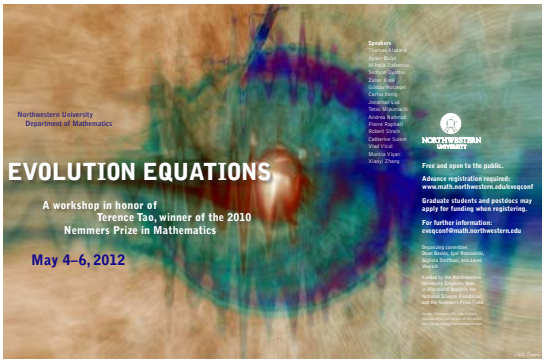
MATHEMATICS DEPARTMENT

NORTHWESTERN UNIVERSITY • THE JUDD A. AND MARJORIE WEINBERG COLLEGE OF ARTS AND SCIENCES • DEPARTMENT OF MATHEMATICS

SPRING 2012 NEWSLETTER



Poster from Evolution Equations: A workshop in honor of Terence Tao, winner of the 2010 Nemmers Prize in Mathematics.

NORTHWESTERN UNIVERSITY
WEINBERG COLLEGE OF ARTS & SCIENCES

FROM THE CHAIR

Bryna Kra, *Chair, Department of Mathematics*

As the academic year comes to a close, it is once again my pleasure to bring you news from the Mathematics Department. The department continues to be incredibly vibrant, with more postdocs, graduate students and undergraduate majors than ever before.

The department added many new faces this year: Anna Marie Bohmann, Si Li, Simon Marshall, and Melissa Tacy joined us as Boas Assistant Professors, Nick Rozenblyum started as a Simons Postdocotral Fellow, Ellen Goldstein as a Postdoctoral Lecturer, Ryan Broderick, Joe Cutrone and Jamison Wolf as Lecturers, and Cheol-Hyun Cho, Anthony Elmendorf, and David Savitt were visiting professors for the year. Although this is a long list of faculty hired last year, hiring did not slow down and was perhaps the busiest part of the past year. In 2012-13, we will be joined by 15 new faculty and visitors.

The new faculty include Valentino Tosatti as an Associate Profesor, Nir Avni, John Francis, and Xinwen Zhu as Assistant Profesors, and Ursula Porod as a Continuing Lecturer. More information on their backgrounds is on page 3.

Three new Boas Assistant Professors are starting in the fall: Patrick Allen is finishing his degree in number theory at University of California, Los Angeles, Orit Davidovich is currently at the Institute for Advanced Study and works in mathematical physics, and Xiakui Yang who is also finishing his degree at University of California, Los Angeles works in differential geometry. Santiago Canez from University of Califonia, Berkeley and Derek Garton from University of Wisconsin join the department as Postdoctoral Lecturers.

Emily Peters currently at MIT will be supported by the Research and Training Grant, Dan Lior from the University of Illinois, Dustin Belt from Purdue and Nabil Kahouadji from McGill University will be visiting lecturers, Ben Weinkove from University of California, San Diego will be a Visiting Professor, and Mike Hill from University of Virginia will be a Visiting Associate Professor in the spring.

In another direction, Professors Joe Jerome and Mark Pinsky will both retire at the end of 2011-12.

Our faculty continue to win awards. Professor Steve Zelditch was inaugurated as the Wayne and Elizabeth Jones Professor in Mathematics, a new endowed chair in the college. Professor Kevin Costello will join him as an endowed chair, and we will celebrate his inauguration next year. The faculty continue to win teaching awards, with Professor Eric Zaslow named a Charles Deering McCormick Professorship of Teaching Excellence for 3 years starting in Fall 2012. And I am happy to report that I was named the Arthur E. Andersen Research and Teaching Professor for 2011-2014.

Frank Calegari was promoted to Full

continued on page 10

Departmental News Highlights

News Shorts

John Alongi was promoted to Distinguished Senior Lecturer.

Frank Calegari was promoted to Professor and gave an invited address at the *2012 Spring Central Section Meeting* at the University of Kansas, Lawrence.

Kevin Costello was named the *Wayne and Elizabeth Jones Professor in Mathematics.*

Kevin Costello and **Eric Zaslow** were named *Simons Fellows in Mathematics for 2012-13.*

Bryna Kra was named the *Arthur E. Andersen Research and Teaching Professor for 2011-2014.*

Eric Zaslow was awarded a *Charles Deering McCormick Professorship of Teaching Excellence* for 3 years starting in Fall 2012.

The department and college celebrated the investiture of **Steve Zelditch** as the *Wayne and Elizabeth Jones Professor in Mathematics.*

Tim Ridenour and **Van Cyr** won departmental awards for *Excellence in Teaching*.

Maria Stadnik was the recepient of an *Outstanding Graduate Student Teaching Award* in the Weinberg College of Arts and Sciences for the academic year 2011-2012.

Undergraduates **Zeyu Wang, Xuchen Han** and **Yuxuan Chen** received Honorable Mention in the *2012 Mathematical Contest in Modeling*.

Northwestern's Putnam team ranked 32nd out of 572 participating institutions. Special applause to **Benjamin Segal**, **Zeyu Wang** and **Ewain Gwynne** who finished in the top 10% of the 4440 participants, and to **Siyuan Cai**, ranked 75.5, earning an honorable mention.

Staff member **Nancy Hickey** was awarded a *Service Excellence Commendation* by Northwestern University.

Ingrid Daubechies was awarded the *2012 Frederic Esser Nemmers Prize in Mathematics* for her numerous and lasting contributions to applied and computational analysis and for the remarkable impact her work has had across engineering and the sciences.

Department Transitions

New Math Faculty joining Northwestern

We are happy to welcome the following new mathematics faculty who are joining us in the new academic year.

Nir Avni, Assistant Professor

Nir Avni was born and raised in Israel and moved to the US in 2008 after receiving his Ph.D. from the Hebrew University of Jerusalem. Nowadays, he mostly thinks about algebraic groups, although he has a warm spot for geometry and dynamics.

John Francis, Assistant Professor

John Francis has been a Boas Assistant Professor here at Northwestern since 2008, when he received his PhD from MIT. He works in topology, broadly construed, and its interaction with algebraic geometry and mathematical physics. Before Chicago and Cambridge, he lived in Budapest, Harare, and Washington, DC.

Ursula Porod, Lecturer

Ursula Porod received her Ph.D. in Mathematics in 1994 from Johns Hopkins University. She was subsequently a Miller Research Fellow at UC Berkeley for the two year period 1994-96 and then a member of the Princeton Institute for Advanced Studies for the year 1996-7. She has published 5 papers on random walks on Lie Groups and specializes in the cut-off phenomenon for convolution powers of a measure. After having taken some time off from academe to raise a family, Ursula returned to teaching in 2005 at Johns Hopkins University. She has been a visiting faculty member in the mathematics department of Northwestern since 2009.

Valentino Tosatti, Professor

A native of Trieste, Italy, Valentino Tosatti did his undergraduate studies at Scuola Normale Superiore in Pisa and received his PhD from Harvard University in 2009. Since then he has been a Ritt Assistant Professor at Columbia University. He is the recipient of a Sloan Research Fellowship and a Blavatnik Award for Young Scientists. His research area is Differential Geometry and PDE.

Xinwen Zhu, Assistant Professor

Xinwen Zhu graduated from University of California at Berkeley in 2009, and was employed as a Benjamin Peirce Lecturer in the Harvard mathematics department before joining the Northwestern math department. Xinwen Zhu's research interest lies in various aspects of representation theory, algebraic geometry and number theory. Much of his work is related to the geometrical Langlands program.

Math Faculty Retiring in 2012

The following mathematics faculty are retiring at the end of the 2011-12 academic year.

Joe Jerome, Professor

Joe Jerome received his Ph.D. in 1966 from Purdue University where he was a National Science Foundation Graduate Fellow and held appointments at University of Wisconsin and Case-Western Reserve University before coming to Northwestern in 1970. In 1974 he was awarded the British Science Council Senior Fellowship and in 1996 he was honored with the Purdue University School of Science Distiguished Alumnus Award. He is the Associate editor for the Journal of Computational Electronics, and until last year was the Associate editor for the Journal of Non-Linear Analysis.

Mark Pinsky, Professor

Mark Pinsky received his Ph.D. in 1966 from MIT where he was a National Science Foundation Graduate Fellow. He joined Northwestern's faculty in 1968 and was elected a Fellow of the Institute of Mathematical Statistics in 1977. He was awarded an NSF Creativity Extension in 1986, and elected to the Board of Trustees of MSRI from 1996-2000. In 2000 he received the MSRI Award for Outstanding Service. He has served as an editor for various journals, including as Associate Editor for the Annals of Probability from 1978-1981 and for the Journal of Theoretical Probability since 1990. Mark is the founder of the Midwest Probability Colloquium which he has organized annually since 1981.

2011-2012 Undergraduate Prize Winners in Mathematics

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

Outstanding Achievement in Mathematics by a Junior
Ewain Nathanael Gwynne, Daniel Beagan Kaplan

Outstanding Achievement in Mathematics by a Sophomore
Siyuan Cai, Kevin Patrick Schwarz

Excellence in Mathematics by a Freshman
Andrew Jeehyun Ahn, Xiaowen Chen, Sara Marielle Cohen, Fillan Grady, Xuchen Han, Yuqing He, Ed Kim, Ji Ho Kim, Daeyoung Lee, Hanqiao Lin, Kevin Wang, Ziyang Xu

Outstanding Contributions to Undergraduate Mathematical Life
Hanqing Lu, Daniel Beagan Kaplan, Frederick Reis Robinson

Outstanding Achievement on the William Lowell Putnam Examination
Siyuan Cai

High Achievement on the William Lowell Putnam Examination
Ewain Nathanael Gwynne, Benjamin Louis Segal, Zeyu Wang

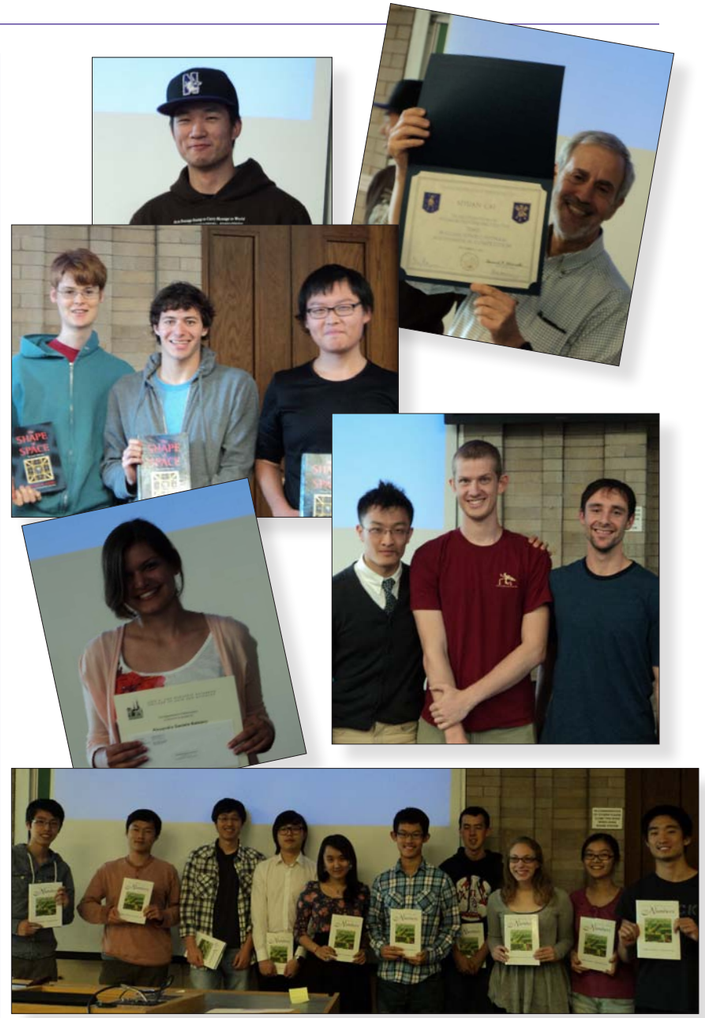
Excellence as an Undergraduate Teaching Assistant
Alexandra Daniela Baleanu

Math Majors Elected to Phi Beta Kappa

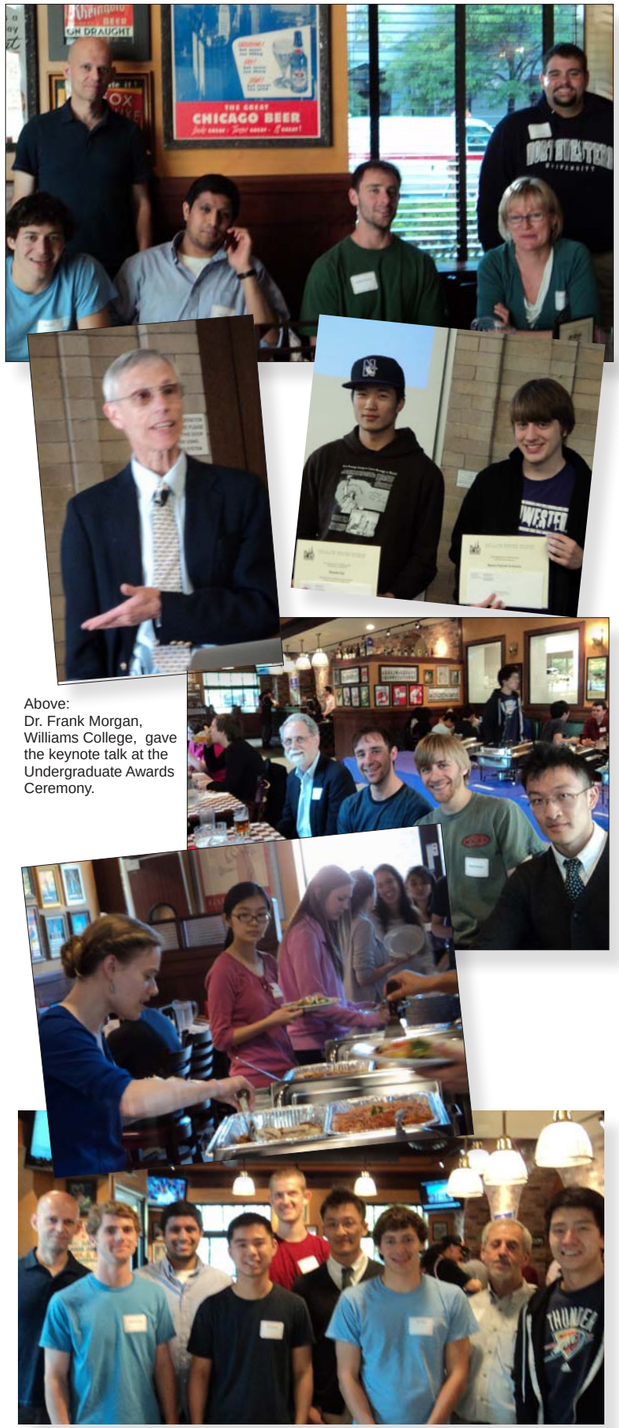
The following Math majors were elected to Phi Beta Kappa this year. Congratulations to all!

Elected as juniors:
Ewain Nathanael Gwynne, Monica Manohar Kalwani, Daniel Beagan Kaplan, Andrew S Srisuwananukorn

Elected as seniors:
Alexandra Daniela Baleanu, Steven Weyhan Chen, Sungsoo Michael Choi, Yi Han, Lauren Cathleen Linzmeier, Hanqing Lu, Michael Steven Slonkosky, Kevin Benjamin Soter, Scott R Williams, Peter Hai Zhang



Photos: 2012 Mathematics Undergraduate Awards Ceremony, 2012 Math Undergraduate Dinner at Giordanos. Photo credit: Daniel Nissani



Above: Dr. Frank Morgan, Williams College, gave the keynote talk at the Undergraduate Awards Ceremony.

Photos: 2012 Mathematics Undergraduate Awards Ceremony, 2012 Math Undergraduate Dinner at Giordanos. Photo credit: Daniel Nissani

Last spring, I wrote a column to send off the graduating seniors. In the blink of an eye, I now find myself in the same shoes. (Assuming I will pass Roman Civilization, knock on wood!) As the end looms on the horizon, I am feeling a spectrum of mixed emotions. On one hand, I am excited about my future after Northwestern, but on the hand, it will be difficult to leave the nest where I have happily spent the past four years.

I owe both sentiments, at least in part, to the mathematics department. I will be starting my doctorate in economics in Cambridge next fall, but it would not have been possible without the superb mathematical training from my home department. It is hardly an exaggeration to claim that a rigourous course in real analysis is first item admissions committees at economics departments look for on the transcripts of potential applicants. The mathematics curriculum has prepared me well for a career after Northwestern, but the reason why graduation will be so bittersweet has been my experience outside the classroom. I still remember being a bright-eyed freshman when I declared my mathematics major in Mike Stein's office. Ever since the first week of my first year at Northwestern, the mentorship from the faculty has been truly wonderful. Of course I am biased, but I would argue that mathematicians are probably the smartest professors, yet they are also the most modest, down to earth folks you will ever meet. I have always enjoyed the company and conversation of the faculty and graduate students each time I stay for afternoon tea in the lounge. As I embark on my own academic career, I hope that wherever I go, I will find the same collegial environment and camaraderie that I have enjoyed within the math department.

I especially want to thank Mike Stein and Eugene Kushnirsky for their support and friendship during my four years as mathematics major. Eugene has had to put up with me since freshman year calculus, and then through analysis and topology. I assure you that is no easy feat of patience! I probably spent countless hours in his office hours shooting the breeze, perhaps at the expense of the good students. From the very first time we met, Professor Stein has always been an endless source of wisdom and interesting stories. He matches the classical archetype of the friendly, grandfatherly professor, but whenever I am in his office I feel as if we are old friends. Years down the road, when I come back to Northwestern, I know that I will always be welcomed home to Lunt.

—George Lu, WCAS '12

George Lu is Co-President of the Undergraduate Math Club and represents Mathematics on the Dean's Student Advisory Board.

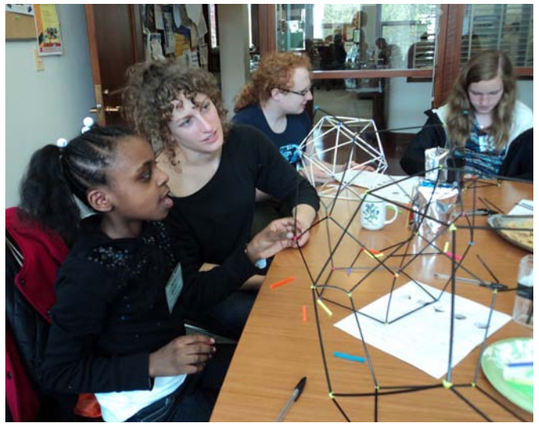





Photos this page clockwise from top left: Staff members Nancy Hickey (left) and Cheryl Albiniak with Nemmers Prize recipient Terence Tao; 2012 Holiday Pary; At the department toast honoring Mark Pinsky (front row 3rd from left) and Joe Jerome (2nd row 2nd from left) on the occasion of their retirement at the end of 2011-12; Annual Holiday Party; Tim Ridenour (red hat) and Van Cyr (striped shirt) are awarded Math Department Excellence in Teaching Awards; Evolution Equations: A Workshop in Honor of Terence Tao.



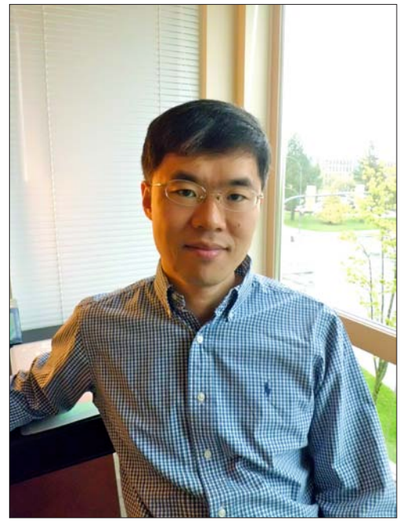





Photos this page clockwise from top left: Steve Zelditch honored at a reception after his investiture as the Wayne and Elizabeth Jones Professor in Mathematics; Audience attending investiture of Steve Zelditch as the Wayne and Elizabeth Jones Professor in Mathematics; Eric Zaslow (center) awarded a Charles Deering McCormick Professorship of Teaching Excellence; Undergraduate Dinner; Kids learn about math comcepts at Take Our Daughters and Sons to Work Day; 2012 Holiday Party.

Young-Heon Kim,

PhD, Class of 2005



Professor Young-Heon Kim received his PhD from Northwestern in 2005. Since then, he has worked at the Universities of Toronto and British Columbia, where he is currently an Assistant Professor. This year, he received a Research Fellowship from the Sloan Foundation, which is awarded to only 20 young mathematicians in North America each year (and only 126 in all fields of science), and shared the Aisenstadt Prize awarded annually to a young Canadian mathematician by the Centre de Recherche Mathématiques in Montreal. This email interview was conducted with Professor Ezra Getzler.

EG: How would you describe what you work on to a non-specialist?

YHK: My recent research is in optimal transport theory. One wants to understand how to transport a resource distributed over a region over to another region in the most efficient way, where efficiency is measured by a given cost function. For example, how do you match given water resources to population distributions in the most cost-effective way?

A fundamental issue is estimating derivatives of optimal transport maps, which are solutions to highly nonlinear partial differential equations, called Monge-Ampère type equations. I have been working on this problem, especially where the transportation occurs in a landscape which is not Euclidean.

EG: Does your work have any real-world applications?

YHK: My motivation for working on these problems of regularity is purely mathematical. But a rigorous understanding of smoothness of solutions to differential equations leads to better numerical algorithms for finding solutions in practice.

Optimal transportation theory has seen many recent applications in economics, biology and physics. For example, the applied mathematician Qinglan Xia (University of California, Davis) has used optimal transport theory to predict the shapes of leaves.

EG: You have worked at universities in Korea and North America. Is there anything you wish we at Northwestern could learn from Korean universities, or vice versa?

YHK: I am not good at answering this kind of question, but I will try!

I think it would be beneficial for Koreans if there were more emphasis on communication skills and collaboration, as I have found that there is in North America. On the other hands, Korean students seem to be more independent than students in North America: I think they try to be less reliant on their peers and their professors.

EG: Congratulations on your Sloan Fellowship. Do you have any ideas on how you plan to use it?

YHK: Thank you very much. This award would not have been possible without the help of many people around me over the years (including many at Northwestern!). I will be using the fellowship to participate in the special programs in optimal transportation at MSRI (Berkeley, California) in Fall 2013, and the Fields Institute (Toronto) in Fall 2014.

Paul Goerss, *Director of Graduate Studies*

The Department of Mathematics is an exciting and vibrant community of scholars. There are around a hundred of us, all working on a multi-faceted project of research and teaching. Nearly half of the members of this community are graduate students, and they make important contributions to all aspects of the program.

The 2011-12 academic year began when we welcomed the first-year class of eleven new graduate students. They are a diverse and accomplished group from top institutions: seven received their undergraduate degrees in the US or Canada, two from China, and one each from Korea and Switzerland. The year will end with graduation of eleven new PhDs. Of particular note are Austin Ford, who will be a Szego Instructor at Stanford with an NSF Postdoctoral Fellowship next fall, and Owen Gwilliam, who will go on to Berkeley, also with an NSF Fellowship.

In between these beginnings and endings, the on-going students have a remarkable impact, both in the department and nationally. Two of our students, Austin Ford and Hiro Tanaka, hold Presidential Fellowships, the most prestigious award Northwestern bestows on graduate students. Hiro, Jesse Wolfson and Joel Specter hold National Science Foundation Graduate Fellowships, and four more Fellows will join us next year. PhilSang Yoo, one of our first year students, holds a Samsung Fellowship. Other students are supported on the Department's Research Training Grant in Mathematical Physics.

Inside the department, we recognized the accomplishments of our students. Vesna Stojanoska who won the Best Thesis Prize in 2011 is now a Moore Instructor at MIT and will give a lecture series at the University of Bochum this summer on her work. A newer award, created through the generosity of Professor David Nadler, is the Gelfand Award for extraordinary contributions to the research goals of the community of graduate students. This year's winner was Boris Hanin, joining past winners Owen Gwilliam and Austin Ford. In teaching, Maria Stadnik has recently been awarded the Outstanding Graduate Student Teaching Award by the Weinberg College of Arts and Sciences.

Professor Paul Goerss presents the Mathematics Department Best Thesis Award to Owen Gwilliam.

Outside the department, graduate students Hiro and Owen, along with Shee Ganatra and Saul Glasman of MIT, organize the MIT Talbot Workshop, which gathers graduate students from all over with a faculty mentor to work through some topic of current research. This year, they will work through Goodwillie's Calculus of Functors with Professor Greg Arone and Michael Ching. Now in their ninth year, the Talbot Workshops were originally organized by John Francis, Mike Hill, and Andres Henriques. We recently hired John as an Assistant Professor and Mike Hill will be in residence next year as part of our emphasis year in algebraic topology. Our students have been able to go to many other exciting conferences and workshops, partly because of a generous grant from an alumnus specifically for graduate student travel. With the aid of these grants, our students have been all over the country and the world.

Professor John Alongi presents the Mathematics Department Graduate Teaching Assistant Award to Boris Hanin.

Finally, in alumni news, Congratulations to Young-Heon Kim, a former student of Ezra Getzler and currently an Assistant Professor at the University of British Columbia, on his receipt of the Andre-Aisenstadt Prize for 2012. This prestigious prize recognizes talented young mathematicians in Canada; past winners include Ravi Vakil and Nigel Higson.

First year grad students, shown here performing a new dance, organized entertainment at the Math Department's annual Holiday Party.

Remembrance from Mark Pinsky

Mark Pinsky(left) was honored at a dinner held during the 33rd Midwest Probability Colloquium. Mark has been the main organizer of the colloquium since it started in 1979. He is retiring from Northwestern at the end of this academic year and is shown here "passing the colloquium bell" to Elton Hsu who will take over responsibility for the annual colloquium.

The following is a remembrance written by Mark Pinsky for this newsletter. Mark is retiring at the end of the 2011-12 academic year.

Professor X faces a calculus class, held in one of the smaller lecture rooms in the Technological Institute. Just before the class begins, there enters a workman who purports to be repairing a leak underneath one of the demonstration tables equipped with water. The problem of "identity theft" is handled loosely by the proclamation of the workman – "Here is my work order" as he pulls out a folded sheet of paper from his hip pocket.

The lecture begins, coupled with the clanking noise of the various wrenches and pliers necessary to seal the leak. At one point, Professor X asks the students to find the derivative of the function $y = 3x^2$. Without further ado, the workman blurts out from below "THE DERIVATIVE IS $y' = 6x$".

What a sophisticated school, where repairmen are fluent in calculus and make no bones about sharing this with the student body. Later it became apparent that the workman was Professor Y, a good friend of Professor X and looking for some theatrical touch to spice up the otherwise predictable engine of calculus.

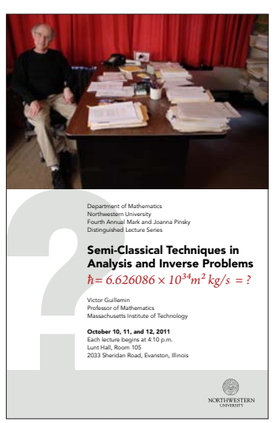
Later in the same academic year 1968-69, Professor Y treated his calculus class to ice cream cones in the snack shop of Scott Hall, which served as student center prior to the construction of Norris Center in 1973. This "treat" was publicized in the Daily Northwestern, either to indicate small classes, cheap ice cream or the good heartiness of a professor who doesn't take himself too seriously.

From the Chair

continued from front page

Professor, and gave numerous invited addresses including one at the 2012 Spring Central Section Meeting of the American Mathematical Society. Ursula Porod, a visiting lecturer for the past three years, has been appointed to the position of Lecturer and John Alongi has been promoted to the rank of Distinguished Senior Lecturer.

Fields Medalist Terence Tao of the University of California, Los Angeles spent a month in residence again this year, in conjunction with the awarding of the Nemmers Prize. The department held a ``Workshop on Evolution Equations'' in his honor, attended by experts from all over the world. Next year we look forward to the visit of our next Nemmers Prize winner, Ingrid Daubechies of Duke University.

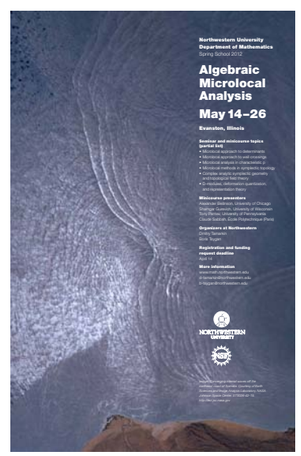


This year's Mark and Joanna Pinsky Lecture series hosted 3 talks by Victor Guillemin from the Massachusetts Institute of Technology.

The department also enjoyed the visit of Professor Victor Guillemin from Massachusetts Institute of Technology, who gave the Mark and Joanna Pinsky Lecture Series. His three lectures on ``Semi-Classical Techniques in Analysis and Inverse Problems'' filled Lunt's largest lecture room to capacity.

After many years of over crowding, the department acquired new space in 619 Emerson. Eight faculty moved there and we were able to give a permanent home to a Calculus Help Room. While we still dream of an addition to Lunt, this did alleviate the overcrowding.

This is my final year as chair, and I am happy to be leaving the department in good hands, with Jared Wunsch taking over as chair. I will be in enjoying a year of leave in Paris and look forward to hearing more excellent news from Evanston.

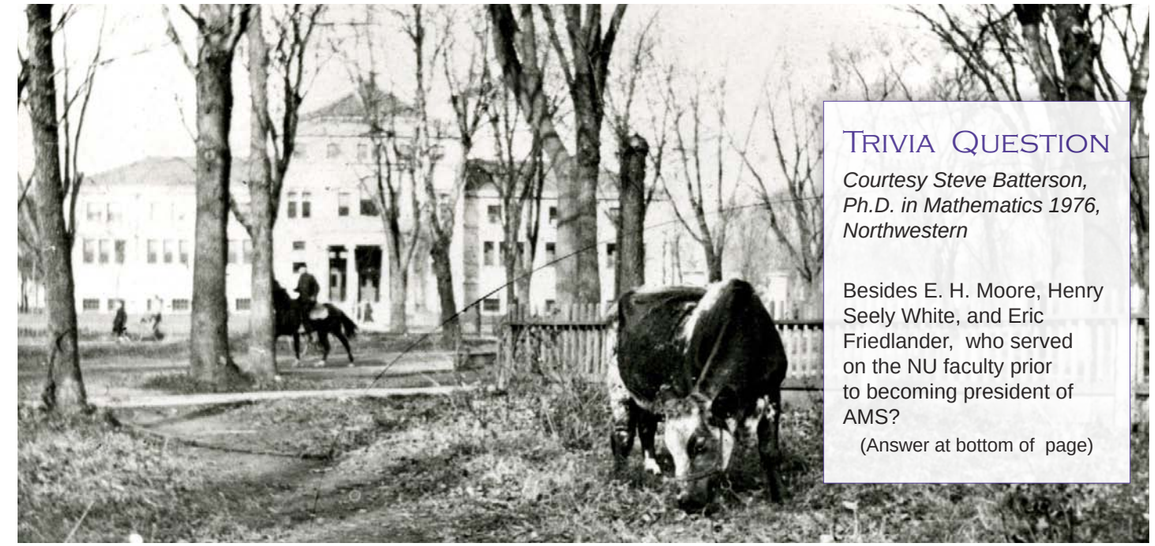


The Spring School on Algebraic Microlocal Analysis hosted 70 scholars over twelve days.

Best wishes,

Bryna Kra
Chair, Department of Mathematics

Mathematics History



Historical photo of Lunt Hall.

Photo *courtesy of The University Archives*

Trivia Question

Courtesy Steve Batterson, Ph.D. in Mathematics 1976, Northwestern

Besides E. H. Moore, Henry Seely White, and Eric Friedlander, who served on the NU faculty prior to becoming president of AMS?

(Answer at bottom of page)

Excerpted from :

A History of the Department of Mathematics At Northwestern University 1855-1905

prepared by Thomas F. Holgate

When Northwestern University was opened in 1855 the study of Mathematics in schools and colleges throughout the United States was at a low ebb and the field of such study in America was quite restricted; higher mathematics in the modern sense was practically unknown.

As an indication of the extent of such studies in the lower schools throughout the country, it may be pointed out that the demands for admission to the oldest colleges included only a knowledge of elements of arithmetic, the rudiments of algebra with ability to solve simple equations, and in rare instances an introduction to geometry. At Harvard, for example, in 1851, the specifications for entrance were Davies and Hill's arithmetic; Euler's Algebra or Davies' First Lessons in Algebra to the Extraction of the Square Root; an Introduction to Geometry and the Science of Form, prepared from the most approved Prussian Textbooks. At Yale the mathematics required for admission was Thomson's Higher Arithmetic; Day's Algebra to Quadratic Equations; Playfair's Euclid, the first two books.

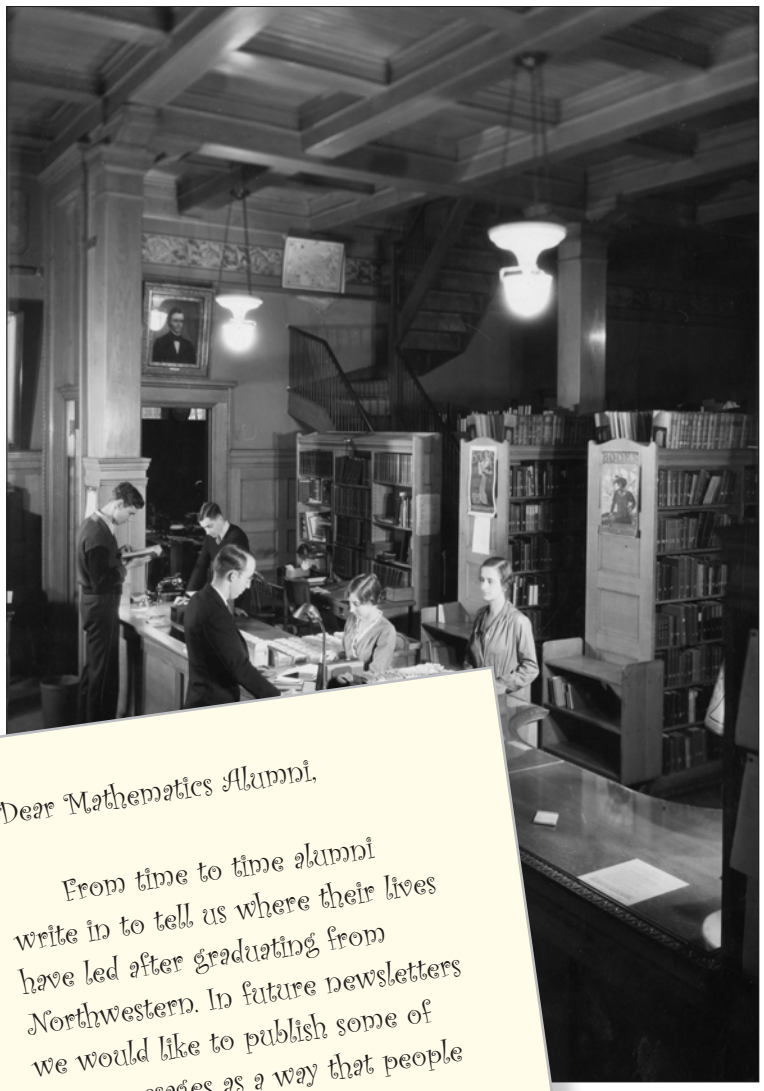
In college administration, the department of Mathematics seldom stood by itself but was commonly coupled with some other as Astronomy or Natural Philosophy. At Harvard again in 1851-52, Benjamin Peirce was Perkins Professor of Astronomy and Mathematics while Joseph Lovering was Hollis Professor of Mathematics and Natural Philosophy.

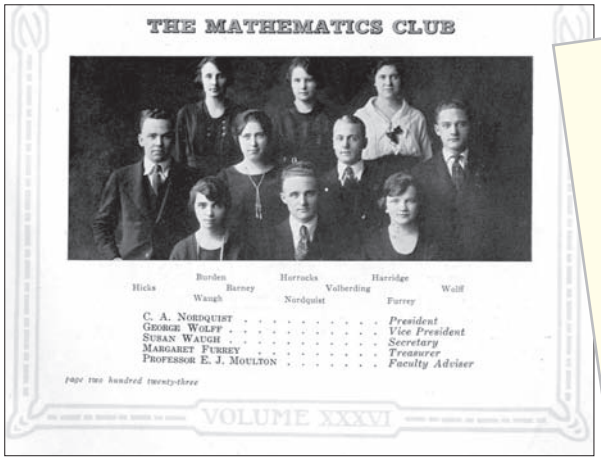
When, therefore, the first appointment to the faculty at Northwestern were a professor of Mathematics, a professor of Classical Languages, and a professor of Rhetoric and English Literature, it would seem that the plan of the young institution was well in line with the most advanced among American colleges. These first appointments, made June 25, 1854, were Henry S. Noyes, Professor of Mathematics; W. D. Godmen, Professor of Classical Languages; and the Reverend Abel Stevens, Professor of Rhetoric and English Literature. Since the last of these three did not accept the appointment, the first faculty of Northwestern University consisted of two members, or whom one was Henry S. Noyes, Professor of Mathematics.

Henry Sanborn Noyes was born December 24, 1822, at Landaff, New Hampshire; was prepared for college at Newbury Seminary, Vermont, and graduated from Wesleyan University, Middletown, Connecticut, in 1848. For a short time during his undergraduate days he taught at Newbury Seminary and immediately following graduation taught in Springfield, Vermont. In 1850 he returned to Newbury Seminary as teacher of Mathematics and Greek, later becoming Principal, in which position he remained for a year after his election as professor of Mathematics at Northwestern University...

Trivia Question Answer: R. L. Moore

Alumni Corresponence





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VOLUME XXXVI

Historical photos of The Mathematics Club and Lunt Library. *Photos courtesy of The University Archives*

Dear Mathematics Alumni,

From time to time alumni write in to tell us where their lives have led after graduating from Northwestern. In future newsletters we would like to publish some of these messages as a way that people can keep in touch. To send a message, just log in at this link:

http://www.math.northwestern.edu/alumni-correspondence/

Best regards,
Department of Mathematics,
Northwestern University

If you make a gift of $15 or more to the Math Department, we will send you an official Northwestern Mathematics T-Shirt! (while supplies last)

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