

Northwestern University Mathematics Department



Summer 2019 Newsletter



Letter from the Chair *Prof. Eric Zaslow*



Strength in Transition

In government, in basketball, and even in mathematics, maintaining a competitive advantage through a period of transition and uncertainty is a great challenge. It is one that we have faced this past academic year as a department, and one from which we have emerged an even stronger and more vibrant department.

Our strengths in research and teaching were evidenced by a few select honors. **Bryna Kra**, the Sarah Rebecca Roland Professor of Mathematics, was elected to the National Academy of Sciences, while Associate Professor **Antonio (Tuca) Auffinger** won the Weinberg College Distinguished Teaching Award. The new guard continues in this tradition of excellence. **Bao Le Hung**, in his first year as assistant professor, won an Alfred P. Sloan Foundation Research Fellowship. Postdoctoral fellows **Brett Frankel**, **Rachael Norton**, and **Clive Newstead** were awarded a Linzer Grant for Faculty Innovation in Diversity and Equity for their Northwestern Emerging Scholars Program.

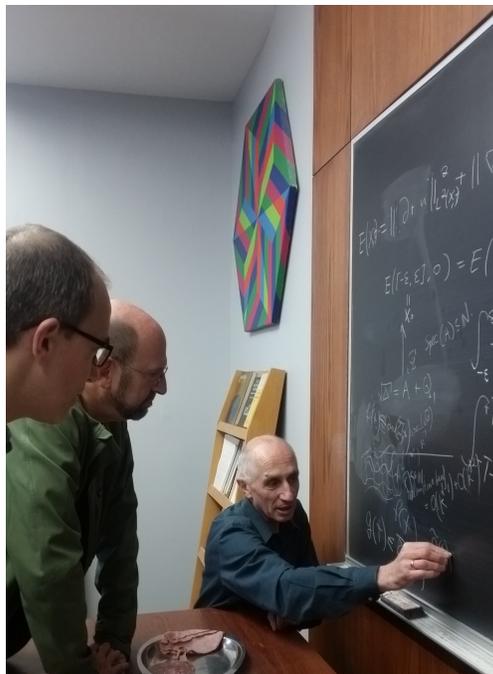
On the academic front, we saw the retirement of **John Franks**, the Henry S. Noyes Professor of Mathematics, after a stellar mathematical career including 49 years of service to Northwestern. Professor Franks has many seminal contributions to dynamical systems. His contributions to Northwestern include being chair and Associate Dean of Faculty Affairs. Also, Professor **Gang Liu**, a dynamic researcher in geometric analysis, resigned his position and we are sorry to see him leave. This year also saw the passing of our former colleague, **Bob Welland**, who was memorialized by family, colleagues and friends.

We cannot replace these members but we have hired new researchers who bring their own expertise to our faculty. **Ilya Khayutin** was hired as an assistant professor, working in areas of dynamics with a number theoretic bent. **Aaron Brown** will join the faculty as a tenured associate professor, having recently made extraordinary contributions to the Zimmer program.

We also expanded our teaching-track faculty with the hiring of **Maria Nastasescu** as an assistant professor of instruction. Dr. Nastasescu's interview included a widely praised talk on areas of number theory related to her own research on L-functions.

There were waves of change in department administration. Our Business Administrator (BA), Greg Jue, retired after a long career in different departments and offices in the university.

(continued on page 3)



Prof. Yakov Eliashberg of Stanford University (right) discusses matters with Prof. Mihnea Popa (left) and Prof. Steven Zelditch (middle) during the 2019 Pinsky Distinguished Lecture Series below artwork of Joanna Pinsky

Summer 2019 Mathematics Dept Newsletter Edited and Designed by Jenima Lyon



"You put the heart in chartstring"

~ Dept Chair, Prof. Eric Zaslow, announcing Greg Jue's retirement as Business Administrator

Graduate students Kitty Yang (left) and Yajnaseni Dutta (middle) congratulate Greg Jue (right)

Greg Jue Retires After Nine Years As Business Administrator

Thanks for the Great Years!

Greg Jue

Thank you to everyone in the Math Dept. for making my years at Northwestern great ones! The daily blackboard collaborations of faculty and students in the Common Room are symbolic to me of the collective drive that characterizes our Department and I am proud to have been a part of it over the last nine years.

I learned A LOT since starting in 2010. Sometime in my first months, I remember a group of faculty waiting by my office door as I'm on the phone asking someone in OSR, "What's Fastlane?" We've come a long way since then, and I am grateful for everyone's friendship over the years.

When I retired in April, I had some ideas of what I'd be doing, but I wasn't exactly sure. I'm sorry to let people know that I will not be doing a fried rice food truck. Instead...

I joined the Northwestern Sailing Center and have been honing my sailing skills with a friend and fellow sailors. So far, I've only capsized once! We righted the boat, but had forgotten to tie the tiller (steering handle) down and lost it somewhere in Lake Michigan. Rudderless, we were rescued by the NU Sailing Center staff! Eventually we will enter the Friday Night Races at the Sailing Center. Wish us luck!

On the evening of June 9th, I told my first story at a public storytelling event, a monthly open mic called "Do Not Submit" at the Celtic Knot. Storytelling is fun! Let me know if you'd like to find out when I tell my next story! Just shoot me an email and I'll let you know when and where I plan to perform next. (You can get my email from Deavon Mitchell).



Greg Jue shares memories at his retirement reception

I'm also continuing to work with the NU student organization LEND (Lending for Evanston & Northwestern Development) which makes micro-loans to local small businesses in Evanston. I feel like I have been on a journey with many great adventures along the way.

Many thanks to everyone in the Math Department for making this most recent adventure...most excellent!

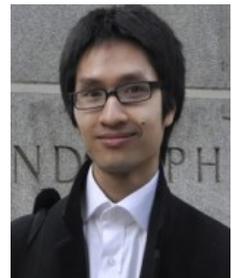
Department Faculty News Highlights



Bryna Kra, the Rebecca Roland Professor of Mathematics, has been **elected to the National Academy of Sciences**. The election is in recognition of Kra's "distinguished and continuing achievements in original research."



Antonio Auffinger, Director of Graduate Studies, received the **2019 Weinberg College Distinguished Teaching Award**. Excellence as an undergraduate instructor is the primary criterion of the award.



Bao Le Hung was selected as a **Sloan Research Fellow in Mathematics**. An assistant professor of Mathematics, Le Hung's current research lies at the intersection of number theory, algebraic geometry and representation theory.

Graduate Student News Highlights

The Weinberg College Committee on Undergraduate Academic Excellence has awarded departmental honors to mathematics majors **Alexander Ortiz** and **Luke Peterson**.

Alexander Ortiz and **Aidan Perreault** each received a Franklin N. and Lee L. Corbin Prize from the Weinberg College of Arts and Sciences. Weinberg awards these prizes to seniors with outstanding academic records who plan to attend graduate or professional school. This fall Alex will study mathematics at MIT, and Aidan will study computer science at Stanford.



Luke Peterson (left), Alexander Ortiz (middle), and DUS John Alongi (right) at the 2019 Undergraduate Awards Ceremony

From the Chair (continued from front page)

We also saw the departures of graduate program assistants and our financial assistant, **Deavon Mitchell**, who was hired as the new BA. The new Graduate Program Assistant is **Liz Gabel** and our new Financial Assistant is **John Mocek**. Throughout the turbulence, Deavon and our Undergraduate Program Assistant, **Jenima Lyon**, helped keep the ship on a steady keel. Things are still new but running well, thanks to the dedication, professionalism and commitment of all staff members. Greg would be very pleased, as are we all.

There was financial uncertainty, as well, as the university undergoes some fiscal restructuring, but there was no diminution in the number or quality of special events, including Bellow Lectures given by **Sylvia Serfaty**, Pinsky Lectures delivered by **Yakov Eliashberg**, and the Nemmers Prize lectures and visit of **Assaf Naor**.

At the programmatic level, our department underwent an extensive self-study and external review. These generally affirmed our assessment that we are a highly functioning and high-quality department—one which should retain and continue to hire excellent faculty but which faces some serious space issues. The faculty issues were discussed above. At the level of space, we are split, with some departmental members housed across campus in Locy Hall. We hope that a plan to reunify the department will emerge from program review recommendations, which are still under discussion. In the meantime, we have taken what measures we can (our "I Love Locy" campaign) to improve the work environment of all members. At Lunt, a common room renovation was completed with the support of donors to the department.

**We greatly appreciate the help we receive from alumni and friends.
Your support contributes vitally to our mission!**



Undergraduate Program Update

John Alongi

Director of Undergraduate Studies

As Director of Undergraduate Studies, it is always gratifying to celebrate the achievements of our students. This spring, we expect the Class of 2019 to include 41 Mathematics majors and 11 Mathematics minors, including several who I am especially proud to recognize.

Alexander Ortiz won the Robert R. Welland Prize for Outstanding Achievement in Mathematics by a Graduating Senior, wrote a senior thesis, and is a recipient of a Franklin N.

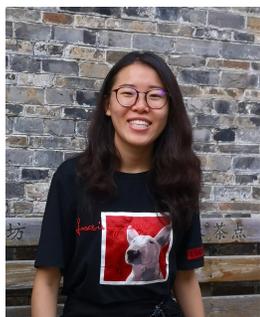
and Lee L. Corbin Prize from the Weinberg College of Arts & Sciences. This fall Alex will begin a Ph.D. program in mathematics at MIT. **Aidan Perreault** is also a Corbin Prize recipient. Aidan scored an impressive 26 points in the William Lowell Putnam Mathematical Competition (an examination on which the median score is zero.) In September Aidan will pursue a doctorate in computer science at Stanford. **Luke Peterson** has been a leader of the Northwestern Undergraduate Math Society (NUMS). Continuing in the direction of his senior thesis in dynamical systems, Luke will begin a doctoral program in aerospace engineering sciences at the University of Colorado Boulder this fall. **Yunhao (Leslie) Liu**, a triple major in mathematics, economics, and French, won our award for Excellence as an Undergraduate Teaching Assistant and will attend Harvard Law School. Alex, Aidan, Luke, and Leslie were among more than twenty students who received awards at the annual Undergraduate Prize Lecture which featured Professor Colin Adams of Williams College.

This year, our undergraduate program received a very positive program review. In the words of the external reviewers, "We were struck by how enthusiastic the undergraduates we spoke with were about the Department's teaching and advising." This is not typical of how Mathematics departments are perceived elsewhere by students who are not "hardcore" Math majors." The reviewers also noted that the Department "admirably serves students in all categories."

Building upon these strengths, we are implementing a new calculus curriculum beginning this fall. The new curriculum is the culmination of four years of careful study, and will provide students with deeper courses that better illuminate the beauty of single-variable calculus. Nonetheless, our program faces challenges, including decreasing enrollments and numbers of majors, as well as persistent underrepresentation of women. The support of alumni will help us meet these challenges and seize the opportunities that they provide. As an alumnus myself, I hope that you will join me in contributing to the Department. **Congratulations to the Class of 2019!**

Undergraduate Student Perspective

Leslie Liu, Graduating Senior



I came into Northwestern knowing that I wanted to pursue majors in economics and French, but not math. Even halfway through my first year with the MENU sequence, I was still unsure whether I wanted to commit myself to a math major. At the same time, I relished the process of problem-solving, looked forward to every class session, and showed up weekly to office hours, if only to meet fellow classmates in the sunny offices of Lunt. As I progressed along the major, I not only took classes that focused on pure math, but also those that intersected with economics and which exposed me to the mathematical foundations of many economic theories.

Outside of the classroom, I became an undergraduate TA in my junior year and helped initiate a new program for freshmen, NESP, during senior year.

Being a TA was an exhilarating experience, and I was able to guide students along their quests of integrals and derivatives while improving my communication skills in the process. More than an isolated, individual effort, TAing also necessitated teamwork and cooperation. As I sat with graduate students and professors in the waning dusk, discussing rubrics over pizza and brownies, I was intensely grateful to be giving back to a department that has given me so much. Looking back on my four years at Northwestern, I am truly astounded at my transformation, and how I owe so much of it to the Math Department.

As I approach my last exams as a college student, I remember one of the best pieces of nerve-calming advice I have ever heard, a line that belong, unsurprisingly, to the wisdom of a math professor: "This class is not a measure of talent. It's a measure of how hard you work." The math major has taught me so much more than working hard to solve problems with matrices and differential equations. I am no longer constrained by the fear of not being good enough when I explore new, unfamiliar domains. Instead, I approach each task with passion and perseverance, confident that I would reach fresh heights at exponential speeds.

2018 Nemmers Prize Winner, Prof. Assof Naor of Princeton University, Presented Workshops and Colloquiums in Spring 2019



The Nemmers Prize is awarded for achievement and work of lasting significance in the field of Mathematics. In particular, the prize recognizes major contributions to new knowledge or the development of significant new modes of analysis. The prize is currently \$200,000. Recipients are selected in even-numbered years, and as a condition of the award, spend several weeks in residence at Northwestern University interacting with students and faculty. Seminars and conferences are often held in conjunction with their visits.

The 2018 Nemmers Prize in Mathematics winner, Prof. **Assof Naor** of Princeton University, presented several seminars and colloquiums at Northwestern University in 2019, including the workshop "The In-Compatibility of 3 and 5 Dimensional Heisenberg Geometry with Lebesgue Spaces" and the MATH + CS workshop, "Metric Embeddings, Sketching, and Dimensionality Reduction".

Our graduate program continues its string of success. The recent program review stressed that nearly all of our recent graduates go on to research postdocs, with more than half of them in the very top schools. This academic year wasn't different. Eight of our graduate students will earn their PhDs: **Robert Chang**, **Sung Yoon Cho**, **Maksym Chorny**, **Yajnaseni Dutta**, **Heng Guo**, **Guchuan Li**, **Sean Pohorence**, and **Piotr Pstragowski**.

Graduate Program Update

Antonio Auffinger
Director of Graduate Studies



Kitty Yang (left) receives The Gelfand Award from Prof. Antonio Auffinger (right) at the 2019 Teaching and Graduate Awards

Yajnaseni Dutta received the annual Best Thesis Award from the department under the guidance of Prof. **Mihnea Popa**. Yagna's work has already gained visibility in the Algebraic Geometry community, with several invitations to give lecture series and seminar talks around the globe. She will take a Hausdorff Postdoc position at the University of Bonn starting next Fall.

The Gelfand Award, which recognizes a graduate student who has achieved outstanding progress in their own research or made extraordinary contributions to the research goals of the department's graduate community, went to **Kitty Yang**. Kitty's research work is in symbolic dynamics under the supervision of Prof. Bryna Kra. Kitty goes to infinity and beyond: she is a leader in our graduate community, has organized reading groups, spoken up for graduate students, and has helped organize several social activities (for example, she was one to suggest the wine and cheese poster session, a major success in attendance last Winter).

Congratulations also to **Shuyi Weng** who won the Department Teaching Assistant award. His teaching is quoted as "superb" and according to many his office hours is one of the main attractions on campus. Kudos to Dylan Wilson (Ph.D. 2018) who received a NSF Postdoctoral research fellowship.

This academic year was also the inaugural year of our Directed Reading Program, an initiative of **Prof. Ezra Getzler**. In this program, our graduate students are paired with undergraduates to undertake independent study projects of various sizes. The initial demand was phenomenal and we have high hopes that this will become a successful new bridge between undergraduate and graduate programs. Meanwhile, the massive NSF Research Training Group (RTG) grant, "Analysis in Manifolds," continues at full speed, sponsoring many of our graduate students interest in analysis.

We have a small incoming class of graduate students joining our family in the next academic year: **Gregory Bixler** (Vanderbilt), **Jennifer Jones** (University of Guanajuato), **Nicholas Lohr** (Notre Dame), and **Stephan Snegirov** (Tel Aviv University). Jennifer Jones has been awarded an NSF graduate fellowship, joining **Catherine Ray** as our department's current GFRP recipient.

Thanks to the effort of our graduate students, our graduate community remains as friendly and as healthy as ever. We owe our special thanks to **Kyle Casey** for organizing many of our wine and cheese receptions and our weekly happy hours.

2019 Undergraduate Award Winners

Excellence in Mathematics by a First-Year

John Cao	Nick Fiete
Andrew Chung	Peter Guan
Alex Farmer	Benjamin Major
Jacob Denenberg	Jun Sung
Ruichen Gao	An Xie
	Yunru Zheng

Honorable Mention for Achievement in Mathematics by a Sophomore

Zihan Wu

Outstanding Achievement in Mathematics by a Sophomore

Nicholas Karris
Yintian Zhan

Outstanding Achievement in Mathematics by a Junior

Jinming Zhang

Excellence in Mathematics by a High School Student

Liam O'Carroll

Honorable Mention for Achievement in Mathematics by a Senior

Aidan Perreault

Robert R. Welland Prize for Outstanding Achievement in Mathematics by a Graduating Senior

Alexander Ortiz

Special Recognition for Outstanding Achievement in Mathematics

Fiona Brady

Certificate of Recognition for Service as an Undergraduate Teaching Assistant

John Bjornstad
Yunhao Liu
Alexander Ortiz
Aidan Perreault
Hassan Sayed

Excellence as an Undergraduate Teaching Assistant

Yunhao Liu

Outstanding Contributions to Undergraduate Mathematical Life

Alexander Ortiz
Luke Peterson

High Achievement on the William Lowell Putnam Examination

Fiona Brady
Aidan Perreault

Congratulations to all 2019 Mathematics Department Award Winners on Your Academic Achievements!

2019 Graduate and Teaching Awards

Gelfand Prize

Kitty Yang

Best Teaching Assistant Award

Shuyi Weng

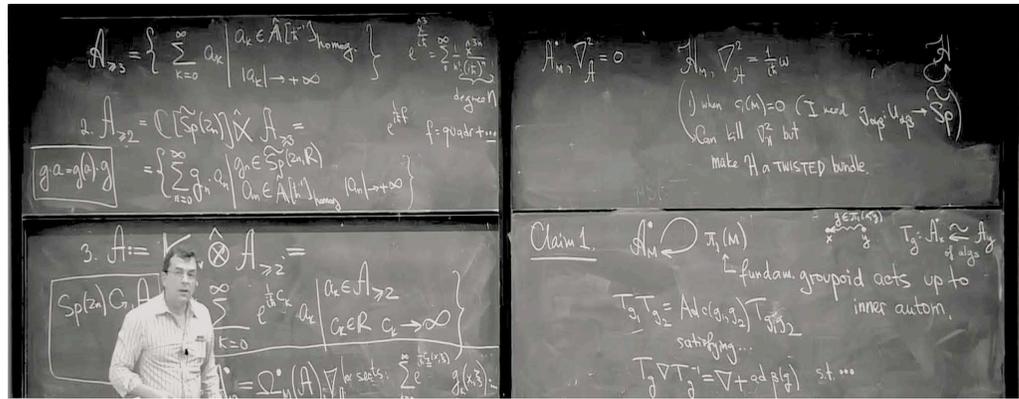
Best Thesis Award

Yajnaseni Dutta

Excellence in Teaching by a Postdoctoral or Visiting Faculty Member

Daniel Cuzzocreo
Rachael Norton

2019 Emphasis Year: Modern Trends in Non-Commutative Geometry

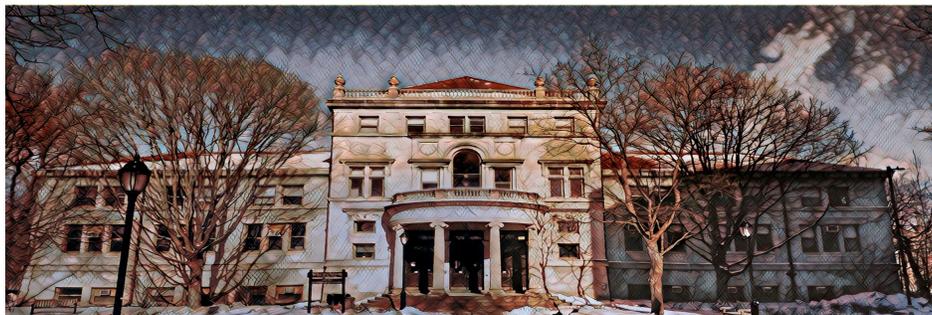


Prof. Boris Tsygan, presenting a microlocal category associated to symplectic manifolds

The Emphasis Year is designed to investigate particular topics in mathematics over the course of an academic year. The Mathematics Department at Northwestern University has been running Emphasis Years for more than 40 years.

The 2018-19 Emphasis Year was Non-Commutative Geometry, led by Northwestern University Mathematics Faculty **Prof. Dmitry Tamarkin** and **Prof. Boris Tsygan**. During the course of the academic year our department hosted a number of scientific events, which were supported by a combination of funds from the Mathematics Department at Northwestern University, and the National Science Foundation.

One of these events was the "Mini-Conference on Topological Cyclic Homology," which Northwestern University hosted Nov 3-4, 2018. Speakers from the Steklov Mathematics Institute, Montana State University, University of Indiana, and University of Chicago gave presentations. Another event, the "Modern Trends in Non-commutative Geometry" Conference, was held May 20-24, 2019, in honor of Prof. Boris Tsygan's 60th Anniversary at Northwestern University.



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