



2016 NEWSLETTER OF THE DEPARTMENT OF MATHEMATICS

Northwestern University • The Judd A. and Marjorie Weinberg College of Arts and Sciences • Department of Mathematics

FROM THE CHAIR

by Paul Goerss, Department Chair



The department here at Northwestern University is a rich and diverse community, working together to study and teach mathematics. All of us contribute, each in his or her own way, to the overall project. We are

a welcoming group, with an incredibly rich slate of visitors, special lectures, and any number of conferences. It is also an ever-changing and ever-renewing community. One of the great benefits to being Chair of the department is that I get to meet and get to know all these remarkable people. Here is some news about some of them.

Our research faculty is internationally known. This visibility and impact means that we have the privilege of marking many awards. For example, Bryna Kra was elected to the American Academy of Arts and Sciences; she has also been awarded a Simons Fellowship, joining Laura DeMarco and Mihaela Popa, who were fellows last year. Steve Zelditch gave an American Mathematical Society Invited Address on billiards and vibrations on drums. New hire Emmy Murphy has been awarded the Birman Prize in Topology and Geometry from the Association for Women in Mathematics. There are Northwestern honors as well: Aaron Naber and Eric Zaslow have both been elevated to named Professorships, an honor bestowed by the University for high-impact research.

Great mathematicians visit as well, both in our weekly seminars and in more exceptional events. Every two years Northwest-

ern awards the Nemmers Prize in math, a prestigious honor given for path-breaking mathematics. This spring, the 2014 winner, Mike Hopkins of Harvard, is in residence, and we've announced the 2016 winner: János Kollár from Princeton. We also have three prestigious lecture series each year: Nalini Anantharaman from Strasbourg was the Bellow lecturer, Alexei Borodin of MIT was the Pinsky lecturer, and Gerhard Huisken of Oberwolfach and Tübingen University was the Yamabe lecturer. Parallel to these events is the ongoing emphasis year, this year run by Tuca Auffinger and Elton Hsu, which brings in its own visitors, both individually and in a series of conferences. The emphasis year is a remarkable departmental tradition going back to 1973.

Conferences don't need to be entirely about research. In the fall we had the first Graduate Research Opportunities for Women (GROW) conference designed to introduce undergraduate women to life as a graduate student; it was a remarkable success, tapping into an exciting cohort, and it will be held again in October 2016. The emphasis year is holding a summer school for graduate students as well.

Teaching is equally part of the profession and there is plenty of news there as well. Associate Chair Ursula Prod was promoted to Associate Professor of Instruction this spring. Ursula's contributions to teaching and departmental administration are numerous and multi-faceted; the department wouldn't run without her. Santiago Cañez, in his first year as an Assistant Professor of Instruction (API), is slated to take over the directorship of MENU next year.

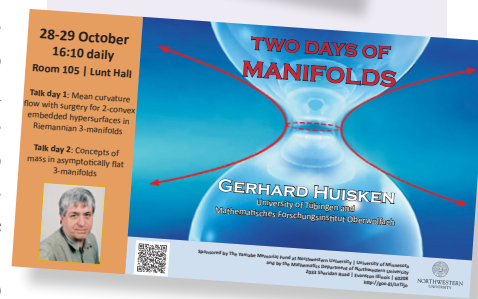
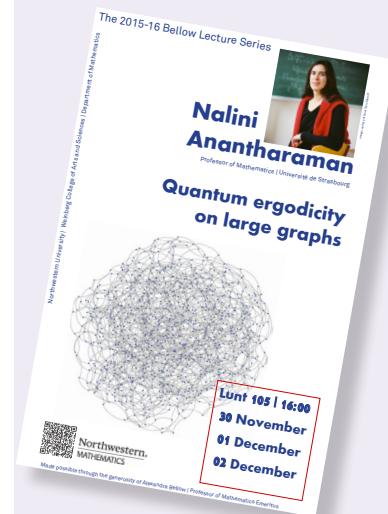
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Northwestern

Department of Mathematics

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DEPARTMENT NEWS

Fellows Elected to the American Academy of Arts & Sciences

Bryna Kra has been elected as a new member to the American Academy of Arts & Science in the field of Mathematics, one of the nation's oldest and most prestigious honorary societies recognizing the path-breaking work of accomplished scholars and practitioners.

2016 Joint Mathematics Meetings

Steve Zelditch was an Invited Speaker at the Joint Mathematical Meetings with the Mathematical Association of America and the American Mathematical Society. Zelditch delivered the invited address *Chaotic Billiards and Vibrations of Drums* in January 2016.

Simons Fellowship in Mathematics

Bryna Kra has been awarded a Simons Fellowship in Mathematics for the academic year 2016-17. The Simons Fellowship provides funding to advance the frontiers of research in mathematics to promote strong collaborations and unexpected breakthroughs through new understandings.

Sandy Zabell Appointed to a Committee of the National Institute of Standards and Technology

Sandy Zabell has been appointed to a DNA Analysis Committee of the National Institute of Standards and Technology (NIST), tasked with promulgating forensic science

standards and guidelines.

Nemmers Prize Awarded to János Kollár

János Kollár of Princeton University was awarded the Nemmers Prize for outstanding achievements in algebraic geometry and mathematics. **János Kollár** will deliver public lectures and participate in other scholarly activities at Northwestern during the 2016-17 and 2017-18 academic years.

Kamil Duszenko Award

Kate Juschenko was awarded the Kamil Duszenko Award in Mathematics, granted by the Wrocław Mathematicians Foundation for research in mathematics.

Postdocs Elected as MAA Project NExT Fellows

Silas Johnson and **Jason Siefken** were accepted by the Mathematical Association of America as a Project NExT Fellow. Project NExT (New Experiences in Teaching) is a professional development program for new or recent Ph.D.s in the mathematical sciences.

Faculty Members Awarded TIMES Fellowship

Silas Johnson and **Jason Siefken** were awarded the TIMES Teaching Fellowship to support inquiry-oriented teaching in mathematics.

INCOMING FACULTY



GANG LIU

Gang's research is in differential geometry and its connections with complex geometry, metric geometry and algebraic geometry. Currently his research interest is in the uniformization conjecture of Yau, together with its related problems, such as the Gromov-Hausdorff limit of Kahler manifolds with curvature lower bound.

EMMY MURPHY

Emmy Murphy is a geometric topologist, primarily interested in symplectic and contact geometry. She received her BS from University of Nevada, Reno, and her PhD from Stanford University. Prior to coming to Northwestern, she was at MIT as an instructor and later as an assistant professor.

Her work is mostly focused on applying tools from smooth topology to contact and symplectic geometry. Much of her work uses tools from h-principles, which are general methods of reducing geometric problems to easier questions in algebraic topology.



Paul Goerss Received Mentoring Award

Department Chair **Paul Goerss** received an Award for Excellence in Mentoring Undergraduate Research in the Weinberg College of Arts and Sciences

Graduate Student Nicole Looper Received Award

Nicole Looper received the Outstanding Graduate Student Teaching Award in the Weinberg College of Arts and Sciences.

Silas Johnson hosts (INTER)^2SECT Mathematics Contest

Silas Johnson, in conjunction with Mathleague.org, hosted the (INTER)^2SECT contest for young mathematicians on March 13. Thirty-two middle-school aged students from five schools were in attendance.

Inaugural GROW Conference

In October, organizers **Laura DeMarco**, **Ezra Getzler**, and **Bryna Kra** coordinated the first Graduate Research Opportunities for Women Conference. This weekend long conference devoted to addressing the gender imbalance in mathematics hosted fifty female identified students interested in graduate level studies in mathematics.

Kenneth F. Burgess Professor of Mathematics

Aaron Naber has been named the Kenneth F. Burgess Professor

of Mathematics.

Chair to the Board of Lady Managers of the Columbian Exposition

Eric Zaslow was named the Chair to the Board of Lady Managers of the Columbian Exposition for a three year term. This endowed chair was created in 1916 out of funds raised at the Women's Building of the Columbian Exposition of 1893. It recognizes the work of some of the University's most esteemed faculty from across the College.

Faculty Promotions

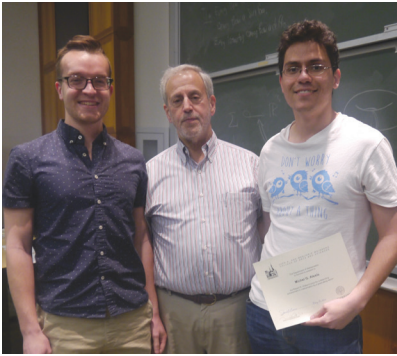
Nir Avni was promoted to Associate Professor. **John Alongi** was promoted to Professor of Instruction. **Aaron Naber** and **Valentino Tosatti** were promoted to Professor.

Mathematics Department Excellence in Teaching Awards

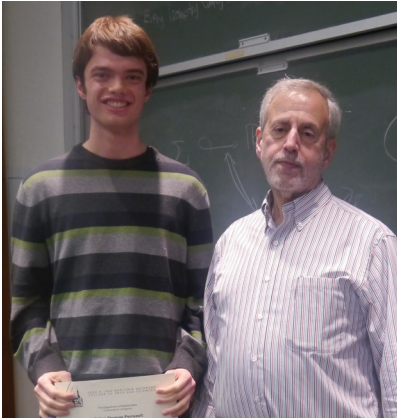
Diana Davis, **Aaron Peterson** and **Ross Sweet** were awarded the Mathematics Department Excellence in Teaching Awards for 2015-2016.

Staff Wins Commendation

Staff member **Deavon Mitchell** was awarded a Service Excellence Commendation by Northwestern University.



Outstanding Achievement in Mathematics by Graduating Senior winners Joseph Breen and Michel Alexis with Mike Stein



Outstanding Achievement in Mathematics by a First Year Student winner Aidan Thomas Perreault with Mike Stein



Excellence in Mathematics by a First Year Student winners Ziyi Lu, Zinan Katherine Liu, Robert Burns Smart, and Daniel Ari Wilensky with Diana Davis



Outstanding Contributions to Undergraduate Mathematical Life winner Joe Breen with Eugene Kushnirsky

2015/2016 Undergraduate Prize Winners in Mathematics

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

Michel G. Alexis, Joseph Breen

Honorable Mention for Achievement in Mathematics by a Senior

Josiah Hyun Oh, Alberto Takase

Outstanding Achievement in Mathematics by a Junior

Araminta Gwynne, Samuel Alexander Mossing

Honorable Mention for Achievement in Mathematics by a Junior

Kimberly Anne Clinch, Mohammed Harris Khan

Outstanding Achievement in Mathematics by a Sophomore

Jiaqi Shang

Honorable Mention for Achievement in Mathematics by a Sophomore

Ethan Dlugie, Meng Wu

Outstanding Achievement in Mathematics by a First Year Student

Aidan Thomas Perreault

Excellence in Mathematics by a First Year Student

Megan Marie Agnell, John Bailey Bjornstad, Joseph W. Buzzi, Rainy Che, Thomas Patrick Large, Wung Jae Lee, Ari Joshua Levin, Xiaoyu Liu, Zinan Katherine Liu, Jiayi Lu, Ziyi Lu, Alexander Edward Ortiz, Thomas Arthur Ritz, Robert Burns Smart, Daniel Ari Wilensky

Outstanding Achievement in Advanced Mathematics Classes by a High School Student

Fiona Brady

Outstanding Contributions to Undergraduate Mathematical Life

Joseph Breen

High Achievement on the William Lowell Putnam Examination

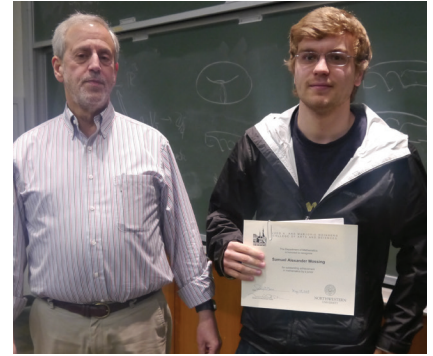
Jiaqi Shang

Excellence as an Undergraduate Teaching Assistant

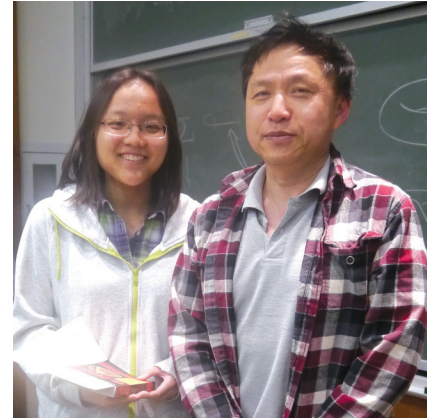
Michel G. Alexis, Malcolm Spilka Lazarow

Certificate of Recognition for Service as an Undergraduate Teaching Assistant

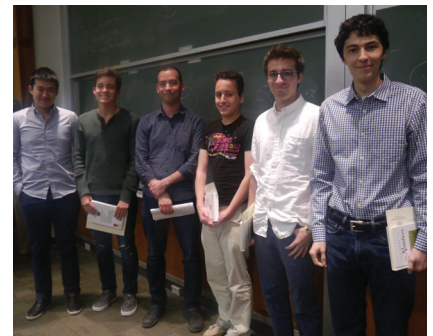
Michel G. Alexis, Joseph Breen, Malcolm Spilka Lazarow



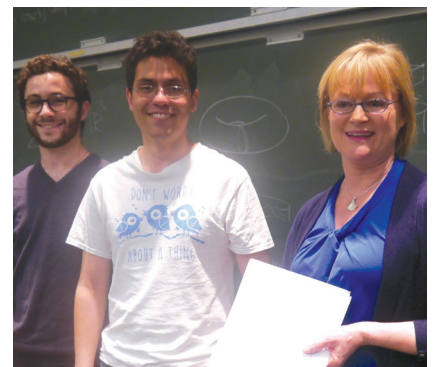
Outstanding Achievement in Mathematics by a Junior winner Samuel Alexander Mossing with Mike Stein



Outstanding Achievement in Mathematics by a Sophomore winner Jiaqi Shang with Elton Hsu



Excellence in Mathematics by a First Year Student winners Xiaoyu Lu, Thomas Arthur Ritz, Joseph W. Buzzi, Thomas Patrick Large, and Alexander Edward Ortiz with Santiago Cañez



Excellence as an Undergraduate Teaching Assistant winners Michel Alexis and Malcolm Lazarow with Ursula Porod

THE UNDERGRADUATE PROGRAM 2015-2016

By Mike Stein, Director of Undergraduate Studies

As I write this, we are fast coming up to our annual prize ceremony and dinner. Nemmers Prize winner (and NU-triple-alum) Mike Hopkins will be the featured speaker, initiating our undergraduates into the mysteries of the Arf invariant. Once again we have a stellar group of prize winners, from first-years to seniors. For the fourth and last time, we will present a special award to high school student Fiona Brady, who will enroll this coming fall at the University of Chicago. Fiona began with us in Math 291 and 331; she has long since progressed into graduate courses. We'll miss her!

Among our approximately 55 graduating seniors are 4 – Michel Alexis, Joe Breen, Suchan Oh, and Alberto Takase – who wrote honors theses and are continuing to math PhD programs (UC Irvine, UCLA, Wisconsin, Ohio State). Alberto's thesis in mathematical logic was supervised by a



logician in our Philosophy department. Alberto may have started a trend; next year, another senior will write a math thesis with an outside mentor (in theoretical computer science).

After record large graduating classes of close to 100 in the past two years, we are regressing to the mean with about 55 graduates this year. Nevertheless, the total number of math majors is still above 250.

We are grateful to our graduates who donate to our department. The donations continue to increase from year to year and help fund our awards and many other departmental initiatives. Information on how to make a gift to the Math Department can be found on the back page of this newsletter.

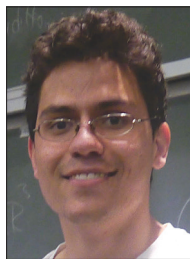
LIFE AT NORTHWESTERN: AN UNDERGRADUATE PERSPECTIVE

By Michel Alexis, Undergraduate Math Major

“NORTHWESTERN’S MATH DEPARTMENT LET ME DO SOMETHING I NEVER EXPECTED TO BE ABLE TO DO WITH MY MATHEMATICS INTEREST: SHARE IT WITH OTHERS.”

When I began freshman year at Northwestern, I was resolved to keep growing, both as a person and an intellectual. Having always loved mathematics in high school, I feared that if I indulged myself solely in mathematics courses I would limit my overall development, and so I made myself explore those other subjects as well. I took classes in physics and creative writing. I minored in philosophy and computer science. I ran club track. And yet, when I look back on my four years at NU, I can't help but remark that nonetheless my most significant flourishing moments occurred within the math department.

Academically, my development was fostered by what my peers and I can only call remarkable, passionate instructors. Many of the best professors I've had at Northwestern have been in the mathematics program. That quality of pedagogy, combined with the MENU program, not only nurtured my ripening interest for mathematics but allowed myself and others to develop the tools necessary to pursue that interest.



Furthermore, Northwestern's math department let me do something I never expected to be able to do with my mathematics interest (certainly not in high-school): share it with others. Between the enthusiastic undergraduates, the graduate students, and the approachable faculty, I have been able to talk math to my heart's content and was inspired countless times by the ensuing conversations. And as an undergraduate TA, I in turn have been able to share that same passion with my own students. I not only thrived as an academic, but as a mentor.

Finally, the connections I've made at NU's Math Department are ones that I will always value. The friends I made in freshman year math class are still some of my closest friends today. My professors and mentors continue to serve me as role models not just for their mathematical achievements, but their overall attitude towards education and learning. When I leave NU this June, I leave as a better, more passionate mathematician.

PHOTO GALLERY



Chair Paul Goerss welcomes everyone to the 2015-16 Beginning of the Year Party.



Laura DeMarco talks with visiting students at the inaugural GROW Conference, October 2015.



Graduate students celebrate at the Beginning of the Year Party.



2015-16 Beginning of the Year Party

“Pay attention to the little intangible things... remember that you’re joining a community as well as joining an endeavor, and the sense that you fit in the community is a strong indicator that it’s a good intellectual match. I was very lucky to find that [here].”

—Mike Hopkins (see our Interview on page 10)



Nemmers Prize winner Mike Hopkins at the 2016 Undergraduate Award Ceremony



Members of the NU Association for Women in Mathematics (NUAWM) model new t-shirts to celebrate the student group’s founding.



Students celebrate with faculty at the 2016 Undergraduate Awards Dinner at KOI Restaurant in Evanston.



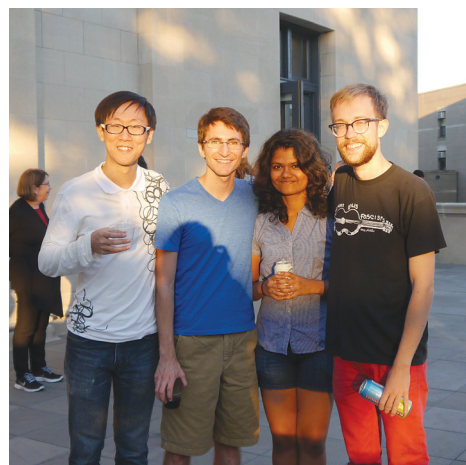
First-year student Aidan Thomas Perreault (left) and area high school student Fiona Brady (right) receive awards from Mike Stein at the 2016 Undergraduate Awards Ceremony.



Teatime activities in the Common Room



Diana Davis teaches participants at the 2016 *Take Our Daughters and Sons to Work Day*.



2015-16 Beginning of Year celebration



Participants of the inaugural Graduate Research Opportunities for Women (GROW) Conference in 2015



Left: Math Department members play as a team in the Northwestern Intramural Basketball League.



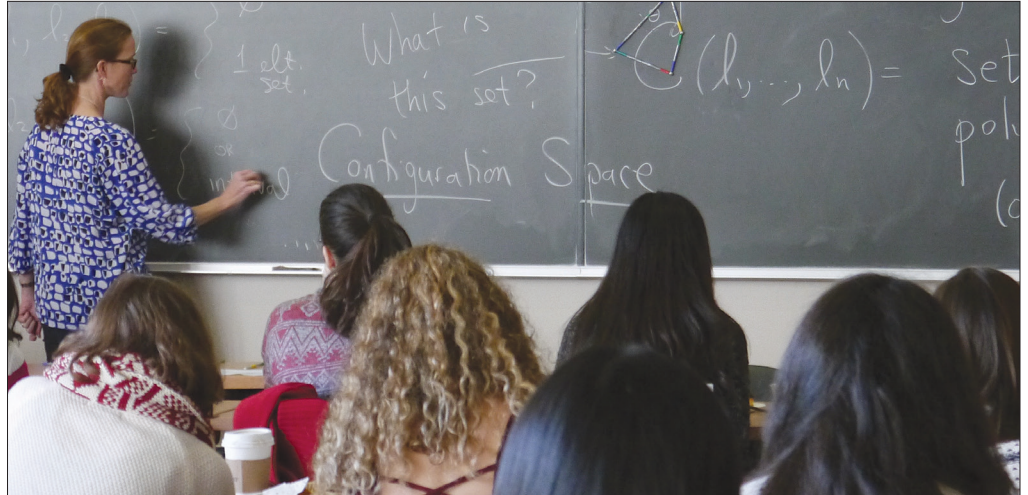
Right: Visiting undergraduate students arrive at Lunt Hall during the October 2015 GROW Conference

FOSTERING THE NEXT GENERATION OF FEMALE IDENTIFIED GRADUATE STUDENTS

THE INAUGURAL GRADUATE RESEARCH OPPORTUNITIES FOR WOMEN (GROW) CONFERENCE

By Emily Kefferstan

On October 23, 2015 the Mathematics Department hosted the first-ever Graduate Research Opportunities for Women (GROW) conference for undergraduate women interested in pursuing graduate work in mathematics. The conference organized by Laura DeMarco, Ezra Getzler and Bryna Kra of the Department of Mathematics featured panel discussions and lectures on cutting-edge research, and featured a lecture by renowned mathematician and professor emeritus Alexandra Bellow. More than fifty female undergraduates from across the country traveled to be a part of the intensive conference focusing on addressing the gender imbalance in mathematics and helping young women continue their academic goals in mathematics.



email to Kra thanking the GROW committee for helping her feel more equipped to make this goal a reality.

The first GROW conference was a resounding success made possible by the Edith Kreeger-Wolf Endowment, The Graduate School, The National Science Foundation, and members of the Department of Mathematics. Plans to continue the GROW tradition for a new larger audience of undergraduate women are underway in addition to a new invited Summit Meeting on the broader issues facing women in mathematics.

On October 14, 2016 Lunt Hall will once again open its doors to eighty new undergraduate female identified students to help foster a passion in advanced mathematics to a new generation.

“It is an opportunity for Northwestern to take a leading role in what we hope will be a concerted effort among mathematicians to change our demographics,” Kra reports when speaking of the GROW 2015 conference — a mission the Department of Mathematics is eager and proud to support.

Applications and more information on the GROW 2016 conference can be found at: <http://www.math.northwestern.edu/events/conferences/graduate-research-opportunities-for-women.html>



“This was not the usual room of undergraduates distracted by texts, emails or social media,” remarked Kra, the chief organizer of GROW. “The students were fascinated by the mathematical presentations, asked deep and thoughtful questions during the panel discussions, and sought out mentors to glean particular information.”

After two days of lectures and activities, participants left with a renewed passion to continue their pursuits in advanced mathematics and higher education. “I’ve completely abandoned my subconsciously-harbored conception that mathematics is a ‘gentlemen’s club’. I resolutely envision myself pursuing a doctorate and eventual career in pure mathematics and research,” one participant remarked in an



Photos counter-clockwise from top: Laura DeMarco gives a research lecture; conference attendees participate in a lecture on knots; conference participants network during a break.

GRADUATE STUDENT NEWS

By Elton Hsu and Valentino Tosatti, Directors of Graduate Studies 2015-2016



Graduate students (left to right) Xavier Garcia, Joel Specter, Yajnaseni Dutta, Kitty Yang, Dylan Wilson, and Corinna Wendisch

Our graduate program had a successful year in 2015-2016.

Ben Knudsen has been awarded an NSF Postdoctoral Fellowship, and will be at Harvard University for the next three years. Ben also received the annual Best Thesis Award from the mathematics department, together with Wenbo Sun. The Gelfand Award went to Peng Zhou, while the Best Performance on the Preliminary Examination went to Sean Pohorenc.

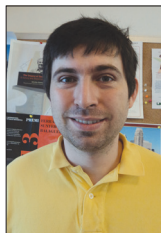
The Department's big NSF Research Training Group (RTG) grant "Analysis on Manifolds" has started this year, and we have already seen direct benefits on the graduate program, with graduate students working in analysis (broadly construed) receiving funding for travels to conferences, as well as reduced teaching quarters.

The Big Buddy program is still going strong, with bigger buddies (second-year or up) having lunches with little buddies (incoming graduate students) and discussing with them any possible issues, or just relaxing and having a good time.

Congratulations to Nicole Looper, who received the Outstanding Graduate Student Teaching Award from the Weinberg College of Arts and Sciences, and to Robert Chang and Peng Zhou who won the Department Graduate Teaching



Elton Hsu



Valentino Tosatti

Assistant Award.

The following graduate students will be graduating this year: Eric Dolores Cuenca, Philip Egger, Chris Elliott, Zili Huang, Ben Knudsen, Robert Legg, Xiaokai Liu, Matthew Mahowald, Richard Moy, and Wenbo Sun.

Our recruitment effort has resulted in a great new class of graduate students: Viktor Burghardt, *Karlsruhe Institute of Technology (Germany)*; Kyle Casey, *Duke University*; Maksym Chaudkhari, *Taras Shevchenko University of Kyiv (Ukraine)*; Xi Chen, *University of Rochester*; Signe Emalia Jensen, *Roskilde University (Denmark)*; Pax Kivimae, *University of California, Los Angeles*; Rachel McEnroe, *University of Chicago*; Grigory Papayanov, *National Research University HSE (Russia)*; Abraham Rabinowitz, *Stony Brook University*; Xi Sisi Shen, *McGill University*; John Snadden, *University of Western Australia*; Junxiao Wang, *Zhejiang University (China)*.

Thanks to the effort of our graduate students, our graduate community remains friendly as ever. We owe our special thanks to Kitty Yang (wine & cheese), Dylan Wilson (last year's Gelfand Award), and Aron Heleodoro (happy hour).

From the Chair continued from page 1

We've added Aaron Peterson to the ranks of the APIs, starting this fall. Aaron has been with us for a few years as a Postdoctoral Lecturer and is already an important member of the department.

Another extremely important group for us is the postdocs, who are typically here for three years right after they earn their Ph.D. There are about a dozen Boas Assistant Professors—the research postdocs—and perhaps three or four Postdoctoral Lecturers, whose primary mission is teaching. They are vital members of the department, but by the very nature of these positions these mathematicians are with us for only a few years. We are always a little sad to see them go, but we take delight in their success: for example, Patrick Allen is now in a tenure-track position at the University of Illinois at Urbana-Champaign, Anna Marie Bohmann has a similar position at Vanderbilt, Diana Davis

will leave us for a prestigious teaching postdoc at Williams, and Xiaokui Yang, who was a Boas in 2012-15, is now a full professor at the Chinese Academy of Sciences in Beijing.

It is not only the roster of the postdocs which changes. Frank Calegari, one of our number theorists, has moved to the University of Chicago and Martina Bode, our long-time Calculus Director, has taken a position to revitalize the calculus program at the University of Illinois at Chicago. We wish them both the best. There is also renewal: Yifeng Liu, a number theorist, joined us this year. We have also hired two new research faculty: Gang Liu, currently at Berkeley, works in Geometric Analysis, and Emmy Murphy, from MIT, in Symplectic Geometry and Topology. Both offer exciting new directions for us, and we are very pleased to have them with us.

INTERVIEW WITH MIKE HOPKINS

Interviewed by Emily Kefferstan

Mike Hopkins was the winner of the 2014 Nemmers Prize in Mathematics for his contributions to algebraic topology, stable homotopy theory, and derived algebraic geometry. This May Mike Hopkins returned to Northwestern's Math Department, where he completed his undergraduate and graduate degrees, for a series of special lectures and events. Following is a selection from our interview. The full interview can be found at:

<http://www.math.northwestern.edu/about/newsletter/mike-hopkins-full-length-interview.html>

EMILY: You've had a long association with the Math Department at Northwestern. How did you come to work with Mark Mahowald and the Math Department at Northwestern?

MIKE: Mark is a very important person in my life. I was here [at Northwestern] for a 3 year degree from '76-'79 and then went to Oxford for a couple of years on a Rhodes scholarship. I returned here for grad school and I wrote a second thesis under Mark's direction, and that began a lifelong friendship and collaboration.

I knew [Mark] as an undergraduate, but I hadn't really started working with him yet. He was about the age of my father, and our nickname for him was "Dad" (because he just seemed like your dad.) Mark was kind of a hero of mine when I was an undergraduate because everyone was around trying to understand the things he said. I remember a visiting professor teaching an algebraic topology course was trying to read a paper of Mahowald's and I asked him if he understood it and he said "Well, kinda. Barely," and when I asked "How long have you been studying algebraic topology?" and he replied "20 years." I remember thinking "WOW, someone can write a paper that's hard, even for someone who's been studying for 20 years." It impressed me.

E: Is that what made [Mark Mahowald] a hero to you—his academic writing and thinking?

M: That's an answer I suppose that changes as the years go by, but I think it is because he was clearly deeply admired and yet he was really humble and really generous. I also liked that when you'd ask him questions, he would really think about what you asked. I really admired him a great deal.

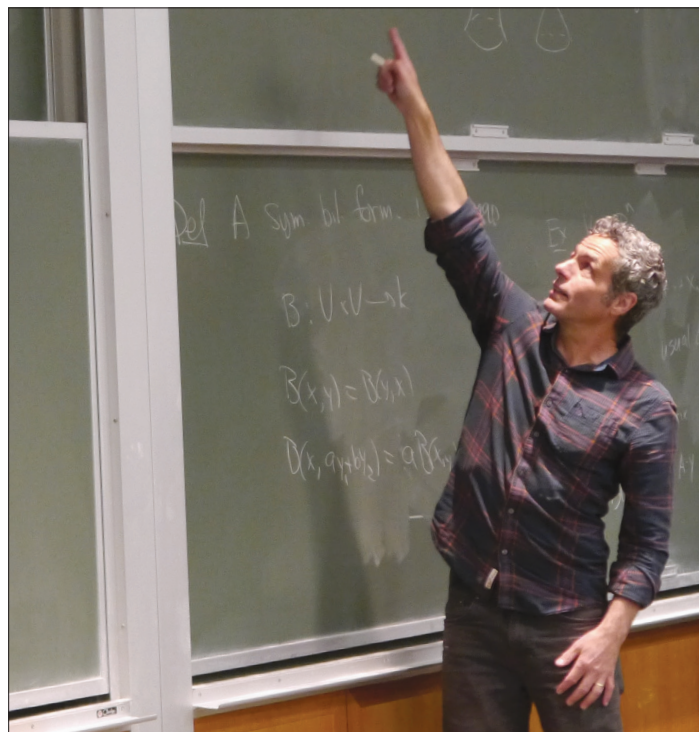
E: Is that balance something you try to do with your students as well as to try to continue the mentor relationship you built with Mark?

M: I think I adopted some of [that balance.] I guide a lot of young people into finding their field in math or figuring out where they want to go to school, and one of the pieces of advice that I always give is to pay attention to the little intangible things. It is important to remember that you're joining a community as well as joining an endeavor, and the sense that you fit in the community is a strong indicator that it's a good intellectual match. I was very lucky to find that. I followed my best friend to college and came here not knowing anything about Northwestern's Math department and I found this—Mahowald and that field here. I really, really like the

people in it. I really felt a part of it. I try to pass that on to my students. I can't live up to what Mark was, but I can try.

E: If you didn't come to Northwestern thinking you would become a mathematician, what helped introduce you to mathematics and how did you fall in love with it?

M: I always liked math, I just didn't really know you could do it for a living. I played guitar in a rock band and Northwestern has a strong music department where I thought I would study music. In retrospect I wasn't really that good at it. I had taken some pretty advanced math classes in high school and when I got here I didn't want to take anymore calculus. I met with Mark Pinsky, who was the person you talked with to figure out where you got placed, and he wrote some formula on the board and I lied—I told him I had seen it before and I started taking these really advanced math classes, and it just clicked. I just loved it. The community here was a huge part of why I fell into mathematics. The grad students who I was hanging around with—after my freshman year I was taking classes with the grad students and I knew them all; I had an office here and was hanging around in the basement all night with all of them.



Mike Hopkins delivers a lecture at the Mathematics Department's Undergraduate Award Ceremony in May, 2016.



It was just a wonderful community—really supportive, really exciting. Imagine sitting around a group of your closest friends where everybody is reading books and somebody says “wait I’m confused,” and then everybody just drops everything to help.

E: In the *Harvard Gazette* you mentioned how you liked seeing students grow and evolve, ushering in the dozens of students you have mentored into the community of mathematicians. What do you find to be the most enjoyable aspect of welcoming these students into the field, and watching their contributions change the mathematical community?

M: There’s so many phases of a student’s development that are really fun to see, so it is hard to choose. My first job [when meeting with students] is to help them find something they really, really care about. You’re going to work really hard on stuff you really care about. By the time I’m seeing them they have whatever mathematical ability they’re given and I try to get them to discover their mathematical taste. My first job is to figure out what really moves them and so it’s always really fun when we find that, to watch that click and see a student suddenly really get into a topic and ask their own questions. That’s when the fire starts to light. It’s exciting. And it grows and grows and grows. Since I’m old enough, I’ve had students that became professors and have students of their own, and I’ve also gotten a lot of pleasure out of watching their voice at that level grow and watch them have their own impact in mathematics.

E: In your years of teaching what is one of the most exciting or interesting changes to the mathematical community that you have witnessed or been a part of in your mathematical career?

M: One game changer thing that I’m still sort of processing is

an online discussion forum called Math Overflow. Over the years it has become an incredible repository of information and discussions about mathematical issues. In recent years I’ve started to see the top undergraduates have a really sophisticated understanding of high level math. It has been a huge jump. What I realized was that Math Overflow gave a community and a place where a talented high school kid could go online and access digested mathematical information that just didn’t exist before. When I was young you had to go to a library and open a book—chances were there was no one you knew that could explain anything in that book to you and you just had to deal with the structures that way. But now, you can go on Math Overflow—that’s changed things a lot from where I sit.

E: What advice do you have for students and budding mathematicians today?

M: There are several layers to that question. I think the first thing is to really understand your tastes in math—what you like and what you don’t like. Those are the things more so than your abilities that will be the beacons that light your path. It’s important to heed the things you like and don’t like. The other thing to realize is that there are a lot of things you can do with math—way more than when I was young. You can go into biology, economics or all kinds of aspects of science. If you’re an undergraduate studying math, your math professors are people who decided to go into pure math and you sort of forget, and we also forget, there are many, many more opportunities. Not everybody fits in the math academic framework. It’s important to remember that that’s not all there is—just because that may not be where you fit—it doesn’t mean there’s not a future for you in math. There’s a lot more out there.

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