the first complete renovation of the interior since we moved into the building. But perhaps Gretchen's most visible achievement is the Learning Centre, every detail of which was planned and overseen by Gretchen or was done with her input.

Gretchen Smith, C. 2001

It is impossible to do justice to the full extent of Gretchen's achievements and the influence she had on creating and maintaining such a positive atmosphere in the department. In addition to being helpful to everybody, she showed great kindness especially to students in need. In recognition of her service to students, she was awarded the Rosemary Gill Award on two separate occasions.

After 43 ½ years of service to this department, Gretchen retired in the Fall of 2012. When the department officially said Thank You to Gretchen in the afternoon of October 23, 2012, a banner over the entrance to the Learning Centre, read "Gretchen's Room" in large colourful letters. That room has rarely been so crowded before or after. In addition to almost the whole department, many guests from other units attended the event, as well as a good number of alumni and friends of the department and of Gretchen's.

After her retirement, Gretchen retained her Dalplex membership, and together with a good friend she was at the gym every morning, as it opened at 6 am.

Gretchen also remained interested in department matters, kept up with news including new hires and retirements, and occasionally attended department events or Tuesday Lunches. Although in poor health and with failing eyesight, she still attended last year's department social in February of 2025, about half a year before her passing.

Reflection

RIGHT TIME, RIGHT PLACE, RIGHT SKILLSET: THE "ACCIDENTAL" LEGACY OF ANDREW LENARD

Roman Smirnov

To paraphrase a quote Gian-Carlo Rota (1932-1999) once attributed to Stan Ulam (1909-1984), an academic career has two stages: first, you are younger than everyone else, and then, suddenly, you are older than everyone else. There is no middle ground. Since I have almost certainly aged out of the first group, it seems like the perfect moment to pause, reflect, and wax philosophical —hopefully to the benefit of younger scholars and students.

Being part of a department that serves as a hub of such constant intellectual motion naturally invites this kind of perspective. Defined by a vast range of research and a vibrant community of scholars, our department acts as an epicentre of academic discovery. We pride ourselves on a faculty of decorated teachers—such as Sarah Chisholm, Andrea Fraser, Joanna Mills-Flemming, Richard Nowakowski, and Peter Selinger—and researchers who lead in fields as diverse as analysis, applied mathematics, bioinformatics, category theory, combinatorics, data science, general relativity, mathematical physics, and statistical genetics. From the theoretical depths of commutative algebra and number theory to practical solutions in climate change, oceanography, social networks, and quantum computing, our expertise addresses the most pressing challenges of our time.

In view of the above, I would like to say a few words about how major discoveries in mathematics sometimes happen in unexpected ways. To be sure, the necessary conditions for such a breakthrough include being an absolute expert in one's field, maintaining a familiarity with adjacent disciplines, providing mentorship to strong students (or being mentored by strong scholars), and being surrounded by like-minded individuals. However, these are merely the pre-requisites. Sometimes, an extraordinary achievement occurs simply because one happens to be in the right place, at the right time, with the right set of skills.

I will illustrate this with the remarkable story of Andrew Lenard (1927–2020), a Hungarian-born Holocaust survivor and renowned physicist and mathematician, who worked at Columbia, Princeton, and Indiana Universities. A single fifteen-minute breakthrough of his led directly to the theory of bi-Hamiltonian systems—Hamiltonian systems that admit more than one Hamiltonian structure. Today, this theory stands as a cornerstone of modern mathematical physics and integrable systems, vital because it reveals the hidden patterns that render complex physical systems completely solvable.

To provide some context: my interest in the theory of bi-Hamiltonian systems began during my PhD studies at Queen's University (1992–1996), where I studied under the late Oleg Bogoyavlenskij (1948–2024), a distinguished faculty member at both Queen's and the Steklov Mathematical Institute in Moscow. It was a remarkable time to be in academia; having arrived in Canada from newly independent Ukraine in 1992—just a year after the dissolution of the USSR—the world felt as though it was in a state of profound transition, much as it does today. I recall asking my supervisor, "What problem will I be working on?" He responded with the utmost seriousness: "Roman, if you wish to survive in research beyond your PhD, you must learn not just how to solve problems, but how to see and formulate new ones yourself. Anyone can solve a mathematical problem once it is properly formulated!"

Armed with this wisdom, I was fortunate to find a problem formulated within the framework of bi-Hamiltonian theory. In the process, I learned a great deal of modern mathematics, spanning dynamical systems, Hamiltonian theory, differential geometry, algebra, and Lie group theory. Furthermore, I had the privilege of learning from many beautiful papers written by the world's top mathematicians who contributed to this area, including Israel Gel'fand (1913-2009), Irene Dorfman (1948-1994), Martin Kruskal (1925-2006), and Franco Magri, among many others. This experience gave me the gift of a lifelong appreciation for invariant quantities—the ultimate anchors of reality. When you change your perspective, your coordinate system, or the state of a system, almost everything changes, except for invariants. These amazing quantities manifest themselves everywhere, from physics and economics to many core areas of mathematics.

The bi-Hamiltonian property was first observed as the defining feature of the celebrated Korteweg–de Vries (KdV) equation, leading to a hierarchy of nonlinear PDEs that share the same essential properties as the KdV itself (see Miura et al. **[1]** and Gardner et al. **[2]**). Magri **[3]** subsequently demonstrated that this feature is inherent in other nonlinear PDEs. Finally, Gel'fand and Dorfman **[4]** extended these concepts to finite-dimensional Hamiltonian

systems, showing, in particular, that the compatibility of two Poisson bi-vectors (structures) is equivalent to the vanishing of the Nijenhuis tensor of the linear operator constructed from them. (Students who took MATH4530/5530 Differential Geometry last year may recognize the origins of some of the homework problems.) These ideas formed the foundation of the theory; however, a missing link remained. Several authors of the aforementioned papers cited a "private communication with Andrew Lenard" **[1,2],** crediting him with the foundational idea that led to the development of the theory. Gel'fand and Dorfman **[4]** even mentioned the term "the Lenard scheme," noting that they learned of it from a lecture by Peter Lax (1926–2025) during his visit to Moscow in 1976. Naturally, I wanted to present a complete picture of the origins of bi-Hamiltonian theory in my thesis. However, no papers on the topic existed under Andrew Lenard's authorship. In the infancy of the internet, I failed to locate him or get in touch. Fast-forward about ten years: I was an assistant professor teaching at Dalhousie University. Specifically, among other courses, I taught Mathematical Methods in Physics (MATH4165/PHYC4160/MATH5165/PHYC5160), which was and likely still is the most cross-listed course in our department. At that time, my research focus had shifted to the invariant theory of Killing tensors. Yet, I still felt a void from not knowing exactly how Lenard conceived the bi-Hamiltonian theory.

During the 2004–2005 academic year, Jeff Praught took the course. Jeff was a MSc student working under John Clements; he is now a military doctor with the Royal Canadian Navy. Because the course required graduate students to complete a research project, I suggested that Jeff work on a problem related to bi-Hamiltonian systems. I also shared the story of the "missing link" regarding the theory's conception and noted that it would be wonderful to speak with Lenard directly. Jeff did exactly that. He located Lenard and wrote him a letter explaining the project and his desire to learn about the origins of the theory. Professor Lenard kindly obliged and shared his story, which is reproduced in full below:

"Thank you for your communication. It is quite appropriate in the connection of your work, and I shall try to reply as best as I can.

In the earlier part of the 1960s, I was a scientific staff member of the Plasma Physics Laboratory (PPL) operated by Princeton University in conjunction with the Atomic Energy Commission. There, Martin Kruskal was a friend and colleague. He, together with his co-worker Norman Zabusky, discovered an astonishing phenomenon of the KdV differential equation, not until then noticed; namely, that in spite of its non-linear nature, certain wave solutions maintained their shapes unchanged after passing through a time interval of intense non-linear interaction. This was followed by the discovery of a type of "linearization" of the problem by a functional transformation relating it to the one- dimensional Schroedinger Equation. In addition, first one and then several simply expressible constants of motion were found for the KdV evolution equation. Due to the combined work of Clifford Gardner, John Greene, and others, soon an infinite hierarchy of such constants of motion were generated.

I left the PPL at this point to come to Indiana University. However, on a visit back to Princeton during the summer of 1967 (I believe) I went back to the PPL to see my old friends. It was there that something remarkable happened.

I arrived at coffee time in the afternoon. In the common room there were some blackboards. In front of one a crowd was gathered, centered around Kruskal, excitedly discussing something. I went up to ask what it was. They explained that another differential equation, similar to KdV but of higher order, was found, showing all those features of KdV I just described. Someone wanted to know how one could systematically discover it, rather than just by lucky hit and miss. I heard Martin Kruskal shout at me: "There must be a method to generate many more, probably infinitely many such higher and higher order DE's, don't you think, Andrew?" I asked for a yellow pad and pen, and went to sit down in a quiet corner to gather my thoughts. I was at that point particularly expert on generating functions as a means of summarizing information about infinite sequences in one mathematical construct. So naturally I tried this idea on the problem at hand, and it worked! It took me only fifteen minutes or so, and I could explain to the gathered friends how by means of a generating function an infinite hierarchy of KdV-like DE's could be generated, all of them having the same kind of behavior. This was

greeted with admiration and satisfaction. I had my coffee and left. Later, I saw that an article in the Comm. Appl. Math. (Courant Institute, NYU) by Gardner, Greene and Miura and perhaps others, had an appendix on my discovery. I myself never published anything, nor concerned myself with the subject, then or since. Several times during the intervening years I was surprised to hear my name being mentioned in connection with this, but actually much of it in connection with mathematics too high for me to appreciate. For instance, someone once told me that what I discovered was a dynamical system on a symplectic manifold with two different Hamiltonian structures. And someone mentioned the "Lenard-Recursion Operator", and asked whether that was the same person as I.

Naturally, I am satisfied that I could make a contribution, even in such a fortuitous and judicious manner as I told you.

I hope this story will be satisfactory for you and answer your questions. By all means, feel free to share it with any like-minded person if you care to. I don't mind it at all if the history of how "Lenard" became a concept in this area will be generally known.

Much good luck for your own studies, and sincerely yours:

Andrew Lenard

> *P.S.: I recall that a mathematician at Dalhousie University (probably retired by now) whom I knew as a friend and colleague when he was at Indiana University during the early 1970s, is Peter Fillmore [1]. Say hello to him for me if you see him."*

Jeff and I really enjoyed Lenard's story, particularly how modest and humble the scholar was about his discovery. This kind of behavior typically points to a scientist of the highest caliber. Consequently, we have decided to write a mathematical paper around his account, illustrating the narrative with the corresponding mathematical formulas and explanations. Our paper **[5]**, titled *Andrew Lenard: A mystery unraveled*, was published that year in the inaugural volume of *Symmetry, Integrability and Geometry: Methods and Applications* (SIGMA). Established in 2005, SIGMA is a prominent, independent, open-access journal covering geometrical methods in mathematical physics, Lie theory, integrable and dynamical systems, quantum groups, and quantum gravity. Published in Ukraine by the National Academy of Sciences (NAS), its editorial office is located in downtown Kyiv at the Institute of Mathematics.

Beyond Jeff Praught and myself, several of our faculty members and former graduate students have proudly contributed to the journal since its inception, including Alan Coley, Theo Johnson-Freyd, Josh MacArthur, David McNutt, Rob Milson, and Kunpeng Wang. In fact, our paper with Jeff was later republished in full in the January 2021 issue of the *International Association of Mathematical Physics News Bulletin*, with the gracious permission of the authors and SIGMA, honoring the memory and scientific contributions of Andrew Lenard.

Following the unprovoked and brutal full-scale Russian invasion launched in February 2022, Ukrainian academic infrastructure has faced deliberate and catastrophic destruction. The journal's physical home, a historic 1848 building, suffered significant structural harm, shattered windows, and extensive facade cracking when a devastating Russian rocket strike targeted central Kyiv. Across the country, the war of aggression has damaged or destroyed over 1,400 scientific buildings, decimated research equipment, slashed budgets, and forced a vast portion of the scientific community into displacement or frontline military service.

Yet, against the backdrop of constant blackouts, air raid sirens, and existential threats, the indomitable strength and defiance of the Ukrainian people have shone through. Refusing to let their intellectual heritage be silenced by terror, the editors and local researchers have continued to work unfailingly from bomb shelters and temporary spaces. Because of this profound resilience, SIGMA has maintained its regular publication schedule without interruption, proudly disseminating the newest breakthroughs in global mathematics. For example, in 2023–24, SIGMA published a special issue honoring Peter J. Olver's 70th birthday, a volume that beautifully complemented the *Symmetry, Invariants, and their Applications* conference hosted by our department in the Chase Building. We strongly encourage you to consider supporting this remarkable community by contributing your own work to SIGMA.

[1] Peter Fillmore, FRSC, Professor Emeritus and former Chair, is one of the most distinguished scholars to have ever worked in our department. He is also the father of His Worship Andy Fillmore, Mayor of the Halifax Regional Municipality, and former Member of Parliament (MP) for Halifax (2015-2024).

What can we learn from Andrew Lenard's contribution to the inception of bi-Hamiltonian theory? A few years ago, while attending a first-year student event as then the Director of the Mathematics Division, I heard Chris Moore, then Dean of the Faculty of Science, offer this advice: "Take a course in an area you've never explored before." Rephrasing this in light of Lenard's story yields further wisdom: attend a seminar far outside your usual field; read a paper in a brand-new discipline; or talk to your office mate about their research, even if it seems unrelated to yours. Your expertise in category theory, commutative algebra, or topology might be exactly what is needed for the next breakthrough in data science or bioinformatics. You never know.

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[2] Gardner, C. S., Greene, J. M., Kruskal, M. D., Miura, R. M.: Korteweg-de Vries equation and generalizations. VI. Methods for exact solution. *Comm. Pure Appl. Math.* 27 (1974), 97-133.

[3] Magri, F.: A simple model of the integrable Hamiltonian equation. J. Math. Phys. 19 (1978), 1156-1162.

[4] Gel'fand, I. M., Dorfman, I. Ya.: Hamiltonian operators and algebraic structures related to them. *Funct. Anal. Appl*. 13 (1979), 248-262.

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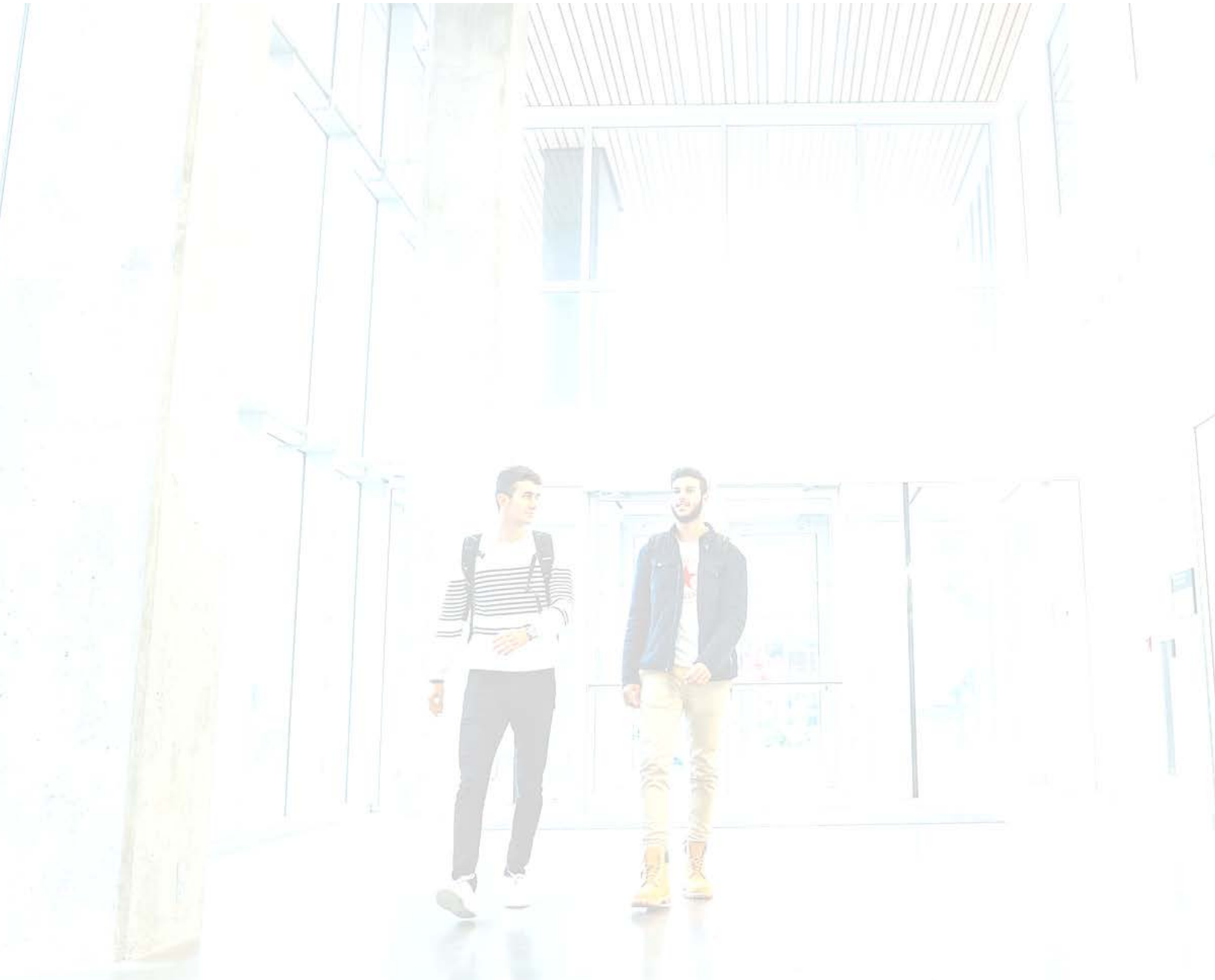


Summary of Colloquia and Seminars

Everyone who is interested are welcome to attend our discussions and seminars:

- Departmental Colloquium – Mathematics
- Departmental Colloquium – Statistics *(Seminars in Statistics)*
- Honours Seminar (Mathematics)
- Number Theory Seminar (Mathematics)
- Atlantic Category Theory & Algebra Seminar (ATCAT) (Mathematics)
- Dalhousie-AARMS Analysis-Applied Math-Physics Seminar (Mathematics)
- Graph Theory Seminar (Mathematics)
- Relativity Seminar (Mathematics)

Additional information on the colloquia and seminars is available on the Department website: **dal.ca/faculty/science/math-stats/news-events/colloquium.html**

We would like to highlight the two colloquia series. The Mathematics Colloquia Series was organized by Theo Kolokolnikov (Fall 2025) and Peter Selinger (Winter 2026), and included these presenters:

- **December 11** Sébastien Labbé (CRM-CNRS)
- **January 22** Susan Morey (Texas State University)
- **March 5** Hans Christianson (University of North Carolina at Chapel Hill)
- **March 9** Martina Rovelli (University of Ottawa and University of Massachusetts)
- **April 29** Malabika Pramanik (University of British Columbia)
- **May 25** Uwe Nagel (University of Kentucky)

The Seminars in Statistics (STAT 7320) were organized by Théo Michelot and Orla Murphy. Once again, this year the seminar series alternated between in-person and online presenters, including the following:

- **September 26** Ross Dickson (ACENET) **[IN-PERSON]**
- **October 3** Le Bao (Penn State) **[IN-PERSON]**
- **October 24** Max Turgeon (University of Manitoba) **[ONLINE]**
- **October 31** Graduate student speakers: Cameron Moffatt, Sarah Organ, Shanglun Li, Thu Thi Minh Nguyen, Margo Paris (Dalhousie University) **[IN-PERSON]**
- **November 7** Marouane Il Idrissi (UQAM) **[ONLINE]**
- **November 28** Aurelie Labbe (HEC Montréal) **[ONLINE]**
- **January 9** Ben Bolker (McMaster University) **[IN-PERSON]**
- **February 13** Sean MacKinnon (Dalhousie) **[IN-PERSON]**
- **February 27** Vianey Leos Barajas (University of Toronto) **[IN-PERSON]**
- **March 27** Michelle Everson (Ohio State University) **[ONLINE]**

Affiliated Organizations & Societies

AARMS

Andrew Irwin, AARMS Director

AARMS supported a wide range of activities in Atlantic Canada and at Dalhousie in particular over the past year. We awarded two new Collaborative Research Grants (CRGs) in Fall 2025, one new PDF in Winter 2026, and four USRAs in the Spring. We continue to support a wide range of conferences and workshops. Many students and post-docs receive travel support to attend meetings and pursue collaborations. We support numerous outreach activities including the three annual math camps at Dalhousie. One of the AARMS graduate scholarships was awarded to Thiago Holleben and one of the AARMS doctoral thesis awards went to Dr. Wensha Zhang, both at Dalhousie.

We continue to collaborate with the other Mathematics Institutes on national and international programming, notably the summer IDMS (Increasing Diversity in the Mathematical Sciences) in 2025 at U Manitoba (mathematics of molecular and cellular biology, Canadian and International students, partnering with 3MC in South Africa and ICMS in Edinburgh) and in 2026 at UBC Okanagan/BIRS (algebraic methods in combinatorics, focusing on women and gender-diverse individuals).

AARMS
Atlantic Association for Research in the Mathematical Sciences

We have plans to restart the industrial problem-solving workshops (https://aarms.math.ca/ipsw/) in summer 2027, following disruptions to this program started by the COVID-19 Pandemic. We will be soliciting both industrial partners and faculty mentors to work with students on problems in the near future. I encourage anyone interested in this program to contact me for more information.

AARMS can now receive donations to support our work. Donations are made to Dalhousie, result in a charitable donation receipt, and are kept in a special purpose account. For information please see https://aarms.math.ca/donations/

Community Outreach and Beyond

DALHOUSIE MATH CHALLENGE CLUB

DORETTE PRONK

During the 2025-2026 school year we have run both a junior high math club (for grades 5-8) and a high school math club for grades 9-12. Both clubs were well attended. In fact, the junior high club had often up to 30 students with some of them a bit younger than the intended age group. The youngest ones were so enthusiastic and eager to learn that we allowed them to keep coming and we encouraged some of the grade 7 and 8 students to join the high school group. They were challenged but learned a lot! In fact, some of these students (Easen and Neelan Wong with Alyssa and Michael Campbell) formed a team and participated in the first World Robotics Competition in Houston where they won an innovation award.

During the fall semester the clubs were taught by undergraduate students enrolled in MATH 3790 (Problem Solving in Mathematics). The students taught the math clubs about their favorite topics in mathematics and provided them with challenging problems as well as fun mathematical games. Math club students learned about a wide range of topics from geometry and symmetry operations to new ways of counting and statistics. Some nights felt particularly challenging, but the students were intrigued by all the new concepts and techniques they learned. Unfortunately, we could not participate in the fall contests due to the late start of the semester and a missed opportunity to obtain funding.

During the winter semester the club was taught by volunteer undergraduate and graduate students: Nabil Abi Daoud, Jeremiah Hockaday, Veronika Keras, Ana Mastnak, Bram Ogus, and Noah Wayne. A special thank you goes to Nabil, Veronika and Bram who are graduating this semester! You have all had a great impact on these students with your skill, enthusiasm, encouragement and patience. We were also joined by Dr. Monalisa Middya, a mathematician from India, who joined us as an instructor in the high school math club.

The final highlight for this year was our participation in the Purple Comet Math Contest. This is a team contest for both middle school and high school teams. We entered the contest with two middle school and two high school teams. All four teams worked well together and were able to use what they had learned this year, although the contest had a lot of challenging problems. It also kept the team of instructors engaged over the next week. We spent our final math club sharing solutions and ideas on how to approach these problems and it was great to see that for some problems the students were instructing the teachers.

We look forward to continuing the problem-solving adventures with these students in September. We will then also train a new group of university students as problem solving coaches.

MATH CAMPS IN THE DEPARTMENT

Black Educators' Association (BEA)/Dalhousie Math Camp; The annual BEA and Dalhousie Math Camp took place from July 6-11, 2025, and will return in Summer 2026. **AARMS/CMS/Dalhousie Senior High Math Camp;** ran from July 20 to 25, 2025 and is slated to return in Summer 2026. Our **Dalhousie Indigenous Students' Math Camp** held its second session from July 27 to August 1, 2025. The camp returns summer 2026.

NOVA SCOTIA MATH CIRCLES

LEILA MOHAMMADI & HASAN MAHMOOD

New Leadership

This spring, Nova Scotia Math Circles welcomed Leila Mohammadi and Hasan Mahmood as co-managers under the continued guidance of Dr. David Iron, and Dr. Dorette Pronk, as faculty advisors. Both co-managers previously worked with Math Circles as presenters and outreach facilitators before transitioning into leadership roles supporting program coordination, school visits, and operations.

The Team

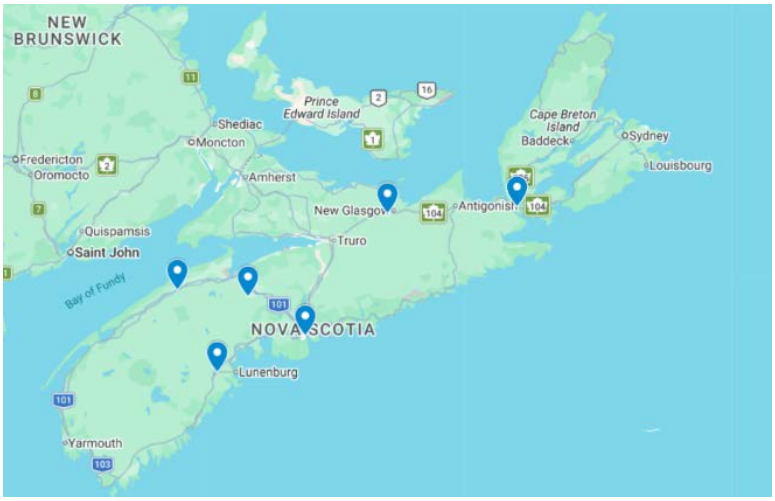
Nova Scotia Math Circles continues to be supported by a dedicated team of undergraduate and graduate student presenters and content developers. Current presenters contributing to school visits and program development include:

Ana Mastnak, Carys McNeil, Daniel Teixeira, Jeremiah Hockaday, Kian Soares Da Costa, Monalisa Middya, Mubaraka Ghadiali, Noah Wayne, Nour Allam, and Sara Soltani.

The work of these presenters remains essential to Math Circles' ability to deliver engaging mathematical experiences to students in schools and community events throughout the province.

Outreach

Since spring 2026, Nova Scotia Math Circles has continued outreach activities across multiple regions of Nova Scotia. The map below highlights communities where school visits have occurred or are planned, reflecting the program's continued effort to reach students beyond the HRM.



Recent activities included participation in Nova Scotia Engagement Days, where presenters introduced students to interactive mathematics activities and hands-on problem solving, as well as Dalhousie Discovery Days, which brought junior high students to campus to explore recreational mathematics and mathematical thinking beyond the classroom.

Nova Scotia Math Circles also continued to connect with students through classroom visits and outreach activities designed to make mathematics engaging, creative, and accessible. Presenters delivered activities ranging from mathemagics and cryptography to logic puzzles, counting techniques, and games that encourage curiosity and problem solving.

As new co-managers, current priorities include continuing outreach activities while strengthening the systems behind the program to support future growth and sustainability.

Building Systems for Sustainability

Alongside outreach, efforts this year also focused on strengthening the infrastructure behind the program through improved presenter coordination, organization of contracts and payroll processes, development of centralized tracking systems for school visits and expenses, and

improved documentation to support continuity between future leadership teams. These changes aim to strengthen long-term sustainability as outreach activities continue to grow.

Continuing Growth

Future priorities include expanding presenter training, strengthening relationships with schools across Nova Scotia, improving access to program resources, and continuing to develop outreach activities that encourage curiosity, confidence, and enjoyment in mathematics.

Nova Scotia Math Circles remains committed to making mathematics engaging, accessible, and meaningful for students throughout the province.

SCIENCE ATLANTIC

ANDREW IRWIN, DORETTE PRONK, AND PETER SELINGER

A group of students from the Department of Mathematics and Statistics attended the Science Atlantic Conference at Cape Breton University. Many thanks to Dorette and Peter for joining the students at CBU for the annual Science Atlantic conference. In all we sent 22 students **[see below at right]** (13 undergrad and 9 graduate students) to the meeting. The Mathematics, Statistics, and Computer Science (MSCS) sector of Science Atlantic will next be held in University New Brunswick (Saint John). To find out more about Science Atlantic, you can visit their website, https://scienceatlantic.ca/

Congratulations to the following graduate students for winning awards for their talks: **1st** – Tim Power; **2nd** – Thiago Holleben; and **3rd** – Rory Schepp.

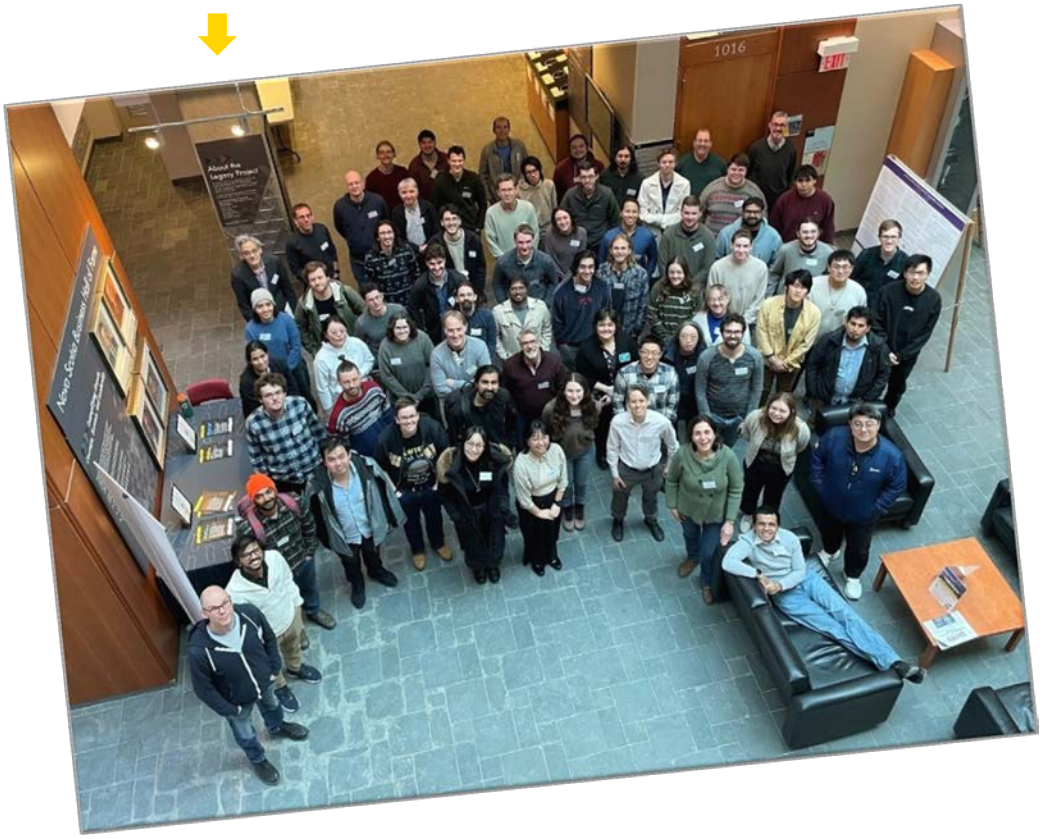
TWENTY-THIRD CAAC CONFERENCE

SARA FARIDI

In January 2026 we hosted the annual conference **C**ombinatorial **A**lgebra Meets **A**lgebraic **C**ombinatorics. The local organizers were Sara Faridi and Dharm Veer, both from the math department. The event was extremely successful, with over eighty participants from all over Canada and the United States, and some from further abroad, who helped build an outstanding program. The

program, like every year, started Friday afternoon (January 23rd) and ended on Sunday (January 25th) around lunchtime.

As is the tradition with this conference series, several of the talks were presented by graduate students. Photos, and more information about this conference series, can be found at https://www.mathstat.dal.ca/~faridi/research/inverse_systems/workshop.html



ATLANTIC TOPOLOGICAL QUANTUM FIELD THEORY (TQFT) SPRING SCHOOL

THEO JOHNSON-FREYD

The fourth Atlantic TQFT Spring School was held May 18-22, this time here at Dalhousie, organized by Cameron Krulewski and Theo Johnson-Freyd. With more than 50 participants, it was our largest and most successful yet. The school was targeted towards early-career graduate students. There was a strong contingent of students from Canada, including seven from Dal and five from the Toronto area, but the school also drew students from around the world, including from the U.S, Japan, the Netherlands, and Uruguay. Participants were also gender-diverse, including six women and six agender or non-binary students and one-woman lecturer.

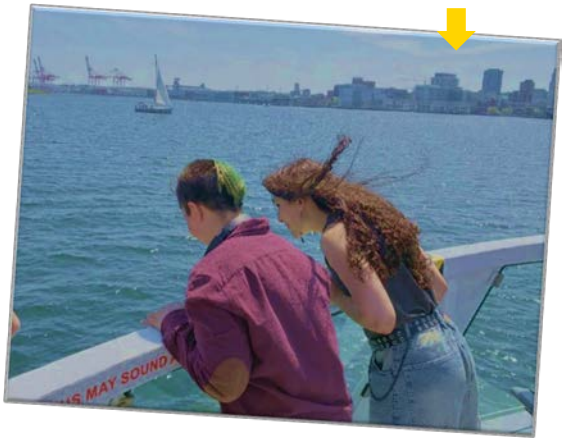
The backbone of the school was three five-hour lecture series:

- Lyne Moser (University of Regensburg), *(∞,n)-categories*
- Luuk Stehouwer (Durham University), *Stable homotopy and unitary TQFTs*
- Campbell Wheeler (Institut des Hautes Études Scientifiques), *Quantum 3-manifold invariants*

Each lecture series focused on a different aspect of topological quantum field theory (TQFT), a growing topic in the intersection of topology, algebra, category theory, geometry, and physics. Each lecturer provided a pedagogical series that also touched on areas of current research.

In addition, students joined daily two-hour problem sessions led by PhD students Jonathan Buchanan (MIT) and Daniel Teixeira (Dalhousie). At each session, students were able to get to know each other better as well as reinforce their learning.

It was not just classwork: the schedule included time for collaboration, networking, and socializing. A highlight was the Wednesday afternoon ferry trip and walk to Dartmouth. In our feedback form, some students said this was the best iteration of the TQFT school yet!



CHASE **ANNUAL REPORT** 2026

The **Chase Annual Report 2026** is published for students, alumni, and friends of the Department of Mathematics and Statistics, Dalhousie University. Your suggestions and comments are welcomed for future issues (email **mathstat@dal.ca**).

This year's edition of the Chase Annual Report was produced and designed by **Mark Monk.**

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