



College of Letters & Science
UNIVERSITY OF WISCONSIN-MADISON



*V³: a newsletter for alumni and friends
of mathematics at UW-Madison*

2023



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Cover photo by Sara Nagreen

Department of Mathematics
University of Wisconsin-
Madison 215 Van Vleck Hall, 480
Lincoln Drive, Madison, WI
53706

Chair: Timo Seppäläinen

math.wisc.edu • (608) 263-3054

A Word from the Chair



Dear Friends of the Math Department,

It's spring again. Students are preparing for finals, and Van Vleck has been noisy to the sounds of construction as the outside of our building gets a new layer of caulk around our windows and a good power washing. This marks the end of my three years in the department chair's office. Jean-Luc Thiffeault takes the reins on June 1 as our next chair.

We have much to be thankful for. Campus has continued to invest in our faculty, allowing us to extend offers to several new extremely talented mathematicians! The U.S. News and World Report on the best graduate schools

ranked our department 16th overall nationwide. In specific areas of math we ranked 11th in algebra, 20th in analysis, and 22nd in applied math. We continue to be the most active department in teaching in the university.

Our faculty are winning honors left and right. Daniel Erman won a Vilas Mid-Career Investigator award and Saverio Spagnolie was named a Vilas Associate. Jose Rodriguez is an overachiever: he won both a Sloan fellowship as well as a Distinguished Honors Faculty Award. Mihaela Ifrim has been named a Visiting Miller Professor at UC Berkeley. Mihaela, Botong Wang, and yours truly won Simons Fellowships to support our upcoming sabbaticals. Jean-Luc Thiffeault has been named a fellow of the American Physical Society (APS). Jing-Yi Cai and Betsy Stovall have been named American Mathematical Society (AMS) Fellows. Such amazing honors for our fabulous group!

We've committed to a two-year renovation of our former library space. It will better house our postdoctoral staff and provide improved tutoring space for the Math Learning Center. We hope to improve the situation of our postdoctoral community so that their research can flourish. Improving the MLC will allow more small group tutoring and better spaces for office hours. It will help us solve a space crunch that has caused us to rethink how we use spaces to fit more and more into the confines of Van Vleck Hall.

It's the 175th anniversary of UW-Madison, and we are working towards sharing our celebration with you! In October, we wish to organize a dinner and a lecture to highlight our math department and its impact on the UW and the world. We are also looking to do a "family open house" style event in April in Van Vleck Hall to open our department to the community, friends, and alumni. We hope very much that as many alumni and friends as possible can participate. Look for more on the 175 celebration plans inside the newsletter.

Yours,

Timo Seppäläinen
Department Chair

Sigurd Angenent to Retire



Professor Sigurd Angenent retired this spring after 36 years. He started in the Math Department in 1987 as an Assistant Professor, then was promoted to Associate Professor in 1989, and Professor in 1994.

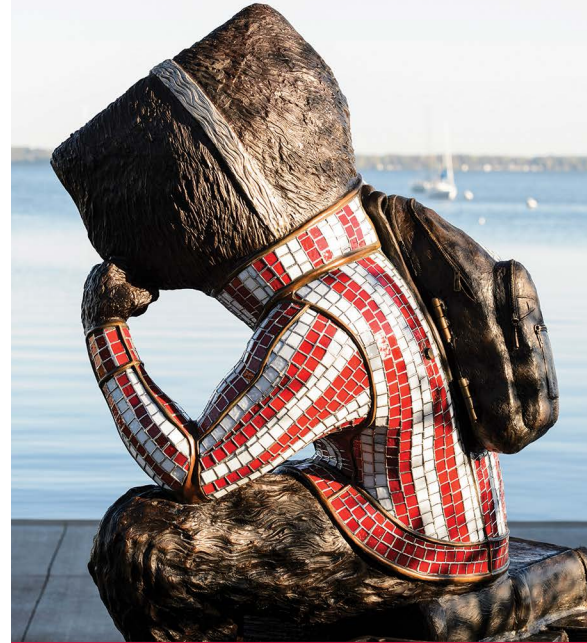
He obtained his PhD in Mathematics from Leiden University in 1986. In 1996 Angenent became correspondent of the Royal Netherlands Academy of Arts and Sciences.

Sigurd's research interests include partial differential equations, with recent research on heat and diffusion equations. He has also enjoyed working with engineering teams on problems in image processing and later has had

the pleasure of helping cell biologists formulate and analyze mathematical models to complement their experiments. He's had 4 graduate students.

After teaching Math 319, which is techniques in Ordinary Differential Equations for several years, Sigurd taught the Calculus sequence for many years, and produced his own notes that he used in lieu of a textbook. Recently he's been teaching a course in Linear Algebra, which has been popular with high school students who have outgrown their local high school's math courses. He has found them engaged and curious about the topic.

He's looking forward to traveling to visit his children who are on the east coast, and plans on continuing to attend and present seminars in the department. At some point, he and his wife, Professor Gloria Mari-Beffa, plan on spending part of their retirement in Spain, her home.



Join Math Alumni!

Help us build our Math Alumni Site!

When you come to Wisconsin to study math, you become part of the Wisconsin family. We'd love to hear back from you how your life is going, and what exciting things are happening!

We've built a brand new Math Alumni page to better sort and display the updates that our alumni provide, and we'd love to have your help in building it.

Your information is the most valuable part of this site. There's no accounts to create, just a form to tell us about your accomplishments. And then we'll take your post and make sure it is put on display to share with your fellow alumni.

Check it out: <https://mathalumni.math.wisc.edu>

MAKE A GIFT

To mail a donation to support the Mathematics Department, include the designation "Mathematics Annual Fund" in the check's memo line. The check should be made payable to the UW Foundation.

Please send it to
 UW Foundation
 US Bank Lockbox
 P.O. Box 78807
 Milwaukee, WI 53278-0807

To make a secure gift online using your credit card, please visit supportuw.org/giveto/math

Flipping out

Math professor Jean-Luc Thiffeault weighs in on the biggest backyard grilling question of all: How many times should you flip your burgers?



Jean-Luc Thiffeault
Professor of Mathematics

Outdoor meat grillers have all been there before: Hovering uncertainly over the backyard grill, squinting at the ground beef patties sizzling below, as the eternal question gnaws at our minds.

Should I flip them again?

Backyard wars have been launched over the question of the optimal number of times to flip hamburgers, steaks or zucchini on the grill—is

once sufficient? Does ten flips result in a better, more quickly cooked burger?

It's a question that also fascinated Professor of Mathematics Jean-Luc Thiffeault, who was inspired to develop a simple mathematical model to explore the issue. The upshot? Flipping your burgers more than once can provide a 29 percent optimal improvement in cooking time over flipping them only once, but there's no advantage gained from flipping more than 3-4 times. His findings appear in an upcoming edition of Science Direct.

Thiffeault's interest in the project began with potatoes, not burgers. About ten years ago he partnered with a pair of mathematician friends from Stanford to experiment with optimal cooking temperature using sliced potatoes in a pan. Thiffeault, who holds multiple degrees in physics, is deeply familiar with the parameters of thermal transfer—the way something goes from cold to hot—and has written several papers on cooling principles. Making a mathematical model for a single piece of food seemed a more focused exercise.

“As an applied mathematician, often part of the part of the charm--and part of the job--is to make a simple model of things that are complicated and then analyze them very well,” says Thiffeault. “Even if you know the answer is not necessarily going to be quantitatively correct, you'll at least learn something along the way about the process itself.”

Thiffeault approached the burger-flipping problem as if he were trying to cool a microprocessor or ventilate a room. In this case, the question was how to make the entire burger as hot as possible, as fast as possible. Rather than trying to begin with a complex framework that accounted for concepts such as the coefficient of thermal transfer, Thiffeault's model sticks with simple constants, like assuming a single temperature under the bottom of the burger. For backyard chefs who crave a little more nuance, he also developed a computer program alongside his scientific paper to allow burger aficionados to account for different grilling temperatures.

“When I first posted this on Twitter, I got a zillion people saying, ‘Why did you account for this and not account for this?’” says Thiffeault. “Again, I'm an applied mathematician. To me, the whole point is to produce an elegant model upon which I can say something mathematical.”

Applied mathematicians appreciated the way Thiffeault's model echoed the concept of turbulent convection, when fluid rises from a heated surface and begins to circulate, heating an object evenly from all sides. Flipping a burger several times in quick succession can create a similar scenario.

“Flipping your burger, you're overturning the air in a way,” says Thiffeault. “You're getting a very similar solution structure, which is a flat middle with something called boundary layers around the edges.”

While food scientists were somewhat less impressed with his model, Thiffeault is quick to point out that he never intended what he calls his “toy” exercise to be the final word on the subject. He is aware that his model omits certain key factors, like moisture effects—you know, the thing that happens when you flip a burger and dump all the fat that's accumulated on the top surface onto the coals. He also did not account for the people who can't help taking off the cover of the grill multiple times to check on the meat.

“If your goal is to get a nice burger, you might want to sear the meat a little bit at the base and get some grill marks,” he admits. “There's many other factors to cooking than just temperature.”



Rycroft part of a team to study early development in cricket embryos



Christopher Rycroft
Professor of Mathematics

Professor **Christopher Rycroft** worked with the Extavour Laboratory to study the early stages of development in cricket embryos. In humans, an embryo starts from a single cell that undergoes repeated divisions. But in crickets and many other insect species, the cell nuclei initially move and divide within a shared cytoplasm, with cell boundaries only forming later.

Using light-sheet microscopy, the team tracked the complicated motion of the nuclei over the first 24 hours of development. During this period, the nuclei spread out through the embryo to form the blastoderm, which is an important precursor for the formation of body parts of the cricket.

The microscopy data showed that the nuclei are remarkably efficient in filling the embryo volume, and do so far faster than would be expected via just random motion. Rycroft and the team developed a geometrical model that explains this process. Each nucleus has a cloud of microtubules growing out radially from it. Those clouds grow outward until they reach clouds from other nuclei. The cloud shapes are closely related to Voronoi cells, a technique in computational geometry that is used in many different scientific fields.

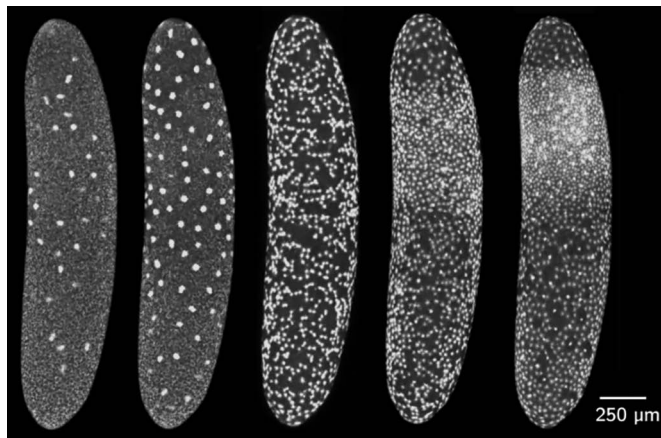
The team hypothesized that microtubules exert pulling forces on the nuclei. If a nucleus borders empty space, then its microtubule cloud extends further in that direction. Nuclei are therefore preferentially pulled toward empty space. The team developed a computational model to test this hypothesis. Across a range of different conditions, the model was able to predict the rapid expansion of nuclei inside the embryo volume.

Insect embryos have a wide range of shapes and sizes. While the model was originally developed to study crickets, it is likely that the same principles apply to many different insect species, and it serves as a foundation for further work exploring the importance of geometry in the early stages of insect development.

Flipping out (continued...)

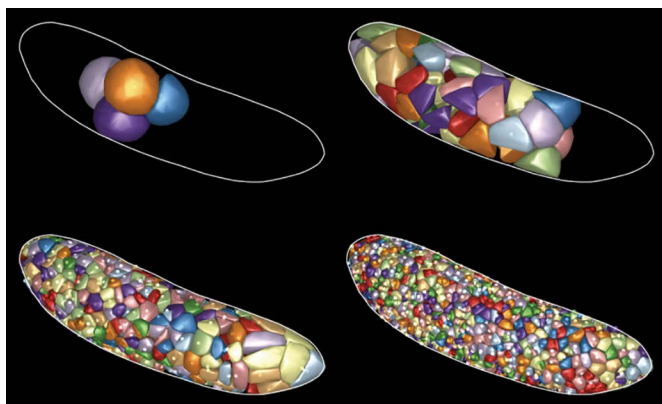
Caveats aside, there's no question that Thiffeault's exercise has added to the discussion. One of his favorite parts is the idea of what he calls the final optimal flipping interval—the best sequence of flips to get the shortest cooking time.

“The optimal solution predicts that the last flip should be twice as long as all the other flips' intervals,” says Thiffeault. “If you pick your first two properly, then the last one should be twice as long. That is maybe the most promising thing that might affect actual grilling.”



TARO NAKAMURA AND SETH DONOUGHE

Five snapshots showing nuclei (white) as they divide and spread through the embryo of the cricket *Gryllus bimaculatus* during the initial 24 hours of development.



JORDAN HOFFMANN

Four snapshots of a computer simulation of nucleus movement in a cricket embryo. Each colored region corresponds to a cloud of microtubules surrounding a nucleus, which exerts pulling forces on the nucleus, biasing its motion toward empty space.

This work was published in *Nature Communications* during July 2022, and was subsequently covered in *The New York Times* and *The Scientist*.

Thiffeault is open to the possibility of exploring the burger-flipping question further, maybe getting a student interested in adding some complexity to the model, focusing on testing the limits of rapid flipping. In other words, the power-flippers who insist on turning their burgers 20 times or more could be the next subject of a theorem.

“What I created here is a mixture of relevant real-world application and interesting mathematical directions,” he says. “It's kind of fun to see math applied to burger flipping.”

— By Aaron R. Conklin

Quantum Communications focus of NASA Student Intern, AMEP student

Collin Frink was a senior at the University of Wisconsin–Madison pursuing a double major in applied math, engineering, physics (AMEP), and computer science. Collin spent the summer of 2022 within the Space Communications and Navigations (SCaN) Student Internship Project (SIP) at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Each intern is paired with a mentor, an expert in their field, who can guide interns to success. Interns work with their mentors to complete a project of measurable importance to further NASA's mission.

For his project, Collin was brainstorming low-cost solutions to quantum computing problems, particularly in quantum algorithm development. He began his investigation of applications for low-cost quantum computing by familiarizing himself with potential implementation tools. His primary tool

was Qiskit, an open-source software development kit based on Python. Frink implemented Shor's and Grover's algorithms, two training benchmarks for quantum cryptography.

Once large-scale quantum computers are physically realized, Collin's research will support efforts to create low-cost implementations of quantum algorithms to speed up and further secure quantum communications, quantum key distribution, and more. Today, Collin's work supports other NASA experiments in quantum tomography, quantum compressive sensing, and quantum communications—all growing topics in NASA's exploration of efficient and novel communications solutions.

SIP interns contribute to Exploration and Space Communications (ESC) in a variety of roles across many diverse disciplines from cybersecurity to public outreach. Intern projects further ESC's mis-



sion, pursuing bold new lines of inquiry and lending fresh eyes to the communications challenges of today. Past interns have enhanced network capabilities, patented unique communications technologies, and improved the efficiency of agency operations.

Many SIP interns go on to work for NASA, furthering the pipeline of new talent to the agency by becoming mentors themselves. Collin graduated from the UW–Madison in December 2022.

Two perspectives on the Madison Experimental Math (MXM) Lab

The Madison Experimental Math (MXM) Lab matches groups of students with faculty mentors to explore math research questions during the course of semester. One of the students, Jingyun Jia, has moved from participating as a student in one research group to serving as a mentor in a subsequent group. Both were mentored by Prof. Benedek Valko.

Jingyun found the structure of the MXM different from a class. The students weren't taught but given a research problem and a way to engage with that problem. The next steps were theirs; they had to discuss the problem amongst themselves and decide how to proceed. It is essentially an independent group research project, guided by the mentor, instead of taught.

"It gave me a way to interact with people of different backgrounds. One of my group had a background in programming and was able to help with simulations. We had to communicate with each other during



the research and get ideas from each other," Jia noted.

The group gave their results as a poster at the Spring 2022 MXM Open House. The topic was offered again for advanced students to pick up where the first group left off. Jingyun was happy to sign on again, but this time as a Statistics Ph.D. student, and this time as a mentor himself. The second group taught Jingyun to motivate students from simple cases to more complicated results to derive conclusions.

Benedek Valko was pleased to be involved with Jingyun and both research groups. "The 2nd semester, with a different group of students, built on the results and could even push those results further, given another semester. The MXM structure gives the opportunity to have students engage in that material, and meet regularly to discuss the problem and possible approaches."

"It's a great way to get undergraduate students involved in research. In the past if a student was interested in undergrad research we had to say "knock on some doors", but now we can point them to the structure of the MXM, and they'll have a group for interested students to really get engaged with, and have a product to show at the end of the semester.", noted Professor Valko. "But long term development of the questions has to come down to the interest of the students. Jingyun has continued to show interest in continuing this research with me."

Atari and the Multiverse of Doughnuts

What do a math lecture and a video game have in common?

In Atari's Asteroids, you fly a spaceship that destroys asteroids with a ray gun. When you fly off the top of your TV, you reappear from the bottom. When you fly off the right, you reappear from the left. The top of TV is "glued" to the bottom, making a cylinder, and the left end of the cylinder is "glued" to the right end, making a doughnut. The Asteroids universe is a doughnut.

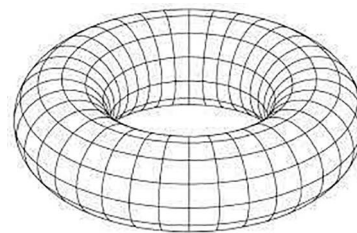
TVs used to have 4:3 aspect ratios, and now they're usually 16:9. We can play Asteroids on both. Both universes are doughnuts, but they're different shapes. If we took the ship captain out of her universe, and marooned her in a new one, would she be able to tell? Could different TVs give her the same universe? Are

there directions she can fly that take her to every point in her universe?

These are basic versions of questions that mathematicians study: What are the possible shapes of a given object? Can we tell two objects apart by studying their geometry from within, as in our marooned captain's dilemma?

Autumn Kent used this video game as a jumping off point to discuss the topology of moduli spaces, and created a downloadable JavaScript version of the game to show what it would be like to live in some of these surfaces.

This talk was given at the University of North Carolina at Asheville on October 27, 2022. It was the Parsons Lecture, funded to provide the UNC-Asheville



community with the ability to attend a presentation by a nationally renowned mathematician speaking on a topic accessible to the general audience. Kent is an alumna of UNC-Asheville. Want to have a look? Check out the Youtube link below!

Youtube Link: <https://www.youtube.com/watch?v=rz0rKcDasEw>

Downloadable video game: <https://people.math.wisc.edu/~kent/GoldenAsteroidsHot>

COMAP Mathematical Modeling Contest

Every year, over ten thousand teams of up to three undergraduate students compete in a 96 hour international mathematical modeling contest focusing on complex real-world problems. Participants must develop a mathematical model, derive and/or compute solutions, and present the results in a formal paper. Clarity, analysis, and design are of critical importance.

This year the department fielded six teams. The team composed of undergraduates Donald Conway, Jimmy Vineyard and Ethan Yang earned a Meritorious designation (top 10%), the department's seventh such success. Additionally, Braeden Bertz, George Ekman and Marlin Lee (pictured) earned an Honorable Mention placement. Here's what Donald, Jimmy, and Ethan had to say:

"We analyzed a dataset on Wordle that contained data from a year of Wordle results, including the daily word, the number of participants, and the percent of participants who guessed the solution right in 1-6 guesses. We started by plotting and exploring the data. Ethan built linear regression models to understand how different

properties of the word impacted the average number of guesses it took people to get the word correct. Jimmy shouldered the burden of writing up our final report in LaTeX. I worked hard on literature search. Our analysis of the number of players over time was inspired by a math paper that modeled internet meme popularity over time."

– Donald Conway

"We put a huge effort into this competition. We worked together in the basement of Van Vleck to the point of exhaustion. But we were pleasantly surprised by our commitment and the ability to meet the challenges before us."

– Ethan Yang

"This competition is easily the most difficult thing I have ever done. We spent almost half a day just figuring out exactly what we were being asked to do, and over 2 days trying to come up with models that could accomplish the requirements. A lot of our initial attempts failed to do anything, and our final models were definitely imperfect. Despite these difficulties and imperfections, on the last day of



the contest we stopped modeling and wrote. We poured hours upon hours into the write-up. Things that probably worked in our favor during judging were the clarity and readability of the write-up, and our honesty with regards to our models. We did not exaggerate the quality of our models. We simply stated how they worked, their shortcomings, and what they predicted. The contest was an incredible experience. It taught us more about working on a project under pressure than any course ever had, or likely ever will. It has certainly been the highlight of my undergraduate education so far, and I'm excited to do it again next year!"

– Jimmy Vineyard

Financial support for these students was provided by the math department and the AMEP program; preparation and organization was provided by faculty members Saverio Spagnolie and Amy Cochran. For more details see <https://go.wisc.edu/comap>.

UNDERGRADUATE



AWARDS &

Undergraduate Awards

Augusta Schurrer Undergraduate Student Support Fund:

Alexis Liu

Linnaeus Wayland Dowling Scholarship:

Basia Klos, Kenneth Ma

Violet Higgitt Frank Scholarship:

Binhao Chen, Kenny Ja

Felice Michaels Levin Scholarship Fund for Mathematics:

Clarence Harley

Frank D. Cady Scholarship:

Edgar Gevorgyan, Greg Selfors, Kendall TerHaar

R. Creighton Buck Prize Fund:

Kenneth Ma

Mark H. Ingraham

Math Scholarship Fund:

Lucas Allen

Mary Ellen Rudin

Mathematics Fund:

Mengwei Sun, Sara Murley

David L. Young

Mathematics Scholarship Fund:

Yufei Zhan, Ziling Hu

Undergraduate Math Competition

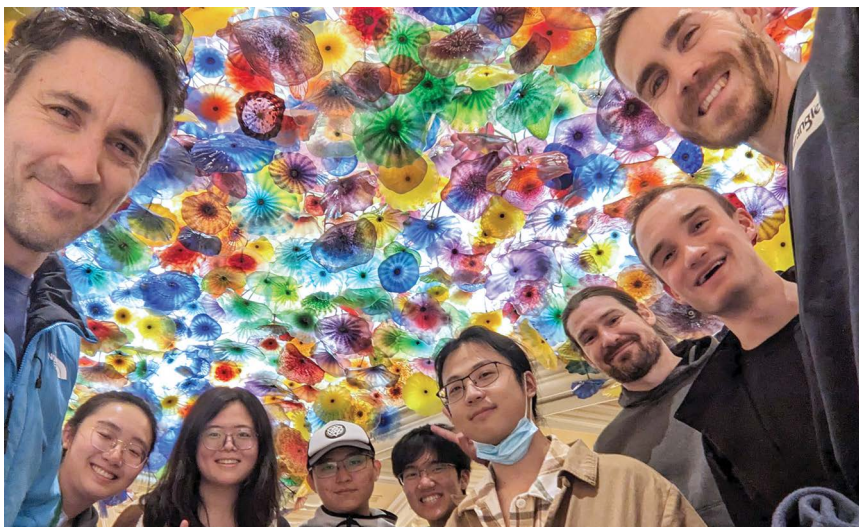
Each spring, our faculty put together an independent exam for our undergraduates to participate in that is UW only. These are designed to be achievable but challenging problems, and we are pleased to announce the winners

First place: Haran Mouli

Second place: Lucas Allen

Third place: Matthew Norton, Ben Braiman, Jonah Guse

Lab Corner



Research laboratories in mathematics are very special and exciting spaces for research activity and student training, but they are just as unusual.

Yet the Mathematics Department at UW–Madison has two! By engaging with such labs undergraduates take part in foundation building and career forming research activity. Graduate students and postdocs are trained not only as excellent researchers, but as mentors and as communicators of critical and scientific thinking.

This year in the Madison Experimental Mathematics (MXM) Lab, 17 undergraduate research teams were hard at work, led by a faculty member who proposed the project and assisted by a graduate student. Research areas represented included dynamical systems, complex analysis, combinatorics, and applied mathematics. Each semester culminates in an Open House Poster Session where undergraduates have the opportunity to display and discuss their work with the broader department and campus community.

Most projects last only a semester, but occasionally a research team will want, and be able, to continue into the following semester. One such project was “Identifiable Linear Compartmental Models” led by Professor Aleksandra Sobieska and graduate student John Cobb. Linear compartmental models are used to represent the transfer of a substance between components of a system, such as a drug between organs in the body or a toxin through an environment. An identifiable system is one where the rates at which the substance moves between the different components can be recovered based solely on the input and output data. The project’s goal was to experiment with determining whether a model was identifiable, with a larger goal of predicting identifiability directly from a graphical representation of models based on linear differential equations.

Nuha Dolby, a senior, was initially hesitant to apply. “I’d never done anything like this, and knew a lot of people who were wanting to do it, so my odds of

GRADUATE STUDENT



AWARDS &



BUBBLE GRAPH OF INDUSTRIES OF EMPLOYMENT OF UW-MADISON PHD GRADUATES

Campus Wide Graduate Student Awards
Two of our TAs have won Campus TA awards. Both were recognized by an awards ceremony on March 21, 2023.

Exceptional Service Award is awarded to TAs who have demonstrated exceptional commitment and impact in their service to the department, university, or profession. **Karan Srivastava**.

Early Excellence Award is awarded to new TAs with exceptional teaching records. **Boyana Martinova**

Math Department Graduate Student Awards

Early Excellence Awards (for TA's who have shown exceptional teaching during their first 1-2 years)

Alex Menzia, Eiki Norizuki, John Spoerl

Exceptional Teaching Award (all TA's are eligible for this award)

Ewan Dalby, Caitlin Davis, Yuxi Han, Aidan Howells, Jianhui Li, Sun Woo Park, Amelia Stokolosa, Yunus Tuncbilek, Sophia Wiedmann, Ashley Zhang

Exceptional Service Award (for Phd students who have performed exceptional service related to the mission of their department and university)

Allison Byars, John Cobb, Karan Srivastava

Bung-Fung Lee Torng Award (for female Ph.D. students for funded support for research during the summer)

Anjali Nair, Tejasi Bhatnagar

Capstone Award (for a graduating PhD student with an extraordinary teaching record during their time)

Evan Sorensen

2022-2023 PhD Graduates

Parvathi Madathil Kooloth (Smith)

Lingxiao Zhang (Street)

Asvin Gothandaraman (Ellenberg)

Michael Jesurum (Stovall)

Jianhui Li (Stovall)

Evan Sorensen (Seppalainen)

Yu Sun (Roch)

Jianhui Li (Stovall)

Anjali Nair (Q. Li/Stechmann)

Jason Torchinsky (Stechmann)

Shuqi Yu (Roch)

Ashley Zhang (Poltoratski)

Di Chen (Ellenberg)

Qiao He (T. Yang)

Caitlyn Booms Peot (Erman)

Colin Crowley (Wang)

Yu "Jerry" Fu (Ellenberg)

Will Hardt (Ellenberg)

Tianhong Huang (Stechmann)

Changhun Jo (Lee-ECE/Roch)

Jeremy Johnson (Pimentel-Alarcon/Ellenberg)

2022-2023 MA GRADUATES

Lovish Arora

Zijian Chen

Yu Chen

Haochen Cheng

Ugur Cin

Ewan Dalby

Yuxiao Fu

Yihan Gu

Zubing Guo

Lixin He

Jiarui Huang

Pubo Huang

Yifan Huang

Chengfeng Jiang

Dian Jin

Ruochong Jin

Jianwei Ke

Shixiao Liang

Simo Liu

Michelle Lobb

Xiaoxuan Lu

Devanshi Merchant

Tsz Fung Ngai

Aditya Sarma

Phukon

Erika Pirnes

Yahui Qu

Karthik Ravishankar

Jordan Radke

Dingtao Shen

Qifeng Tan

Emma Thomas

Zhengwei Tong

Kaustubh Verma

Shihao Wang

Zeyu Wang

Ron Yang

Ruocheng Yang

Yunyan Yao

Yuxuan Yao

Jiahong Yuan

Yunting Zhang

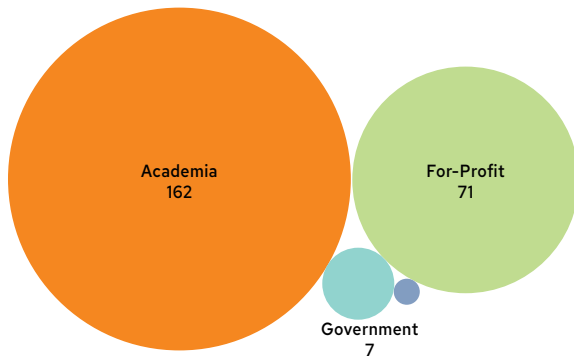
Yuxuan Zhao

NEWS

What do our Ph.D. graduates go on to do? Where do they live? Who do they work for?

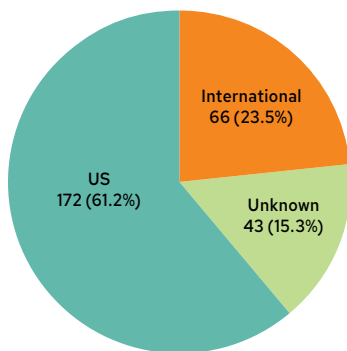
Using 15 years of data, the Graduate School Department of Academic Analysis, Planning and Assessment produced the following visualizations.

INDUSTRIES OF EMPLOYMENT



Employers found for 241 of 281 selected alumni (85.8%)

LOCATION



TOP FIVE

EMPLOYERS

- 1 Google
- 2 AMAZON
- 3 Harvard University
- 4 Rutgers – New Brunswick
- 5 Stony Brook University, State University of New York

JOB TITLES

- 1 Assistant Professor
- 2 Associate Professor
- 3 Software Engineer
- 4 Professor
- 5 Lecturer

US METRO AREAS

- 1 San Jose-Sunnyvale-Santa Clara, CA
- 2 New York-Newark-Jersey City, NY-NJ-PA
- 3 Boston-Cambridge-Nashua, MA-NH
- 4 Madison, WI
- 5 Seattle-Tacoma-Bellevue, WA

US STATES

- 1 California
- 2 New York
- 3 Massachusetts
- 4 Wisconsin
- 5 Michigan

COUNTRIES

- 1 United States
- 2 China
- 3 United Kingdom
- 4 Korea, Republic of
- 5 Hong Kong

Master's Student Update

The Master of Arts: Foundation of Advanced Studies had an amazing graduation season. Among 28 spring graduates, 11 have been accepted to top-notch PhD programs and five have received job offers in the U.S. and China. This past academic year was the first year that we returned to in-person classes since spring 2020, due to the pandemic. Students were resilient and hardworking individuals, who are now prepared for their new academic and professional endeavors.



Where are our graduates going?

Yu Fu, postdoc, Caltech

Asvin Gothandaraman, Postdoc, Hebrew University of Jerusalem

Qiao He, postdoc, Columbia University

Michael Jesurum, Mathematician, United States Federal Government

Parvathi Madathil Kooloth, Pacific Northwest National Laboratory

Jianhui Li, Boas Assistant Professor of Mathematics, Northwestern

Yun Li, Postdoctoral Fellow, Yau Mathematical Sciences Center, Tsinghua University

Anjali Nair, William H. Kruskal instructor, University of Chicago

Caitlyn Booms Peot, tenure track, Mt Marys, Milwaukee

Evan Sorenson, Postdoctoral Research Scientist, Columbia

Yu Sun, Machine Learning Engineer, Tiktok

Ashley Zhang, postdoc, Vanderbilt University

Lingxiao Zhang, Assistant research professor, University of Connecticut

FACULTY/STAFF News & Awards

Faculty News

Jordan Ellenberg was one of two winners for the 2023 Joint Policy Board for Mathematics (JPBM) Communications Award. It was awarded during a prize reception at the Joint Mathematics Meetings in Boston, Massachusetts, on Wednesday, January 4, 2023.

He received it for his clear and entertaining prose that brings the power and beauty of mathematics to general audiences. In addition to authoring two best-selling books, *How Not to be Wrong: The Power of Mathematical Thinking* (2014) and *Shape: The Hidden Geometry of Information, Biology, Strategy, Democracy, and Everything Else* (2021) — Ellenberg also contributes numerous articles to newspapers and magazines in print and online. Link: <https://go.wisc.edu/jbpaward>

The National Academies of Sciences, Engineering, and Medicine announced the inaugural recipients of the Eric and Wendy Schmidt Awards for Excellence in Science Communication, given by the National Academies of Sciences, Engineering, and Medicine in partnership with Schmidt Futures. Supported by Schmidt Futures, these prestigious awards recognize science journalists and research scientists who have developed creative, original work that addresses issues and advances in science, engineering, and/or medicine for the general public. **Jordan Ellenberg** was honored as part of the mid to late Research Scientist group. Link: <https://go.wisc.edu/excscicomm>

Jean-Luc Thiffeault was named as an 2022 Fellow by the American Physical Society. He is cited “for innovative contributions to the understanding of mixing and transport in dynamical systems, including the development of topological methods, and the understanding of enhanced diffusion by swimming microorganisms.” He is one of four recipients on the UW campus.

The APS Fellowship Program was created to recognize members who may have made advances in physics through original research and publication, or made significant innovative contributions in the application of physics to science and technology. They may also have made significant contributions to the teaching of physics or service and participation in the activities of the Society.

Fellowship is a distinct honor signifying recognition by one’s professional peers. Each year, no more than one half of one percent of the Society’s membership (excluding student members) is recognized by their peers for election to the status of Fellow of the American Physical Society. Link: <https://go.wisc.edu/apsfellowjlt>

Betsy Stovall and **Jin-Yi Cai** have been named as 2023 AMS Fellows. This program recognizes members who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics.

Jin-Yi Cai has been named “For contributions to computational complexity theory, especially in the areas of complexity dichotomy.”

Betsy Stovall has been named “For contributions to harmonic analysis.” Link: <https://go.wisc.edu/amsfellow2023>

Mihaela Ifrim has been awarded a Visiting Miller Professorship at the Miller Institute, housed at UC-Berkeley. The purpose of the Visiting Miller Professorship is to bring promising or eminent scientists to the Berkeley campus on a short-term basis for collaborative research interactions within the Institute’s interdisciplinary community. Link: <https://go.wisc.edu/millerprof>

Mihaela Ifrim, **Timo Seppäläinen** and **Botong Wang** have been awarded 2023 Simons Fellowships. The Simons Fellows program extends academic leaves from one term to a full year, enabling recipients to focus solely on research for the long periods often necessary for significant advances. Link: <https://go.wisc.edu/simonsmath2023>

Jose Rodriguez has won a Distinguished Honors Faculty Award. Each year, the L&S Honors Program solicits student nominations of faculty members (or instructional academic staff) who have had a special impact as instructors of Honors courses, as supervisors of Honors theses, or as teachers and mentors of Honors students. The Faculty Honors Committee reviews these nominations and votes to confer Distinguished Honors Faculty status on the strongest nominees for these awards each spring. Jose is one of five noted in the award. Congratulations! Link: <https://go.wisc.edu/mathdistfac>

Professor **Saverio Spagnolie** has been named a Vilas Associate. The Vilas Associates Competition recognizes new and ongoing research of the highest quality and significance. Recipients are chosen competitively by the Divisional Research Committees of the Office of the Vice Chancellor for Research and Graduate Education on the basis of a detailed proposal. Link: <https://go.wisc.edu/2023vilasassoc>

José Rodriguez has been awarded a Sloan Fellowship, one of two awarded to UW–Madison faculty. These awards are given to early-career scholars who represent the most promising scientific researchers working today. Their achievements and potential place them among the next generation of scientific leaders in the U.S. and Canada. Links: <https://go.wisc.edu/mathslloanfellow2023>, <https://go.wisc.edu/lssloanfellow2023>

Daniel Erman has won a Vilas Mid-Career Investigator Award. The award is meant to recognize research and teaching excellence in faculty who are at mid-career. The mid-career designation generally

means faculty 10 to 20 years into a career. Link: <https://go.wisc.edu/mathvilasinv2023>

The Math Department's newly formed Dynamics Group has been awarded a National Science Foundation Research Training Group grant that will bring the university \$2.48M over 5 years. The grant will be run by PI **Autumn Kent**; co-PIs **Tullia Dymarz**, **Caglar Uyanik**, **Chenxi Wu**, and **Andrew Zimmer**; and senior personnel **Paul Apisa**, **Marissa Loving**, and **Grace Work**. The funding will be used for the research training and professional development of mathematicians at the undergraduate, graduate, and postdoctoral levels, and will have a deep and lasting effect on the department.

Tonghai Yang has won a Kellett Mid-Career Award. The Kellett awards recognize outstanding faculty seven to 20 years past their first promotion to a tenured position. Supported by the Wisconsin Alumni Research Foundation, they provide research funding to the winners at a critical stage of their careers. <https://go.wisc.edu/mathkellett2023>

Former Faculty Updates

Melanie Matchett Wood, who was a faculty member from 2011–2019, has won a **Macarthur Fellowship**. These awards are unrestricted fellowships to talented individuals who have shown extraordinary originality and dedication in their creative pursuits and a marked capacity for self-direction. Melanie is now at Harvard University.

Former Van Vleck Assistant Professor **Donghyun Lee** (2015–2018) is appointed as a named distinguished professor at Pohang University of Science and Technology (POSTECH), a private research university in Pohang, South Korea.

Donghyun Lee has also won a **Hanwoomul Phagi Basic Research grant** from the Korean Ministry of Science (the total amount of his award is about two million USD over 10 years). Dr. Lee is the only winner in math, among 15 awardees in the areas of bioscience, medical science, engineering, and natural sciences.

Mark Shusterman, Van Vleck Professor from 2018–2020, has won the prestigious **Levitzki Prize**. The prize is awarded every two years to a young Israeli mathematician for research in Algebra or related areas. The Levitzki prize committee decided to award the 2022 prize to Mark Shusterman in light of his many contributions to group theory and particularly to number theory in function fields.



UW is celebrating its demisemiseptcentennial, that's 175 years!

"For the past 175 years, UW–Madison has been a place where extraordinary ideas become life-changing realities, where we honor traditions of the past while also continuing to propel Wisconsin forward," says Chancellor Jennifer Mnookin. "In the year ahead, we'll celebrate many of the people, events and important advancements that have made UW–Madison one of the most respected institutions in the nation."

So, what is the Math Department doing to join in on the fun?

This October, we'll be hosting a special dinner and lecture for selected alumni here in Van Vleck Hall. Of course, that will mean plenty of time to reminisce about old times and enjoy all that campus life has to offer.

Then, in April 2024, we'll be opening our doors to all of our alumni for an in depth tour of all we've managed to do over our last 175 years, and what we plan on doing in our next 175!

This is in addition to the excellent events that are being planned state-wide to celebrate the UW's 175th! Check those out here: <https://175.wisc.edu>

If you are interested in attending either of our Math events, please check out Math's 175th anniversary webpage: <https://math.wisc.edu/175th-anniversary-of-the-university/>



Alumni News

Alumni News

Wanlin Li (Ph.D., Ellenberg, 2019) starting at Washington University of St. Louis as an Assistant Professor.

Yuan Liu (Ph.D., Boston, 2019) starting at University of Illinois Urbana-Champaign as an Assistant Professor

Ruiwen Shu (Ph.D., Jin, S., 2018) starting at University of Georgia as an Assistant Professor

Tess Anderson (B.S., 2010, Postdoc 2015-2018) starting at Carnegie Mellon as Assistant Professor

Polly Yu (Ph.D., Craciun, 2021) is at the NSF-Simons Center for Mathematical & Statistical Analysis of Biological Systems at Harvard University as an Independent Fellow.

Eric Egge (Ph.D., Terwilliger, 2000) has been appointed Associate Provost at Carleton College Minnesota.

Laura Cladek (Ph.D, Seeger, 2016) is currently a Von Neumann Fellow at the Institute for Advanced Study in Princeton, New Jersey as well as a tenured professor (Senior Lecturer) at the Australian National University located in the capital city of Australia, Canberra.

Mikayla Kelley (B.S., 2016) is starting as an Assistant Professor in Philosophy at the University of Chicago

After a 2 year postdoc at Oxford University, **Ilyas Khan** (Ph.D., Angenent, 2021) got an NSF postdoc, to go to Duke University

Yuhua Zhu (Ph.D., formerly by Shi Jin and then Qin Li, 2019), joined UCSD as a tenure track professor last year.

Di Fang (Ph.D., formerly by Shi Jin and then Qin Li, 2019), just landed with a tenure track position at Duke and will be joining them this fall.

Zhiyan Ding (Ph.D., 2022, Qin Li) joined Berkeley as their Morrey Visiting assistant professor

Manuel Elgueta, (Ph.D., Nagel, 1975) has passed away. He joined the faculty of Pontificia Universidad Catolica de Chile in 1978, and retired in 2017.

Rajula Srivastava wins the AWM Dissertation Prize 2023

Along with two others, Rajula Srivastava received the seventh annual Association for Women in Mathematics Dissertation Prize. The prize was presented at the Joint Prize Session at the 2023 Joint Mathematics Meeting (JMM) in Boston, Massachusetts.

Rajula Srivastava received her Ph.D. from University of Wisconsin-Madison in 2022, under the supervision of Andreas Seeger. She is currently a Hirzebruch Research Instructor at the Hausdorff Center for Mathematics, Rheinische Friedrich-Wilhelms-Universität Bonn, and the Max Planck Institute for Mathematics. Rajula Srivastava's research is in harmonic analysis. Her dissertation, "Three Topics in Harmonic Analysis: Maximal Functions on Heisenberg Groups, Cotlar-type Theorems and Wavelets on Sobolev Spaces", as the title suggests, covers a broad range of topics. Two of the chapters address the problem of establishing optimal Lebesgue space estimates for local maximal averaging operators on Heisenberg groups. In another chapter, Rajula determines the range of smoothness of Sobolev spaces for which there exists an unconditional basis of orthonormal spline wavelets of a given order. In yet another part of the dissertation she provides L^p bounds for a Cotlar-type maximal operator under minimal smoothness assumptions. The results have led to four publications in research journals, three of which are single-authored.

Raymond Damadian, BS, 1956, inventor of the MRI, dies at 86

Raymond Damadian, inventor of the MRI, died in his Woodbury, NY home in August 2022. While researching nuclear magnetic resonance spectroscopy with rats, he discovered magnetic fields on cancerous tissues created different radio signals than normal tissues. He published these findings in Science in 1971, and three years later, he patented a machine using the technology for detecting cancer. The actual machine was built in 18 months, and originally known as a nuclear magnetic resonance scanner, or N.M.R., for his company, Fonar. Dr. Damadian had to fight with corporations who created their own machines using this technology as well as the Nobel Prize committee, who awarded two other researchers who built on Dr. Damadian's work for the technology instead of recognizing his contribution. Dr. Damadian protested his exclusion with several newspaper ads that he called "a wrong that must be righted". While the Nobel recognition did not occur, he was honored with several awards, including the National Medal of Technology in 1988, and admission into the National Inventors Hall of Fame in 1989. He won monetary awards for patent infringement from several manufacturers after lengthy legal battles. He continued to innovate, creating open MRI machines, as well as mobile and stand up scanners. In the end, there's no controversy about who is the inventor of this technology and the impact it has had on thousands of people. Dr. Damadian is survived by his daughter, Keira Reinmund; his sons, Timothy, Fonar's president and chief executive since 2016, and Jevan; nine grandchildren; three great-grandchildren; and a sister, Claudette Chan. His wife, Donna (Terry) Damadian, died in 2020.

In Memoriam

SEYMOUR PARTER

Seymour Victor Parter, Age 95, of Madison, Wisconsin, passed away peacefully on Friday, October 21, 2022, at his home. Seymour was born on June 9, 1927, in Chicago, Illinois. He became acquainted with hard work at an early age, when he took over running his family's restaurant as a teenager. He earned a B.S. degree and an M.S. degree in Mathematics both from the Illinois Institute of Technology while continuing to run the family business.

In March 1951, Seymour left Chicago for the remote mountains of New Mexico, where he became a staff member at Los Alamos National Laboratories. It was here that he was introduced to serious scientific computing and became friends with many outstanding mathematicians and physicists. In October 1951, he was handed a manual for a new computer (the SEAC) and sent to Washington to program the computer for Los Alamos.

In 1953 he was sent to New York to work on the new UNIVAC computer for Los Alamos, where he also enrolled in graduate school at the Courant Institute of Mathematics and earned his Ph.D.

Ruth and Seymour were married in October 1957 and celebrated 65 years of marriage this month. They raised two sons who are both computer scientists.

His long career at the University of Wisconsin Madison started in 1963 with a joint appointment to the Mathematics and Computer Science departments, including a stint as the chair of the Computer Science department.

Seymour is survived by his wife, Ruth; his sons, David and Paul; daughter-in-law, Susan, and grandchildren, Alicia, Ezra, and Danielle.

Interesting historical link: <https://minds.wisc.edu/handle/1793/72132>

DONALD CROWE

Donald Warren Crowe, 94, passed away on July 4, 2022 in Madison, Wisconsin. He was born October 28, 1927 in Lin-

coln, Nebraska to Lawrence and Vera (Pereau) Crowe.

Donald was a distinguished professor of mathematics at UW-Madison from 1962 through 1998. As a geometer specializing in the study of symmetry and patterns in primitive art he had the opportunity to bring artists and scientists together in a unique and rewarding collaboration. His work was Internationally recognized and allowed him to travel extensively worldwide and share ideas with some of the best minds in his field of study.

He co-authored three books and published many articles and papers over his career. While UW-Madison was his home-base, his love of travel also led him to professional positions in such places as Nigeria, Hungary, Australia, England, Tonga, Ghana, and Canada.

Donald developed many meaningful friendships with his colleagues and students at the UW Math Department. Of special importance was his enduring friendship with his dear friend Steve Bauman. In recent years the weekly "Old Guys" luncheon gatherings with his Math Department colleagues became an important part of his life.

Donald was active with the Bridges Organization, which oversees the annual Bridges conference on mathematical connections in art, music, architecture, and culture. He was honored to have his work included in these proceedings and greatly enjoyed attending these conferences, which were held at various locations around the globe.

Donald is survived by his wife, Mary Crowe, his three daughters Helen (Lars) Crowe-Blomgren of Stockholm, Sweden, Zannah (Bob) Crowe of West Bend, Wisconsin & Laila Crowe of Madison, Wisconsin, two sons Brendan (Michelle) Ozanne of Carlsbad, California & Colin (Lindsey) Ozanne of Buffalo, New York and his sister Barbara (Don) Reeves of Oberlin, Ohio. He also leaves behind 9 beloved grandchildren and one brand new great-grandchild.

Conference dedicated to Dick Askey

The 16th International Symposium on Orthogonal Polynomials, Special Functions And Applications which was held remotely at CRM (Centre de Recherches de Mathematiques) in Montreal from June 13-20, 2022. It was dedicated to Dick Askey. There was a day's program with talks from former students and colleagues about the role of Dick in their work. Two of Dick's students, Dennis Stanton and Shaun Cooper gave talks. Howard Cohl is organizing the lectures and other more publishable form, as a tribute to Dick. Link: <https://go.wisc.edu/askeysymposium2022>

Mary Ellen Rudin (1924-2013)

It's good I married another mathematician. Someone on my level.

Someone who'd understand.

We lived in a house shaped like a multiplication table. The square on the diagonal.

Our house, a compact topological space. A continuous image of total order. A monotonically normal space.

A house designed by a man with three names.

A house only we could get.

A set of calculations resulting in a finite set.

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Department of Mathematics
UNIVERSITY OF WISCONSIN-MADISON

215 Van Vleck Hall
480 Lincoln Drive
Madison, WI 53706

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SARA NAGREEN

Professor Christopher Rycroft shares a laugh with one of the Visiting International Student Program (VISP) students during their Mid-Autumn celebration.