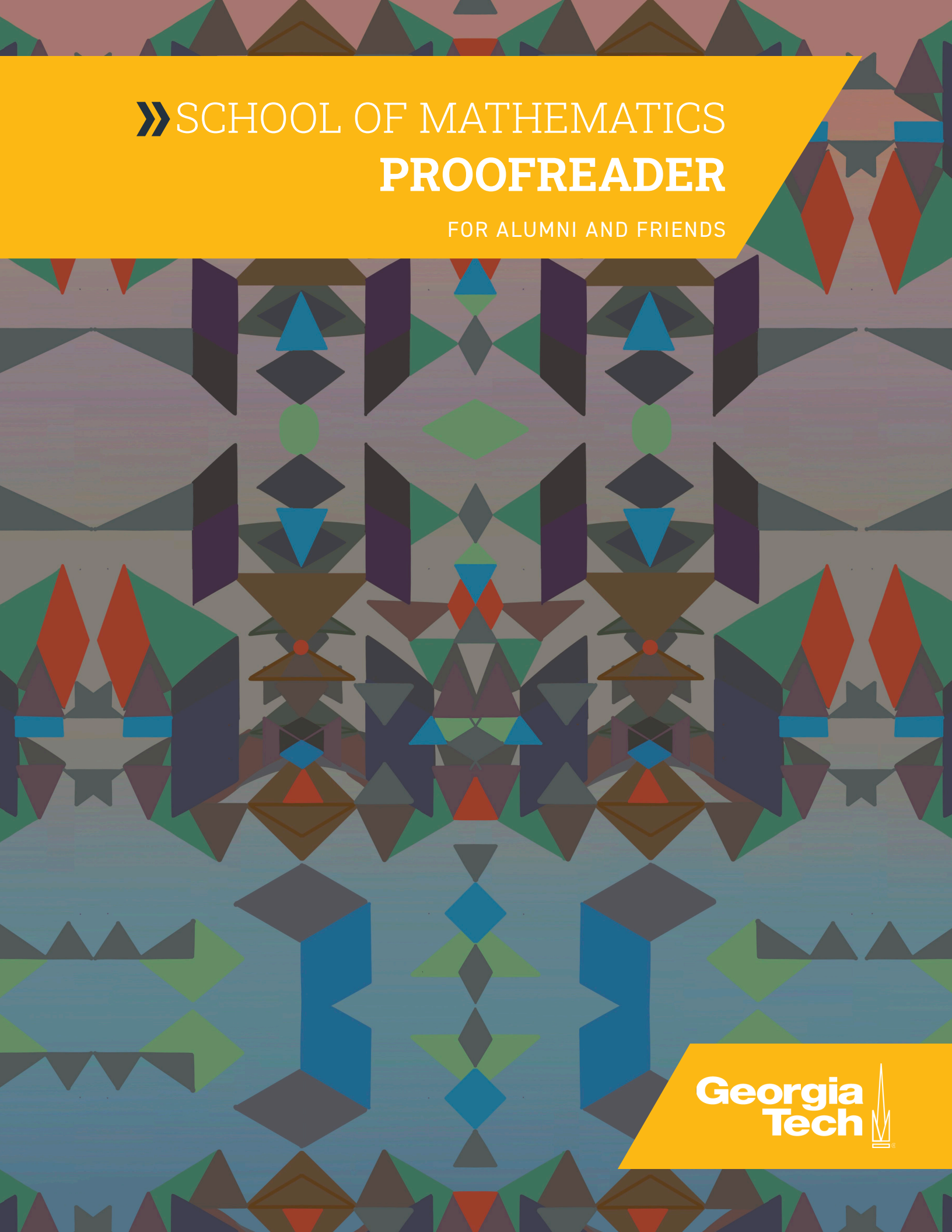


SCHOOL OF MATHEMATICS

PROOFREADER

FOR ALUMNI AND FRIENDS

Georgia Tech

LETTER FROM THE CHAIR

JULY 28, 2024 | ATLANTA, GA

SoM Chair Mike Wolf

I've now been chair of this fantastic school for a bit over two years, and it's been a wonderful whirlwind of activity. I have loved getting to know this school and its students and discovering all of its programs. Everyone has been so welcoming and supporting, and I am excited to help with creating all that we will accomplish together in the next few years.

I will want to dwell in this note a bit later on how you can involve yourself more in what we do, but first, let me start by setting the stage with a snapshot of the school at the moment. We have a faculty of nearly 100(!) comprising cohorts of academic professionals, postdoctoral faculty and fellows known as Visiting Assistant Professors, and tenure-track Professors. There are now about 130 graduate students studying for degrees in six different research areas, and about 400 undergraduate majors in five different concentrations.

> The School of Mathematics teaches one out of every nine undergraduate credit hours at Georgia Tech, from precalculus and calculus, advanced linear algebra, and differential equations, to a broad collection of more advanced classes.

The Teaching Mission

We have an enormous presence on campus, teaching one out of every nine undergraduate credit hours. As all of you know, Mathematics touches just about all areas of scientific knowledge and technological endeavors, usually in a myriad of ways. Of course, large swaths of the undergraduate student body pass in their early years through our precalculus and calculus classes, and then through our somewhat more advanced courses on linear algebra and differential equations -- but we also teach a broad collection of more advanced classes to students from just about all the majors on campus.

Statistics, Numerical Analysis, Probability, Algebra, Partial Differential Equations, Graph Theory, Number Theory, Combinatorics, Mathematical Biology -- we do it all! Did you know that we teach a 3000-level class on Discrete Mathematics to more than a third of every entering class, every year?

SoM Chair Mike Wolf

Our Distance Learning Program

Here's a program that deserves to be better-known. Many high school students exhaust their high school's calculus classes before they graduate high school. But they are eager to learn Mathematics, so what should they do? We have a distance learning program that this year will provide a dual enrollment opportunity to more than 1300 high school students at about 100 students in Georgia.

> Our Distance Learning program celebrates its twentieth anniversary this year, and expands this year in a pilot program to provide a precalculus course to two local Title I high schools.

Driving this program is a committed team of faculty and staff that includes Professor Michael Lacey, Academic Professional Greg Mayer and Senior Lecturer Stephanie Reikes, among others.

Georgia Tech College of Sciences

School of Mathematics

Get Involved!

Ok, I promised to say how you can be more involved.

> Here's a first, easy, inexpensive and very impactful way that you can get involved: tell us what you did with your math major!

On page 69, you can read a profile of our alumna Nikki Cross BS (Applied Math) 2001, MS (Analytics) 2021. I hope you'll quickly turn to read Nikki's story. Of course, like many of our majors, she followed a path of problem-solving through some industry that she likely didn't anticipate a career in as an undergraduate. But mathematics training is uniquely useful: our graduates are comfortable with quantitative reasoning and are great problem-solvers. They have careers in many directions.

Be Featured on our Website

One of our greatest challenges in the School of Mathematics is communicating all of the opportunities that Mathematics presents to prospective students. They love Mathematics, but will it lead to a career? They are not sure...and often neither are their parents.

> So, please write to me at comm@math.gatech.edu and send me a paragraph about what you are doing with your math major to be featured on our website.

With your permission, I'll assemble all of these stories into a webpage so that students can see how truly applicable a math major can be. And we'll be reaching out for more profiles in the months to come.

In this Edition

So much has happened since I last wrote to you. Please read about the major research awards and accomplishments of our faculty, the extraordinary undergraduate research conducted by our students, the prizes won by our graduate students, our outreach at the Atlanta Science Festival and at High School Math Day, two dramatic theater performances highlighting women's experiences in Mathematics, the many conferences we ran encompassing several fields, and our two generously funded and highly attended Stelson lectures by Yale Chair Wilhelm Schlag and Fields Medalist Hugo Duminil-Copin.

Mathematics at the Core

> We live in a golden age of mathematics, where the work we are doing is having real-time, foundational effects on creating the next landscape of the world that we will all live in.

Machine Learning and Artificial Intelligence are the most striking examples of our recent effects on the world, but while this work fundamentally involves many branches of mathematics -- from geometry to stochastic analysis -- in fact there are many other areas of math that are prominent as well: percolation theory explains breakups of ice covers, topology informs data, and algebraic geometry powerfully drives the computer vision software in self-driving vehicles. And Tech Mathematics is at the core of all of it.

We hope that you enjoy reading about everything that has been happening, and we hope to hear from you soon. Finally, if you find yourself in Skiles, feel free to drop in for a visit!

SoM NEW STAFF AND STAFF PROMOTIONS

AUGUST 6, 2024 | ATLANTA, GA

The School of Mathematics would not function without the constant support of our incredible staff. We welcomed three new staff members and celbrated two promotions this year. Thank you for all that you do!

New Staff

» Alfred "Don" Bryant and Jasmine Richardson
Faculty Support Coordinators

Don and Jasmine (not pictured) help to prepare, process and submit travel expenditures for faculty, post docs and graduate students. They also provide conference and colloquium support, as well as helping to make orders and process payments for specialty items such as books, membership renewals, and technology needed for teaching. Don is also one of the new members of the DEI committee.

» Tranae Caldwell
Graduate Academic Program Coordinator II

Tranae provides support for the graduate program such as keeping records, employment information, helping to resolve visa issues, admissions support, and processing grade corrections. Tranae is also responsible for the graduate student orientation, campus tours, and assists with the distribution of course textbooks.

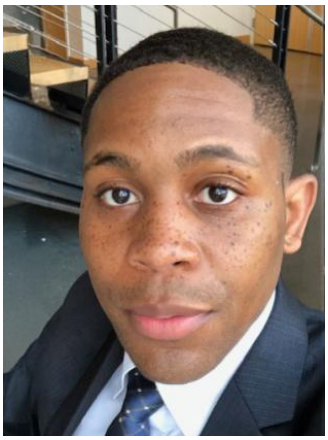
Staff Promotions

» Rayshma Pereira
Administrative Manager II

Rayshma manages all faculty, graduate student and undergraduate hiring, and she is responsible for faculty affairs such as leaves, appointments, and re-appointments. Rayshma also helps to resolve HR issues, processes payroll for biweekly employees, and she also processes supplemental payments.

» Kaprina Zachary
Financial Analyst II

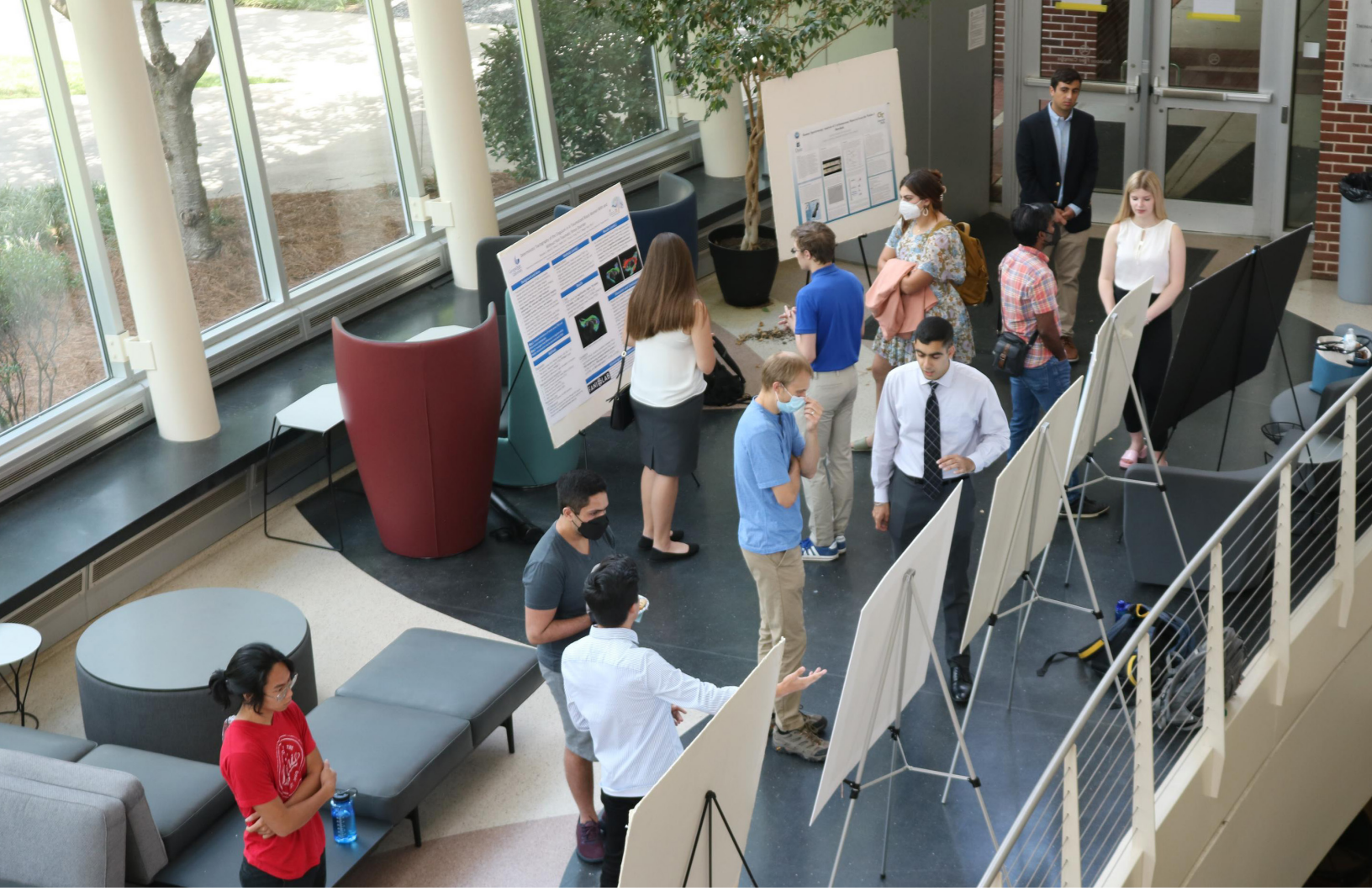
Kaprina handles the overall financial planning for the department, which includes monitoring and reconciling State financial budgets for accuracy. She manages the start-up/research funds as well as the video and distance learning funds. Kaprina also assists the staff payroll team to ensure correct worktag is utilized for hired staff and students.


Alfred "Don" Bryant


Tranae Caldwell


Rayshma Pereira


Kaprina Zachary



Students conduct poster sessions during 2022's Summer Research Experience for Undergraduates (REU) in the Ford Environmental Science and Technology building. (Photo Renay San Miguel)

UNDERGRADUATE STUDENT RESEARCH 2022: SUMMER ACROSS THE COLLEGE OF SCIENCES

August 2, 2022 | Atlanta, GA

As the mercury climbed across Atlanta this summer, student research heated up across the College of Sciences, thanks to special summer programs for undergraduates from around the globe that help undergraduates get a head start on research experience for STEM careers in academia, industry, and beyond.

This year's initiatives included National Science Foundation Research Experiences for Undergraduates (NSF REU) programs, an initiative to engage Georgia community college students, summer workshops in computational chemistry and quantitative biosciences, and more.

Through the workshops, students learned to navigate new methods of research that involve data analysis and computational aspects of disciplines like chemistry and biology — as well as communicate connections across concepts like group theory, topology, combinatorics, and number theory.

NSF REUs feature conferences and student workshops that offer ample opportunities for students — current, prospective, and visiting — to hone their research skills in the College of Sciences.

Meanwhile, the NSF REU programs across the College's six Schools of Biological Sciences, Chemistry and Biochemistry, Earth and Atmospheric Sciences, Physics, Psychology, and

Mathematics, as well as the Undergraduate Neuroscience Program, allowed early-year students to get their first taste of in-depth research with unique expertise and equipment available at Georgia Tech.

Other students took advantage of special fellowships to attend summer conferences in their chosen disciplines, where they networked with fellow young scientists and mathematicians while soaking up knowledge from peers and mentors.

School of Mathematics REUs

The School of Mathematics has a rich tradition of offering summer undergraduate research programs. The projects have been mentored by faculty and postdocs covering a range of topics, such as graph coloring, random matrices, contact homology, knots, bounded operators, harmonic analysis, and toric varieties. The Summer 2022 REU mentors and topics were:

- Igor Belegradek - Moduli Space of Complete Nonnegatively Curved Riemannian Metrics
- Anton Bernshteyn - Bounding Chromatic Number of Graphs with Girth at Least 5 and On the Average Chromatic Number and Independence Number
- Austin Christian and Agniva Roy - Product Structure as an Invariant for Legendrian Knots
- Austin Christian and Agniva Roy - Legendrian Connected Sums
- Christian Houdré - The Eigenvector-eigenvalue Identity: Generalizations and Extensions
- Jonathan Simone and Hannah Turner - Applications of Donaldson's Diagonalization Theorem
- Edward Timko - Estimates for Power-Bounded Operators -
- Manasa Vempati - Dyadic Decomposition Approaches in Harmonic Analysis and the T(1) Theorem
- Ashley K. Wheeler - The Toric Structure of Principal 2-minor Varieties

Every year Math REU students publish several papers, win a number of awards, and are often very successful in their graduate school applications.

"The main purpose of our REU is to give students research experience which should help them decide if they want to do math research for a living, and in particular, go to a math grad school," said Igor Belegradek, professor and director of Teaching Effectiveness in the School of Mathematics. Belegradek also coordinates the Math REU programs. "Also, if there is a publication or poster at a conference, their grad school application will definitely become more competitive."

Sometimes that application is sent to Georgia Tech.

"We did have a few students who were accepted to our grad school after attending an REU with us," Belegradek said. "It definitely helps put Georgia Tech Mathematics on the map. This summer we have 22 REU students, and only two of them are from Georgia Tech."

Mathematics topics for the 2022 REU included aspects of graph coloring, Legendrian contact homology, Eigenvectors and eigenvalues of Gaussian random matrices, and applications of Donaldson's Diagonalization theorem.

In July 2022, the School of Mathematics also hosted its biennial Topology Students Workshop, organized by Professor Dan Margalit since 2012.

Events included a public lecture on campus, "Juggling Numbers, Algebra, and Topology", accessible for curious people of all ages and backgrounds.

"One goal of mathematics is to describe the patterns in the world, from weather to population growth to disease transmission," event organizers said. The workshop used mathematics to describe juggling patterns, count the different kinds of patterns, and create new patterns, "making surprising connections to group theory, topology, combinatorics, and number theory."

Emily Almgren, Haverford College

Not many undergraduates get a chance to conduct research before they get their B.S. degree. How important is that to you?

"It's really important for figuring out whether I want to do research, whether I want to go to graduate school, and also

Find more details about REUs on our website:
https://math.gatech.edu/undergraduate-research

Continued from previous page...

know what kind of research you want to do without having done that research. So the experiences are really important for forming that decision of where to apply to grad school."

Aaron Lee, University of California, Davis

What brought you to Georgia Tech for an REU?

"Frankly, I was looking for things to do over the summer. And my mentor was like, 'Aaron, you should do an REU.' I applied a week before the deadline. And I thought, wow, it'd be really cool to work on this. I'm really interested in applied math. This is sort of a trial run for me — do I want to go to grad school? But personally, it's really important to me, just because I think I've always really wanted to do research, and contribute to the space of human knowledge."

What do you hope to do for a career?

"I'm actually planning to become a teacher. And I really hope to share the enjoyment of math that I've had over the years with students. I think there are a lot of different ways to teach math. I really want to help people understand exactly why math is the way it is — and it's not just something that a bunch of old guys came up with to torture you."

Summer REUs 2022:

- Moduli Space of Complete Nonnegatively Curved Riemannian Metrics - Igor Belegradek
  - Dimitrios Kidonakis
- Bounding Chromatic Number of Graphs with Girth at Least 5 and On the Average Chromatic Number and Independence Number - Anton Bernshteyn
  - Faren Roth Henry Asa Simmons, Cameron Alexander Chang, Horace Fusco, Sarah Peterson
- Product Structure as an Invariant for Legendrian Knots - Austin Christian and Agniva Roy
  - Michael J Edwards, Manyi Guo, Bitong (Shelly) Cao
- The Eigenvector-eigenvalue Identity: Generalizations and Extensions - Christian Houdré
  - Dorian Kidonakis
- Legendrian Connected Sums - Austin Christian, Agniva Roy
  - Edo Biluar, Sarah Vaughn Brown
- Applications of Donaldson's Diagonalization Theorem - Jonathan Simone and Hannah Turner
  - Evan Huang, Sophia Fanelle, Ben Huenemann
- Estimates for Power-Bounded Operators - Edward Timko
  - Yash Rastogi
- Dyadic Decomposition Approaches in Harmonic Analysis and the T(1) Theorem - Manasa Vempati
  - Edward Bielawa, Zhaocheng Dong, Peter Grundy Nydam
- The Toric Structure of Principal 2-minor Varieties - Ashley K. Wheeler
  - Andrew Rodriguez, Erick Boniface, Saisudharshan Sivakumar

NSF RESEARCH EXPERIENCES FOR UNDERGRADUATES PROGRAM RETURNS FOR 2023

JANUARY 23, 2023 | ATLANTA, GA

Mathematics Research Experiences for Undergraduates

The summer 2023 REU projects in mathematics were mentored by many different faculty, on topics ranging from fad formation, to random walks, tropical geometry, one bit sensing, extremal graph theory, and convex polyhedra. Students had opportunities to publish papers, win awards, and succeed in graduate school applications. The Summer 2023 mentors and topics were:

- Austin Christian and Daniel Irvine - Persistent Legendrian Contact Homology
- Orli Herscovici - Numerical Approaches to Statistics on Ordered Set Partitions
- Tom Kelly - Random Latin Squares
- Rachel Kuske, Rahul Kumar, and Christina Athanasouli
  - Dynamics of a Vibro-Impact Energy Harvester Under Non-Smooth Forcing
  - Markov Chain Modeling of Inelastic Impacts in Energy Harvesters
- Anton Leykin
  - Solving System of Polynomials via Analytic Continuation and Monodromy
  - 6R Robots and their Inverse Kinematics via Monodromy
  - Pose Determination with Conics
- Dan Margalit, Sahana Balasubramanya, Karim Sane Ryan Kickmann, and Wade Bloomquist
  - The Curve Graph of the 5-Punctured Sphere
  - Property (NL) in Coxeter Groups
  - The Non-Simple Arc Graph
  - Geodesic-preserving Bijections of Thurston Geometries
- Jonathan Simone - Cubiquitous Lattices and χ-sliceness

2022 Summer REU Retreat, Amicalola Falls, GA

The National Science Foundation Research Experience for Undergraduates Program

The NSF REU (Research Experience for Undergraduates) program is designed to provide meaningful research experiences to undergraduates who may not otherwise have the opportunity, with an ultimate goal of increasing matriculation in STEM careers and graduate school.

Most NSF REU programs are designed to pair students attending smaller and undergraduate-only schools with faculty and lab groups at larger host institutions for mentorship and a meaningful research experience.

Importantly, as NSF notes, "The inclusion of historically under-represented groups in STEM (minorities, low socio-economic status, first generation students, veterans and women) will serve to broaden the STEM talent pool."

As such, most REU programs in the College of Sciences at Georgia Tech host a diverse cohort of approximately ten non-Georgia Tech undergraduates, who have limited research opportunities at their current institution.

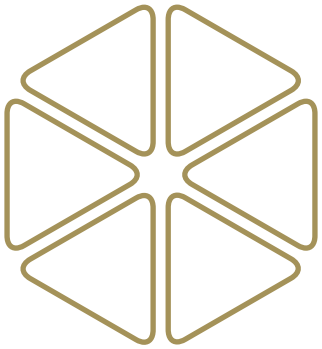
Continued from previous page...

> "Georgia Tech has had a long, outstanding record of hosting REU students," said College of Sciences Assistant Dean for Academic Programs Cameron Tyson. "We are delighted that we can offer programs affiliated with each of the six schools in the College of Sciences at Georgia Tech."

Each of the six schools in the College of Sciences participate in the eight to 10-week program. The REU supplements — which include stipends, housing, and travel allowances — engage students in research related to a new or ongoing NSF research award. Application deadlines are typically in January and February each year, depending on the program.

Summer REUs 2023:

- Persistent Legendrian Contact Homology - Austin Christian and Daniel Irvine
  - ◊ Maya Basu, Ethan William Clayton, Fredrick Mooers
- Numerical Approaches to Statistics on Ordered Set Partitions - Orli Herscovici
  - ◊ Aryaan Jena, Austin Longin
- Dynamics of a Vibro-Impact Energy Harvester Under Non-Smooth Forcing- Rachel Kuske, Rahul Kumar, and Christina Athanasouli
  - ◊ Emily Helene Almgren, Hung Nguyen, Nilay Patel
- Markov Chain Modeling of Inelastic Impacts in Energy Harvesters - Rachel Kuske, Rahul Kumar, and Christina Athanasouli
  - ◊ Samuel Ho-Ching Kwan, Aaron Lee, Karthik Krishnan
- Random Latin Squares - Tom Kelly
  - ◊ Alexander Divoux, Camille Elisabeth Kennedy, Jasdeep Singh Sidhu
- Solving System of Polynomials via Analytic Continuation and Monodromy - Anton Leykin
  - ◊ Timothy Cheek, Taoran Wen
- 6R Robots and their Inverse Kinematics via Monodromy - Anton Leykin
  - ◊ Vladyslav Havriutkin, Cameron MacMahon
- Pose Determination with Conics - Anton Leykin
  - ◊ Harris Barton, Vishal Muthuvel
- The Curve Graph of the 5-Punctured Sphere - Dan Margalit, Sahana Balasubramanya, Karim Sane Ryan Kickmann, and Wade Bloomquist
  - ◊ Sami Aurin, Darrion Thornburgh
- Property (NL) in Coxeter Groups - Dan Margalit, Sahana Balasubramanya, Karim Sane Ryan Kickmann, and Wade Bloomquist
  - ◊ Georgia Burkhalter, Rachel Niebler
- The Non-Simple Arc Graph - Dan Margalit, Sahana Balasubramanya, Karim Sane Ryan Kickmann, and Wade Bloomquist
  - ◊ Sophie Gardiner, Alyssa McPoyle
- Geodesic-preserving Bijections of Thurston Geometries - Dan Margalit, Sahana Balasubramanya, Karim Sane Ryan Kickmann, and Wade Bloomquist
  - ◊ Matthew Palani Lideros, Akash Narayanan
- Cubiquitous Lattices and χ-sliceness - Jonathan Simone
  - ◊ Katerina Stuopis, Erica Choi



AN INTERVIEW WITH AREN RUSS

LINEAR ALGEBRA: THE MUSICAL

JUNE 28, 2022 | ATLANTA, GA

What: Linear Algebra: The Musical

When: Opening night Friday, July 1st at 8pm. Second and final performance Saturday, July 2nd at 8pm.

Where: Dramatech Theater, 349 Ferst Dr NW, Atlanta, GA 30332, in between the Boggs building and the Student Center.

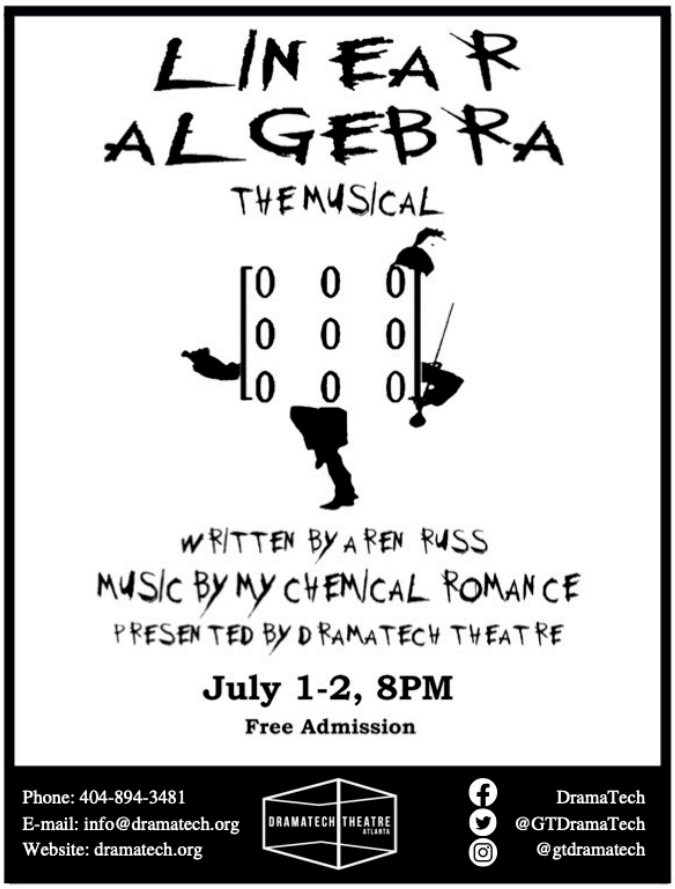
Why: It's a musical about linear algebra... !

Who: Everyone! Admission is free.

Eight actors and a dozen theater tech enthusiasts will put on what is bound to be a joyful romp through a dystopian futuristic world populated by matrices, where your societal rank is equal to your matrix rank.

Dramatech is Tech's on-campus, student run theater company and their newest offering is ***Linear Algebra: The Musical***, a jukebox musical written by Tech student Aren Russ, a rising fourth-year physics major who first started writing the script as a study guide to Dr. Mayer's Spring 2019 class, Math 1554 Linear Algebra.

We had an opportunity to chat with the playwright Aren Russ about how this amazing musical was created and to get a glimpse into what anyone attending the performance can expect. Here is what we found out.



Linear Algebra - The Musical

Q: So, Linear Algebra: The Musical, how did this happen.

About 2 years ago I took Math 1554 Linear Algebra the four hour version, with Dr. Mayer. I'm a physics major so I wanted to take the longer version for when I would need it for quantum [mechanics]. I was trying to memorize all the definitions for the final exam, and I memorize scripts a lot easier than I can memorize pages of notes, so I jokingly said I should just write a script about linear algebra. So just opened a word document and at the top I jokingly wrote Linear Algebra: The Musical, and this title was too funny to not do anything with.

Q: Completely agree. Is that when you wrote the play?

About a year later, Dramatech was looking for student works to do readings. I went back and found what I had done before and then wrote [the play] over the course of 3 days, it was a very interesting period of my life. I realized about a day into it, that it needed to be a musical and so I needed songs. The song "Teenagers" by My Chemical Romance came on the radio and I could picture the characters of the story singing the songs.

Q: Can you tell us a bit about the plot?

The plot centers around four zero matrices who live in a dystopian future where your matrix rank determines your societal rank. So since their rank is zero they are at the bottom and they are all edgy and angsty about it. It's implied that every five years you add another row or column [to your matrix]. The whole society is led by the identity matrices because they are the top dogs, and so you see the journey of these zero matrices working through society and trying to find a place for themselves, and working to make a statement for the rights of zero matrices, and you end up finding out by the end that zero matrices are already pretty interesting: they are already in reduced echelon form, they are diagonalizable, basically they are already perfect matrices, and the identity matrix was hiding that because he wanted to be the only perfect matrix and not them.

Q: Do matrices get to rank up in your world, or are they stuck with the same rank forever and I guess they just learn to accept it?

It's implied that the rank that you are around graduating high school is the same rank that you are going to be regardless of how you age.

Q: How did you come up with the jokes in the play?

A lot of the jokes were me just going back to the linear algebra notes and seeing terms, things that I enjoyed in the class, and then working them into the script and basing characters off of them or just writing little throw away lines. I ended up doing a motif where I would take pop culture references, and change one thing about them to be linear algebra themed. So for example, one of the characters mentions an artist named Megan The Subspace, and there is a party where they drink SmirNULL Ices (instead of Smirnoff Ice).

Q: Was this your first play that you wrote?

I have written quite a few plays and musicals, but this is the first one that I've actually found a space and opportunity to perform. And so I've had the time to really rewrite it and polish it. Most of my other works are less campy and jokey, and it is much harder to find a space to perform them. They either require a lot of technical aspects or they are just relatively serious intense topics that are not really the vibe of Dramatech.

Q: So you are a physics major, and you write plays for fun?

I do a lot of things with my life. I'm a physics major but i want to go into meteorology, and I love writing but I do a ton of art. I'm a professional artist, doing art is my main source of income. I'm also working with a graphic design marketing job, and then the writing has just been a side hobby up until now.

Q: What is the Dramatech community like?

The community is wonderful, I love all of them so much, they are such a welcoming and accepting group of people who let you put on shows like Linear Algebra: The Musical.

There are about 8 actors, and 12 tech people. We of course have a lot more tech theater kids than on-stage actor kids, and being at Dramatech we often find ways to incorporate our love for the sciences and engineering into the theater productions that we do. So we have a lot of people that are interested in lighting design, we have a master electrician, a master carpenter and we often end up with some really cool set builds.

We work 6pm-10pm pretty much every night. The actors have been doing an amazing job memorizing their lines and learning the seven songs in the musical.

Q: What was the experience like going from your written play to a living breathing production, or did things pretty much stay the same as how you were originally envisioning?

It's been really cool to see how [the show] changes from my mental image to actually being on the stage. The cast

that I got they are amazing, I love them all so much. Casting was a bit of a struggle, it's a minimum of 8 people but only 7 people signed up and some people were dropping last minute but eventually we got one freshmen and one third year who are here for the summer recruitment events, they are noobies to Dramatech. But casting-wise I just put people in random roles based on their vocal range and how much theater experience that they had, and I ended up casting them as themselves. So all of the actors are playing their exact type, playing pretty much their own personality on stage.

Q: What was it about Math 1554 Linear Algebra that made you want to create the musical?

First of all, I loved [Dr. Mayer's] class he was an amazing teacher. The content, well, not my favorite math course I've ever taken - I'm much more of a differential calculus kind of person. But he made it really palatable and fun to learn despite it being at 8am. And I was having trouble memorizing all the different terms and all the different definitions, because there were so many different ways to classify everything and so many different methods of processing everything, and I was trying to think of fun ways to memorize everything. And I was putting everything into a word document and I thought it would be a good joke to write a script about it, and then it wasn't a joke.

You end up finding out by the end that zero matrices are already pretty interesting: they are already in reduced echelon form, they are diagonalizable, basically they are already perfect matrices.

It was a series of funny, one line jokes that I had: your matrix rank equals determines societal rank, and a couple other bitty style one-liners, that I just sat down and over the course of three days just kind of made a script out of it.

Q: Are your other plays also science or math based?

I've spent a nonzero amount of my life practicing bridging scientific topics with artistic things, being an artist myself who does a lot of drawing, illustration, writing, and painting and other forms of art. Pretty much as long as I can remember I have always been doodling characters based on the elementary [classical physics] model, or super heroes based on the periodic table, so it was surprisingly in my wheelhouse to transfer these linear algebra concepts into an art form. Understanding them from a logical on-paper standpoint, and then using that understanding to create an artistic impression of them.

Q: That's actually really cool. Can you explain that a bit more?

I think it comes from my love for the two fields. My love for the pure sciences and the pure arts, and wanting to do the two things - not wanting to have to choose between the two things I love. So it's kind of driven out of necessity, almost, the necessity to not have to give up either aspect of myself. I was raised on shows like Mythbusters and Magic Schoolbus which are art-forms that portray scientific concepts and I absolutely loved those growing up. And I guess I wanted to kind of do that in my own way. Like in high school I would explain what a photon is by showing my friends a silly little doodle of an anime girl who can fly through walls because she has no mass.

Q: I absolutely love that, and I'm super excited to go see the show!

I love seeing the interest that people have in this, because it wasn't clear to me that anyone would even be interested in this kind of thing. I genuinely didn't realize there were so many people on this campus interested in bridging the two [art and science]. But it turns out that people really enjoy getting to see this thing that they spent hours of their life studying and pouring themselves into in a much more fun, lighthearted, and low stakes format with fun songs and dance, lights and costumes.

Now that I've discovered the shared interest people have in bridging art and these scientific ideas, I'm hoping to bring more stuff like this to campus in this final year that I have here.

SoM RISES IN U.S.NEWS RANKINGS

DECEMBER 3, 2023 | ATLANTA, GA

The School of Mathematics continues to advance in the graduate school rankings published by the U.S. News and World Report.

Released on April 25, the 2023-2024 U.S. News Best Graduate School Rankings features all six College of Sciences schools among its best science schools for graduate studies:

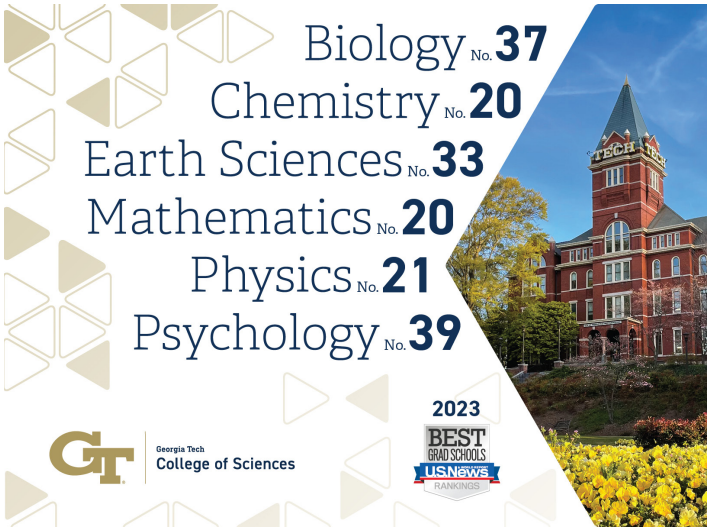
- Biological Sciences – No. 37
- Chemistry – No. 20
- Earth Sciences – No. 33
- **Mathematics – No. 20**
- Physics – No. 21
- Psychology – No. 39

Mathematics advances by one to No. 20, tied with Carnegie Mellon University, Johns Hopkins University, UC-San Diego, University of Illinois Urbana-Champaign, University of Maryland-College Park, and University of Minnesota-Twin Cities.

In Mathematics specialty graduate programs, Discrete Mathematics and Combinatorics remains the top 5, while Analysis ties for No. 20, and Applied Math ties for No. 16. Uniquely organized across the Colleges of Sciences, Computing, and Engineering, the Institute's Algorithms, Combinatorics, and Optimization program kept its No. 5 spot from last spring.

Mathematics Specialty Programs

- Analysis — No. 20 (tie)
- Applied Math — No. 16 (tie)
- Discrete Mathematics and Combinatorics — No. 5 (tie)



Fellow colleges across Georgia Tech are also on the rise in this year's U.S. News "Best Graduate Schools" set, with Engineering remaining in the top ten in its overall disciplines — and Business, Computing, and Public Affairs also ranking among top programs in the nation. The full roster of current Georgia Institute of Technology graduate school rankings can be found at the link below, along with U.S. News' methodology for graduate rankings here.

The full list of Georgia Tech Graduate School rankings cam be found here:

https://www.usnews.com/best-graduate-schools/georgia-institute-of-technology-139755/overall-rankings

GEORGIA TECH MATHEMATICIANS AT THE FOREFRONT OF RESEARCH WITH ICERM AT BROWN

DECEMBER 20, 2022 | ATLANTA, GA

Professor Rachel Kuske

Georgia Tech's School of Mathematics is dedicated to exploring the frontiers of computational and experimental research in its discipline, so much so that one of the leading math research centers in the country now has Rachel Kuske, a professor in the School of Mathematics serving as the chair of its board of trustees.

Rachel Kuske's new role with the Institute for Computational and Experimental Research in Mathematics (ICERM) is just one Georgia Tech connection to the Center, based at Brown University in Providence, Rhode Island.

More than 20 School of Mathematics faculty members and graduate students have participated in recent ICERM programs, including a series of seminars during Fall 2022's semester on harmonic analysis and convexity, mathematical processes that help researchers navigate large collections of data.

"The participation of School of Mathematics members at different levels in ICERM, one of several leading math research institutes in the U.S., is representative of the School's leadership in the broader research community," said Kuske, a former School of Mathematics chair. "Georgia Tech's multi-faceted involvement benefits the research groups here in the school as well as research advances and the development of talent in the community of mathematics researchers as a whole," Kuske said.

John Etnyre, a professor specializing in low-dimensional topology, is also involved in various ICERM activities, and helped co-organize a semester-long program on braid theory in Spring 2022.

"ICERM is an excellent research center, they provide a great environment to collaborate with others, as well as great conference facilities. They are certainly one of the best mathematical research centers in the world, and they are unique in their focus on bringing computation and experimentation into mathematics," Etnyre said.

ICERM: Mathematics labs and more

ICERM's mission is to expand the use of computational and experimental methods in mathematics, support theoretical advances related to computation, and address problems posed by the existence and use of the computer through mathematical tools, research and innovation.

ICERM pursues these goals by supporting what Kuske calls "mathematics labs," which are typically human resource-intensive, and highly collaborative nationally and globally.

> "ICERM's goals include catalyzing new directions in research and collaborations, as well as exploiting and expanding the interface between mathematics, computations, and experiments, computational and otherwise," Kuske said.

These intersections have historically been represented in ICERM's scientific board, with Kuske citing Dana Randall, ADVANCE Professor of Computing in the School of Computer Science, and an adjunct professor in the School of Mathematics, as an example.

Kuske views chairing ICERM's Board of Trustees as a way to "provide an opportunity to contribute in several directions, including making sure that present and future resources, policies, and procedures support ICERM's mission."

These include increasing diverse and inclusive participation in mathematical sciences and relevant areas, raising public awareness of the impact of mathematics, and continued service and leadership in the research community.

Etnyre said an important computational aspect to topology — the study of surfaces that can be twisted, bent, or otherwise deformed but never broken — has been around for a while, "but its importance has been increasing over the years," he said. For example, software called SnapPea/SnapPy "is a program where you can input a three-dimensional space and it will compute a myriad of data about the space. It also has a list of thousands of spaces and data about them. When trying to determine if something you are interested in is true or not, it is always helpful to be able to check its validity on such a large sample of spaces."

More recently, Etnyre says several teams of people have been using machine learning algorithms to explore relations involving knot theory, the study of closed curves in three dimensional spaces.

> "There are many other ways in which computation and experimentation is important in topology, and it was great that the ICERM program was able to expose these techniques to a large number of researchers during our program."

Knot theory and an associated subdiscipline, braid theory, help bring structure to large, complex data problems. Possible applications include finding out more about DNA recombination, Etynre said. "There are also connections with physics through string theory and gauge theory.

Professor John Etnyre

There are connections between braids and many areas in mathematics. That was really the focus of the program at ICERM last spring," referring to the Spring 2022 program he helped co-organize at the center.

Collaboration on convexity

Galyna Livshyts, associate professor in the Georgia Tech School of Mathematics, Ben Jaye, assistant professor, and postdoctoral researcher and visiting assistant professor Naga Manasa Vempati recently completed the semester-long program on harmonic analysis and convexity at ICERM. Livshyts said the center is one of several institutions around the world that provide such lengthy research opportunities for various areas in mathematics.

"The harmonic analysis and convexity research program presented us with the opportunity to collaborate with other researchers in the area during this time," Livshyts said. "Also, ICERM often hosts various interesting and stimulating workshops. ICERM is located in the buzzing town of Providence, and it has excellent facilities to allow people to discuss mathematics, and also provide some great views."

ICERM & SoM

The following Georgia Tech School of Mathematics faculty and students have participated in various recent ICERM programs:

» Anton Leykin was an organizer for the Nonlinear Algebra semester-long program, Sep 5 - Dec 7, 2018, which featured over 200+ invited speakers.

» The Combinatorial Algebraic Geometry virtual workshop in early February 2021 included Trevor Gunn, Arvind Ramaswami, Matthew Baker, Cvetelina Hill, and Alperen Ozdemir.

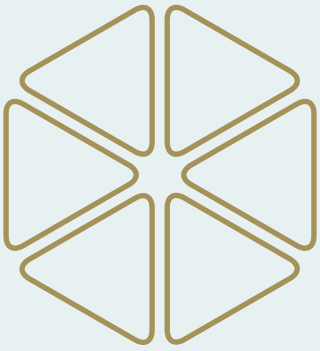
» Matthew Baker, Justin Chen, Tianyi Zhang, Anton Leykin, Josephine Yu, and Josiah Park also took part in Collaborate@ICERM projects in 2021.

» School of Mathematics students Yvon Verberne, Sudipta Kolay, Justin (Yi-Chang) Chen and Jiaqi Yang were named ICERM Postdoctoral Fellows for 2021-22.

» Professor John Entyre co-organized the Spring 2022 Braids semester program at ICERM, and Professor Dan Margalit participated in Braids in Symplectic and Algebraic Geometry. Postdoctoral students Miriam Kuzbary and Hannah Turner took part in the entire Braids program. Graduate student Sally Collins and undergraduate student Sarah Pritchard participated in the Braids in Low-Dimensional Topology conference in April.

» Georgia Tech faculty and students taking part in the Harmonic Analysis and Convexity program in September 2022 at ICERM included Manuel Fernandez, Orli Herscovici, Galyna Livshyts, Naga Manasa Vempati, Shixuan Zhang, and Ben Jaye.

» Mohit Singh and Swati Gupta participated in an ICERM program, Combinatorics and Optimization, March 27-31, 2023.



Anton Leykin, Professor in the School of Mathematics

IMPLICATIONS OF NEW RESEARCH SPAN FROM MATH

MATHEMATICIANS DISCOVER HIGHLY EFFICIENT METHOD FOR SOLVING 'HARD MINIMAL PROBLEMS'

OCTOBER 9, 2022 | ATLANTA, GA

Mathmatician Anton Leykin and his team at Georgia Tech have developed a powerful new technique for solving problems related to 3D reconstruction. The research team's open access paper, "Learning to Solve Hard Minimal Problems", has also won the prestigious best paper award at CVPR 2022, the Computer Vision and Pattern Recognition Conference (CVPR) — selected from a pool of over 8,000 papers submitted this year.

The team's research idea revolved around developing a new way to solve a family of problems known as hard minimal problems, which are essential for 3D reconstruction.

> "A minimal problem is a smallest geometric problem one can consider in the 3D reconstruction context," Leykin explained.
>
> "For example, recovering a 3D scene consisting of 5 points from 2 views (2-dimensional images of 5 points in the plane) without knowing the relative position and orientation of the second camera with respect to the first."

In other words, the problem focuses on "solving" how to see in three dimensions by analyzing multiple two-dimensional perspectives — this is how humans and self-driving cars see

in 3D. One way to understand this is by imagining our eyes as cameras. Both eyes capture two-dimensional images, each from a slightly different perspective. By considering the perspective of the image sent by each eye, our brains create a 3D rendering of these two-dimensional images. While our brains might do this with seeming ease in the case of our vision, solving these problems mathematically can be more difficult.

Implications of new research span from math, to helping autonomous vehicles use 2D camera images to "see" in three dimensions, and beyond.

Petr Hruby, currently a Ph.D. student at the ETH Zurich Department of Computer Science with a recent Master's degree from Czech Technical University, serves as the paper's lead author. He is joined by co-authors Anton Leykin, a professor in the School of Mathematics at Georgia Tech; Timothy Duff, NSF Postdoctoral Fellow at the University of Washington (Georgia Tech Ph.D. in Algorithms, Combinatorics, and Optimization, 2021); and Tomas Pajdla, professor at the Czech Technical University in Prague Czech Institute of Informatics, Robotics and Cybernetics. The core of the team started working together during the Institute for Computational and Experimental Research in Mathematics (ICERM) semester on Nonlinear Algebra in 2018, of which Leykin was the primary organizer.

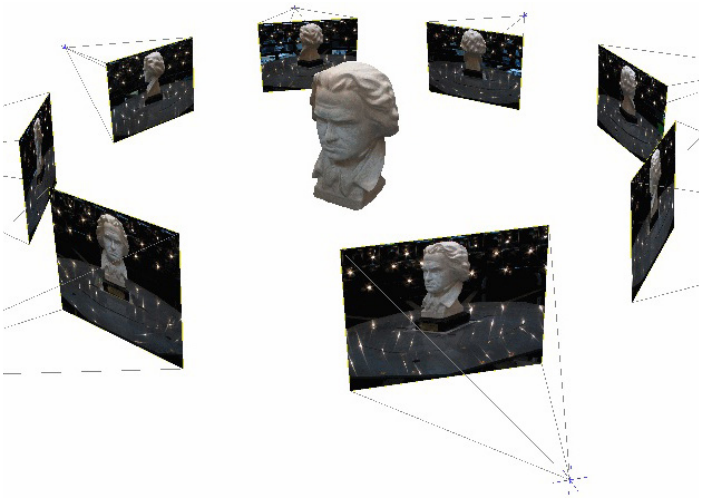
After their first project won the best student paper award at the 2019 International Conference on Computer Vision (ICCV), the team decided to pursue research in hard minimal problems.

Since the technique the researchers developed is general, Leykin said it can be applied to many other situations with similar mathematical problems. In addition, the software pieces derived from the researchers' findings are in the public domain, and can be used by a broad computer vision community.

Solve-and-Pick vs. Pick-and-Solve

Solving minimal problems can be difficult, because they often have many spurious solutions (solutions that might solve the equation, but are ultimately unhelpful or unexpected).

Previously, the state-of-the-art technique for solving minimal problems used a "solve-and-pick" approach. Solve-and-pick involves first determining all of the possible solutions to a problem, and then picking the optimal solutions — this is done by removing non-real solutions, using inequalities, and evaluating how well they support the solution. But, when there are many spurious solutions, this type of optimization can be costly and time-consuming.



Multiple 2D photographs taken from different locations can be used to create a 3D image — solving minimal problems allows the 3D image to be rendered. *Source: "Continuous ratio optimization via convex relaxation with applications to multiview 3D reconstruction"*

Instead of using this traditional solve-and-pick approach, the researchers investigated the opposite: a "pick-and-solve" technique that learns, for a given data sample, how to first pick a promising starting point and then continue it to a meaningful solution. This approach is unique in that it avoids computing large numbers of spurious solutions.

By selecting a suitable starting point and solving from that point (instead of solving from all points), the method can quickly find and track a path to the solution more quickly, learning how to find that target solution more efficiently.

"Instead of finding all possible solutions and then deciding which one is relevant, we aimed at 'guessing' which path leads to one physically meaningful solution — as long as the guess is correct with high probability, this becomes practically useful," said Leykin.

"For a 'hard' minimal problem, this is like finding a needle in a haystack — we need to guess one correct path out of several hundreds."

Continued from previous page...

To do so, the research combined concepts spanning several fields of mathematics: algebra, geometry, numerical analysis, and statistics. Computer science and engineering components also played a vital role: "We had to use neural networks for one particular task and, of course, implement the algorithms efficiently," Leykin said. Since the minimal problem solvers are executed as subroutines millions, billions, or trillions of times, efficiency was essential.

Solving the hard problems

To test their method, the researchers developed a solver using their pick-and-solve technique for a well-known problem in the field. They benchmarked and studied their engineering choices with another familiar problem.

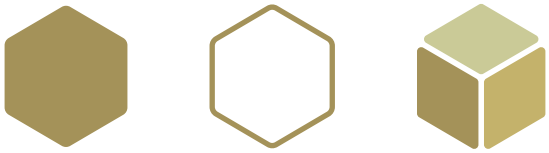
Finally, they applied their technique to a harder problem – reconstructing a 3D view using four 2D points in three views. The researchers' implementation of their method solves this problem in about 70 microseconds on average – ten times faster than any other method.

The team hopes that their solution could change how these problems are approached and solved in the future.

> "Previously, 'hard' minimal problems were avoided in practical applications, since there were no fast reliable solvers for them," Leykin said. "We hope that, over time, our work will convince the industry to reconsider – the 'hard' problems are not that hard after all!"

Citation:

Hruby, Petr & Duff, Timothy & Leykin, Anton & Pajdla, Tomas. (2021). Learning to Solve Hard Minimal Problems.



Leykin delivered a colloquium on the work in the School of Mathematics colloquia series. Learn More: https://math.gatech.edu/this-week-s-seminar-and-colloquia

AMS FEATURED ARTICLE

MIXING SURFACES, ALGEBRA, AND GEOMETRY

APRIL 30, 2023 | ATLANTA, GA

Mixing Surfaces, Algebra, and Geometry

This featured article is a written version of a lecture that Dan Margalit, former professor in the School of Mathematics, gave at the 2022 Joint Mathematical Meetings of the American Mathematical Society (AMS). The Society established the Maryam Mirzakhani Lecture in 2018 to honor the memory of Mirzakhani, the first woman and first Iranian to win the Fields Medal, one of the highest honors in math. Margalit writes that on a basic level, Mirzakhani's work centers around the geometry of surfaces, as understood through their simple curves:

> "Starting from this humble-seeming topic, Mirzakhani made surprising and sweeping connections between numerous fields of mathematics, including algebraic geometry, Teichmüller theory, moduli spaces, dynamics, homogeneous spaces, symplectic geometry, and billiards."

Professor Dan Margalit

Read the full article here: https://margalit.droppages.net/papers/mm.pdf

Watch the AMS Maryam Mirzakhani Lecture https://www.youtube.com/watch?v=MPcdJFv4OAc

GEORGIA TECH'S ML EXPERTS SHARE THEIR KNOWLEDGE AT THE INTERNATIONAL CONFERENCE ON MACHINE LEARNING

JULY 19, 2023 | HONOLULU, HI

At the International Conference on Machine Learning in Honolulu, Hawaii, Georgia Tech's leading experts in machine learning shared their insights into the field, how their work is breaking new ground, and what comes next for the field of artificial intelligence.

One of the experts in Honolulu was Wenjing Liao, an assistant professor in the School of Mathematics who specializes in deep learning, artificial intelligence, and machine learning.

Assistant Professor Wenjing Liao

Machine Learning

Machine learning aims to produce machines that can learn from their experiences and make predictions based on those experiences and other data they have analyzed. The Machine Learning Center at Georgia Tech (ML@GT) is an Interdisciplinary Research Center that is both a home for thought leaders and practitioners as well as a training ground for the next generation of pioneers.

The field of machine learning crosses a wide variety of disciplines that use data to find patterns in the ways both living systems, such as the human body and artificial systems, such as robots, are constructed and perform. Whether it's being applied to analyze and learn from medical data, or to model financial markets, or to create autonomous vehicles, machine learning builds and learns from both algorithm and theory to understand the world around us and help create the tools we need and want.

In addition to machine learning (ML), Liao's research interests include imaging, signal processing, and high dimensional data analysis.

Honolulu Highlights | ICML 2023
https://sites.gatech.edu/icml-2023/highlights/

Read More About the Conference
https://sites.gatech.edu/icml-2023/

Read More About ML at Georgia Tech
https://ml.gatech.edu/

SCHOOL OF MATHMATICS WELCOMES TWO NEW ENDOWED FACULTY

DECEMBER 13, 2023 | ATLANTA, GA

The School of Mathematics is pleased to announce two new endowed faculty appointments for the 2023-24 academic year.

These appointments through the College of Sciences help further our mission to cultivate curiosity, encourage exploration, and foster innovation to develop leaders and scientific solutions for a better world.

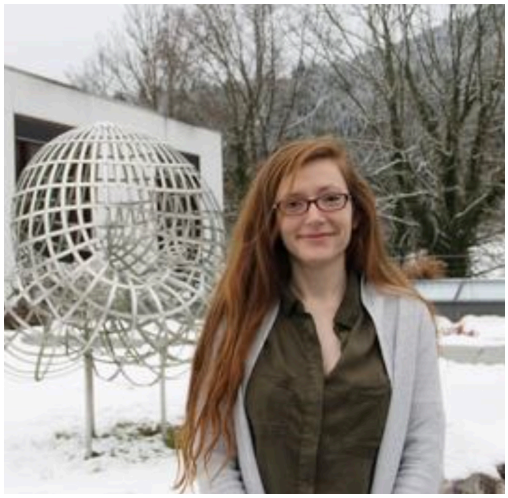
Rose McCarty and Xiaoyu He will join the School of Mathematics as Richard A. Duke Assistant Professors.

Rose McCarty, who studies combinatorics, will join the School of Mathematics and School of Computing in January 2024. Her research interests include structural graph theory and its connections to matroid theory, discrete geometry, finite model theory, and algorithms and complexity.

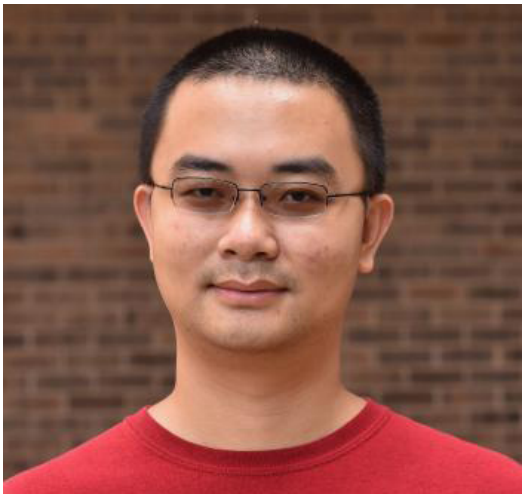
Xiaoyu He will also be joining the School of Mathematics, with research interests in extremal, probabilistic, and algebraic combinatorics, with specific interest in Ramsey theory, graph coloring, additive combinatorics, discrete geometry, and coding theory, with applications to computer science.

About the Richard A. Duke Endowed Assistant Professorships

The Richard A. Duke Faculty Endowment was created by former Georgia Tech faculty member Professor Richard Duke to commemorate his over 34 year career as a faculty member in the School of Mathematics. His legacy continues through the Richard A. Duke faculty appointments.



Assistant Professor Rose McCarty



Assistant Professor Xiaoyu He

FIRST COHORT ANNOUNCED FOR ASCEND FACULTY PROFESSIONAL DEVELOPMENT PROGRAM

JANUARY 15, 2024 | ATLANTA, GA

Ascend, a new career development program for mid-career faculty, launched its first cohort in Spring 2024. Supported by the Office of Faculty Professional Development, Ascend cohort members include academic professionals and lecturers from across campus.

The cohort will build on current strengths and successes and explore ways to thrive mid-career and in the future. Using a faculty learning community model and the Appreciative Inquiry framework, participants will explore their interests, values, and goals, and create an actionable, individual strategic plan while developing skills for career growth and leadership.

One member of the first cohort is one of our own Senior Academic Professionals, Christopher Jankowski, who serves as the School of Mathematics' Director of Graduate Advising and Assessment and the Director of Postdoctoral Teaching Effectiveness.

Participants in this program will learn to use the Appreciative Inquiry model to develop a personal development plan that includes a vision and mission; goals for personal learning, professional development, and career momentum; and an action plan.

The program is designed to support faculty as they practice skills essential for collegiality and leadership in a cohort environment and explore opportunities for growth and career vitality at Georgia Tech. Participants will also take advantage of four professional coaching sessions during the calendar year with International Coaching Federation-accredited Director of the Office of Faculty Professional Development Rebecca Pope-Ruark.

Clockwise from top-left: Chris Jankowski, and Roberta Shapiro, Greg Mayer and Stephanie Reikes (opposite page)

ROBERTA SHAPIRO RECIEVES THE HERBERT P. HALEY FELLOWSHIP

JULY 21, 2022 | ATLANTA, GA

Six graduate students, one from each school in the College of Sciences, are among the latest recipients of the Herbert P. Haley Fellowship at Georgia Tech. The initiative recognizes significant accomplishments and outstanding academic achievements for graduate students at Georgia Tech.

"Mathematics is all about collaboration," and so as a fourth-year graduate student Roberta plans on using the funds to attend conferences "and make connections with future collaborators. That means there's going to be more math coming soon!"

Haley scholars receive a one-time merit award of up to $4,000 thanks to the generosity of the late Marion Peacock Haley. Haley's estate established the creation of merit-based graduate fellowships at Georgia Tech in honor of her late husband, Herbert P. Haley, ME 1933. It is an award which may be held in conjunction with other funding, assistantships, or fellowships, if applicable.

About Roberta Shapiro

Roberta Shapiro's research focuses on using topology — the study of geometric properties that stay the same, even when they are deformed — to answer questions in the field of complex dynamics.

We asked Roberta what she plans to do with the money, and she told us that "mathematics is all about collaboration," and so as a fourth-year graduate student she plans on using the funds to attend conferences "and make connections with future collaborators. That means there's going to be more math coming soon!"

COLLEGE OF SCIENCES SELECTS INCLUSIVE EXCELLENCE FACULTY FELLOWS

AUGUST 28, 2022 | ATLANTA, GA

Stephanie Reikes and Greg Mayer have been selected as the recipients of the 2023-2024 College of Sciences Inclusive Excellence Faculty Fellowship.

Stephanie Reikes and Greg Mayer, from the School of Mathematics, along with colleauge Bekki George from the School of Psychology, submitted an interdisciplinary application to create the "Open Course" database to support student success for students taking courses in mathematics and psychology.

Their "Open Course" database aims to support student success in College Algebra, Precalculus, Multivariable Calculus and Introductory Statistical Methods by offering a set of courses that offer additional course content students can use to supplement their learning. These courses are pre-requisites for more advanced courses and have a combined enrollment of over 1000 students in fall semester alone. The set of courses being developed will be open to students to self-enroll at no cost and they will have access to curated course content, quizzes, and assessments.

This database will be beneficial to undergraduates enrolled in these courses, students in upper-level courses that use these classes as pre-requisites, and transfer students or students re-entering college after an extended time away.

This award is funded by the Howard Hughes Medical Institute (HHMI) Inclusive Excellence Grant and Center for Promoting Inclusion and Equity in the Sciences (C-PIES). C-PIES is excited to support this new pedagogical approach to inclusive teaching.

SoM WELCOMES NEW FACULTY

AUGUST 6, 2024 | ATLANTA, GA

2023

- Assistant Professor Alexander Dunn - number theory, analysis.
- Academic Professional Karthik Mamillapalle
- SoM and ISyE Assistant Professor Dmitrii M. Ostrovskii - optimization, learning theory, mathematical statistics.
- Academic Professional Thomas Tran
- Lecturer Haiyu Zou

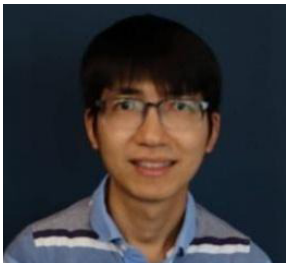
2024

- Assistant Professor Leonardo Abbrescia - partial differential equations.
- Richard A. Duke Assistant Professor Xiaoyu He - combinatorics.
- Assistant Professor Asaf Katz - dynamics, ergodic theory.
- SoM Richard A. Duke and School of Computer Science Assistant Professor Rose McCarty - graph theory, matroid theory, discrete geometry.
- Assisstant Professor Benjamin McKenna - probability.
- Assistant Professor Tobias Ried - mathematical physics.
- Academic Professional Cuyler Warnock
- Associate Professor Anton M. Zeitlin - representation theory.
- Assisstant Professor Wei Zhu - math of data science, machine learning.

Alexander Dunn

Karthik Mamillapalle

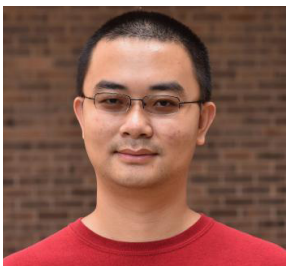
Dmitrii M. Ostrovskii



Thomas Tran

Haiyu Zou

Leonardo Abbrescia



Xiaoyu He

Asaf Katz

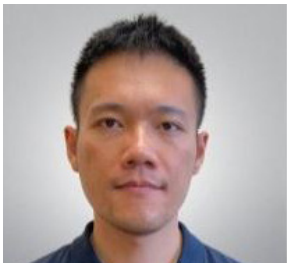
Rose McCarty

Benjamin McKenna

Tobias Ried

Cuyler Warnock

Anton M. Zeitlin



Wei Zhu

JEN HOM RECOGNIZED BY THE AMERICAN MATHEMATICAL SOCIETY FOR RESEARCH AND SERVICE

NOVEMBER 21, 2022 | ATLANTA, GA

School of Mathematics associate professor Jen Hom has been named a 2023 American Mathematical Society Fellow. The Fellows of the American Mathematical Society program recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics.

Jen Hom

Jen Hom, an associate professor in the School of Mathematics, has been named to the 2023 Class of Fellows of the American Mathematical Society for her "contributions to low-dimensional topology, Heegaard Floer homology, and service to the mathematical community."

Hom's research focuses on "knots, surfaces, and their higher dimensional analogs," referring to certain mathematical structures embedded in three-dimensional space.

"It is an honor to welcome a new class of AMS Fellows and to congratulate them for their notable contributions to mathematics research and service to the profession," said AMS President Ruth Charney.

Hom joined Georgia Tech in 2015 and is a previous recipient of the College of Sciences Cullen-Peck Fellowship Award.

> "It's a great honor to be named an AMS Fellow, and to join this esteemed list of mathematicians that includes many of my mentors," Hom said.

Rather than the kinds of knots used in ropes and shoelaces, the ends of strings in mathematical knots are joined together. Surfaces, meanwhile, refer to the outsides of malleable geometric shapes.

Jen Hom

Knots and surfaces are found in topology, the study of surfaces and shapes that can be bent, twisted and otherwise deformed but never broken or torn. Heegaard Floer homology helps mathematicians make sense of these shapes, Hom said.

> "Heegaard Floer homology is a powerful tool for studying these objects that helps translate questions about shapes into questions about algebra."

Before coming to Georgia Tech, Hom was Ritt Assistant Professor at Columbia University, and was a member of the Institute for Advanced Study in Princeton, N.J. She received her B.S. in Applied Physics from Columbia, and her Ph.D. in Mathematics from the University of Pennsylvania.

AMERICAN MATHEMATICAL SOCIETY HONORS TRIO OF FACULTY WITH TOP RESEARCH PRIZE

NOVEMBER 22, 2023 | ATLANTA, GA

A trio of School of Mathematics faculty have received top honors from the American Mathematical Society, with Professor Jennifer Hom taking home the 2024 Levi L. Conant Prize, and Professors Greg Blekherman and Thang Le selected as 2024 AMS Fellows.

The American Mathematical Society (AMS) announced the 2024 recipients for top honors which inclues three School of Mathematics professors, comprising a top research award as well as two faculty recognized as AMS Fellows for their work in advancing their fields.

Levi L. Conant Prize

School of Mathematics Associate Professor Jennifer (Jen) Hom has received the 2024 Levi L. Conant Prize from the AMS. The award recognizes the best expository paper published in either Notices of the AMS or Bulletin of the AMS in the preceding five years. Hom is recognized for her paper, "Getting a handle on the Conway knot," which was published in the Bulletin in 2021. Jen Hom was also named an AMS Fellow in 2023.

"These awards partially signal the depth and breadth of accomplishment and influence of these three remarkable scholars," says School of Mathematics Chair Mike Wolf. "Jen's tribute is for her how she was able to communicate the clarity of her understanding of fundamental and difficult mathematics to a wide audience, creating a resource that will affect mathematics and mathematicians for many years."

> "I am honored to receive the 2024 Levi L. Conant Prize," Hom says. "An extremely important but often undervalued part of our job as mathematicians is communication, and I'm grateful to the AMS for valuing high-quality exposition in their publications."

Hom adds that she's "proud to be in the company of my esteemed former colleague Dan Margalit," who won the Conant Prize in 2021.

Margalit then served as a Mathematics Professor at Georgia Tech, and is now Stephenson Professor and Chair of the Department of Mathematics at Vanderbilt University.

> AMS cited Hom's article as "a wonderful resource for the community on timely and important material,"

School of Mathmatics AMS Award Winners

Jennifer (Jen) Hom

Greg Blekherman

Thang Le

adding that "Hom's paper packs a remarkable amount of knot theory into 11 pages, but remains clear, engaging, and easy to read throughout. Readers are left with new understanding and a sense of excitement for the future of this field."

American Mathematical Society Fellows

Last year, Hom was also recognized as an AMS Fellow for her topology research and ongoing service to the mathematical community.

This season, two fellow School of Mathematics faculty, Professor Greg Blekherman and Professor Thang Le, also have joined those ranks.

"Thang and Greg received a distinction reserved for only the top few percent of research mathematicians nationwide," Wolf says. "Thang was singled out for his deep work in the creation and development of the fairly new subject of quantum topology over the last quarter century as well as for that subject's implications for the very classic area of low-dimensional topology. Quantum topology is now a vast area, but many of its most prominent achievements came about through the work of Thang.

"Greg's work courses through and blends algebraic and convex geometry as well as combinatorics and optimization — and also mathematical biology," Wolf explains. "Most notably, Greg is known for his diverse and important contributions to the theory of nonnegative and "sum of squares" polynomials, a hugely important topic in contemporary optimization theory.

Blekherman and Le are two among the scarcely three dozen mathematical scientists from around the world named 2024 AMS Fellows — a cohort which also includes Kasso Okoudjou, a former School of Mathematics Ph.D. student advised by Professor Christopher Heil.

"It is my pleasure to congratulate and welcome the new class of AMS Fellows, honored for their outstanding contributions to the mathematical sciences and to our profession," notes AMS President Bryna Kra. "This year's class was selected from a large and excellent pool of candidates, highlighting the many ways in which our profession is advanced, and I look forward to working with them in service to our community."

"The school is just thrilled by these well-deserved awards to our wonderful colleagues," Wolf added.

About Jennifer (Jen) Hom

Hom joined Georgia Tech as an assistant professor in 2015 after she served as a Ritt Assistant Professor at Columbia University. She has been an associate professor in the School of Mathematics since 2018. Hom's research centers on low-dimensional topology, which she usually studies using Heegaard Floer homology. She was asked to speak in the topology section of the 2022 International Congress of Mathematicians, the world's largest gathering of mathematicians. Hom has held a Sloan Fellowship and a Simons Fellowship, is an AMS Fellow, and holds a National Science Foundation CAREER award.

About Greg Blekherman

Blekherman, who joined Georgia Tech in 2011, is a 2012 recipient of the Sloan Research Fellowship. His research interests lie at the intersection of convex and algebraic geometry. Blekherman received his Ph.D. in 2005 from the University of Michigan under the direction of Alexander Barvinok, and he has held postdoctoral positions at the Microsoft Research Theory Group, Virginia Bioinformatics Institute, Institute for Pure and Applied Math (UCLA) and UC San Diego before joining Georgia Tech.

About Thang Le

Le received his M.S. and Ph.D. from Lomonosov Moscow State University, and joined Georgia Tech in 2003. His research interests include differential topology, 3-manifolds, knot theory, and quasicrystals. He serves as an editor of Quantum Topology, The Journal of Knot Theory and Its Ramifications, and Acta Mathematica Vietnamica.

Find the official AMS press release here:
https://www.ams.org/news?class_id=1&expand=1&type=news

CHASING CHAOS

ALEX BLUMENTHAL AWARDED CAREER GRANT FOR RESEARCH IN CHAOS, FLUID DYNAMICS

APRIL 18, 2023 | ATLANTA, GA

Associate Professor Alex Blumenthal

How do you picture chaos? To Alex Blumenthal**,** it's a raging river, the wake behind a boat, and the infinite swirls coffee creamer makes as it's mixed into a mug of joe.

The chaos in these examples is in the seemingly unpredictable and unrepeatable way the fluids move– imagine predicting the exact motion of particles in a patch of whitewater, or recreating the exact way frothy water pours from a faucet into a full sink.

Now, Blumenthal, an associate professor in the School of Mathematics, has been awarded an NSF CAREER grant to work towards just that.

The National Science Foundation Faculty Early Career Development Award is a five-year grant designed to help promising researchers establish a foundation for a lifetime of leadership in their field. Known as CAREER awards, the grants are NSF's most prestigious funding for untenured assistant professors.

The award, for "Chaotic dynamics of systems with noise," will help Blumenthal continue tackling some of the most difficult questions in his field– those of chaotic fluid dynamics.

Because Blumenthal's work with fluid dynamics intersects with chaos and disorder, the impacts of his work range from weather prediction to how we model economics.

The Butterfly Effect

Mathematicians have been interested in predicting chaotic, dynamical systems since Leonardo Da Vinci first sketched frothy, unpredictable jets of water hitting a canal, but solving this type of problem is notoriously difficult.

One reason for the challenge? The butterfly effect – where a small deviation (like a butterfly flapping its wings) can have compounding impacts on a system (like that tiny gust of wind gathering into a tornado). Because even a microscopic change in conditions can compound as the system changes, it is impossible to exactly recreate an experiment, and extremely difficult to model mathematically.

"Creating rigorous mathematical proofs is difficult in this situation, because the chaos and non-chaos coexist in these systems – and the initial conditions heavily impact the results of the mathematics,"

Mosaic Turbulence

Blumenthal explains. Imagine stirring that drop of creamer into a cup of coffee again– could you recreate exactly where the first drop is added, down to a molecular level?

It wasn't until 2020, when Blumenthal, alongside a team of researchers, proved that it is possible to predict those folds and striations, called "swiss rolls," that you see as the creamer is stirred into the coffee, or as two colors of paint are stirred together, providing the most rigorous mathematical proofs on turbulence to date, and proving a decades-old theory called Batchelor's Law.

Additionally, since the mathematical proof can be used to predict how fluids might mix, it can help scientists predict salinity profiles in the oceans, or atmospheric conditions.

Another key application of the research? The development of a new problem-solving framework, which Blumenthal plans to investigate with the CAREER grant as a key for unlocking new research into broader turbulence and chaos problems.

Bringing Research-Level Topics to Students

The grant also includes funding to bring students to the forefront of the field.

"One cool thing about these systems is that they lend themselves to a lot of computational projects that are accessible to undergraduates," Blumenthal says.

"I'll be designing a short curriculum on these random dynamical systems that's accessible to undergraduates– bringing them to research-level topics in this field in a short amount of time."

The undergraduate topics class will serve as an introduction to the kind of probabilistic perspective one takes while tackling chaotic theory, a class he plans to pilot in the Spring of 2023.

He expects the intersection with data science will be particularly interesting to undergraduates, explaining that

> The principles of chaotic dynamics underlie a lot of the assumptions in data science. Data science is implicitly leveraging these ideas, so this will help students explicitly understand those implicit ideas. It's a theoretical primer students could leverage in the data science field.

The field is ripe for research, and Blumenthal is eager to include both graduate students and undergraduates, allocating funds for research experiences for undergraduates, alongside a graduate student workshop, where students from across the world could be invited to Georgia Tech for a weeks-long program, learning from Blumenthal and other experts about the chaotic dynamics of random systems.

> "There's a whole lot of new stuff to do, and these things lend themselves to numerical exploration – pencil and paper proofs, and computer-assisted proofs," Blumenthal says. "There's a growing community of people studying random dynamics, and a growing community of people doing computer proofs– it's a great place for undergrads to have meaningful research experiences."

SOLVING THE INFINITE PROBLEMS

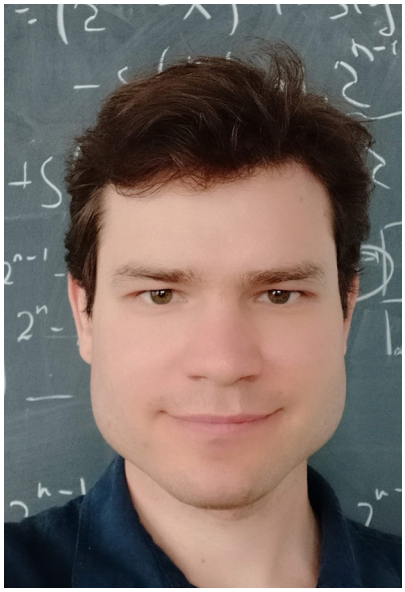
ANTON BERNSHTEYN AWARDED NSF CAREER FOR DEVELOPING NEW, UNIFIED THEORY: DESCRIPTIVE COMBINATORICS

APRIL 17, 2023 | ATLANTA, GA

Anton Bernshteyn is forging connections and creating a language to help computer scientists and mathematicians collaborate on new problems — in particular, bridging the gap between solvable, finite problems and more challenging, infinite problems.

Now, an NSF CAREER grant will help him achieve that goal.

The National Science Foundation Faculty Early Career Development Award is a five-year grant designed to help promising researchers establish a foundation for a lifetime of leadership in their field. Known as CAREER awards, the grants are NSF's most prestigious funding for untenured assistant professors.



Anton Bernshteyn

Bernshteyn will focus on "Developing a unified theory of descriptive combinatorics and local algorithms" — connecting concepts and work being done in two previously separate mathematical and computer science fields. "Surprisingly," Bernshteyn says, "it turns out that these two areas are closely related, and that ideas and results from one can often be applied in the other." "This relationship is going to benefit both areas tremendously," Bernshteyn says. "It significantly increases the number of tools we can use"

By pioneering this connection, Bernshteyn hopes to connect techniques that mathematicians use to study infinite structures (like dynamic, continuously evolving structures found in nature), with the algorithms computer scientists use to model large – but still limited – interconnected networks and systems (like a network of computers or cell phones).

Bernshteyn has been an assistant professor in the School of Mathematics since 2020. In the fall of 2024, he will be moving to the University of California, Los Angeles (UCLA).

"The final goal, for certain types of problems," he continues, "is to take all these questions about complicated infinite objects and translate them into questions about finite structures, which are much easier to work with and have applications in practical large-scale computing."

Creating a Unified Theory

It all started with a paper Bernshteyn wrote in 2020, which showed that mathematics and computer science could be used in tandem to develop powerful problem-solving techniques. Since the fields used different terminology, however, it soon became clear that a "dictionary" or a unified theory would need to be created to help specialists communicate and collaborate. Now that dictionary is being built, bringing together two previously-distinct fields: distributed computing (a field of computer science), and descriptive set theory (a field of mathematics).

Computer scientists use distributed computing to study so-called "distributed systems," which model extremely large networks — like the Internet — that involve millions of interconnected machines that are operating independently (for example, blockchain, social networks, streaming services, and cloud computing systems).

"Crucially, these systems are decentralized," Bernshteyn says. "Although parts of the network can communicate with each other, each of them has limited information about the network's overall structure and must make decisions based only on this limited information." Distributed systems allow researchers to develop strategies — called distributed algorithms — that "enable solving difficult problems with as little knowledge of the structure of the entire network as possible," he adds.

At first, distributed algorithms appear entirely unrelated to the other area Bernshteyn's work brings together: descriptive set theory, an area of pure mathematics concerned with infinite sets defined by "simple" mathematical formulas.

"Sets that do not have such simple definitions typically have properties that make them unsuitable for applications in other areas of mathematics. For example, they are often non-measurable – meaning that it is impossible, even in principle, to determine their length, area, or volume," Bernshteyn says.

Because undefinable sets are difficult to work with, descriptive set theory aims to understand which problems have "definable"— and therefore more widely applicable— solutions. Recently, a new subfield called descriptive combinatorics has emerged.

> "Descriptive combinatorics focuses specifically on problems inspired by the ways collections of discrete, individual objects can be organized," Bernshteyn explains. "Although the field is quite young, it has already found a number of exciting applications in other areas of math."

The key connection? Since the algorithms used by computer scientists in distributed computing are designed to perform well on extremely large networks, they can also be used by mathematicians interested in infinite problems.

Solving Infinite Problems

Infinite problems often occur in nature, and the field of descriptive combinatorics has been particularly successful in helping to understand dynamical systems: structures that evolve with time according to specified laws (such as the flow of water in a river or the movement of planets in the Solar System).

> "Most mathematicians work with continuous, infinite objects, and hence they may benefit from the insight contributed by descriptive set theory," Bernshteyn adds.

However, while infinite problems are common, they are also notoriously difficult to solve.

> "In infinite problems, there is no software that can tell you if the problem is solvable or not. There are infinitely many things to try, so it is impossible to test all of them. But if we can make our problems finite, we can sometimes determine which ones can and cannot be solved efficiently," Bernshteyn says. "We may be able to determine which combinatorial problems can be solved in the infinite setting and get an explicit solution." "It turns out that, with some work, it is possible to implement the algorithms used in distributed computing on infinite networks, providing definable solutions to various combinatorial problems," Bernshteyn says. "Conversely, in certain limited settings it is possible to translate definable solutions to problems on infinite structures into efficient distributed algorithms — although this part of the story is yet to be fully understood."

A New Frontier

As a recently emerged field, descriptive combinatorics is rapidly evolving, putting Bernshteyn and his research on the cutting edge of discovery.

> "There's this new communication between separate fields of math and computer science—this huge synergy right now—it's incredibly exciting," Bernshteyn says.

Introducing new researchers to descriptive combinatorics, especially graduate students, is another priority for Bernshteyn. His CAREER grant funds will be especially dedicated to training graduate students who might not have had prior exposure to descriptive set theory. Bernshteyn also aims to design a suite of materials ranging from textbooks, lecture notes, instructional videos, workshops, and courses to support students and scholars as they enter this new field.

> "There's so much knowledge that's been acquired," Bernshteyn says. "There's work being done by people within computer science, set theory, and so on. But researchers in these fields speak different languages, so to say, and a lot of effort needs to go into creating a way for them to understand each other. Unifying these fields will ultimately allow us to understand them all much better than we did before. Right now we're only starting to glimpse what's possible."

WENJING LIAO AWARDED DOE EARLY CAREER AWARD FOR MODEL SIMPLIFICATION, DEEP LEARNING

OCTOBER 3, 2023 | ATLANTA, GA

Liao selected as one of the 93 early career scientists from across the country who are receiving a combined $135 million in DOE funding.

Wenjing Liao, an associate professor in the School of Mathematics, has been awarded a Department of Energy (DOE) Early Career Award for her research into how deep learning might be leveraging to make mathematical advances in achieving more efficient modeling techniques.

Liao was selected as one of the 93 early career scientists from across the country who are receiving a combined $135 million in DOE funding. The awards aim to support the next generation of STEM leaders, and identify early-career scientists whose research will have global impacts.

Earlier this year, Liao was also selected for an National Science Foundation (NSF) Faculty Early Career Development Program (CAREER) Award, one of the most prestigious grants that a scientist can receive early in their profession.

> "Supporting America's scientists and researchers early in their careers will ensure the U.S. remains at the forefront of scientific discovery and develops the solutions to our most pressing challenges," said U.S. Secretary of Energy Jennifer M. Granholm.

The funding "will allow the recipients the freedom to find the answers to some of the most complex questions as they establish themselves as experts in their fields."

Model Simplification; Complex Problems

Real-world applications of computer modeling often call for large, complex data simulations, which can be time-consuming and expensive, limiting their applications. Liao's project "Model Reduction by Deep Learning: Interpretability and Mathematical Advances" focuses on a technique called model reduction, which allows researchers to reduce the size of problems computer models must solve to smaller ones that computers can efficiently solve.

Wenjing Liao

Liao notes that while traditional model-reduction methods have been successful, the technique is mostly limited to low dimensional linear models, or those with fewer important features that the model can include. However, many problems found in nature are the opposite. Liao hopes that by identifying the underlying nonlinear structures in natural problems, she can broaden the application of model-reduction techniques.

To do so, her research will focus on three key questions. First, she will investigate how to leverage deep neural networks to extract low-dimensional nonlinear structures in data sets. Next, Liao will investigate how to use the nonlinear structures in model reduction. Finally, in order to better harness deep learning, Liao aims to develop new deep learning-based model reduction methods.

> "This project has the potential to drive significant advances in scientific machine learning," Liao says in her abstract. "The proposed model-reduction methods can be used to analyze large datasets and simulate complex phenomena in physics, biology, and engineering."

To read about more the DOE Early Career Award, check out:
https://science.osti.gov/early-career

JOSEPHINE YU ARTICLE APPEARS IN AMS NOTICES

JANUARY 10, 2023 | ATLANTA, GA

Josephine Yu and her coauthors have had a recent work published in the AMS Notices.

From the article:

> In this article we introduce some of the basic constructions in tropical geometry, focusing on linear spaces and Grassmannians for their combinatorial significance. We give pointers to some recent research frontiers and discuss applications in matroid theory, phylogenetic trees, and auction theory.

Professor Josephine Yu

Dr. Josephine Yu was recently promoted to a Full Professor in the School of Mathematics, in 2022. Prof. Yu's research lies in the area of Tropical Algebraic Geometry and its applications to combinatorics, matroid theory, and analytic and computational geometry, and since arriving at Tech her work has been continually supported by the NSF.

Prof. Yu has organized many conferences since 2011 including the Meeting on Applied Algebraic Geometry in 2019, and the Computational Tropical Geometry Minisymposium at the SIAM Algebraic Geometry meeting in 2017. Prof. Yu was also the Program co-chair of SIAM AG21 and has served on the Advisory Board of MEGA (Effective Methods in Algebraic Geometry) since 2019.

Josephine Yu

Prof. Yu is also currently an Editor for two journals, Combinatorial Theory and Algebraic Statistics (AStat), is the Associate Editor for the Journal of Software for Algebra and Geometry (JSAG), and was the Editor in Chief for the Journal of Combinatorial Theory, Series A (JCTA) from 2018 until 2020.

Prof. Yu's research lies in the area of Tropical Algebraic Geometry and its applications to combinatorics, matroid theory, and analytic and computational geometry.

In addition to her impressive research and organizational work, Prof. Yu has mentored three graduate students and two masters students including award winning graduate students Cvetelina Hill and Marcel Celaya.

Find the Article Here:

https://www.ams.org/journals/notices/202301/rnoti-p34.pdf

SANTOSH VEMPALA NAMED SIMONS INVESTIGATOR

MARCH 26, 2023 | ATLANTA, GA

Not constrained to any one project, the funding is meant to empower award recipients to push forward on any foundational challenges to computer science.

Santosh Vempala has been named a 2023 Simons Investigator in theoretical computer science by the Simons Foundation.

The Simons Investigator award supports "outstanding theoretical scientists in their most productive years, when they are establishing creative new research directions, providing leadership to the field, and effectively mentoring junior scientists."

Vempala is the Frederick Storey II Chair of Computing and Distinguished Professor in the School of Computer Science at Georgia Tech, with courtesy appointments in the School of Mathematics and H. Milton Stewart School of Industrial and Systems Engineering.

He will receive $150,000 per year for five years from the award, which could be renewed for another five years. Not constrained to any one project, the funding is meant to empower award recipients to push forward on any foundational challenges to computer science that are related to their interests.

For Vempala, who also serves as Director of the Algorithms, Combinatorics, and Optimization Program at Georgia Tech, these challenges have to do with geometry and randomness.

"Some of the most exciting problems in science are those related to efficient algorithms. Computer science really has uncovered fundamentally new questions but also provided novel perspectives on classical problems in mathematics," Vempala said. "We are yet to understand extremely basic questions such as how best to solve linear systems and linear programs."

Santosh Vempala

About Santosh Vempala

Vempala received his Ph.D. in Algorithms, Combinatorics, and Optimization at Carnegie Mellon University before spending a year as a Miller Fellow at University of California, Berkeley and a decade as a professor of mathematics at the Massachusetts Institute of Technology. Upon joining the faculty at Georgia Tech, Vempala served as the founding director of Tech's Algorithms and Randomness Center. He is a fellow of both the Association for Computing Machinery and the American Mathematical Society.

ALEX BLUMENTHAL NAMED SLOAN FELLOW

FEBRUARY 19, 2024 | ATLANTA, GA

School of Mathematics Assistant Professor Alex Blumenthal has been selected to receive the prestigious Sloan Research Fellowship for 2024.

The annual awards from the Alfred P. Sloan Foundation honor early-career researchers whose "creativity, innovation, and research accomplishments make them stand out as the next generation of leaders in the fields."

In total, four Georgia Tech faculty are among the 126 individuals selected from a pool of over 1,000 North American researchers nominated this year, including School of Physics Assistant Professor Chunhui (Rita) Du, Juan-Pablo Correa-Baena of the School of Materials Science and Engineering, and Daniel Genkin of the School of Cybersecurity and Privacy.

"Sloan Research Fellowships are extraordinarily competitive awards involving the nominations of the most inventive and impactful early-career scientists across the U.S. and Canada," says Adam F. Falk, president of the Alfred P. Sloan Foundation.

Recipients will receive a two-year $75,000 Fellowship in support of their cutting-edge research.

> "I am thrilled to be a recipient of the Sloan Fellowship this year, and I am thrilled for what can be done with it," says Blumenthal. "I am immensely grateful for the support of my colleagues and that of SoM at large, without whom this would not have been possible."

Blumenthal was also recently awarded an NSF CAREER grant to study chaotic fluid dynamics, one of the most challenging problems in his field. His research focuses on dynamic systems, and their statistical properties.

Many systems and nature exhibit these seemingly random behaviors — imagine smoke rising from a candle and mixing with the air in a room, or the ripples of cream as they're swirled into coffee. While extremely difficult to mathematically model and solve, Blumenthal explains that solving these

Alex Blumenthal

types of problems could lead to innovations ranging from atmospheric modeling and weather predictions, to economics, to creating better salinity profiles in oceans.

Including the 2024 class, 55 Georgia Tech faculty have received Sloan Research Fellowships, among them School of Mathematics faculty Hannah Choi in 2022, Yao Yao in 2020, Konstantin Tikhomirov in 2019, Lutz Warnke in 2018, Zaher Hani in 2016, Jen Hom in 2015, and Greg Blekherman in 2012; along with School of Chemistry's Vinayak Agarwal in 2018, School of Earth and Atmospheric Sciences' Christopher Reinhard in 2015; and School of Physics' Tamara Bogdanović in 2013.

MATT BAKER AWARDED SIMONS FELLOWSHIP

MARCH 26, 2023 | ATLANTA, GA

Matt Baker is one of 39 researchers around the country named to the 2023 Class of Simons Fellows.

Matt Baker is one of 39 researchers around the country named to the 2023 Class of Simons Fellows. Baker is a professor in the School of Mathematics, and will soon depart his role as the inaugural College of Sciences associate dean for Faculty Development to focus on the new fellowship.

The Simons Fellows are part of the Simons Foundation's mission to support discovery-driven scientific research undertaken in the pursuit of understanding the phenomena of our world. It provides funds to faculty for up to a semester-long research leave from classroom teaching and administrative obligations.

"I'm really excited to have the opportunity to pursue some intellectual projects next year that I haven't had time for in the recent past," Baker said. "And I'm grateful to the School of Mathematics, the College of Sciences, and the Simons Foundation for their support."

Baker has announced his intention to use the fellowship, along with a Georgia Tech Faculty Development Grant, for a sabbatical he will take during the 2023-2024 academic year.

Over the past five years, as the College's first associate dean for Faculty Development, Baker has instituted important processes regarding the hiring and retention of faculty, said Susan Lozier, College of Sciences Dean and Betsy Middleton and John Clark Sutherland Chair.

"Matt will be leaving an indelible mark on the College," said Lozier. "Over these past five years, he has tirelessly worked to recruit, retain, promote and support faculty. Under his leadership, we now have annual faculty hiring plans that guide our growth. We have a set of robust new faculty mentoring workshops, a more inclusive faculty development grant program, a consistent distribution of best practices in faculty hiring, and a more open process for the solicitation of faculty awards.

Matt Baker

"It has been nothing short of a pleasure to work with Matt these past few years, and I will miss the wisdom and wit that he brought to his position."

Plans for a research-centric year

"The Simons Fellowships have become a principal distinction for senior mathematicians," explains Michael Wolf, professor and chair of the School of Mathematics. Annually, "only about 40 mathematicians in the U.S. and Canada receive these awards, and they go to the mathematical scientists with the best research records in the previous five years, whose potential to use a semester to think promises the greatest possibilities. The awardees are the household names of the

mathematicians doing the best current work nationally, and while it is natural to see Matt included, it is still a wonderful statement of how his impact is appreciated by his colleagues in this country."

Baker's research includes his work on matroid theory, which the American Mathematical Society (AMS) describes as "a combinatorial theory of independence which has its origins in linear algebra and graph theory, and turns out to have deep connections with many other fields." Baker will turn the notes from his Spring 2020 graduate course, Topics in Matroid Theory, into a freely available AMS Open Math Notes resource.

"Matt will be leaving an indelible mark on the College," said Lozier. "Over these past five years, he has tirelessly worked to recruit, retain, promote and support faculty."

Baker said he plans to travel for collaborations with other math researchers, and to attend workshops and conferences. He will also resume regular blogging about math research; his blog recently surpassed 300,000 views.

About Matt Baker

Baker received his B.S. in Mathematics in 1994 from the University of Maryland at College Park, where he graduated summa cum laude. He earned a Ph.D. in Mathematics from the University of California, Berkeley, in 1999.

Baker was a National Science Foundation Postdoctoral Fellow and an assistant professor at Harvard University from 1999-2002. He was a visiting professor at the University of Paris, and an assistant professor at the University of Georgia before joining Georgia Tech in 2004. He was elected as a Fellow of the American Mathematical Society in 2012, and was named the College of Sciences' first associate dean for Faculty Development in 2018.

Baker has written three books about math. His fourth book, "The Buena Vista Shuffle Club," published in 2019, details his lifelong love of magic and how he explores its connections to mathematics. The Georgia Magic Club selected Baker as its Greater Atlanta Magician of the Year in 2015 and 2019.

FULMER AWARDS 2023-2024

FEBRUARY 19, 2024 | ATLANTA, GA

About the Fulmer Prize

We thank the late Howard Woodham (Georgia Tech alumnus, Engineering '48) for the establishment of the Herman K. Fulmer Faculty Teaching Fund Endowment for the School of Mathematics, in memory of Professor Herman Fulmer, his former mathematics professor. Each year this award recognizes one of our faculty who exhibit genuine regard for undergraduate students during the first few years of their Engineering studies at Georgia Tech."

2023 Fullmer Prize: Klara Grodzinsky

Klara Grodzinsky is a Senior Academic Professional and the Director of Teaching Assistants for the School of Mathematics. Over her 27-year career in SoM, Ms. Grodzinsky has been a critical component to the teaching mission of Georgia Tech and the School of Mathematics.

In 2000, she co-created a training program for graduate and undergraduate teaching assistants, which earned the Board of Regents Teaching Excellence Award in 2006 and has been used as a model for other campus departments. In addition to directing the TA program, Ms. Grodzinsky has taken on key roles in course coordination, registration, permits, and the course scheduling team.

2024 Fullmer Prize: Sal Barone

Sal Barone is a Senior Academic Professional who first arrived at Georgia Tech in 2013 as a Hale Postdoctoral Fellow doing research in Real Algebraic Geometry, and became the school's first Director of Communications (DoCSoM) as an Academic Professional in 2017. With a clear passion for teaching, Dr. Barone has contributed to the service mission of SoM by coordinating Math 1554 Linear Algebra since Spring 2020.

STELSON LECTURE 2024 - HUGO DUMINIL-COPIN

DECEMBER 3, 2023 | ATLANTA, GA

Fields Medalist Prof. Hugo Duminil-Copin gave two talks for the Stelson Lecture series, a public lecture on March 7th at 4:30pm-5:30pm in Howey-Physics L3, and a School of Mathematics Colloquium on March 8th at 11am in Skiles 006. The public lecture is designed to be accessible to a wide audience.

From Coffee to Mathematics: Making Connections and Finding Unexpected Links

Details

Public lecture, March 7th at 4:30pm in Howey-Physics L3

Description

The game of HEX has deep mathematical underpinnings despite its simple rules. What could this game possibly have to do with coffee?! And how does that connection, once identified, lead to consideration of ferromagnetism and even to the melting polar ice caps?

Join Hugo Duminil-Copin, Professor of Mathematics at IHES and the University of Geneva, for an exploration of the way in which mathematical thinking can help us make some truly surprising connections.

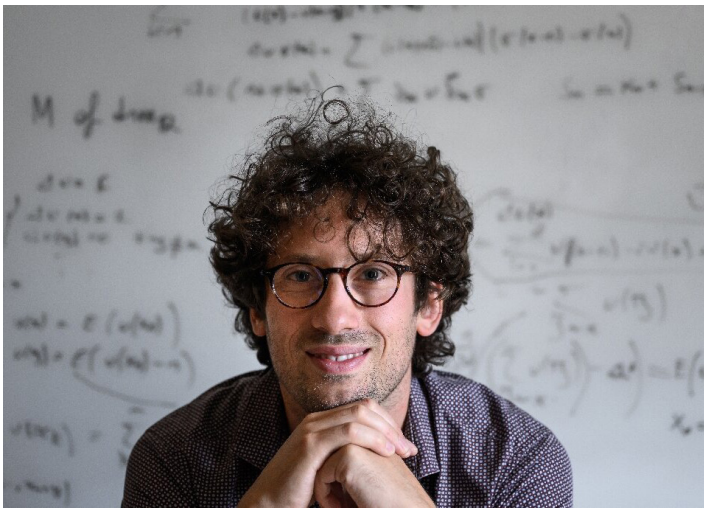
Critical Phenomena Through The Lens of The Ising Model

Details

Colloquium, March 8th at 11am in Skiles 006

Description

The Ising model is one of the most classical lattice models of statistical physics undergoing a phase transition. Initially imagined as a model for ferromagnetism, it revealed itself as a very rich mathematical object and a powerful theoretical tool to understand cooperative phenomena. Over one hundred years of its history, a profound understanding of its critical phase has been obtained. While integrability and mean-field behavior led to extraordinary breakthroughs in the two-dimensional and high-dimensional cases respectively, the model in three and four dimensions remained mysterious for years.



Fields Medalist Professor Hugo Duminil-Copin

In this talk, we will present recent progress in these dimensions based on a probabilistic interpretation of the Ising model relating it to percolation models.

About the Speaker

Professor Duminil-Copin is a French mathematician specializing in probability theory, who studies the border between mathematics and physics and analyzes models of fluids flowing through a porous medium, such as water coursing through coffee grounds. Such models, which involve the formation of connected clusters in random networks, can also represent the spread of a disease, the circulation of a rumor, or the advance of a forest fire.

Prof. Duminil-Copin has diverse interests in a range of activities which also characterizes his work, and has sampled tools from various fields in an ongoing effort to transform mathematicians' understanding of phase transitions.

For that work, Duminil-Copin was awarded the Fields Medal in 2022 for "solving longstanding problems in the probabilistic theory of phase transitions in statistical physics, especially in dimensions three and four".

STELSON LECTURE 2023 - WILHELM SCHLAG

MARCH 9, 2023 | ATLANTA, GA

Professor Wilhelm Schlag is the Phillips Professor of Mathematics and the Chair of the Department of Mathematics at Yale University. A world-leading expert in harmonic analysis, mathematical physics, and partial differential equations, much of Schlag's work has been devoted to the study of wave propagation, both in structured as well as in disordered media.

Schlag is a recipient of Sloan and Guggenheim fellowships, among others. He was a plenary speaker at the International Congress of Mathematical Physics in 2012 as well as an invited speaker at the International Congress of Mathematicians in 2014. Prior to joining the Yale faculty, he was the Holmer J. Livingston Professor of Mathematics at the University of Chicago. Before that, he served as professor at the California Institute of Technology, and as assistant professor at Princeton University.

Nonlinear waves, spectra, and dynamics in infinite dimensions.

Details

March 10th, 4-5pm in Klaus 1443 Lecture Auditorium

Abstract

Waves are ubiquitous in nature. Some wave phenomena are conspicuous, most notably in elastic objects, and in bodies of water. In electro-dynamics, quantum mechanics, and gravity, waves play a fundamental role but are much more difficult to find.

A world-leading expert in harmonic analysis, mathematical physics, and partial differential equations, much of Schlag's work has been devoted to the study of wave propagation, both in structured as well as in disordered media.

Over the past centuries, major scientific breakthroughs have been associated with the discovery of hidden wave phenomena in nature. Engineering has enabled our modern information based society by developing sophisticated methods which allow us to harness wave propagation.

Professor Wilhelm Schlag

Seismic exploration relies on wave scattering in the discovery of natural resources. Medicine depends heavily on wave-based imaging technology such as MRI and CAT scans.

Mathematics has played a major role in the understanding of wave propagation, and its many intricate phenomena including reflection, diffraction, and refraction. In its most basic form, the wave equation is a linear partial differential equation (PDE). However, modern science and engineering rely heavily on nonlinear PDEs which can exhibit many surprising and delicate properties. Mathematical analysis continues to evolve rapidly driven in part by the many open questions surrounding nonlinear PDEs and their solutions. This talk will survey some of the mathematics involved in our understanding of waves, both linear and nonlinear.

Wilhelm Schlag also gave a colloquium talk:

https://math.gatech.edu/seminars-colloquia/series/stelson-lecture-series/wilhelm-schlag-20230314

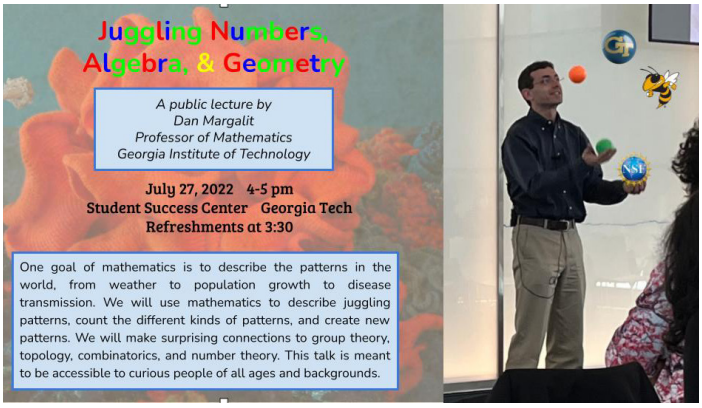
TOPOLOGY STUDENTS WORKSHOP

JULY 27, 2022 | ATLANTA, GA

July 27 was the biennial Topology Students Workshop, organized by Dan Margalit since 2012. As part of this event, there was a public lecture on Wednesday, July 27, 4-5 pm, in the Student Success Center. The title of the talk was Juggling Numbers, Algebra, and Topology.

Juggling Numbers, Algebra, and Topology

One goal of mathematics is to describe the patterns in the world, from weather to population growth to disease transmission. We will use mathematics to describe juggling patterns, count the different kinds of patterns, and create new patterns. We will make surprising connections to group theory, topology, combinatorics, and number theory. This talk is meant to be accessible to curious people of all ages and backgrounds.



Technology Student Workshop

THE 2023 ATLANTA SCIENCE FESTIVAL

SoM MATHAPALOOZA! EVENT

MARCH 18, 2023 | ATLANTA, GA

Atlanta Science Festival

Returning March 10–25, 2023, the Atlanta Science Festival is an annual public celebration of local science and technology. The College of Sciences and School of Mathmatics has partnered with Science ATL to bring STEAM events to curious community members of all ages!

Mathapalooza!

Presented by The School of Mathmatics:

"At Mathapalooza! there will be big spaces filled with engaging puzzles, games, and artwork," explained Evans Harrell, professor and associate dean emeritus in the School of Mathematics and one of the event organizers.

> "Up on the stage you will see how math connects with music, circus arts, comedy, drama, and more... You will be astonished and delighted that math can dance!"

Atlanta Science Festival (Photo: Atlanta INtown Paper)

For more details about the festival and to find events near you:
atlantasciencefestival.org

POSTDOC SOCIAL!

SEPTEMBER 30, 2022 | ATLANTA, GA

The Skiles Building

The first postdoc social of the Fall semester was at 4:30 PM, Friday, Sept. 30 at the Skiles Courtyard.

This was an opportunity to address any teaching-related questions and concerns as we made our way through the middle of the semester.

What is this?

The SoM Postdoc Mentoring Social is an informal event that is held from time to time each semester. Tenure/Tenure-track faculty are also welcome to join. Therefore, feel free to invite your mentor along!

Why are we having this?

The aim of these events is to give you a chance to talk about various teaching-related challenges in a completely informal and social setting. Talk to your friends, get advice from your peers, listen to ideas of people who have been through it all, unwind after a hectic week of classes and so on.

What kind of food and drinks?

There will be wine, cheese and crackers, sodas and beer.

Do I have to pay anything?

Of course not! See you there.

THE MATH 4441 ART SHOW

DECEMBER 8, 2022 | ATLANTA, GA

This semester, the students of Math 4441 Differential Geometry are writing term papers in lieu of a final exam. Some groups of students are also creating works of art to accompany their papers.

Math 4441 Art Show

In the Math 4441 Art Show, several students from Georgia Tech's undergraduate Differential Geometry course will display works of visual art created to accompany their term papers. These optional projects are based on geometry and topology topics of the students' choosing, and the artists will be present to discuss the mathematics which motivated their work. This come-and-go event is open to all.

At this come-and-go event, interested students will have the opportunity to display their artwork and discuss the mathematics that inspired them. I hope you'll stop by to ask the students about their work!

Georgia Tech College of Sciences
School of Mathematics

AMS SECTIONAL MEETING AT SoM

FEBRUARY 21, 2023 | ATLANTA, GA

This spring, Georgia Tech will host one of the largest regional meetings of mathematicians in the country. The 2023 Spring Southeastern Sectional Meeting of the American Mathematical Society (AMS) comes to campus March 18-19, 2023.

Approximately 800 mathematicians are expected to attend lectures and special sessions in Skiles and Clough Undergraduate Learning Commons, with a reception scheduled for Saturday evening at the Academy of Medicine.

Michael Wolf, professor and chair of the School of Mathematics, said the AMS meeting is shaping up to be one of the busier ones in recent memory.

"Georgia Tech is just thrilled to be hosting this sectional meeting of the American Mathematical Society, and we've been amazed at the response. This will be one of the larger sectional meetings to be held," Wolf said.

"Mathematics advances through sustained conversation, and one can see the hunger for personal connection that has built up over the pandemic," he added, "reflected in the large number of special sessions and the robust attendance. We are looking forward to a wonderful event where we can all reconnect in person with mathematicians we have not seen in a while and younger people can join the community that has only recently opened up beyond the virtual."

The School of Mathematics will host 800 mathematicians on campus for a theorem-filled weekend of sessions and lectures — including one from a College of Sciences alumna — at the AMS Spring Southeastern Sectional Meeting.

41 special sessions are scheduled for the AMS meeting. Topics speak to a wide range of mathematics research interests: combinatorics, the intersection of math and biology, geometric group theory, quantum systems, disease transmission, big data, and new methods for teaching math to undergraduates.

Special AMS Lectures

A School of Mathematics alumna will deliver one of the four invited addresses at the Southeastern Sectional Meeting. Blair Dowling Sullivan graduated from Georgia Tech in 2003 with a double major in applied mathematics and computer science.

Sullivan went on to receive her M.A. and Ph.D. in mathematics from Princeton University. After internships with the Oak Ridge National Laboratory and Microsoft, she served on the faculty of North Carolina State University. She is currently an associate professor in the School of Computing at the University of Utah. Her address, "Taking a Hard Look at Generalized Coloring Numbers," is scheduled for 11 a.m. on Saturday, March 18 in Clough Room 152.

The AMS's annual Erdős Memorial Lecture, named for prolific mathematician Paul Erdős (1913-1996), will be given by Amie Wilkinson, professor at the University of Chicago, at 5 p.m. on Saturday in Clough Room 152. Wilkinson's Erdős Lecture is titled "Symmetry Rigidity."

Wilkinson's research interest is smooth dynamical systems and their relationship with other structures in pure mathematics — geometric, statistical, topological, and algebraic.

"The basic idea of dynamical systems is that you do some 'move' to a 'space' over and over again, and try to figure out what will happen in the long term," explains Dan Margalit, a School of Mathematics professor whose research topics include topology and geometric group theory. "An example is what happens to the solar system in the long term? Will Jupiter fly out of the solar system, or will it stay in orbit around the sun forever? Another example is the rolling of pastry dough, like a croissant. This is an example of a chaotic dynamical system."

Margalit, a co-organizer of the meeting along with fellow School of Mathematics Professor Greg Blekherman, adds that Wilkinson has published many times in top journals such as Annals of Mathematics. She has also been very active with educational and public outreach.

"It will be a very lively atmosphere," Margalit added.

RANDOM-APPROX 2023 + TETFEST60

SEPTEMBER 11, 2023 | ATLANTA, GA

Georgia Tech will host in September three national conferences in the areas of algorithms, approximation, optimization and randomness.

These apparently separate areas have surprising synergies. Clearly, optimization is important for applications where we try to do as well as possible. One needs algorithms to actually compute effectively these optimal results. One also needs to develop systematically simpler models that capture the essential features but are more tractable. Somewhat more surprising is that sometimes including a bit of randomness in the algorithms can help them perform better than a purely deterministic one. Jiggling the algorithmic steps a bit can lead to paths that were difficult to predict, and this can sometimes be more effective than a purely deterministic method. Of course there are other times that noise will confuse the results which makes both methods valuable in different situations.

Understanding and taking advantage to choose between these two possibilities and avoiding the pitfalls of each requires deep mathematics, mathematics that unify these apparently different objects and make quantitative predictions. New paradigms of computation are needed. GT has long been a leader in developing this area of mathematics, and in particular the ACO program has been nationally prominent for decades.

Two series of conferences (RANDOM and APPROX) had been run annually for the last 25+ years. Recently, they have been held jointly, even if they have different history and a different team of organizers.

A third event will be a celebration of the 60th birthday of Prof. Prasad Tetali, who has been a leader in these areas for decades.

Prof. Tetali's career provides a wonderful example of unifying different areas and discovering important synergies.

Prof. Tetali spent most of his career at GT arriving as a junior assistant professor and leaving as a Regents professor. Prasad has left a profound mark on GT and the School of Mathematics. He is now the head of the Mathematical Sciences Department of Carnegie Mellon. Besides his outstanding scientific contributions and mentoring of students and junior colleagues, organization of national conferences and special years, Prasad performed outstanding service to GT, being director of ARC, director of ACO, and interim chair of the School of Mathematics.

Prasad Tetali, former Regents Professor in the School of Mathematics and the School of Computer Science

Celebration for Prof. Tetali details:
https://sites.gatech.edu/tetfest60/

For a joint page on all 3 events visit:
https://sites.gatech.edu/randomapprox2023/

JOSEPHINE YU GIVES PLENARY TALK AT SYMPOSIUM DISCRETE MATHEMATICS AND RICHARD-RADO PRIZE

SEPTEMBER 20, 2022 | ATLANTA, GA

Josephine Yu

Executive Committee:

- Michael Joswig, TU Berlin
- Volker Kaibel, Otto von Guericke University Magdeburg
- Mihyun Kang, TU Graz
- Anusch Taraz, TU Hamburg

Local Organizers:

- Peter Baasch, TU Hamburg
- Dennis Clemens, TU Hamburg
- Anusch Taraz,TU Hamburg
- Marco Wolkner, TU Hamburg

Josephine Yu gave a Plenary talk at the Symposium Discrete Mathematics and Richard-Rado Prize in Hamburg, Germany, which took place from September 30th to October 1st, 2022.

The Symposium Discrete Mathematics

The Symposium Discrete Mathematics, the biennial meeting of the Discrete Mathematics Group of the German Mathematical Society, took place at TU Hamburg on 30th September and 1st October 2022.

On the occasion of the symposium, the Richard-Rado Prize 2022 for a dissertation in Discrete Mathematics was awarded.

Professor Josephine Yu

Dr. Josephine Yu was recently promoted to a Full Professor in the School of Mathematics, in 2022. Prof. Yu's research lies in the area of Tropical Algebraic Geometry and its applications to combinatorics, matroid theory, and analytic and computational geometry, and since arriving at Tech her work has been continually supported by the NSF.

For more about Prof. Josephine Yu, see the article on Page 34.

For more information on the history of the Symposium Discrete Mathematics and the Richard-Rado Prize:
http://www.fg-diskrete.mathematik.de/

CONFERENCE IN HONOR OF MICHAEL LACEY HELD IN BARCELONA, SPAIN

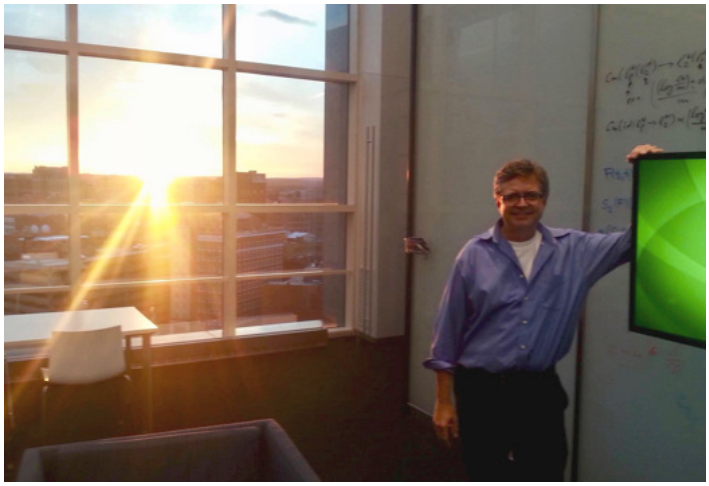
SEPTEMBER 21, 2022 | ATLANTA, GA

Workshop on Harmonic Analysis and Related Topics

This workshop aimed to bring together experts in Harmonic Analysis and related fields. A Clay lecture was delivered by Christoph Thiele. Organised in partnership with the Clay Mathematics Institute. The workshop was held in hybrid format, with opportunities to take part online. We are happy to announce that most speakers agreed to give talks in person! The workshop took place right after the El Escorial and was held from June 13 to June 17, 2022.

Organizers:

- Dario Alberto Mena Arias, Universidad de Costa Rica
- Dmitriy Bilyk, University of Minnesota
- Galyna Livshyts, Georgia Institute of Technology
- Ioannis Parissis, University of the Basque Country Maria del Carmen
- Reguera Rodriguez, University of Birmingham
- Sergey Tikhonov, Centre de Recerca Matemàtica (CRM)



Michael Lacey

Professor Michael Lacey

Micael Lacey has been a Professor of Mathematics in the Shool of Mathematics since 1996. Prof. Lacey's research has touched on the areas of probability, ergodic theory, and harmonic analysis. In 2004, he received a Guggenheim Fellowship for joint work with Xiaochun Li. In 2012 he became a fellow of the American Mathematical Society.

For More Information Visit The Links Below:

https://www.crm.cat/harmonic-analysis-and-related-topics/

https://glivshyts6.math.gatech.edu/Lacey-conference.html

TECH TOPOLOGY CONFERENCE 2022-23

DECEMBER 9, 2022 & DECEMBER 6, 2023 | ATLANTA, GA

Tech Topology Banner

Tech Topology Conference

These were the twelfth and thirteenth annual Tech Topology Conferences, which are held in December each year.

Organizers for 2022:

W. Bloomquist, A. Christian, J. Etnyre, J. Hom, M. Kuzbary, D. Margalit, N. Saglam, J. Simone, H. Turner

Organizers for 2023:

A. Christian, J. Etnyre, J. Hom, J. Simone, H. Turner

About the Conference

The 2022 conference featured several sessions of five-minute pre-recorded and live lightning talks. If you are interested in participating in future events please find the "Registration and Support" page on the School of Mathmatics news archive page for the event.

Supported by the NSF and the Georgia Institute of Technology

For more details find out more at:
ttc.gatech.edu

WORKSHOP ON RECENT TOPICS IN DYNAMICAL SYSTEMS AND MEMORIAL IN HONOR OF PROFESSOR SHUI-NEE CHOW

FEBRUARY 18, 2024 | ATLANTA, GA

Professor Shui-Nee Chow

Workshop in Memory of Shui-Nee Chow

The conference aimed to celebrate the life and contributions of the late Professor Shui-Nee Chow at the one-year anniversary of his passing away. This memorial conference provided a platform for his students, collaborators, and friends from around the world to gather and pay homage to Professor Chow's legacy by discussing the latest progress in dynamical systems and differential equations.

Organizers:

Luca Dieci, Chongchun Zeng, and Haomin Zhou.

The Portman Sculpure, KR+C on Georgia Tech Campus

TECH TOPOLOGY SUMMER SCHOOL 2023

JULY 24, 2023 | ATLANTA, GA

The second ever Tech Topology Summer School took place in 2023. Each iteration of this biennial event focuses on a different area of modern topology. Last year's theme was the L-space conjecture and ran from July 24 to 28.

There were mini-courses by:

- Adam Clay, University of Manitoba
- Sarah Rasmussen, University of Cambridge
- Rachel Roberts, Washington University in St. Louis

There was also an overview talk given by:

- Cameron Gordon, University of Texas, Austin

And research talks were given by:

- Nathan Dunfield, University of Illinois at Urbana-Champaign
- Jonathan Hanselman, Princeton University
- Tao Li, Boston College
- Hannah Turner, Georgia Institute of Technology

If you are interested in attending the next Tech Topology Summer School, planned for 2025, please let us know by registering on the website so we can add you to the participants page and include you in e-mails about the conference.

Participants are expected to know Algebraic Topology and Differential Topology at the level of a first year graduate course in the subjects.

Organizers:

- John Etnyre
- Jennifer Hom
- Miriam Kuzbary
- Nur Saglam
- Jonathan Simon

Supported by the NSF and the Georgia Institute of Technology

WORKSHOP ON GRAPH THEORY AND COMBINATORICS, IN MEMORY OF ROBIN THOMAS

AUGUST 19, 2022 | ATLANTA, GA

Robin Thomas

About Robin Thomas

Robin Thomas was a renowned mathematician and Regents' Professor in the School of Mathematics at Georgia Tech, who passed away on March 26, 2020, following a long struggle against Amyotrophic Lateral Sclerosis.

Robin made major contributions to the development of graph theory and related fields, proving transformational results and mentoring dozens of junior researchers.

Robin Thomas won the top prize in combinatorics, the Fulkerson prize, twice: first in 1994 for his work with Robertson and Seymour on Hadwiger's Conjecture, and then again in 2009 for proving the Strong Perfect Graph Theorem with Chudnovsky, Robertson, and Seymour. In his classes, however, Robin was very modest. He once attempted to attribute this influential theorem only to "CRST", until his assistant was obliged to point out what the "T" stands for.

Robin Thomas directed Georgia Tech's interdisciplinary PhD program in ACO (Algorithms, Combinatorics, and Optimization) for 13 years, graduating 16 PhD students. Robin's lasting impact as a mentor was apparent at this conference. Many of the speakers and attendees worked with Robin as colleagues, postdocs, PhD students, undergraduates, and as friends. Robin's family were honored guests at the conference dinner, which featured wonderful talks and anecdotes in his memory.

Robin Thomas is also honored by the creation of the Robin Thomas Memorial Fellowship at Georgia Tech, by the 2022 conference CSGT which was dedicated to him and held in Prague, where he always maintained close ties, and by a 2023 issue of the journal JCTB, which was a tribute to his work.

About the Workshop

This workshop was combined with the Atlanta Lecture Series in Graph Theory and Combinatorics, and focused on recent advances in graph theory and combinatorics that are related to the work of Robin Thomas.

Sponsors:

- Math@Tech Hub (M@TH) - School of Mathematics, Georgia Institute of Technology
- ACO -Algorithms, Combinatorics and Optimization, Georgia Institute of Technology
- National Security Agency and National Science Foundation (for Atlanta Lecture Series)

For More On The Atlanta Lecture Series:
https://yu.math.gatech.edu/robin_workshop/

WENJING LIAO TO ADDRESS AMERICAN MATHEMATICAL SOCIETY MEETING

JANUARY 9, 2024 | ATLANTA, GA

Wenjing Liao was invited to give a lecture on machine learning and deep learning at the American Mathematical Society (AMS) Southeastern Sectional Meeting on March 23-24, 2024, at Florida State University in Tallahassee.

Wenjing Liao, associate professor in the School of Mathematics, joins a long list of faculty members who in recent years have been invited to take part in the American Mathematical Society's Spring Southeastern Sectional Meetings, for the 2024 version that took place from March 23-24 at Florida State University.

Liao's expertise in artificial intelligence — specifically machine learning and deep learning — earned her the invitation to give one of three addresses at the March AMS meeting.

Liao will present some statistical learning theory of deep neural networks where data are concentrated on or near a low-dimensional manifold. (Low- and high-dimensions refer to the number of observations versus features in a dataset.)

> "When data are sampled on a low-dimensional manifold, the sample complexity crucially depends on the intrinsic dimension of the manifold, which demonstrates that deep neural networks are adaptive to low-dimensional geometric structures in data," Liao says.

Liao is organizing a separate special session on mathematical advances in machine learning during the meeting. Two School of Mathematics visiting assistant professors are also organizing special sessions: Papri Dey's session is on combinatorics of geometry in polynomials, and Austin Christian's will focus on topological interactions of contact and symplectic manifolds.

Wenjing Liao

> "For Wenjing to give a presentation like this at an AMS Spring Southeastern Sectional meeting, at this early stage of her career, speaks volumes about the impact her research into machine learning and especially low dimensional loci within data is having on the field," says Michael Wolf, professor and chair of the School of Mathematics.
>
> "It is my honor and privilege to speak at the Sectional Meeting," Liao says. "This is a great opportunity for me to share our research on deep learning theory with the community."

Georgia Tech and AMS Connections

Last spring the School of Mathematics hosted the AMS 2023 Southeastern Sectional Meeting, which saw alumna Blair Dowling Sullivan (MATH 2003) deliver one of four invited addresses.

Several former and current faculty and graduate students and postdoctoral scholars also organized special sessions and lectures during the AMS 2023 meeting, including Christine Heitsch, Kevin Shu, Mehrdad Ghadiri, Brandon Jerome Legried, Gong Chen, Ryan Dickmann, Abdoul Karim Sane, Dan Margalit, Benjamin Jaye, Naga Manasa Vempati,

Galyna Livshyts, Orli Herscovici, Anton Bernshteyn, Matthew Powell, Burak Hatinoglu, Zhiyu Wang, Xingxing Yu, Miriam Kuzbary, Jon Simone, and Nur Saglam.

> "We were excited and proud to host approximately 800 mathematicians on campus for the March AMS Southeastern Sectional Meeting," Wolf shares.
>
> "It cemented for us just how important these regional conferences are in our discipline. We got to hear the latest on issues like combinatorics, the intersection of math and biology, and quantum systems. We look forward to continuing our regional relationships at the upcoming meeting at Florida State."

Wolf says other current and past School of Mathematics faculty who have spoken at previous AMS Southeastern Sectional meetings include Professors Matt Baker, Greg Blekherman, Rafael de la Llave, John Etnyre, Christine Heitsch, Michael Lacey, Michael Loss, Dan Margalit, Dana Randall, Prasad Tetali, Robin Thomas, Michael Wolf, and XingXing Yu.

About Wenjing Liao

Liao received her Ph.D. in Applied Mathematics at the University of California, Davis, and joined Georgia Tech in 2017. In addition to machine learning, her research interests include imaging, signal processing, and high-dimensional data analysis.

Liao was also part of the Georgia Tech contingent attending this summer's International Conference for Machine Learning in Honolulu. She recently won a U.S. Department of Energy (DOE) Early Career Award for her work on how deep learning might be leveraged to make mathematical advances in achieving more efficient modeling techniques.

Liao's machine learning research also won her a National Science Foundation (NSF) Faculty Early Career Development Program (CAREER) Award in 2022.

Machine Learning Versus Deep Learning

While machine learning relies on algorithms to search for predictability and patterns in sets of structured data, deep learning algorithms imitate how the brain's neural networks work to find patterns in large sets of unstructured data.

> "It is a common belief that deep neural networks are capable of learning various geometric structures hidden in data sets," Liao said.
>
> "One of the central interests in deep learning theory is to understand why deep neural networks are successful, and how they utilize low-dimensional data structures."

Liao's upcoming AMS address, "Exploiting Low-Dimensional Data Structures in Deep Learning," will discuss how deep learning has made "astonishing breakthroughs" in various real world applications over the past decade.

AMS American Mathematical Society

For more information about the AMS conference visit: https://www.ams.org/meetings/sectional/2313_program.html

WORKSHOP IN ANALYSIS

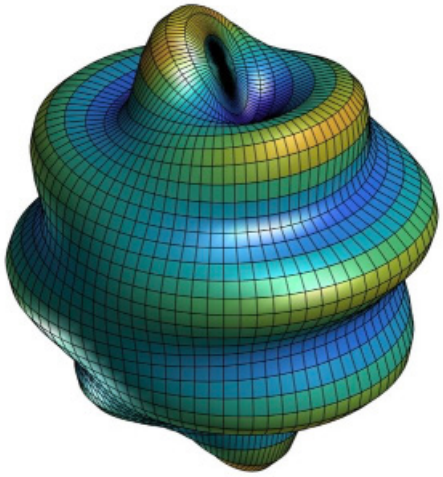
DECEMBER 8, 2023 | ATLANTA, GA

Where:

Atlanta, GA, Georgia Tech campus

Description:

This workshop aimed to bring together researchers working in various branches of Analysis for an exciting and fruitful weekend. Due to the broad focus of our workshop, the talks were aimed at a fairly general audience of analysts. In addition to the talks there was a poster session. All the talks were 40 minutes.



Organizers:

- Dmytro Bilyk dbilyk@umn.edu
- Gong Chen gc@math.gatech.edu
- Benjamin Jaye bjaye3@gatech.edu
- Galyna Livshyts glivshyts6@math.gatech.edu
- Shahaf Nitzan shahaf.nitzan@math.gatech.edu

The organizers are thankful to Aminnah Witten for her invaluable help!

For more information:
https://glivshyts6.math.gatech.edu/workshop_analysis_2023.html

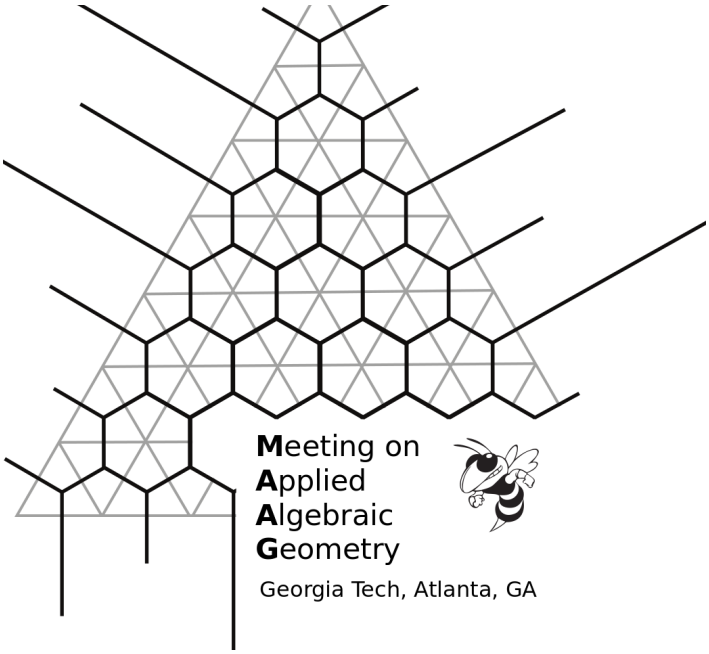
Tech Tower

Ramblin' Wreck

Portman Sculpture

MEETING ON APPLIED ALGEBRAIC GEOMETRY

APRIL 15, 2022 | ATLANTA, GA



About

The Meeting on Applied Algebraic Geometry (MAAG 2023) is a regional gathering which attracts participants primarily from the South-East of the United States. Previous meetings took place at Georgia Tech in 2015, 2018, and 2019, and at Clemson in 2016.

MAAG was followed by a Macaulay2 Day on April 16, organized by Anton Leykin.

Organizers

- Abeer Al Ahmadieh
- Greg Blekherman
- Anton Leykin
- Josephine Yu

Supported by the NSF and the Georgia Institute of Technology

MAAG 2023 website
https://sites.google.com/view/maag-2023/home

Student Center

Exhibition Hall Walkway

Exhibition Hall Patio

SOUTHEAST APPLIED AND COMPUTATIONAL MATH STUDENT WORKSHOP

MARCH 27, 2024 | ATLANTA, GA

Where:

School of Mathematics
Georgia Institute of Technology, Atlanta, GA

When:

April 5 - 6, 2024

Description:

The Southeast Applied and Computational Math (ACM) Student Workshop is for graduate students, postdocs, professors, and other researchers in Southeast US to meet and exchange ideas, highlight local ACM research and to foster collaborations. This annual workshop was initiated in 2023 and is open to the entire research community.

Plenary Speakers:

- Peng Chen, Georgia Tech, Computational Science and Engineering
- Sung Ha Kang, Georgia Tech, Math
- Zecheng Zhang, Florida State University, Math
- Haomin Zhou, Georgia Tech, Math

Organizers:

- Peng Chen, Georgia Tech
- Sung Ha Kang, Georgia Tech
- Wenjing Liao, Georgia Tech
- Haomin Zhou, Georgia Tech
- Feng Bao, Florida State University
- Sanghyun Lee, Florida State University
- Ziad Musslimani, Florida State University
- Zecheng Zhang, Florida State University

Conference website:
https://wliao60.math.gatech.edu/2024ACMWorkshop.html

Workshop in 2023:
https://www.math.fsu.edu/~lee/2023_FGACMW/

Skiles Stairway

Students on Campus

Skiles Walkway

EXTERNAL NEWS

ALUMNA AWARDED FOR EXCELLENCE IN RESEARCH

OCTOBER 24, 2022 | ATLANTA, GA

Diana M. Thomas

Georgia Tech alumna Diana M. Thomas was awarded the 2023 AMS Dolciani Prize for her work exploring the interface of math with obesity and nutrition.

NOTE: This news release first appeared on the website of the American Mathematical Society.

Thomas is currently a professor of mathematics at the United States Military Academy, an adjunct professor at the Pennington Biomedical Research Center, and a research associate at the New York Obesity Research Center at Columbia University. She was awarded the prize for her outstanding research at the interface of mathematics with nutrition and obesity; her work in number theory, combinatorics, and dynamical systems; and her impressive work with undergraduates.

Thomas has an extensive publication record with more than 150 articles, book chapters, and conference proceedings. Much of her research is interdisciplinary and has been published in a diverse set of journals, including those specializing in nutrition, obesity, behavioral science, biology, and pure mathematics.

Thomas' work on obesity and metabolism has been particularly impactful:

> Her nominators write that "she has published a remarkable series of highly original and imaginative papers that display creativity and quantitative rigor, and more recently, on the dynamics of energy exchange and weight gain in pregnancy. Each of these areas suffered substantial quantitative assessment gaps."
>
> "The reports by Thomas provide not only important new biological insights, but also important clinical advances and assessment tools. She is rapidly filling the gap between classical mathematics and biological processes. In so doing, she adds a new dimension to the study of human obesity that is so pervasive across adults and children."

Work by Thomas has led to the design of innovative software that assists users with weight-related health issues, and which has been covered by several media outlets. The work of Thomas and her colleagues has been funded by numerous grants, including six projects funded by the National Institutes of Health. Thomas received an American Heart Association Most Impactful Publications Award in 2014 and the Obesity Society George A. Bray Founders Award in 2017.

Thomas has advised undergraduate research in both pure and applied mathematics, and has coauthored more than 50 publications with undergraduates, including first-generation college students.

She inspires undergraduates with informal discussions inside and outside of the classroom, and masterfully draws them into research projects that are appropriate for their background and interests. Undergraduates she has mentored have pursued many different professions, including enrollment into doctoral programs and careers in education and medicine.

Passionate about transforming mathematics education, Thomas has served in several important leadership roles in this regard. She directed the Mathematical Association of America's undergraduate research poster session competition, and while serving as Director of the Center for Quantitative Obesity Research at Montclair State University, grouped together STEM students engaged in quantitative research, medicine, and nutrition to develop and integrate their knowledge across disciplines.

In addition, Thomas teaches an annual short course on Mathematical Science in Obesity Research, and she recently served as a Remote Teaching Dean's Fellow at the United States Military Academy. As her nominators note,

> Her leadership, collegiality, and results-oriented focus are three strengths that drive any program that she takes on to use science to answer hard questions.

She has inspired, educated, and mentored generations of mathematics and nutrition researchers to choose fact and science to make policy decisions.

From Diana M. Thomas:

> "To be nominated for this award by my colleagues is the ultimate recognition and reflects the level of support that I experience daily. My continued intellectual and personal development have been made possible by my relationships with the nominating team, which includes Colonels Hartley, Scioletti, Lindquist, and Gist; Lieutenant Colonels Bluman and Wallen; and Doctors Misiurewicz, Calkin, Heymsfield, and Allison. What we, as professors, live for is the opportunity to play a role in the lives of our students and our mentees. The former students and early career faculty who have reached out because of this award have warmed my heart and remind me of the impact we make."

> "Finally, I would like to thank my mother, Mary Thomas. No career is without obstacles. Every time I hit the big ones, she's the person I turned to. As the tears and the heartache flooded, she would hold my hands and tell me to be patient and continue to work hard. She was confident that as long as I stuck to this work ethic, I would be successful. It is my hope she will be at the JMM awards ceremony this year to know that her words are why I persevered."

Biographical Sketch of Diana M. Thomas

Diana M. Thomas received her Ph.D. from the Georgia Institute of Technology in 1996. Dr. Thomas has been an active research mathematician for more than 25 years with a focus on nutrition and obesity related modeling. She co-invented the remote weight loss program SmartLoss™, which has been clinically applied worldwide to guide and improve individual patient weight loss adherence through smartphone technology. Dr. Thomas has published more than 150 peer-reviewed articles and book chapters, including more than 50 articles with undergraduates. Her work has been covered by The New York Times, The Wall Street Journal, Fitness magazine, Good Housekeeping, CBS News, and ABC News. Dr. Thomas holds the 2012 Mathematical Association of America of New Jersey Distinguished Teaching Award and the 2017 Obesity Society George A. Bray Founders Award.

About the Dolciani Prize

The AMS Mary P. Dolciani Prize for Excellence in Research recognizes a mathematician from a department that does not grant a Ph.D., who has an active research program in mathematics and a distinguished record of scholarship. The primary criterion for the prize is an active research program, as evidenced by a strong record of peer-reviewed publications. This prize is funded by a grant from the Mary P. Dolciani Halloran Foundation. Mary P. Dolciani Halloran (1923-1985) was a gifted mathematician, educator, and author.

The 2023 Dolciani Prize will be recognized during the Joint Mathematics Meetings in January 2023 in Boston.

Contact: AMS Communications

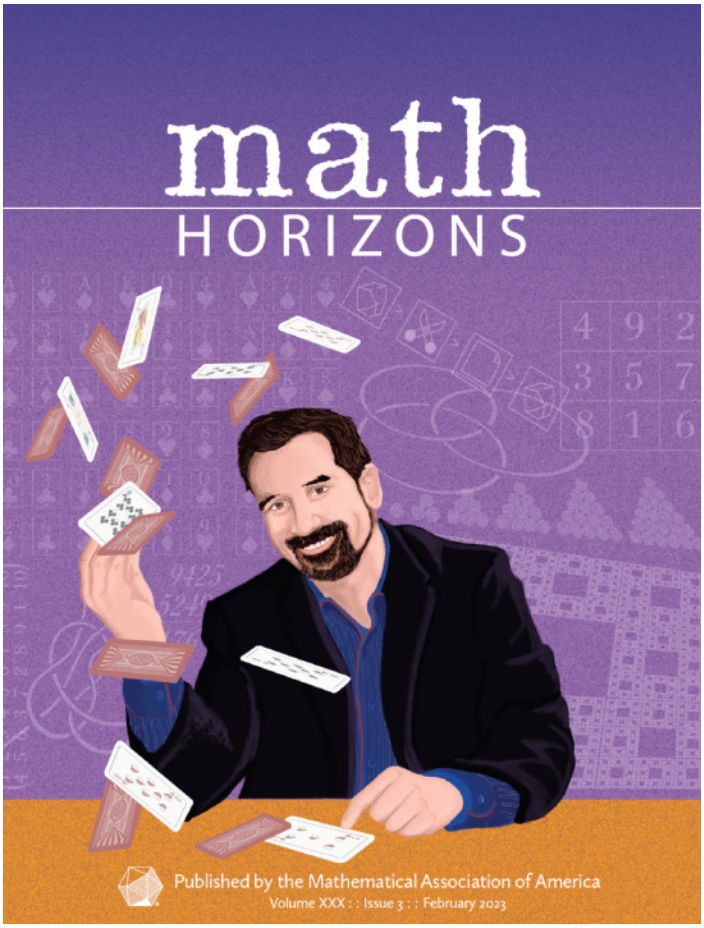
The American Mathematical Society is dedicated to advancing research and connecting the diverse global mathematical community through our publications, meetings and conferences, MathSciNet, professional services, advocacy, and awareness programs.

AMS American Mathematical Society

EXTERNAL NEWS

MATT BAKER ON COVER OF MATH HORIZONS

JANUARY 23, 2024 | ATLANTA, GA



Matt Baker featured on cover of Math Horizons

Matt Baker appears on the cover of the MAA publication Math Horizons, and is featured in an article "On Magic and Math - A Conversation with Matt Baker".

Excerpts from the Article:

Math Horizons (MH): Is it true that every number theorist loves quadratic reciprocity? Is it required to get a PhD in number theory?

Matt Baker (MB): I feel like that's an informal, if not a formal, requirement. During my oral exam at Berkeley, Ken Ribet asked me what my favorite proof of quadratic reciprocity was. At that time, I didn't have an original proof, so I just told him my favorite one that existed; that's the kind of question you actually get as a student in number theory. But my favorite now is my card-dealing proof. There's something unusual about being able to explain basically the whole proof in terms of dealing cards that fits me particularly well; it's kind of uniquely branded to me.

MH: Have you ever used magic to inspire math research?

MB: Glenn Stevens asked me to mentor students in the PROMYS program. One group explored a magic trick I had recently devised. The idea was that you have a stack of cards in some order, and with as few questions as possible, you want to get enough information so that you can determine what cards people have.

MB: Diaconis and Graham have a well-known trick like this using de Bruijn sequences. The students proved a nice theorem—they characterized when you have a special generalized de Bruijn sequence. As far as we can tell, it's a new theorem, which I found surprising.

MH: Do you have advice for aspiring mathematicians, magicians, or anyone trying to pursue their passions?

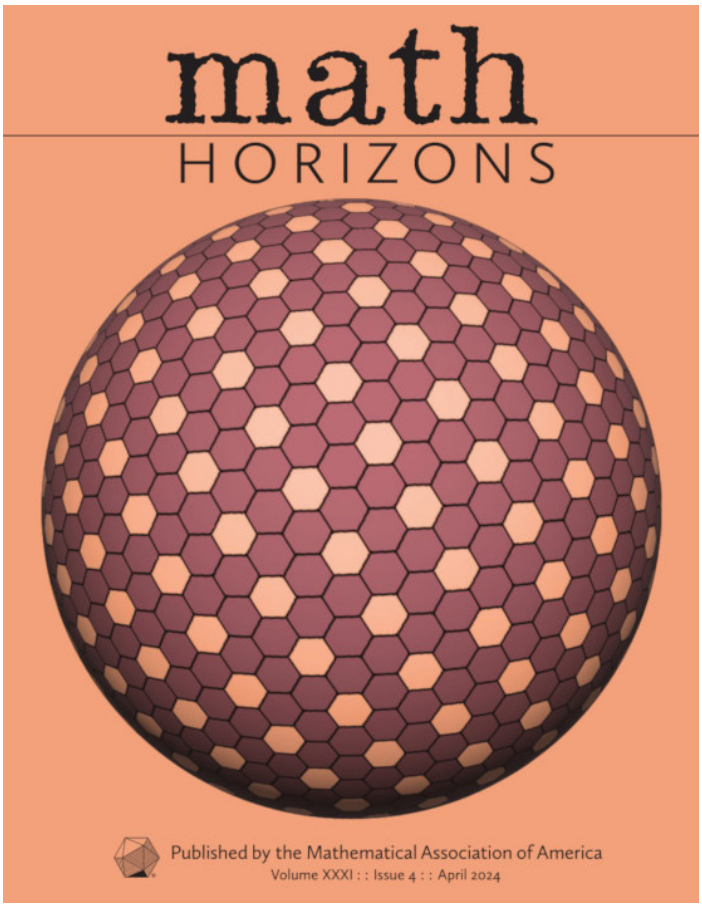
MB: It's fine to just do something because you love it. But the older I get, the more I care about the impact that I can have. So I think you should spend your precious time not

just on something you enjoy, but also on things that you can share with others to bring them enjoyment. The time I spend thinking about magic eventually pays off in that way.

MB: The same goes for my math work. I could spend my time trying to prove a theorem and write a paper about it, and if it's a really good result, that might be the best use of my time. But right now, I actually find that stuff I can share with people (like with my blog or integration of recreational math ideas) is probably going to have a bigger impact than a technical paper that gets read by a handful of mathematicians. I've learned to give myself permission to be playful, and I encourage others to do the same.

MB:

> Finally, you can't just learn everything about math and use all of it. You have to be a little more focused. My advice is to strive to become interested in at least a couple things that are seemingly unrelated and perhaps become quite good at one of those things. Then really try to push the connections a bit because it's just way more likely that you'll make a breakthrough that way.



April 2024 Issue of Math Horizons Cover

For the full article in Math Horizons and interview with Matt Baker visit:
https://maa.tandfonline.com/journals/umho20

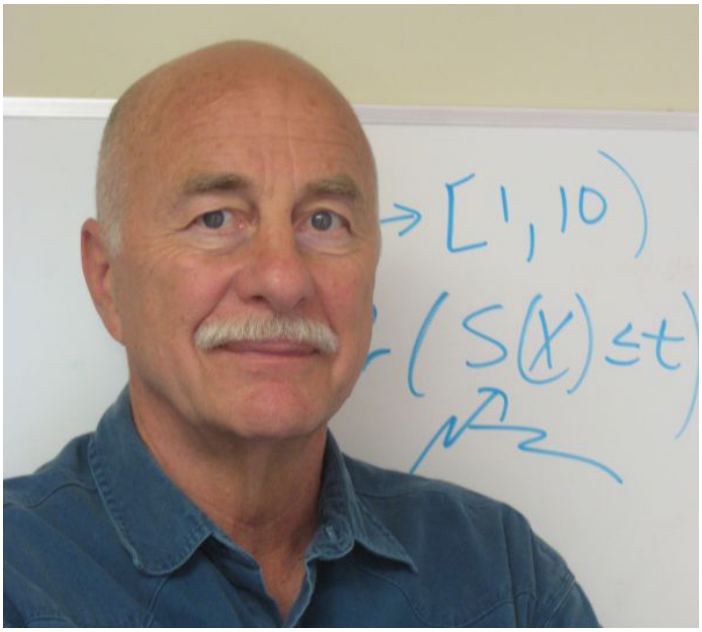
Tech Library

Ramblin' Wreck in Parade

ALUMNA NEWS

THEODORE HILL CITED IN NEWS ARTICLE

FEBRUARY 28, 2023 | ATLANTA, GA



Thodore Hill

Excerpts from the Article:

It was anticipated more than a century ago that the distribution of real-world observations' first digits would not be uniform but would exhibit a trend where numbers with lower first digits (1,2,...) occur more frequently than those with higher first digits (...,8,9).

This phenomenon is known as Benford's law, the law of anomalous numbers, or the first-digit law. It was finally proven in 1995 by Theodore P. Hill, emeritus professor in the School of Mathematics. This law has been found to apply to a wide range of datasets, from countries' populations to financial data, physical constants and earthquakes.

The *ProofReader* (Volume 15, 2024)

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Sal Barone

Selected CoS Stories by
Lindsay C. Vidal, Selena Langner, Renay San Miguel, Audra Davidson, Lea Marzo, and the CoS Communications Team

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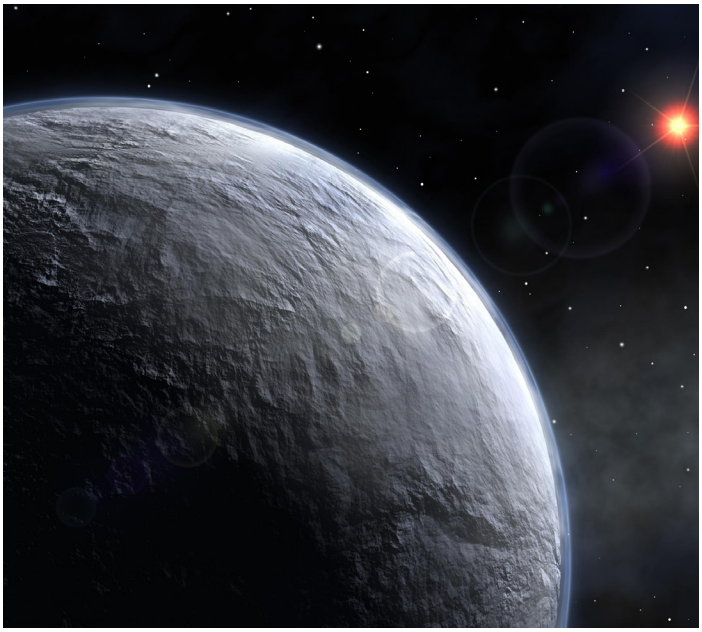
https://math.gatech.edu/proofreader

EXTERNAL NEWS

PROF RAFAEL DE LA LLAVE IN QUANTA

MAY 18, 2023 | ATLANTA, GA



Artist's concept of an ice-covered planet in a distant solar system, resembling what early Earth may have looked like it the right mix of microbial metabolisms and volcanic processes hadn't warmed the climate. Source: European southern observatory (EXO).

Prof. Rafael de la Llave was quoted in a Quanta article about research into the dynamics of the solar system.

Excerpts from the Article:

Research in the 18th century by mathematical giants like Pierre-Simon Laplace and Joseph-Louis Lagrange indicated that, precession aside, the size and shape of the ellipse is stable. It wasn't until the late 19th century that this intuition started to shift, when Henri Poincaré found that even in a model with just three bodies (say, a star orbited by two planets), it's impossible to compute exact solutions to Newton's equations.

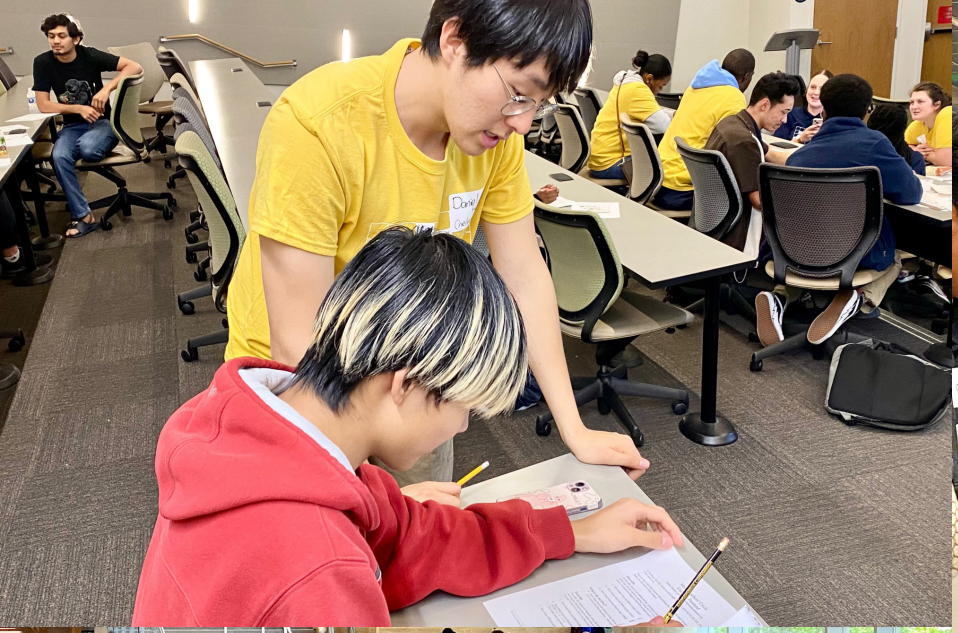
> "Celestial mechanics is a delicate thing," said Rafael de la Llave, a mathematician at the Georgia Institute of Technology.

Alter the initial conditions by a hair — for example, by shifting the assumed position of one planet by a mere meter, as Laskar and Gastineau did in their simulations — and over long timescales the system can look very different.

For the full story from Quanta Magazine please visit:
https://www.quantamagazine.org/new-math-shows-when-solar-systems-become-unstable-20230516/

Students on Campus

Student Center Evening



Photos by Renay San Miguel

OUTREACH

REIMAGINING HIGH SCHOOL MATH DAY — AND MULTIPLYING THE FUN

APRIL 28, 2023 | ATLANTA, GA

Since 1958, the School of Mathematics at Georgia Tech has hosted a day-long math competition for high school students. This year, hundreds of students took part in an expanded day of activities.

Ghenerune Ekuerhar, a ninth-grade student at Kennesaw Mountain High School, is focused intently on a puzzle at Georgia Tech's High School Math Day, held April 22 at Clough Undergraduate Learning Commons.

"It's pretty fun," she says, looking up from the logic challenge she's working to solve.

"The first test, I was racking my brain trying to think of answers. But I really like these activities, because I have to think outside the box for a lot of them."

This year, organizers with the School of Mathematics took a similar approach to reimagining and promoting the event — the first one held in person since Covid hit in 2020.

Formerly called High School Math Competition Day, a tradition at Georgia Tech since 1958, the annual event is now simply known as High School Math Day.

Some 250 students, parents, and teachers attended this year's event.

It's an effort to get more students, including those from historically marginalized and underrepresented communities, thinking about math in a different way, and to have some fun and meet new friends and mentors along the way.

"With the pandemic forcing a pivot in style for the competition, it made sense to relaunch the event in person with different foci and ambitions," said Michael Wolf, professor and school chair. "Part of the day still revolves around a competition by talented high school students who have learned a lot of math in their schools competing as individuals, but there is plenty of fun and challenging mathematics that does not require a lot of background and can also be done productively in groups."

With that in mind, the School reimagined the day around a variety of math activities, from group sessions and an algebra exam, to logic-based games and puzzles.

In one early afternoon session, School of Math graduate students were giving a mini-lecture on combinatorics, the field of math that deals with counting, arranging, and combining numbers. In another part of the room, students were lined up playing chess, Sudoku, board games, and puzzles.

> "They don't have stuff like this at other competitions," said Yinuo Song, an 11th grader at the Gwinnett School of Mathematics, Science, and Technology. "I'm personally more into this type of logic stuff than algebra. So I think it's pretty fun to expand my knowledge and interest."

Song also learned about how mathematics is involved in how nature chooses its shapes. Wolf enjoyed giving that presentation to the attendees.

"And there was an amazing early afternoon scene with hundreds of students in Clough gathered around tables working on problems as a team," Wolf said. "This is modern mathematics in action."

The attendees came from 42 schools around the state. High School Math Day organizers were determined to boost the numbers of students from a broader stretch of communities.

"We wanted to broaden the appeal, make this a more inclusive event," said Trevor Gunn, Ph.D. student in the School of Mathematics and Math Day co-organizer along with Evelyne Smith-Roberge and Wade Bloomquist, both visiting assistant professors. "We advertised to majority-minority counties in the area. And Atlanta is a very diverse region."

Abhishek Dhawan leads a session on combinatorics during Georgia Tech High School Math Day. (Photo Renay San Miguel)

"We tried to advertise to schools that we normally haven't advertised to," added Lea Marzo, Program Operations Director for the College of Sciences' Center for Promoting Inclusion and Equity in the Sciences (C-PIES), who also worked in School of Mathematics outreach for over eight years before joining the newly created C-PIES earlier this year.

"I've noticed that there are more students of color here than in the past."

Teacher Anu Krishna brought four of her students from Cambridge High School in Alpharetta. A first-timer to High School Math Day, Krishna was impressed with the campus and the way the event was organized.

> "I wanted to bring the students who have actually loved this experience to go back and explain it better," she said. "But we do have a bunch of other members who will probably represent us next time. I'm looking forward to that."

Wolf added that the High School Math Day rebranding also resulted in some attendance growth, "and a lot of fun — for a lot of students. Going forward, we hope the word gets out and we are able to grow the participation to as many high schools as we can, with activities that are accessible and inspiring to high school students of any age, and with any mathematical background." "After all, for every person, there is a math problem that is fun for them to engage with and then make their own."

OUTREACH

THE 2024 ATLANTA SCIENCE FESTIVAL

JANUARY 23, 2024 | ATLANTA, GA

A young participant experiencing virtual reality for the first time at the 2023 Georgia Tech Science and Engineering Day.

Whether you've always wanted to see a real brain, are curious about the science behind coffee brewing, or anything in between, this is one event you should have marked on your calendar:

The Atlanta Science Festival

> "The festival spans three weeks and includes events all over town," says Jennifer Leavey, assistant dean for Faculty Mentoring in the College of Sciences, principal academic professional in the School of Biological Sciences, and longtime festival volunteer. "It helps me recharge my science enthusiasm batteries every year and lets me approach science education creatively."

The annual festival features over 150 science-themed events for all ages and has become an Atlanta staple over the past decade. This year, the festival will host events from March 9 to March 22, culminating in the Exploration Expo event in Piedmont Park featuring 100 different demonstrations — on March 23.

As one of its founding partners, Georgia Tech has served a key role in the Festival for over a decade. Last year's iteration featured several events hosted by Tech — from a science fashion show to a virtual college prep workshop — hosted by volunteers from across campus.

> "As a volunteer, you could help with one of the partner events or the Exploration Expo: the culminating street party at the end of the festival," says Leavey. "Volunteering is a great way to meet people, learn more about science, get in events for free, and share your love of science with the community."

These are just a few ways to get involved with this year's festival. Look out for the full schedule and attendee registration on the Atlanta Science Festival website.

Atlanta Science Festival Website
https://atlantasciencefestival.org/

Volunteer for GT Science and Engineering Day

March 9th, 2024

For several years, Georgia Tech has opened its doors to the Atlanta community during Science and Engineering Day. With demonstrations on everything from robotics and neuroscience to paper and chemical engineering, there's always been an activity for everyone. Last year's event saw over 1,500 attendees, with more than 40 host units and student organizations.

This year, Science and Engineering Day will serve as the kickoff event for the entire festival, taking place on March 9 from 10 A.M. to 2 P.M. Those interested in volunteering or hosting a demonstration of their work should register by January 25.

Find more information about GT Science and Engineering Day here:
research.gatech.edu/ATLScienceFestival

High School Math Day
March 9th, 2024

Science and Engineering Day will also host this year's High School Math Day, a tradition at Georgia Tech since 1958. A day of logic puzzles, math demonstrations, and friendly competition, last year's event saw over 250 students, parents, and teachers from 42 schools around the state.

> "My favorite part of High School math day is seeing all the students get excited about doing the activities with each other and winning the awards at the end of the day," says Lea Marzo, program operations director for the College's Center for Promoting Inclusion and Equity in the Sciences (C-PIES) and one of the co-organizers of the event.

If you know a high schooler who is a math expert or even math-curious, encourage them to stop by on March 9 from 10 A.M. to 2 P.M.

> "It really is for any level of Math — whether you are in 9th grade Math or more advanced Math," says Marzo. "There are a lot of activities planned for students and it includes food and a cool T-Shirt!"

Find more information about High School Math Day here:
https://hsmd.math.gatech.edu/

Host a Demonstration at the Exploration Expo
March 23rd, 2024

The Exploration Expo is the finale to the Festival, taking over Piedmont park every year with roughly 100 different science demonstrations. Often referred to as "Atlanta's biggest science party," this free event has a little something for everyone.

> "Whether you're about to start preschool or volunteering with your grandkids, you're here because you also believe that Atlanta is a science city — that we're here to learn, teach one another, and improve our world through shared inquiry," shares Jess Hunt-Ralston, Director of Communications for the College of Sciences at Georgia Tech, who also represents the Institute on the Science ATL Board of Directors.

> "And there's nothing quite like seeing the scales of a butterfly wing for the first time, playing brain games with new friends, or peering through a telescope together to help spark and sustain that spirit of curiosity."

Photo Jess Hunt-Ralston

After the Festival:

For more information, please contact Jennifer Leavey:
jennifer.leavey@cos.gatech.edu

Georgia Tech Energy Materials Day
March 27th, 2024

If you're looking for more science after the festival, join us for the Georgia Tech Energy Materials Day on March 27 at the Georgia Tech Exhibition Hall. This event will bring together representatives from academia, government, and industry to accelerate energy materials research. It will also provide an opportunity for key stakeholders to interact with Georgia Tech researchers in this important area.

Photo Jess Hunt-Ralston

Learn about Georgia Tech Energy Materials Day Here:
https://research.gatech.edu/energymaterials

ALUMNA NEWS

SoM ALUMNA TO SPEAK AT AMS SECTIONAL MEETING

JANUARY 23, 2023 | ATLANTA, GA

Alumna Blair D. Sulivan

Blair D. Sullivan, B.S. MATH/CS 2003, will be one of four plenary speakers at the Spring Southeast Sectional Meeting of the American Mathematical Society, scheduled for March 18-19 at Georgia Tech.

Sullivan is now an associate professor in the School of Computing at the University of Utah, with an adjunct appointment at North Carolina State University.

Her research interests include parameterized algorithms, structural graph theory, applied discrete mathematics, random graphs, and combinatorial scientific computing. Sullivan was also a research scientist in the Computer Science and Mathematics Division at Oak Ride National Laboratory.

Several School of Mathematics faculty members are organizing panels and other discussions during the Spring Southeast Sectional Meeting.

Campanile Evening

Student Center Evening

OUTREACH

MATT BAKER APPEARS ON TV SHOW "PENN & TELLER: FOOL US!"

NOVEMBER 27, 2023 | ATLANTA, GA

Penn & Teller: Fool Us!

Penn & Teller are famous magicians who have mixed comedy with their magic since they first started performing in the late 1970s. They've appeared on talk shows, sitcoms, Broadway, and broadcast and cable television specials, with Penn Jillette as the taller, more gregarious partner, while Raymond Teller usually remains silent as their act delights audiences.

"I've watched and admired Penn & Teller since I was a teenager," says Matt Baker, professor in the School of Mathematics at Georgia Tech and an award-winning magician, who found inspiration in their approach. "As an educator, I've used magic to make my classes more fun and interesting, and in some cases, even more educational."

Baker got the chance to show Penn & Teller the latest math-based tricks up his sleeve in person, when he was invited this August to tape a segment of the duo's CW show, Penn & Teller: Fool Us.

The Episode

The series episode, titled "The Bill in Penn's Head Trick," will feature Baker showing off his skills among four magicians.

"As a magician, it's clear why the opportunity to appear on Fool Us was exciting to me — it's the longest-running and most-watched magic show on television, and it's considered the most prestigious gig in the magic business," Baker says.

"I've put a lot of thought and effort into designing original magic tricks which utilize mathematical principles in new and interesting ways," Baker added. "I think the routine I'm performing on Fool Us is a great example of this."

Fool Us has invited aspiring magicians to Las Vegas to appear on the show since it premiered in the U.S. in 2014. If the hosts can't guess how the trick was done, or they guess wrong, the magician receives a Fool Us trophy and a chance to return to Las Vegas for an appearance at one of Penn & Teller's shows.

Matt Baker

A Successful Audition

Baker sent an audition tape of a magic trick — less than five minutes, one continuous shot with no edits — to the show's producers in April. He heard back within a week that he had been selected for the trip to Las Vegas to perform in front of a live studio audience.

"It was truly an unforgettable experience," Baker says. "It's easy to get so stressed out about appearing on television, or performing in front of Penn & Teller, that you don't actually enjoy the experience at the moment, but I didn't have that problem. I had a lot of fun on stage. And I did exactly what I set out to do, performance-wise; I didn't drop any lines or fumble my props, and I think I remembered to look at the camera and smile."

Fooling the Magicians

Baker can't talk about whether or not he successfully fooled Penn & Teller, but said the show's producers make it clear that stumping the duo is a secondary consideration.

"According to Penn & Teller themselves, the purpose of the show is to highlight good magicians and good magic tricks, and the reality TV aspect of making it into a competition is just a gimmick to get people to watch and to keep the show on the air," Baker said. "The producers make a big point of saying that if you appear on the show, you've already won. Fooling Penn & Teller is just a bonus."

About Matt Baker

Baker served as associate dean for Faculty Development in the College of Sciences for five years. In that role, Baker helped develop programs that enhanced the instructional, research, and career opportunities for faculty, with a focus on hiring, mentoring, retention, diversity, and inclusion.

Baker's academic accomplishments have won him numerous awards and honors, including his election as a Fellow of the American Mathematical Society in 2012, and selection for an earlier Simons Fellowship in Mathematics in 2017. Baker has also edited or written four books, but only his most recent one, The Buena Vista Shuffle Club, is about his magic obsession.

That affinity also earned him accolades: the Atlanta Society of Magicians named Baker Greater Atlanta Magician of the Year in 2015 and 2019.

Matt Baker

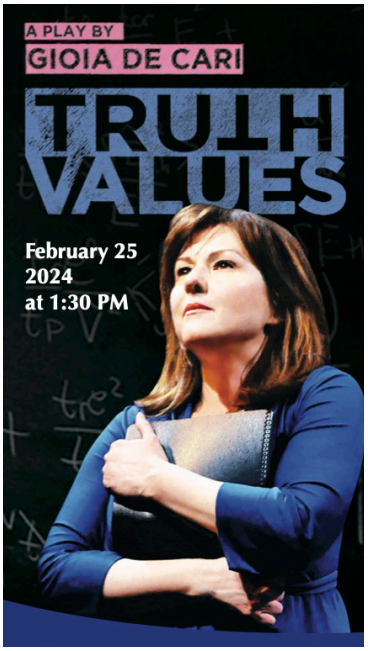
Penn and Teller Show

You can find the show at:

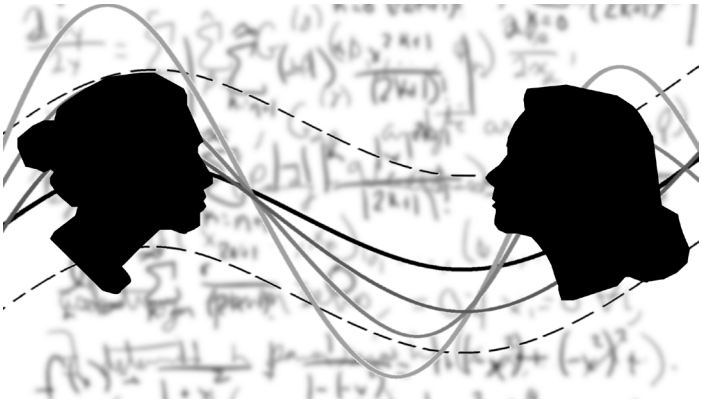
https://www.cwtv.com/shows/penn-teller-fool-us/

For a link to watch the performance you can also click the link below:

https://youtu.be/hOCt8ewYhZk?si=dnKtzVPsfXDlMLSS



Poster for Gioia De Cari's Truth Values (opposite page)



Poster for Corrine Yap's Uniform Convergence (opposite page)

TWO PLAYS HOSTED BY SoM: TRUTH VALUES & UNIFORM CONVERGENCE

FEBRUARY 25 AND APRIL 4, 2023 | ATLANTA, GA

Truth Values

Description:

Join the Gathering 4 Gardner and the Georgia Tech College of Sciences for a special matinee performance of the international hit play Truth Values!

Called "hilarious" by WIRED, Truth Values is also an insightful exploration of the joys and challenges women face in the STEM environment. The story follows NYC Writer/Performer and "Recovering Mathematician" Gioia De Cari's adventures as a math Ph.D. student at the Massachusetts Institute of Technology. Bewitched by the formal mathematical notion of Truth, she struggles with the clash of her personal reality in a world that is not binary.

Winner of a New York International Fringe Festival Overall Excellence Award, the play has been presented at more than 60 theaters and performing arts centers throughout the United States and Canada, including the Ensemble Studio Theatre in New York, the La Jolla Playhouse, and USC's celebrated Visions and Voices Arts and Humanities Series, among many others.

Reviews:

"Energetic, intimate, hilarious." — WIRED

"Funny and insightful... replete with hilarious characters... The story is riveting... go see this show!" — CurtainUp

"Fantastic... pure humor, sadness, intelligence and struggle." – Gigliola Staffilani, Mathematician, Member, National Academy of Sciences

"If you see only one play... about reflexive nonbinary relations, make it this one." — Los Angeles Times

Uniform Convergence

Description:

Uniform Convergence is a one-woman play, written and performed by Corrine Yap, an SoM postdoc.

Through the lives of a 19th century Russian mathematician and a present-day Asian-American math professor, this solo piece explores the struggles of two women trying to find their place in a white male-dominated academic world. Using text, mathematics, movement, and music, the play is an attempt to understand identity and how we communicate who we are.

SoM Postdoc Corrine Yap

ALUMNA PROFILE

SoM ALUMNI PROFILE: NIKKI CROSS

JANUARY 23, 2023 | ATLANTA, GA

Alumna Nikki Cross

Undergraduate and Graduate Work

I am a 2-time Yellow Jacket, graduating with a BS in Applied Mathematics in 2001 and an MS in Analytics in 2021, nearly 20 years apart to the day. While in undergrad, I did a computer science area of specialization. I came to realize that my mathematics degree was simply an education in logic, and that coding problems were a very literal way to put that education to use.

Landing that First Job

During my senior year I struggled with job fairs, seeing that companies generally weren't recruiting directly for math majors; my graduating class was 10 of us and the whole school about 60 at that time. But I found that I could talk my way into a number of conversations. Capital One had just started its iconic marketing push and growth curve, and by January, four months before graduation, I had an offer in hand. This began my 20+ year career in finance.

Building a Career in Finance

I spent nearly a decade at Capital One, moving through the ranks as a statistician, manager, and then corporate strategy consultant. From there, I spent some time at Merkle, working in direct mail consulting as a team manager and analytics lead, before heading back into finance. I worked at a small credit reporting agency (L2C) that was then acquired by TransUnion, spending my time as a solutions consultant, explaining our data and its use to banks and lenders.

As Senior Director of Data Science Solutions at Nova Credit, I have to make the data science and analytics behind our solutions understandable for a wide variety of stakeholders.

I went back to the lender side for a few years, joining an org called LendUp and as part of the founding team of its spin-off, a credit card company called Mission Lane. After taking some time off in 2021 as I wrapped up my masters, I consulted with a firm called EnsembleX, as I figured out my next move.

Blending Finance and Data Science

All of that brought me to my current role - Senior Director of Data Science Solutions at Nova Credit. We are best known for our work with international credit data, allowing immigrants to leverage their credit history after they move to another country. We also have a product that enables lenders to use checking account and deposit data to make better decisions. In both cases, my role is one of consultant - I have to make the data science and analytics behind our solutions understandable for a wide variety of stakeholders. This role is a unique one, blending my history in finance with my status as, as I often joke, the world's only extroverted data scientist.

DONATE TO SoM

Stay in Touch!

We look forward to future opportunities to stay in touch with you. We're very grateful for help in all forms, large and small, from our friends. Here are some ways you can stay involved with the School of Math, along with our Friends of the School of Math and our Alumni.

Give to the School of Math

Your gift can have a large impact on the education and research efforts of the School of Mathematics. Below are some of the many ways this can happen.

Share your story

Send us a paragraph about how you used your Math major and we would love to include your story on our new Alumni Profiles webpage (coming soon!). We also ask all alumni, past visitors, and friends of the School to please update your contact information by sending an email to comm@math.gatech.edu. We hope to hear from you soon!

Sponsor a Seminar

Every week, distinguished speakers come to campus to share their research and consult with our faculty and students. These are both intense intellectual experiences and times for the community to gather and learn together. Even a small gift supports the travel and refreshments for this activity and is available as a naming opportunity.

Graduate and Postdoctoral Fellowships

Our graduate students and postdoctoral researchers are the future of the discipline, integral to all of the efforts of the School—from teaching to research to outreach. Supporting them with fellowships, thesis/research prizes, travel-and professional-expense funds or other types of support has a large impact on their professional development, the School, and the discipline. The School's increased quality and quantity in postdoc and graduate recruitment illustrates how a named fellowship attracts and promotes top talent.

Connect with High Schools

The High School Mathematics Competition is an inspiring event where students gather with others interested in mathematics and compete for scholarships. It is run entirely by undergraduate and graduate student volunteers, with scholarships to bring these talented high school students to Georgia Tech. Contributions toward prize money or operating expenses ensures and expands the on-going inspiration and impact of this event (for registration and other details see http://hsmc.gatech.edu). The School also runs a large distance learning program for High School students, with potential for many areas of growth.

Recognize Teaching, Research, and Leadership in Mathematics

A central part of the mission of the School of Mathematics is teaching, with very talented and dedicated teaching faculty, as well as an extensive training program in teaching for our graduates and postdocs. Recognizing the best of them through awards for excellent teaching and mentoring underlines the importance of these efforts and encourages increased excellence. A named award would be a great way to remember an alumnus, former faculty member, or previous instructor who had a big impact on your life. Likewise, School members are leading research efforts, events, and training at Georgia Tech and around the world, so you may want to recognize their impact.

Create an Endowed Chair

Through an endowed professorship, a donor creates an enduring tribute that realizes their vision of mathematical excellence, provides exceptional opportunities for students and researchers at all levels, and promotes connections locally and globally.

Visit us!

Or even better, deliver your story in person by visiting the School. We especially welcome opportunities for visits from alumni to stop by and connect with our students and School members.

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