



Mathematics Alumni Newsletter



A Note from the Chair

It is often reported, correctly so, that math majors have excellent prospects on the job market. The array of careers in which mathematics is required or at least useful is already impressive and it only keeps growing.

Much of the recent growth is driven by big data and artificial intelligence, a phenomenon that has transformed entire industries. Not surprisingly, our new Provost Jeremy Haefner (who happens to be a mathematician) has initiated a campus wide discussion on artificial intelligence shortly after his arrival at DU. The first tangible outcome of this discussion will be the AI Summit (<https://www.projectxite.org/ai>) on April 11. One of our contributions to the AI initiative is to offer a new undergraduate degree, Bachelor of Science in Mathematics for the Foundations of Artificial Intelligence, which will provide students with rigorous understanding of the mathematical principles used in artificial intelligence. You can read more about the degree below.

While the impact of big data on the industry is by now well recognized, I would like to point out that the field of mathematics itself is undergoing a transformation not seen, in my opinion, since the early 1950s when research mathematics became mainstream at leading American universities. As a harbinger of this change, we have observed that many permanent positions at U.S. math departments traditionally reserved for mathematicians are now open to data scientists or researchers working in AI. Consequently, eminently qualified research mathematicians who do not work in those fields are having a hard time finding permanent jobs in academia, which is counterintuitive, given the sentiment with which I have opened this letter.

In other news, I would like to thank alumni and friends of the department for showing up in record numbers for the Alumni Hockey Night – it was a very enjoyable event. I would also like to invite you to attend our next Herbert Howe Lecture on May 30: Prof. George Andrews, a former president of the American Mathematical Society, will give a public lecture on the topic of Ramanujan’s lost notebooks.

As always, we love hearing from you. Please contact Susan Bolton (susan.bolton@du.edu) if you have news to share.

Best regards,
Petr Vojtěchovský

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Current Undergraduate Degrees

The Department of Mathematics offers a bachelor of arts in mathematics, bachelor of arts in mathematics with concentration in finance and bachelor of science in mathematics. These programs provide a strong foundation in theoretical and applied mathematics with particular emphasis on the development of logical and analytical problem-solving skills. It is an excellent preparation for graduate school in quantitative subjects.

For more information about the undergraduate and graduate degree programs please visit <https://math.du.edu/>
Or contact the Math Office at math-office@du.edu, 303-871-2911

New Undergraduate Degree

Mathematics forms the foundation of our modern understanding of the world and of the technology which supports our societies. Students with skills in mathematics can thus hope to find many enticing and rewarding careers in industry, thanks to their expertise as abstract thinkers, problem solvers and formal scientists. Our faculty wishes to continuously improve our course offering to strengthen the academic preparation of our students and to adapt to new demands. With this in mind, our department will create a new degree: Bachelor of Science in Mathematics for the Foundations of Artificial Intelligence.

The new degree will build upon the available strong theoretical foundations offered by our department in our current Bachelor degrees, and add courses in applied mathematics to prepare students for the many new mathematically oriented careers available in the tech industry. The choices of applied courses will be guided by the current high demand for data scientists and artificial intelligence specialists.

Remarkably, recent developments in the field of artificial intelligence, specifically neural networks and deep learning, are based on numerical methods, analysis and other subjects familiar to mathematicians. With a few well-chosen topic courses based on our real analysis sequence and other courses, students in the new program will thus be well-prepared to further these new technologies and contribute to our evolving society in new ways.

Since the applied courses will be built as sequels to theoretical courses, the degree will retain the advantages of a traditional math degree and, importantly, we will be able to offer the applied courses at a higher level than is common in programs solely focused on applications in data science. We will capitalize on our faculty's broad interests and our students will benefit by connecting the wonderful world of abstract mathematical ideas with the expanding realm of applications.

Dr. Frédéric Latrémolière, Ph.D.
Professor of Mathematics

Moving on...

Wesley Fussner

PhD Fall 2018

Thesis: *Categories of residuated lattices*

Currently, Postdoctoral scholar, Laboratoire J.A. Dieudonné, CNRS France, and Université Côte d'Azur

Kirk Boyer

PhD Winter 2019

Thesis: *Barrier Graphs and Extremal Questions on Line, Ray, Segment, and Hyperplane Sensor Networks*

Currently, Software Engineer, Google

Lauren Nelsen

PhD Spring 2019

Thesis: *Applications of geometric and spectral methods in graph theory*

Accepted, Assistant Professor, University of Indianapolis

Katherine "Kat" Perry

Postdoctoral/Visiting Assistant Professor

Accepted, Assistant Professor, Soka University of America

Congratulations on your accomplishments Wesley, Kirk, Lauren and Dr. Perry. Cheers to your bright future ahead!



Prof. George Andrews

Herbert Howe Lecture

George Andrews

Thursday, May 30, 2019 | 4-5 PM

"The manuscript looks chaotic, even by mathematics standards ."

- George Andrews

Please join us at the Herbert Howe Lecture

Speaker: George Andrews

Title: *Ramanujan's Lost Notebook in Five Volumes – Reflections*

Abstract: Bruce Berndt and I have recently completed the fifth and final volume on Ramanujan's Lost Notebook. All of Ramanujan's assertions (with perhaps one of two exceptions) have been proved or, in very rare instances, refuted or corrected. Among these hundreds of formulas there are a number that stand out. For example, the recent explosion of results on mock theta functions and mock modular forms has its origin in the Lost Notebook. The "sums-of-tails" phenomenon also arose from the Lost Notebook. This talk will be a personal account of highlights from this project and questions, yet to be answered, that arose from this decades long effort.



Srinivasa Ramanujan

About the speaker: Prof. George Andrews is a leading expert in the theory of partitions. He wrote over 250 research and popular articles on q-series, special functions, combinatorics and applications. Prof. Andrews is a member of the National Academy of Sciences, fellow of the American Academy of Arts and Sciences, and a fellow of the American Mathematical Society. He also served as the president of the American Mathematical Society.

Time and location: May 30, lecture 4-5pm, reception 5-6pm, Olin Hall.

Please RSVP to Susan Bolton at susan.bolton@du.edu.

Herbert Howe Lecture Series

The series is named in honor of *Herbert Alonzo Howe*, a 19th century Professor of Mathematics and Astronomy at the University of Denver and Denver's first astronomer.

Herbert Howe joined the faculty in 1881 and received his doctorate in May 1884 with a thesis on a novel solution to Kepler's two body problem. He became the first director of the Chamberlin Observatory, a position in which he remained until his death in 1926.

Among his many accomplishments, he is responsible for determining the location of the original Mile High marker at the staircase of the Colorado capitol building in 1909, later replaced with an etched inscription. His measurements were more precise than those of a 1969 survey and only about 3 feet above the modern 2003 plaque.

John G. Daly Endowment

John Daly received his bachelor's and master's degrees from the University of Denver in mathematics and education, and pursued a gratifying career as a high school mathematics teacher, where he was beloved and influenced countless high school students.

The endowment honors John's memory by supporting the research and travel of students in the Mathematics Department.

The fund continues to provide support for research-related expenses of our students with preference given to graduate students.

Gudder Trust

Ullus Gudder established the Gudder Trust in 1986 to provide funds for the Mathematics Department.

Ullus Gudder always believed in the importance of education and wanted the funds to be used for student travel and education.

Ullus' gift continues to support graduate and undergraduate student research and travel.

Supporting Student Travel

We would like to express our sincere thanks to donors who support travel of undergraduate and graduate students to conferences. Special acknowledgements to the John G. Daly Endowment and Gudder Trust that generously provide funds specifically for our graduate and undergraduate students.

Graduate Student Travel

Ryan DeMuse

January 2018

Joint Mathematics Meetings

San Diego, CA

Presented: Phase Transitions in Edge-Weighted Exponential Random Graphs: Near-Degeneracy and Universality

March 2018

Arizona School of Analysis

Tucson, AZ

Presented: Mixing Times of Vertex-Weighted Exponential Random Graphs

Wesley Fussner

January 2018

Workshop on Logic and its Applications

Johannesburg, South Africa

Paper: Distributive laws in residuated binars

Presented: A duality-theoretic perspective on involutive MTL-Algebras

Lauren Nelsen

June 2018

SIAM Conference on Discrete Mathematics

Denver, CO

Presented: Rainbows Spanning Trees in General Graphs

August 2018

MAA MathFest

Denver, CO

Presented: Graphs from a Linear Algebra Perspective

Hwajin Park

August 2018

SYSMICS (Syntax meets Semantics—Methods, Interactions, and Connections in Substructural Logics) Summer School

Les Diablerets, Switzerland

June 2018

LAT (Logic, Algebra and Truth Degrees) and AiML (Advances in Modal Logic) - jointly held conferences

Bern, Switzerland

Gavin St. John

June 2018

ASUBL—Algebra & Substructural Logics—Take 6

University of Cagliari

Cagliari, Italy

Paper: Undecidability of FL(E) in the presence of structural rules

June 2018

First Algebra Week

University of Siena, Siena Italy

Paper: Undecidability for varieties of residuated lattices

Xiao Zhuang

August 2018

BLAST

Denver, CO

October 2018

FACT (Foundations and Applications of Computational Topology and Information Processing)

Youngstown State University

Youngstown, OH

For more information about supporting student travel, please contact Susan Bolton at susan.bolton@du.edu

Undergraduate Student Travel

“I went there not knowing what I wanted to do once I graduate, and came back with a whole new set of knowledge as to what you can do in the real world with a math degree.”

University of Nebraska Conference for Undergraduate Women in Mathematics (UNCUWM)

Toni Hinkston, BS Mathematics student

I had an amazing experience at the University of Nebraska Conference for Undergraduate Women in Mathematics (UNCUWM). I went there not knowing what I wanted to do once I graduated, and came back with a whole new set of knowledge as to what you can do in the real world with a math degree. I learned about jobs pertaining to pure math and applied math. I talked to professionals in all different types of fields. I listened to inspirational presentations from women making breakthroughs in their fields—who will go down in history for the things they have achieved. While there, I listened to numerous presentations from undergraduate women across America who told us about their research and the importance behind it (which made me that much more excited about my research opportunity this summer). I also learned a lot about REUs and the grad school process. The networking opportunities were incredibly helpful and inspiring because I was able to talk with women who were experts in their field, and were willing to share their knowledge with us. Overall, I had an amazing experience.

Toni Hinkston
BS Mathematics



Research Spotlight

Professor Nikolaos Galatos

I remember being exposed to mathematics by my great grandfather. He taught me about addition and multiplication at first, but he later moved to math riddles. I remember thinking about them for days and sharing my partial attempts with him. It was a new world for me and I felt drawn to it like a magnet. My interest in abstract thinking continued strong and led me in studying mathematics at the university.

“I found it almost magical that we can use algebra to compare different types of logical reasoning, known as non-classical logics.”

Nikolaos Galatos

Professor

PhD 2003 (Vanderbilt Univ.)

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Research interest:

Algebraic Logic

Algebra had been my strong suit from high school and throughout university and the concepts made natural sense, but logic piqued my interest, as well. I started reading on Universal Algebra on my own, having had an introductory course in Lattice Theory as an undergraduate. When I realized later in graduate school how close these two topics are to Algebraic Logic, I was very excited to be able to bring in logic into my algebraic studies, and expand more into proof theory during my postdoc. I found it almost magical that we can use algebra to compare different types of logical reasoning, known as non-classical logics.

In non-classical logics, the main criterion for acceptance of a sentence is not that of truth, but maybe that of constructive provability (the logic that underpins constructive mathematics and computer science), or that of relevance between statements (of particular interest in philosophy), or that of degrees of truths (of use in engineering), or of resource sensitive reasoning of linear logic (with unexpected connections to quantum mechanics), or to the formal parsing of natural language sentences (of importance in linguistics), or of the logic of pointers (indispensable in modern computer programming), and also having connections to verifications of correctness of programs.

At the moment I am the only tenure-track faculty at DU working in the area of Algebraic Logic but I enjoy having an informal seminar with my three PhD students and my postdoctoral researcher. Also, I was fortunate to have been part of the 3-year EU-funded research grant SYSMICS that supported a number of visits to DU from researchers based in Europe, to have hosted two Fulbright scholars (from China and Argentina) and to have made use of a Simons grant that supported my travelling for 5 years. Mathematics is more fun when it takes the form of a collaborative activity!

DU Alumni Hockey Night



Photo credit: denverpioneers.com Men's Ice Hockey

The 121 tickets sold this year marked a record year of attendance for the DU Math Alumni Hockey Night event held on January 19th. The evening kicked off with nearly 100 alumni, friends, family, faculty and staff enjoying conversation during the reception in the Math Building, Knudson Hall room 309. Shortly before 7pm we joined the other DU Math Alumni Hockey Night attendees, and settled in with the sold-out crowd to take in a nail-biting game against Colorado College. The DU Pioneers tied the CC Tigers 4-4, winning the NCHC shootout for the extra point in the conference standings.

For highlights of the game visit, <https://denverpioneers.com/watch/?Archive=2786&type=Live>

If you are interested in attending the game in January 2020 The date and game will be determined once the 2019-2020 schedule is released to the public in early July 2019. Please contact Susan Bolton at susan.bolton@du.edu.

Math Alumni

The Department of Mathematics is fortunate to have active Alumni and Emeriti who continue to support us in the following ways:

- Contributing to our scholarships, awards and travel funds.
- Serving as mentors to our undergraduate students.
- Participating in Networking events.
- Donating to our department library.
- Staying connected.

If you are interested in learning more, please contact Susan Bolton at susan.bolton@du.edu or call 303-871-3344.



Math Department Library

In our new building we created a space for a resource library of math books and journals for our faculty and graduate students.

We would like to thank the faculty and emeriti for the book donations. We especially thank Florin David who recently donated many boxes of books to our growing collection.

If you have any questions, or would like to make a donation to the library, please contact Susan Bolton at susan.bolton@du.edu or at 303-871-3344.

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