

LETTER FROM THE CHAIR, PROF. BEN WEINKOVE

This year saw our department continue to thrive and grow. We welcomed two new tenure-line faculty members in number theory: **Maksym Radziwill** as the Wayne and Elizabeth Jones Professor of Mathematics, and **Ananth Shankar** as Assistant Professor. We were also delighted to welcome our new financial assistant **Rachael Dunphy**, who joins **Jenima Lyon**, **Deavon Mitchell** and **Eric West** to make up our dedicated and hardworking team of staff.

Next year we will be joined by two new assistant professors, both currently postdocs at the Institute for Advanced Study (IAS) in Princeton. **Rachel Greenfeld** works in harmonic analysis, arithmetic combinatorics and discrete geometry. **Allen Yuan** works in homotopy theory, in particular on algebraic K-theory, arithmetic geometry and classical problems in algebraic topology. We are thrilled to have them join us!

Last Fall we were excited to learn that the NSF and Simons Foundation are awarding \$50 million to Northwestern to establish the new National Institute for Theory and Mathematics in Biology (NITMB). This new institute will be based in downtown Chicago. Our colleague **Tuca Auffinger** was one of the original principal investigators of the award and will serve as an Associate Director of NITMB. We look forward to learning about the latest developments on the interface between mathematics and biology!

This has been a busy year for conferences and research activity. We held the 2023 Midwest Probability Colloquium, the conference “Asymptotics in Complex Geometry” in memory of our beloved colleague **Steve Zelditch**, and the 2024 edition of “Gone Fishing”, a conference on Poisson geometry and representation theory. Moreover, this summer we have *two* 2-week summer school/conference events supported by our \$2.5 million NSF Research Training Grant in Dynamics. The first is on “Microlocal Analysis and Quantum Dynamics” in honor of Steve Zelditch, and the second is on “NU Trends in Ergodic Theory”.

We also hosted three distinguished Lecture Series in 2024. **Nicolai Reshetikhin** of Tsinghua University gave the Pinsky Lectures in February, **William Minicozzi** of MIT gave the Yamabe Lectures in April and **Michael Harris** of Columbia gave the Bellow Lectures in May. Many thanks to the dedicated faculty, staff and graduate students for all their work in putting these events together!

Congratulations to two of our faculty for their upcoming promotions starting this Fall: **Yuchen Liu** to Associate Professor and **Maria Nastasescu** to Associate Professor of Instruction! You can read in these pages many of the accomplishments of our faculty and students, and I hope you enjoy reading about their successes.

Unfortunately, there were some departures this year. Our long-serving staff member **Miguel Lerma** retired in March 2024 after 26 years in the department. **Aaron Naber** is leaving us to go to the IAS at the end of this academic year. We are sad to see them go but wish both the very best.

Also in these pages is a remembrance for Professor Emeritus **Judith Sally**, who died this January. She was a faculty member for 30 years in our department and will be much missed.

This is my last year as chair and I’m happy to say it has been an honor and a pleasure to serve in this role. The department is a big and complicated machine, and only works as well as it does because of the collective efforts, good nature and wisdom of our wonderful faculty, staff and students. Thanks to all of you! A special shout out to Director of Undergraduate Studies **Santiago Cañez**, Chair of Graduate Admissions **Ezra Getzler**, and Director of Graduate Studies **Elton Hsu**. All are finishing their terms this year – we’re grateful for your service!

Finally, we are lucky that the impossibly energetic **Tuca Auffinger** will take over as chair in the Fall, and we look forward to seeing the department evolve in his very capable hands!

2023-2024 MATH NEWS**Yuchen Liu Awarded NSF Career Grant**

NU Math faculty member, **Yuchen Liu**, has been awarded a prestigious 2023 CAREER grant from the NSF. The 5-year award titled “K-stability and moduli spaces of higher dimensional varieties” will bring exciting research and training activities in algebraic geometry to our department.

Aaron Naber Named 2023 Simons Investigator in Mathematics

NU Math faculty member, **Aaron Naber**, was named a 2023 Simons Investigator in Mathematics. Naber, the second Northwestern professor ever to receive this honor, is a geometric analyst working on the regularity, singularity and topology of geometrically motivated equations.

Ben Antieau Now a Principal Investigator on Simons Collaboration

NU Math faculty member, **Ben Antieau**, is now a Principal Investigator on a new \$8 million Simons Collaboration on Perfection in Algebra, Geometry and Topology. This is a collaboration across multiple institutions, with Northwestern University’s portion of the grant being \$650K.

Auffinger and the New National Institute for Theory and Mathematics in Biology

The NSF and the Simons Foundation is awarding \$50 million to Northwestern to establish the National Institute for Theory and Mathematics in Biology (NITMB), to be based in downtown Chicago. NU Math Prof. **Antonio Auffinger** was one of the original principal investigators of the award and will be an Associate Director of NITMB.

Gabor Szekelyhidi Elected as a 2024 AMS Fellow

NU Math faculty member, **Gabor Szekelyhidi**, has been elected as a 2024 Fellow of the American Mathematical Society. The Fellows of the AMS program recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics.

Ananth Shankar Awarded NSF Career Grant

NU Math faculty member, **Ananth Shankar**, has been awarded a prestigious CAREER grant from the National Science Foundation. The grant, “Algebraicity and Integral Models of Shimura Varieties”, will provide almost \$500K to support Ananth’s research and educational activities in the department.

Getzler Receives Visiting Professorship

NU Math Prof. **Ezra Getzler** has been selected by the Royal Swedish Academy of Sciences to receive a Visiting Professorship from the Knut and Alice Wallenberg Foundation.



Department Chair, Ben Weinkove,
speaking at the investiture for Prof. Eric Zaslow

2023-2024 MATH NEWS (continued)

Math Digital Materials Project Provides Free Course Materials

NU Math Director of Calculus, Prof. **Aaron Greicius**, coordinated the Math Digital Materials Project, which is providing \$87,296 in funding through the Office of the Provost for access codes to course textbooks and online homework systems for students in eligible courses.

Loyd Awarded NSF Postdoctoral Fellowship

NU Math Graduate Student, **Katy Loyd**, has been awarded a highly competitive NSF postdoctoral fellowship.

Shankar Named a 2024 Sloan Research Fellow

NU Math Prof. **Ananth Shankar** has been named a 2024 Sloan Research Fellow by the Alfred P Sloan Foundation.

Former NU Grad Student Wins 2023 ICCM Graduate Thesis Award

Ruoyu Wang, former graduate student of NU Mathematics faculty member **Jared Wunsch**, was awarded the 2023 Graduate Thesis Award from the International Congress of Chinese Mathematicians.

Ben Antieau Named 2024 Simons Fellow

NU Math faculty member, **Ben Antieau**, was named a 2024 Simons Fellow. The Simons Fellows program extends academic leaves for outstanding mathematicians from one term to a full year, enabling recipients to focus solely on research for the long periods often necessary for significant advances.

Math Major Wins Trjitzinsky Memorial Award

NU Math Major, **Colin Brennan**, won the 2023 Waldemar J. Trjitzinsky Memorial Award of the AMS. This \$3000 award was a bequest from the estate of Waldemar J., Barbara G., and Juliet Trjitzinsky, the income from which is used to assist students who have declared a major in mathematics at a college or university that is an institutional member of the American Mathematical Society.

“Growing up, math was always my favorite subject and greatest passion. Being from just south of Chicago and knowing I wanted to pursue math in college, Northwestern has always been the school for me. If there's one main takeaway I have from the Math Department, it's that there is an abundance of support waiting for you coming from any direction. Whenever there's a moment of doubt, there is always a fellow student or a professor ready to believe in you and remind you of your purpose here.”

~ NU Math Major, **Colin Brennan**, recipient of 2023 AMS Trjitzinsky Memorial Award



2023 RTG SUMMER SCHOOL AND REU

Summer School 2023 on Dynamical Systems took place June 20–June 30, 2023 on the Evanston campus of Northwestern University. It featured preparatory courses (including courses appropriate for advanced undergraduates) as well as advanced courses. Mini-courses were presented by **Alena Erchenko, Mikolaj Fraczyk, Nicholas Miller, Amir Mohammadi, Kurt Vinhage**, and **Daren Wei**.

The research projects for the 2023 REU were Dynamics and Representation Theory, Symmetry in Dynamics, Dynamics on the Infinite Symmetric Group, and Constructing Anosov Actions on Nilmanifolds. The Summer School 2023 organizers were **Nir Avni, Aaron Brown, Osama Khalil, Bryna Kra**, and **Homin Lee**.



Participants during 2023 RTG Summer School and REU

It was funded primarily through the following NSF grants: DMS-2136217 (RTG: Dynamics: Classical, Modern, and Quantum) and DMS-2020013 (CAREER: Rigidity of Group Actions on Manifolds). Additionally funding was provided by Northwestern University's Department of Mathematics.

REU Summer 2023 took place June 20–Aug 11, 2023 on the Northwestern University's Evanston campus. Mentors for the summer 2023 REU included NU Mathematics faculty members **Nir Avni, Aaron Brown, Keith Burns, Solly Coles, Tsachik Gelander, Aaron Peterson**, and **Jeff Xia**.

2023 MIDWEST PROBABILITY COLLOQUIUM

MPC 2023
MIDWEST PROBABILITY COLLOQUIUM
OCTOBER 12-14, 2023



Probability theory has been the most applicable branch of pure mathematics. During the last decade it has seen a clear surge in popularity of probabilistic tools and methods in other branches of pure and applied mathematics. The Midwest Probability Colloquium has been an annual event for several decades. It brings together a wide-breadth of knowledge in the field of probability.

The Midwest Probability Colloquium was held at Northwestern University Oct 12-14, 2023. It was sponsored by the National Science Foundation and Northwestern University.

Ramon van Handel presented 'A New Approach to Nonasymptotic Random Matrix Theory I and II'. 'Hidden Temperature in the KMP Model' and 'Soliton Decomposition of the Zigzag Random Walk' were presented by **Pablo Ferrari**. **Sandra Cerrai** presented 'The Smoluchowski-Kramers Diffusion Approximation for Constrained Stochastic Wave Equations'. 'Permutation Limits' was presented by **Summit Mukherjee** and **Arnab Sen** presented 'Some Results on Levy Spin Glasses.'

The 45th Midwest Probability Colloquium is scheduled to be hosted by Northwestern University Oct 10-12, 2024.

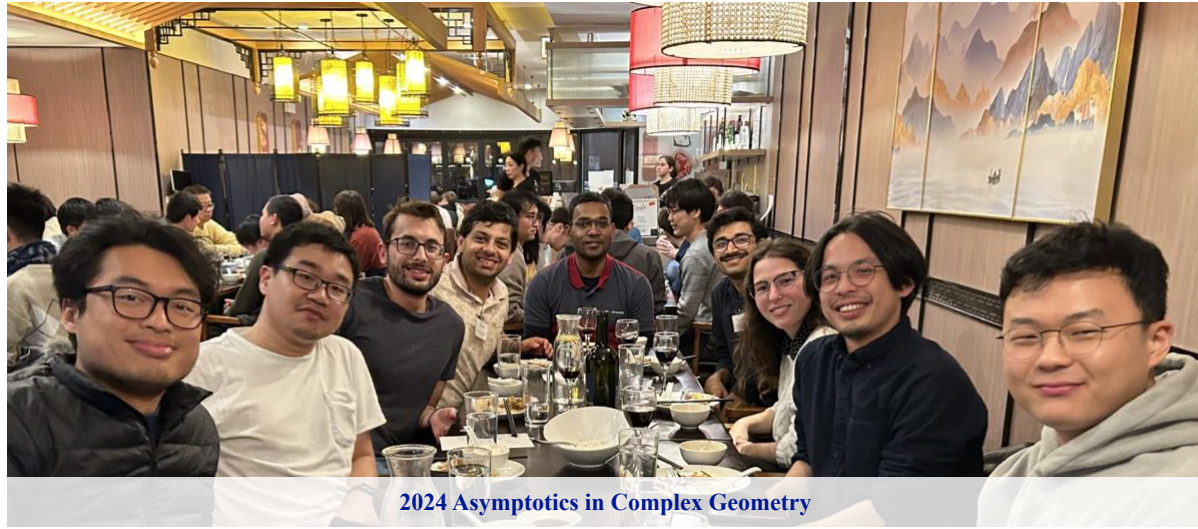
2024 ASYMPTOTICS IN COMPLEX GEOMETRY: A CONFERENCE IN MEMORY OF STEVE ZELDITCH

This conference was in memory of our colleague, **Steve Zelditch**, who sadly passed away on September 11, 2022. The conference gathered experts in the field of complex geometry, to report and understand recent exciting discoveries and techniques. Their common theme was asymptotic techniques, in complex and algebraic geometry, as emphasized by the pioneering work of **Steve Zelditch**.

Asymptotics in Complex Geometry was hosted by Northwestern University March 7-10, 2024 and organized by **Yuchen Liu, Gábor Székelyhidi, and Ben Weinkove**. Talks were presented by **Valentino Tosatti, Mattias Jonsson, Yang Li, Yanir Rubinstein, Chi Li, Jian Song, Siarhei Finski, Tristan Collins, Annamaria Ortu, Chenyang Xu, David Witt Nystrom, Eleonora Di Nezza, Harold Blum, Bernard Shiffman, Ziquan Zhuang, Freid Tong, and Tamás Darvas**.



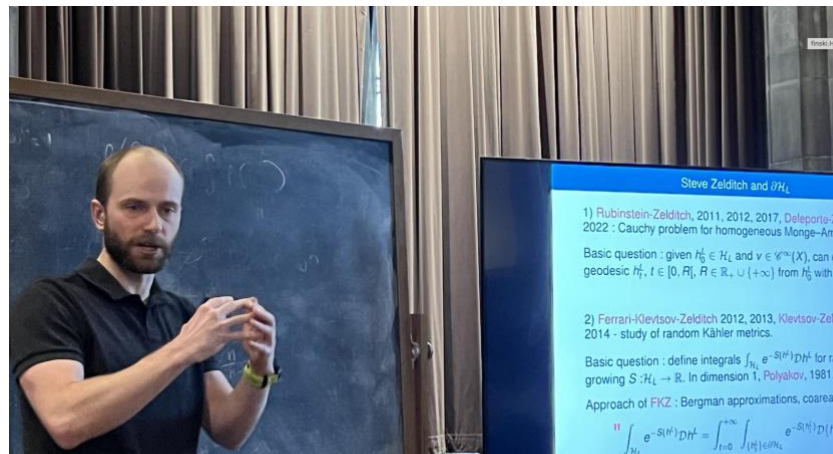
Steve Zelditch



2024 Asymptotics in Complex Geometry



Eleonora Di Nezza presenting at the 2024 Asymptotics in Complex Geometry Conference



Siarhei Finski presenting at the 2024 Asymptotics in Complex Geometry Conference



2024 Asymptotics in Complex Geometry

NU MATH UNDERGRADUATE PROGRAM

2024 NU MATH UG AWARD WINNERS

Santiago Cañez*Director of Undergraduate Studies*

Our undergraduate program expanded this year with new major requirements and new courses! This year we will have a graduating class of 54 majors and 9 minors, a few of which warrant special recognition.

Eight of our students wrote senior theses this year, which is a record number! **Samuel Fiete** wrote about *The Kronecker-Weber Theorem*; **Carmen Jackson** wrote about *Assorted Notions of Complexity in Symbolic Dynamical Systems*; **Peter Jiang** wrote about *Studies of Option Pricing with Theoretical and Numerical Methods*; **Kang Hyun Ki** wrote about *The Complex-Analytic Proof of the Prime Number Theorem*; **Aaron Lu** wrote about *Étale Fundamental Groups*; **Jacob Platnick** wrote about *Stochastic Gradient Descent for Classification of High-Dimensional Gaussian Mixtures*; **Robin Steuteville** wrote about *Exploring Solutions to the Porous Medium Equation*; and **Andrew Swanson** wrote about *Weyl Asymptotics and Eigenvalues of Quantum Graphs*.

We have seen an increase in the number of students who write theses over the last few years, and we hope that the trend continues! We also recognize and thank graduating seniors **Peter Jiang** and **Yao Xiao** for their work as Undergraduate Teaching Assistants over the years.

This fall saw the launch of the new requirements for the mathematics major. I am pleased to say that 21 first-year students have declared mathematics majors so far under the new requirements. The new requirements required making some changes to our existing courses, most notably to our probability course MATH 310-1 which now incorporates some programming in R so as to satisfy the new computing major requirement. Thanks to **Reza Gheissari** for implementing these changes this past fall.

The new computing requirement also spurred the development of a brand new course, MATH 365 Computational Methods in Mathematics, whose intent is to highlight the use of computing in understanding mathematical phenomena. Thanks for **Maria Nastasescu** for leading the effort to develop this course and for being its first instructor, and thanks to the rest of the team---**Sonja Mapes**, **Ben Antieau**, **Sandy Zabell**, and **Tuca Auffinger**---that assisted.

Weinberg's new Advanced Expression requirement also led us to rethink our MATH 395 Undergraduate Seminar, which now formally incorporates written and oral communication components. Thanks for **Ursula Porod** for being the first to teach the seminar this spring under the new guidelines.

Our undergraduate community continued its streak of events and engagement. The Northwestern Undergraduate Mathematical Society, led by **Leo Chang**, continued to host talks throughout the year and hosted undergraduate colloquia and the graduate school panel. Special thanks also to **Cam Kennedy** and **Sofia Pi** for organizing events for the Northwestern University Association for Women in Mathematics, whose membership also welcomes trans and non-binary students.

My time as Director of Undergraduate Studies is coming to an end, and I am confident that the undergraduate program will continue to thrive under the leadership of **Ursula Porod**, who is set to takeover as Director of Undergraduate Studies in September.

I give thanks to all the amazing mathematics majors and minors I have had the pleasure of advising over the last four years. The contributions of all our faculty, staff, and students help our undergraduate program succeed, and we give thanks also to the donors whose contributions make our events possible.

Robert R. Welland Prize for Outstanding Achievement in Mathematics

Jiahn Jiang

Senior Career Award in Mathematics

Brennan Jackson

Carmen Jackson

Aaron Lu

Junior Career Award in Mathematics

Leo Chang

Yung Chi Li

Award for Excellence in Mathematics by a First-Year Student

William Bergman

Will Bruner

Evan Gerns

Nicole Hampton

Kevin Hu

Rithik Khanna

Zach Long

Aiden Novick

Penny Orwang

Rebecca Pae

Jack Thielen

Harry Wang

Bill Zhu

Award for Outstanding Contributions to Undergraduate Mathematical Life

Eliseu Filho

Yung Chi Li

Award for Excellence as an Undergraduate Teaching Assistant

Jiahn Jiang

Undergraduate Teaching Assistant Service Award

Jiahn Jiang

Yao Xiao



Prof. Santiago Cañez presenting the 2024 Senior Career Award in Mathematics to Aaron Lu, Carmen Jackson, and Brennan Jackson

GONE FISHING 2024

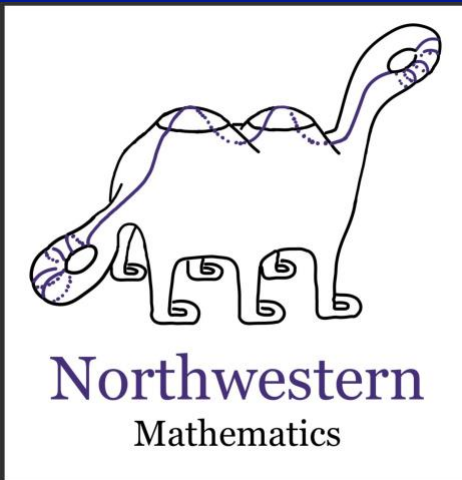
The 10th annual 'Gone Fishing' conference, for the presentation and discussion of new ideas and results in Poisson geometry, was held from April 11- April 14, 2024 on the Evanston campus of Northwestern University.

The theme of the 2024 event was "Poisson Geometry and Representation Theory." Featured speakers included **Pavel Etingof** (MIT), **Alexander Goncharov** (Yale University), **Xin Jin** (Boston College), **Ivan Losev** (Yale University), and **David Nadler** (University of California, Berkeley). The organizing committee was **Sam Evens** (University of Notre Dame), **Gus Schrader** (Northwestern University), **Dmitry Tamarkin** (Northwestern University), and **Boris Tsygan** (Northwestern University). The Poisson Steering Committee was **Ana Balibanu** (LSU), **Sam Evens** (University of Notre Dame), **Rui Loja Fernandes** (University of Illinois, Urbana-Champaign), **Michael Gekhtman** (University of Notre Dame), **Eckhard Meinrenken** (University of Toronto), and **Alan Weinstein** (UC Berkeley/Stanford University).



2024 Gone Fishing Conference

SOLLY COLES WINS NEW MATH LOGO CONTEST



NU Math Prof. **Solly Coles** has won the department's new logo competition!

Solly described his explanation of the image, modified from a paper co-authored by our very own **Keith Burns**:

"This dinosaur-shaped surface comes from a paper by Ballmann-Brin-Burns, providing a counterexample to a remark by E. Hopf about closed surfaces without conjugate points. An interesting feature of the dinosaur is that it almost has conjugate points, but not quite. This is due to the precise construction of the dinosaur's positively curved humps, and how they contrast with its negatively curved limbs."

We look forward to seeing NU Math merchandise this Fall with the new logo.



2023 Department Holiday Party



2024 Causeway Program Summer Celebration

NU MATH GRADUATE PROGRAM

Elton Hsu
Director of Graduate Studies

This is the first year that our graduate students work under a union contract. The department quickly made necessary adjustments and our program continued to thrive thanks to the combined effort of our faculty, staff, and graduate students.

By the end of this academic year, eight students will graduate from our program: **Carlos Cortez Lemos**, **Eivind Hjelle**, **Adam Holeman**, **Erik Hupp**, **Hy Lam**, **Kaitlyn Loyd**, **Randy Van Why**, and **Benjamin Zhou**. We wish them all the best with their new lives after leaving Northwestern.

This September the department will welcome 15 new graduate students: **Agarwal Apoorva** (India; University of Wisconsin), **Dewan Chowdhury** (USA; Rutgers University), **Grindall Cormac** (USA; Rutgers University), **Noah Harris** (USA; Duke University), **Andrew Ho** (Canada; University of Toronto), **Nianchen Liu** (China; University of Michigan), **McCormick Wade** (USA; Princeton University), **Kyrie McIntosh** (USA; Princeton University), **Armibbas Mohammad** (Iran; Sharif University of Technology), **Chi Kin Ng** (Hong Kong; University of Cambridge), **Lakshay Patel** (USA; UC Berkeley), **Dinglong Wang** (China; University of Illinois), **Xun Wang** (China; University of Michigan), **Zeyu Wang** (USA; Princeton University), and **Shun Yin** (China; Peking University).

They were selected from an unprecedented large pool of 436 applicants from all over the world. As in the past few years, we thank the hard work of **Ezra Getzler** and the members of the Graduate Admissions Committee for recruiting this cohort of outstanding new graduate students.

And congratulations to this year's graduate prize winners! **Daniel Mallory** receives this year's Award for Excellence as a Graduate Teaching Assistant. Our now second year student **Daniel Townsend** receives the Award for the Best Preliminary Exams. This year's Gelfand Prize for Service to the Graduate Community is awarded to third year **Curtis Grant**. Curtis has made serious progress towards his thesis in understanding the dynamics of heavy tailed spin glasses; he is also active in various graduate student activities, from running seminars and prelim boot camps to organizing volleyball and soccer games.

The recipient for this year's Best Thesis Prize is **Katy Loyd**. Her thesis, supervised by Professor **Bryna Kra**, studies the question of whether Birkhoff's individual ergodic theorem holds along certain subsequences of integers, a research topic having a long history in our department. Her dynamical approaches give new insight into some

classical results in number theory, such as the prime number theorem and the Erdős-Kac central limit theorem. Katy is also a recipient of the highly competitive NSF Postdoctoral Fellowship, which she will use at University of Maryland. Our former student **Ruoyu Wang** received the Graduate Thesis Award from the International Congress of Chinese Mathematicians for his Northwestern thesis supervised by **Jared Wunsch**.

I would like to end this report with a personal note. Serving the department and our graduate student community as the Director of Graduate Studies for the last three years has been a personally gratifying experience for me. I have served in this position more than once before, but this time I have felt especially proud of our current generation of graduate students, many of whom started their graduate study during the difficult time of the pandemic. They came out of it with a renewed sense of community by helping each other, both in mathematics and in daily life. Reminiscing my own happy years as a graduate student at Stanford University, I often conjure up scenes many years in the future in which our graduate students recollect their life at Northwestern with fond memories of their fellow students and their professors. *Tempus fugit* but memory stays.

CAUSEWAY PROGRAM

Eric Zaslow and Santiago Cañez
Co-directors, Causeway Program

The Causeway Postbaccalaureate Program aims to expand opportunities for graduate education in the Mathematical Sciences for students from groups historically under-represented in these disciplines. This year we had a wonderful cohort of seven students, four in the Pure Track (**Inayah Brown**, **Xzavier Herbert**, **Samantha Rodriguez**, **Caroline Snell**) and three in Applied (**Laura Avila-Lugo**, **Rivkah Moshe**, **Marie-Rose Tonguino**).

Causeway students take foundational classes, work on research and/or independent study projects, and attend seminars workshops introducing them to the profession and to research or preparing them for graduate school and the admissions process. This is made possible through the generous commitment of time and energy by many of you. We are grateful to the faculty, postdocs and graduate students who help as research mentors (**Danny Abrams**, **Nir Avni**, **Keith Burns**, **Eugene Kushnirsky**, **Niall Mangan**, **Daniel Lecoanet**, **Gus Schrader**, **Petia Vlahovska**), graduate peer mentors (**Curtis Grant**, **Ben Hyatt**, **Jenny Jones**, **Nick Lohr**, **Katy Loyd**, **Noah Roselli**, **Bennet Sakelaris**, **Hanru Sun**), boot camp leader **Noah Wisdom** and teaching assistants **Noah Riegenbach** and **Dylan Wilson**.

The Causeway Governance Committee is comprised of **Nir Avni**, **Bryna Kra**, **Onnie Rogers** (Psychology), **Santiago Cañez** (co-director), **Sonja Mapes** and **Eric Zaslow** (co-director). **Dave Chopp** (ESAM) is the liaison for the Applied Track.

Our students will be moving on to study at Georgia Tech, SUNY Albany, UC Berkeley, UC Irvine, UC Riverside, and Yale. Five will attend PhD programs, a sixth will start a masters or PhD program TBD, while a seventh plans to apply to graduate programs in the next cycle. Congratulations to our outgoing class!

Next year's class will be arriving next month, six students all in the Pure Track. Be sure to give them a hearty welcome to Northwestern!



2024 Causeway Program

NU MATHEMATICS ALUMNI: WHERE ARE THEY NOW?



Boris Hanin, PhD 2014,
Advisor: Steve Zelditch



Brian Williams, PhD 2018,
Advisor: John Francis



Robin Neumayer,
RTG/NSF postdoc, 2017-2021



Edgar Santos Vega,
Causeway Program 2021-2022



Austin Ford, PhD 2012,
Advisor: Jared Wunsch

Assistant Prof, Princeton ORFE, 2020-present

I think back often to the almost idyllic years I spent as a grad student at NU Math. To all the wonderful math I was exposed to by the professors and to all the intellectual excitement of my fellow graduate students. That time was really my first introduction – in large part through discussions with my incredible advisor Steve Zelditch – to the fascinating world of asymptotic problems in mathematical physics.

The tools from probability, geometry, micro-local analysis, and so on that I learned back then have continued to serve me well as I have moved more and more to studying asymptotic problems in modern machine learning.

After spending two years in Edinburgh on a postdoctoral fellowship, I began a tenure track position at Boston University in 2022. Now that I am on the other side of the academic spectrum, at BU I have been working on creating a similar environment for graduate students to the one I had the opportunity to be a part of at Northwestern.

It is great that I can still keep in touch with many of the influential people I met as part of the mathematical community at Northwestern.

Since finishing my postdoc at Northwestern, I've been an assistant professor at Carnegie Mellon University. I was recently awarded a CAREER grant and the 2024 AWM Sadosky Research Prize.

My postdoc at Northwestern was mathematically formative - I was introduced to the field of geometric analysis through my mentor Aaron Naber, and got to work with him and another postdoc (Man Chun Lee) on fascinating problems involving scalar curvature.

I look back fondly on my time in the department -- and on getting to see Lake Michigan every day!

As much as I miss the cityscape of the Chicago metro area, I have come to love the Mount Pleasant area where I am now completing my second year at Central Michigan University (CMU) as a PhD student in Mathematics with a concentration in Mathematics Education. On top of my graduate work, I am teaching Intermediate Algebra courses to undergraduate students, which has been very rewarding in both gaining experience and encouraging students.

During my time here, I have become involved in the campus life through different ways, most notably by becoming the Vice President of the AMS Graduate Chapter and helping host a variety of events this past academic year. Our chapter actually got featured by the AMS for our Integration Bee that we hosted last fall!

Staff Product Manager, Databricks, 2022-Present

After my time in mathematics, I've built my career around data and technology in San Francisco. Currently, I work in product management at Databricks, a data and AI platform company, collaborating with teams across the company to address the challenges our customers face with storing, managing, transforming, analyzing, modeling, or otherwise creating value from their data. This work may look far away from microlocal analysis and partial differential equations (and at the surface it is), but the core of what I do as a PM is not far away from what I did as a mathematician—break down problems and communicate ways to solve them.

"The skills and techniques I learned from friends and mentors at Northwestern remain invaluable to me"
~ Austin Ford

"Although grad school has had its challenges and will continue to, Northwestern has prepared me well"
~ Edgar Santos Vega

BRYNA KRA INDUCTED INTO CHILEAN ACADEMY OF SCIENCES

On May 30, 2024, the Chilean Academy of Sciences incorporated as Foreign Corresponding Member, NU Math faculty member Prof. **Bryna Kra**. A Fellow of the National Academy of Sciences (USA) and President of the American Mathematical Society (AMS), Kra's significant contributions in the field of mathematics, in particular on ergodic theory, were highlighted during the ceremony. On the occasion she stated: "I am very honored. It is an extraordinary honor to have been chosen and selected. I hope to continue our many collaborations with the Chileans, and to return many times (to Chile)."

During her master lecture, "Dynamics of the Integers", she said, "Mathematics is a collaborative science. To advance my work, I have students and collaborators from all over the world, including Chile. The CMM in Chile is one of the ways in which I connect with the rest of the world [...]. All mathematics, whether developing theory or finding applications for social problems such as water management or climate change, is interconnected, and this international collaboration is crucial."



Dr. Alejandro Maass, Dr. María Cecilia Hidalgo, and Dr. Servet Martínez congratulating Prof. Bryna Kra

2024 NEMMERS PRIZE

Luigi Ambrosio (*Scuola Normale Superiore in Pisa*) has won the 2024 Nemmers Prize in Mathematics. He receives the prize for his "deep and numerous contributions to calculus of variations and geometric measure theory, and broad and far-reaching influence on these fields." Ambrosio is Professor of Mathematics and currently serving as Director of the Scuola Normale Superiore in Pisa. He has agreed to visit Northwestern in 2025 to receive his prize and take part in some mathematical activities. Dates and details are to be determined.



Luigi Ambrosio (*Scuola Normale Superiore in Pisa*)

The 2024 Nemmers Prize Selection Committee members were **Sir Martin Hairer** (Lausanne/Imperial), **Aaron Naber** (Northwestern) and **Joseph Silverman** (Brown).

MAKSYM RADZIWIŁL INVESTITURE

Maksym Radziwiłł was named the Wayne and Elizabeth Jones Professor of Mathematics when he joined our department in Fall 2023. His investiture ceremony took place on April 8, 2024.

Maksym works in analytic number theory. He has made fundamental breakthroughs on multiplicative number theory, which aims to understand the ways in which integers factorize, and the distribution of integers with special multiplicative properties, such as primes. His work has led to unexpected progress on the famous and far-reaching Chowla conjecture. Maksym's accolades include the 2016 SASTRA Ramanujan Prize, a 2017 Alfred P. Sloan Fellowship, the 2018 Coxeter-James Prize, the 2019 New Horizons Prize and the 2023 Frank Nelson Cole Prize in Number Theory.



Maksym Radziwiłł

ERIC ZASLOW INVESTITURE

NU Math Prof. **Eric Zaslow** was celebrated as the Henry Sanborn Noyes Professor of Mathematics during an investiture ceremony on November 2, 2023.

Eric works on mathematical problems which arise from physical dualities. He is particularly well-known for his work on the Strominger-Yau Zaslow (SYZ) conjecture on the mirror symmetry of Calabi-Yau 3-folds. Eric studies both physics and mathematics together, viewing them as inextricably connected.

Eric joined the mathematics department in 1998, becoming full professor in 2006. He was named an Alfred P. Sloan Fellow in 2000, a Clay Senior Scholar in 2004, a Simons Fellow in 2012 and a Fellow of the American Mathematical Society in 2021. His excellence in teaching was recognized by a Charles Deering McCormick Professor of Teaching Excellence in 2012. His dedication to expanding opportunities in mathematics led to the creation of the Causeway Postbaccalaureate Program, housed in our department. He also served as our department chair from 2018 to 2021.



Weinberg Dean Adrian Randolph and Department Chair Ben Weinkove congratulating Prof. Eric Zaslow

HAPPY RETIREMENT, MIGUEL!

Miguel A. Lerma

Retirement Reflections: My Journey at Northwestern University

After 26 years at Northwestern University, the time has come for me to start the next chapter of my life: retirement. This moment prompts a period of reflection, revisiting past memories and evaluating decisions and accomplishments.

As I shared at my retirement party, my journey began with two passions: computers and mathematics. I owe my fascination with computers to my father, who was a pioneer in the early days of computing in Spain, a time when computers were massive, room-filling pieces of furniture. Although I didn't have direct access to those computers as a child, I learned to program using a FORTRAN manual that my father provided. I would write the programs, and he would punch them onto cards to be run on these machines. I remember him predicting that someday computers would fit on desks and be accessible to everyone—an accurate prediction of the era of personal computing.

My love for mathematics came from another of my father's gifts: a book filled with mathematical riddles. These weren't simple puzzles or boring exercises; they were challenges that captivated my curiosity and stretched my thinking. Most of the book was accessible enough for a high school student and touched on various areas of mathematics.

Years later, with advanced degrees in both mathematics and computer science, I was on the hunt for a position that would encompass these interests. That's when I found a unique opportunity at Northwestern University—a dual role that combined the responsibilities of a computer system administrator with those of a math lecturer in the Department of Mathematics.

At Northwestern University, I had the privilege of interacting with students and sharing with them my passion for mathematics in a role that slowly evolved to become more computer-related—from teaching Algebra and Calculus, to Discrete Mathematics for Computer Science, and finally moving to a purely IT position. However, I never lost touch with my mathematical background, thanks to my participation in training participants for the William Lowell Putnam Mathematical Competition. My initial dual role allowed me to bridge the practical and theoretical aspects of both fields, providing a holistic experience that I hope has been as enriching for my students as it was for me, and at the same time, benefited the Math Department by allowing me to better understand the computational needs of the department.

As I retire, I look back with pride and a bit of nostalgia on the evolution of both my fields of interest and the growth I have witnessed at Northwestern University. The technological advancements we have embraced, and the bright, curious minds we have shaped are highlights of my career. I am grateful for the memories and the challenges I have faced.

We held a retirement event for Miguel Lerma on Thursday March 28, 2024 to thank him for his 26 years of service to the department! Miguel joined us as a Lecturer and Computer Systems Administrator in 1998 and was responsible for all our IT needs. Although Miguel's position eventually transitioned to the centralized NUIT, where he held the title of Senior Technical Support Specialist, his office and primary role was in our department. For computer questions, big or small, Miguel always had the answer. If the system didn't exist, he used his ingenuity to create one from scratch for us!

Miguel holds not one but two PhDs! He received his first in 1991 in computer science from the Universidad Politécnica de Madrid.

He earned his second in 1998 in mathematics from UT Austin, under the direction of Jeffrey Vaaler.

Miguel also held, and continues to hold, the title of Adjunct Lecturer in our department. For many years he was a dedicated member of our Putnam Committee, helping to administer and run training sessions for the undergraduate Putnam Examination.

On top of this, he has an active research program in Machine Learning, with several published papers and international conference presentations in the last few years. He is looking forward to spending more time on this exciting research during his retirement.



Ben Weinkove (right) leading a toast to Miguel Lerma (left) at his retirement reception



Deavon Mitchell (left) leading a toast to Miguel Lerma (right) at his retirement reception

Miguel, we wish you the very best for a happy and long retirement!



Miguel Lerma

FOND FAREWELL TO AARON NABER

Aaron Naber is leaving Northwestern at the end of this academic year to join the Institute for Advanced Study in Princeton. Aaron joined us as an Associate Professor in 2013 and was appointed the Kenneth F. Burgess Professor of Mathematics in 2015. In his 11 years at Northwestern, Aaron made a staggering number of breakthroughs in geometric analysis. These include his resolution of the L^2 curvature conjecture and the codimension four conjecture, and most recently a counterexample to the Milnor conjecture. In recognition of his work, he was an invited speaker at the 2014 International Congress of Mathematicians; elected a 2018 Fellow of the American Mathematical Society; received the 2018 New Horizons Prize, a 2023 Simons Investigator Award, and the 2023 Fermat Prize. In 2024 he was elected a Member of the National Academy of Sciences. Aaron was also a dedicated instructor and advisor and a valued colleague. We are all sad to say farewell to Aaron, but we also wish him the very best in his new position at the IAS!



Aaron Naber

IN MEMORIAM: JUDITH SALLY

Judith Sally (March 23, 1937--January 28, 2024)



Judith Sally

Judith Sally joined the Department of Mathematics at Northwestern University in 1972, where she remained until her retirement in 2002. Initially hired by Northwestern as a Visiting Assistant Professor (1972--1974), she was appointed Assistant Professor in 1974, and then promoted to Associate Professor in 1977 and Professor in 1982. Judith was the second woman to be appointed a Professor in mathematics at Northwestern.

Judith was a highly active researcher during her thirty years at Northwestern. She has more than 40 publications, including her 1978 book *Numbers of Generators of Ideals in Local Rings*. In recognition of her research accomplishments, Judith was invited in 1995 to give the Association for Women in Mathematics Noether Lecture, an honor "for fundamental and sustained contributions to the mathematical science". The AWM summarized her research thus: "Sally's research is in Commutative Algebra, one of the fields in which Emmy Noether's work had such impact. Her main interests lie in the study of Noetherian local rings and graded rings with emphasis on Hilbert functions and birational extensions. These concepts play an important role in ascertaining the nature of singularities in applications in algebraic geometry.

The Hilbert function of a local ring at a point on a variety is a very good measure of how bad the singularity is at the point. One of the themes in Sally's research is the interaction between the local ring and its associated graded ring. This interaction plays a critical role in understanding and computing the Hilbert function. She has also worked on birational blowing up of ideals, the extension of valuations and other concepts in the algebra involved in the resolution of singularities."

Judith's main research centered upon the passage of properties between a Noetherian local ring and its tangent cone. She famously proved that if a ring is either Cohen-Macaulay with minimal multiplicity or Gorenstein with almost minimal multiplicity, then the Hilbert series and Poincaré series are completely determined. She made striking conjectures extending her work, including the *Sally conjecture* (posed in 1983, but only proved thirteen years later, independently by Rossi and Valla in 1996 and Wang in 1997). The Italian group studying her questions used her techniques so much that they dubbed her methods the "Sally machine".

The relationship between the tangent cone and the Rees algebra led her to concentrate on birational maps to various affine blowups, through study of the Rees algebra and *Sally modules*, named in her honor. Her introduction of the *core* of an ideal with David Rees led to an explosion of work on this topic.

During her time at Northwestern, Judith was awarded the National Science Foundation Visiting Professorship for women during the 1988--1989 academic year, during which she traveled to Purdue University. She also won the College of Arts and Sciences Teaching Award, a Bunting Fellowship at the Mary Ingraham Institute at Radcliffe College and the Alfred P. Sloan Foundation Fellowship, which recognizes academics' successful performance and potential to contribute substantially to their fields. Judith directed the dissertations of four students

at Northwestern, as well as being the Director of Undergraduate Studies in 1982-1984 and 1990-1991.

In later years Judith and her husband Paul developed an interest in mathematical pedagogy and outreach. This included teaching mathematics courses for four summers at the University of Chicago for historically underrepresented groups preparing to take the MCAT, and teaching geometry courses and seminars for four years for elementary school teachers. They wrote four books together on mathematical pedagogy.

Judith's service at the national, university, and departmental levels was exemplary: she was Editor of the *Transactions of the AMS* for three years (1990--1994), and she served on at least four AMS committees and panels; fifteen university committees, boards, and panels (including the 1996 Search Committee for the WCAS Dean); and eleven different department committees, including chairing the Undergraduate and Personnel committees twice each.

Judith died on January 28, 2024 in Chicago, at the age of 86. She leaves three children, eight grandchildren, and two siblings; her husband Paul had died ten years earlier. Judith will be remembered as a remarkable mathematician, and a wonderful friend and colleague.

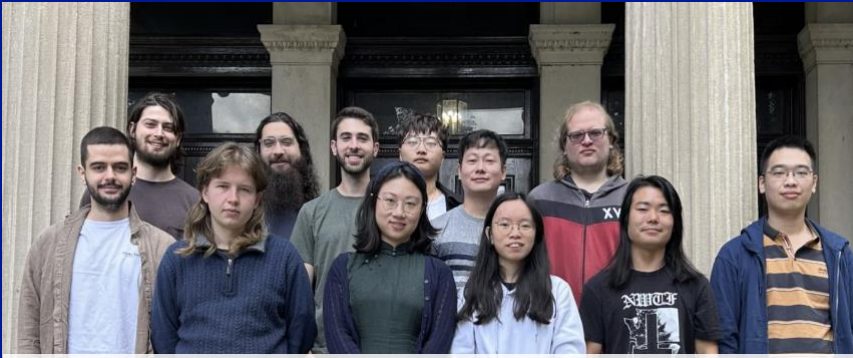


Celebrating Paul Goerss' Retirement at the 2023 Department Beginning of the Year Party



2024 Department Spring Barbecue

NORTHWESTERN UNIVERSITY MATHEMATICS COMMUNITY



New Graduate Students, Fall 2023



New Causeway Students, Fall 2023



2023 Department Beginning of Year Party



Fall 2023 Department Group Photo

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**2023-2024 NU Mathematics
 Department Newsletter**

**Designed and Edited by:
 Jenima Lyon
 NU Mathematics Undergraduate
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