

Duke University

Math News

May 10, 2015



• ♦ • Graduation 2015 EDITION • ♦ •

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Graduation Edition

math.duke.edu

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Commencement

Congratulations to students in the Duke Math community for your accomplishments this year. The 47 math majors and 28 math minors graduating this spring will scatter towards a variety of career paths including graduate school in mathematics, high school teaching, and financial analysis and consulting. These students have each succeeded in one of the University's most challenging programs and this experience will prepare each of them for a rewarding career.

To those of you who are leaving Duke, we wish continued success. At the Graduation Luncheon following graduation exercises on May 10, first majors in math have the opportunity to introduce your family to your classmates and professors. Following the lunch, you will receive your diploma in a short and sweet ceremony.

Do send *Duke Math News* a note from time to time.

Events

Math Faculty Student party

Math majors, graduate students and faculty enjoyed a break on the day after the end of classes to share food and conversation in an informal setting. Graduating students, contest participants and research students were recognized for their hard work and accomplishments. Several were rewarded with 2015 Duke Math shirts, certificates and some generous cash prizes.

Conference for Undergraduate Women

The Southeastern Conference for Undergraduate Women in Mathematics will be held November 7-8, 2015, at Duke. This conference is organized by Emily Braley and Sarah Schott with support from a TENSOR grant from the Mathematical Association of America.

<http://www.maa.org/programs/maa-grants/women-and-mathematics-grants>

Undergraduate News

Duke Math Meet

The 2014 Duke Math Meet took place on Saturday, November 8, with nearly 250 high school students competing.

Columbia Math Club led by David Stoner and Kevin Zhao finished first in the meet. Two teams each from Thomas Jefferson and NCSSM rounded out the top five. Stoner was the individual winner. Kevin Zhao, Sam Hsiang, Sam Kim, Evan Liang and Lloyd Liu participated in the tie breaker for second place.

Thanks to Anne Talkington and Andrew You for coordinating the Meet and to the many Duke student volunteers who devoted long hours to creating problems, registering students, serving meals, and grading solutions.

Undergraduate Research Programs

About 50 Duke undergraduates will receive stipends for participating in math and math related research this summer. These students will be supported by the PRUV Fellow program, the Math Biology REU, the Data+ RTG and other research grants.



- Now in its fourth year, the Mathematical Biology REU will support research of six Duke students, Austin Ferguson, Justin Luo, Kevin Murgas, Emily Shannon, Michael Shen, and Joseph Tharayil, during the first summer term.

- The Data+ Program, which is partially funded by an NSF training grant, provides stipends for 9 weeks of summer research on data-driven problems. Paul Bendich is coordinator of this program. This year the following 37 students are being funded: Sachet Bangia, Nicholas Branson, Ellie Burton, GiSeok Choi, David Clancy, Andy Cooper, Arjun Devarajan, Christine Delp, Bridget Dou, Spenser Easterbrook, Manchen (Mercy) Fang, Haoyang Gu, Sophie Guo, Tess Harper, Brandon Ho, Alex Hong, Kevin Kuo, Joonkyu Lee, Ethan Levine, Yijun Li, Yanmin (Mike) Ma, Sharrin Manor, Hannah McCracken, Tianyi Mu, Kang Ni, Joy Patel, Hans Riess Molly Rosenstein, Annie Tang, Aharon Walker, Kehan Zhang, Wuming Zhang, Xinyi (Lucy) Lu, Luke Raskopf, YunChu Huang, Mike Gao, and Narongsak (Army) Tunjaicon.

These students will work in small teams on projects ranging from weather-prediction via algebraic topology to skull comparison using differential geometry.

<http://www.mathprograms.org/db/programs/342>

- Now in its 15th year, the PRUV program continues to support mentored summer research leading to Graduation with Distinction in Mathematics.

Six students have been named 2015 PRUV Fellows and will work on a variety of research projects from algebraic geometry and number theory to modeling biological systems. They are Fuchsia Chen, Bryan Liu, Tony Qiao, Samadwara Reddy, Kyle Casey, and Paul Ziquan Yang.

- Oscar Li '18 received a grant from ACC Inter-Institutional Academic Collaborative (ACCIAC) program to work with assistant professor Lillian Pierce this summer on questions in analytic number theory relating to counting lattice points inside spheres.

Graduation with Distinction

The following graduating math majors have written their Senior Honors Thesis on their math or math related research



- Rowena Jingxing Gan, *Geometry of Impressionist Music* with Ezra Miller. She will attend the Operations and Information Management program at Wharton.
- David Hemminger, *Augmentation Rank of Satellites with Braid Pattern* with Chris Cornwell and Lenny Ng. He will enter the graduate math program at UCLA.
- Mandy Xiaoyu Jiang, *Dynamic random network model for human papilloma virus transmission* with Marc Ryser. She will study finance at Carnegie Mellon or Columbia.
- Hunter Nisonoff, *Efficient Partition Function Estimation in Computational Protein Design* with Mauro Maggioni. He will continue his research with Dr. Bruce Daniels at Duke.
- Marshall Ratliff, *Introducing the Cover tree to Music Information Retrieval* with Paul Bendich. He will be working in the financial area.
- Brett Schnobrich, *Heisenberg-Weyl Group, Subspace Packings, and Image Processing* with Robert Calderbank. He will join the Boston Consulting Group in Minneapolis.
- Christy Vaughn, *Stochastic Study of Gerrymandering* with Jonathan Mattingly. She will enter the applied math graduate program at Princeton.
- Anne Talkington defended her senior thesis, *Modeling the Dynamics of Cancerous Tumors in Vivo* with Rick Durrett. She plans to graduate in December 2015.
- Math-physics major Eugene Rabinovich wrote his senior thesis *The Conformal Manifold in $N=(2,2)$ SCFTs* with Ronen Plesser for graduation with distinction in physics. He will return to the study of mathematics at the University of California, Berkeley.

NC Election Results

In a paper with her mentor Jonathan Mattingly, Christy Vaughn '15 analyzed the effect of the 2010 redistricting of congressional districts in North Carolina on the 2012 elections. The results of their analysis has been widely quoted in local and national news.

See <http://arxiv.org/abs/1410.8796>

<http://wunc.org/post/duke-mathematicians-investigate-2012-election-results-north-carolina>



Awards

Goldwater Scholar

Congratulations to 2015 Barry Goldwater Scholar Lindsey Brown and to David Builes and Bryan Runjing Liu who received Honorable Mention.

Lindsey has worked with Dr. Mainak Patel on sleep patterns of infant mammals and with professor Mike Reed to model how neural codes represent auditory signals using methods of algebraic topology. She anticipates pursuing a doctorate after Duke. David Builes and Bryan Liu each have completed major research projects and will continue with others this summer.

Lindsey was among 300 engineering, science and mathematics undergraduates to be named Goldwater Scholar. Since the program began in 1986, 30 Duke math majors have won this Scholarship and four others have received Honorable Mention.

<http://goldwater.scholarsapply.org/index.php>

<http://www.math.duke.edu/news/awards/scholarships.html>

Math Contest in Modeling

Duke students once again distinguished themselves in the grueling Math Contest in Modeling. For 96 hours this February, over 7500 teams around the world including only 418 in the US competed in this annual contest. Three open-ended problems were posted at 8pm on Thursday evening and teams researched, created a model, wrote up their solutions and then submitted them to COMAP, the sponsoring organization, the following Monday at 8pm.



Each Duke team, along with 5353 of the others world-wide, devised a strategy to eradicate Ebola. The teams of Andrew You, Tony Qiao, and Roger Zou and of Anne Talkington, Lindsey Brown, and Joy Patel were awarded Meritorious, placing among the top 9% and two of only 21 US teams to achieve that ranking on this problem. Congratulations to them and to Jenny Runzhen Ni, Steve Siyang Wang and

Justin Zihao Zhan for achieving Honorable Mention in this contest.

<http://www.comap.com/undergraduate/contests/mcm/>

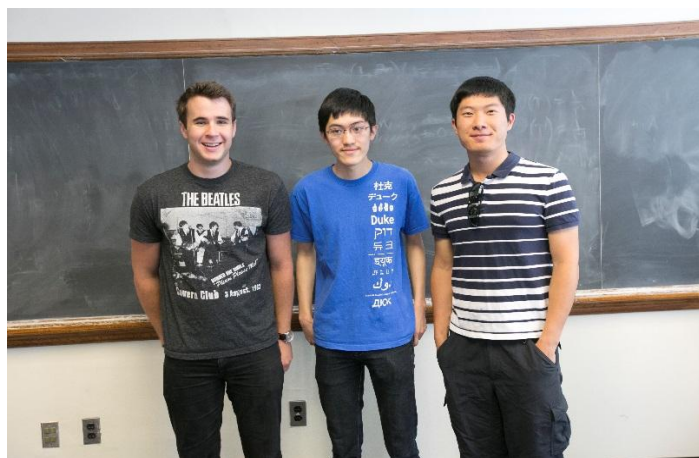
Putnam Competition

The team of Alex Milu, Tony Qiao and Feng Gui finished 8th among 577 colleges and universities in the 75th W.L Putnam Mathematical Competition. Tony Qiao received Honorable Mention and Alex Milu also ranked among the top 100 of the 4320 students in the US and Canada who participated. Trung Can, Feng Gui and Justin Luo also ranked among the top 200.

For the 21th time in the past 25 years, the Duke Putnam team placed among the top ten on the 75th W. L. Putnam Mathematical Competition. During this stretch, Duke achieved 3 first place finishes, 2 seconds and 6 thirds.

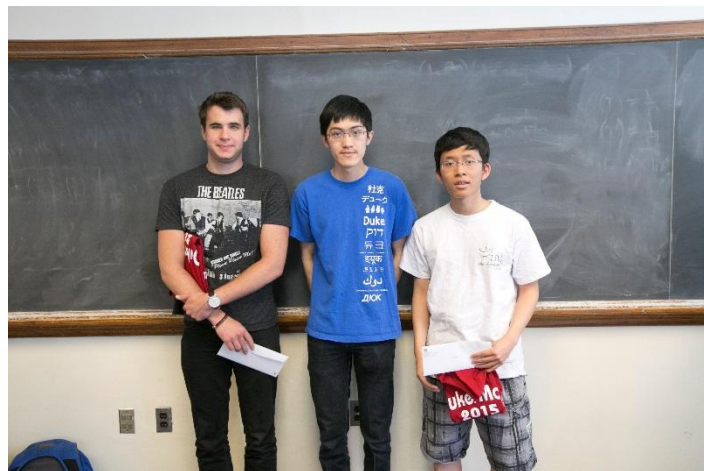
Congratulations to all who participated.

<http://www.math.duke.edu/news/awards/competitions.html#putnam>



Karl Menger Award

Tony Qiao'17, Alex Milu'16 and Trung Can'18 are the winners of the Menger Award given for excellence in mathematical competitions.



Karl Menger exerted a strong influence on many fields of mathematics in Europe and America throughout his long life. He was a member of the Vienna Circle, a group of philosophers and mathematicians that included Carnap, Gödel, Hahn and Reidemeister. Menger's daughter established the Menger Fund in 1990 in his memory.

<http://www.math.duke.edu/news/awards/menger/index.html>

Julia Dale Prize

The Julia Dale winners for 2015 are David Hemminger and Eugene Rabinovich. Hemminger has excelled in graduate level math courses at Duke and in Budapest and is joint author with his mentor, Chris Cornwell, on a paper in knot theory. He will attend the graduate program in mathematics at UCLA. Rabinovich has studied problems in string theory with his mentor Ronen Plesser. He is Goldwater Scholar and Faculty Scholar. He will continue his study of mathematics at Berkeley.



From the many nominees for the freshman Julia Dale prize, Feng Gui, Brandon Ho, Oscar Li, and Gehua Tong were selected for their excellent scholarship early in their mathematical career. We wish each continued success as they continue their education.



Julia Dale taught at Duke for several years before her

untimely death in 1936. Friends and relatives established a fund in her name to honor the most distinguished students in mathematics.

<http://www.math.duke.edu/news/awards/dale/index.html>

Graduate Student News

Humberto Diaz was one of three winners of the Inter-university scholar grant between Duke and UNC. The grants are designed to fund student-led scholarly projects that drive meaningful collaboration between Duke University and the University of North Carolina at Chapel Hill.

With the support of Kenan-Biddle Grant, Humberto and two winners from UNC will organize 6 research talks throughout the 2015 academic year. Ellen Eischen (UNC) and Heekyoung Hahn (Duke) will serve as faculty sponsors.

<http://studentaffairs.duke.edu/ovp/initiatives/kenan-biddle-partnership/kenan-biddle-proposal-guidelines>

May 2015 PhD Graduates and Their Thesis Titles:

- Benjamin Gaines: *Aspects of the $(0,2)$ -McKay Correspondence*
- Tingran Gao: *Hypoelliptic Diffusion Maps and Their Applications in Automated Geometric Morphometrics*
- Andrew Stewart Goetz: *The Einstein-Klein-Gordon Equations, Wave Dark Matter, and the Tully-Fisher Relation*
- Kevin Kordek: *Theta Functions and the Structure of Torelli Groups in Low Genus*
- Tatsunari Watanabe: *Rational Points of Universal Curves in Positive Characteristics*
- Yuan Zhang: *Applications of Spatial Models to Ecology and Social Systems*

Faculty News

Phillips Griffiths professor **Robert Bryant** has assumed his role as President of the American Mathematical Society. He has been featured in the AMS Notices recently:

<http://www.ams.org/notices/201503/rnoti-p260.pdf>

Associate professor **Lenny Ng** has been named Simons Fellow for 2015. The Simons Fellows awards were based on the applicant's scientific accomplishments in the five-year period preceding the application and on the potential scientific impact of the leave period. The program provides relief from teaching and administrative obligations to encourage strong intellectual stimulation and increased creativity and productivity in research

<https://www.simonsfoundation.org/funding/funding-opportunities/mathematics-physical-sciences/simons-fellow-program/simons-fellows-awardees-mathematics/>

James B. Duke professor **Ingrid Daubechies** has been elected member of the National Academy of Engineering, the highest professional distinction accorded to an engineer. Academy membership honors those who have made outstanding contributions such as "pioneering of new and developing fields of technology." She was honored at the 75th anniversary celebration of the Engineering school held on April 24.

On a lighter note, Professor **Hugh Bray** has written a children's book "Trevor the Time Traveler" aimed at promoting math and science to young people. He talked about the science behind the book at the University of Waterloo in March to a large audience of kids and their parents. During the same research visit he also gave another outreach talk, "From Pythagoras to Einstein: The Geometry of Space and Time," aimed at high school and college students.

Department News

Elliott Assistant Research Professorships

In 1979, professor emeritus William W. Elliott (1898-1993) endowed a fund to hire assistant research professors. The University has agreed to honor Professor Elliott by naming the six three-year positions, William W. Elliott Research Assistant Professors.

In 1925, William W. Elliott became the first Ph.D. (Cornell) to teach mathematics at Duke. He continued teaching here for 43 years until his retirement.

Major Grant for Big Data

The University has received \$9.75 million for the information initiative at Duke and its study of Big Data. Robert Calderbank, iiD director and professor mathematics, electrical and computer engineering, and computer science, expressed his gratitude for this generous support. "The availability of massive amounts of data within every

disciplinary domain is transforming research and education." The gift will endow iiD professorships, graduate fellowships in engineering, and educational programs on data-driven problem-solving, both in the classroom and in the field.

Math Degree Candidates

Academic Year 2014/2015

FIRST MAJORS

Mr. Michael Forster Baker
 Mr. Daniel Yifan Ding
 Mr. Zachary Dell Freeman
 Ms. Jingxing Gan
 Ms. Yaqi Guo
 Mr. David Russell Hemminger
 Mr. Nathan Hsieh
 Ms. Xiaoyu Jiang
 Mr. Thomas M Kavanagh
 Ms. Jolie Faye Kemp
 Mr. James Wilson Kennedy
 Mr. William Walton Knowles
 Mr. Joonkyu Lee
 Mr. Ray Alan Lee
 Ms. Emilia Liakhovitsner
 Mr. Victor Liao
 Mr. Hunter Morris Nisonoff
 Ms. Ha Won Park
 Mr. Marshall Messer Ratliff
 Mr. Julian Andres Salazar
 Mr. Thomas Wirt Sale IV
 Mr. Akshay Vinod Save
 Ms. Katharine Wheeler Saveliff
 Mr. Brett Thomas Schnobrich
 Mr. Kevin William Shamieh
 Ms. Diana Maria Stan
 Ms. Christy Jessica Vaughn
 Ms. Kari Elizabeth Vaughn
 Mr. Xiao Wang
 Mr. Christopher Steven Williams
 Ms. Huannan Wu
 Mr. Dennis Born Zhan
 Mr. Michael Jianqiu Zhang

SECOND MAJORS

Ms. Mollie Caroline Breen
 Mr. Nikolai Bogdanov Doytchinov
 Mr. Jonathan Yunshan Gao
 Mr. Ellango Jothimurugesan
 Mr. Duke Duk Kyeom Kim

Mr. Daniel Frank Luker
 Mr. Viju Johnny Mathew
 Mr. Tyler Calvin Nisonoff
 Mr. Chinmay M. Patwardhan
 Mr. Eugene Simon Rabinovich
 Ms. Laxmi Rajak
 Mr. Benjamin Matthew Schwab
 Mr. Sean Alan Scott
 Mr. Matthew Dylan Tyler
 Mr. Mingjun Wang
 Mr. Yueran Zhang

MINORS

Mr. Ali Habib Bootwala
 Ms. Emily Fitch Briere
 Mr. Li Ding
 Ms. Nicole Ashley Gagnon
 Mr. Stephen Matthew Hebert
 Mr. Mao I Hu
 Mr. Yu-Sheng Huang
 Mr. Alexander G. Kazandjian
 Mr. Paul Hyung Suk Kim
 Mr. Thomas Philip Klebanoff
 Mr. Jae Min Lee
 Mr. Seunghyun Lee
 Mr. Hao Liu
 Mr. Brian Luo
 Mr. Gregory Ramon Syntel McLean
 Ms. Crystal Elaine Owens
 Mr. Kenneth Segall
 Mr. Rod Shayesteh
 Mr. Hyun Moh Shin
 Mr. Daniel Joseph Sykora
 Ms. Zixuan Tai
 Mr. Anthony Christopher Weishampel
 Mr. Yifan Ye
 Mr. Haigreeva Narayana Sainath Yedla
 Ms. Ji Soo Yoon
 Mr. Justin Xiyao Yu
 Ms. Beike Xu
 Mr. Chi Zhang

MASTER OF ARTS

Mr. Zachary Doenges
 Mr. Noah Lavine

DOCTORS OF PHILOSOPHY

Dr. Benjamin Charles Gaines
 Dr. Tingran Gao
 Dr. Andrew Stewart Goetz
 Dr. Kevin Anthony Kordek
 Dr. Tatsunari Watanabe
 Dr. Yuan Zhang

Duke Math News

The Duke Math News is published several times a year and is distributed to those in the Duke Mathematics community. For previous editions and other news, see <http://www.math.duke.edu/news/>. We welcome items of interest for our next issue. Send them to dept@math.duke.edu or dkrain@duke.edu.

To read about other news, honors and events concerning mathematics at Duke, visit <http://www.math.duke.edu/news/>. The on-line calendar at <http://www.math.duke.edu/mcal> lists both regular and special seminars and colloquia for the upcoming weeks. The department maintains video archives of talks, lecture series and special conferences at Duke, many of which are available, online.

See <http://www.math.duke.edu/computing/broadcast.html> for more information.

-David Kraines, DMN Faculty Sponsor

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