



College of Letters & Science
UNIVERSITY OF WISCONSIN-MADISON

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

JULY 2020



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Van Vleck Vector (V^3) was
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A Word from the Chair

WELCOME TO THE 2020 EDITION OF THE VAN VLECK VECTOR.

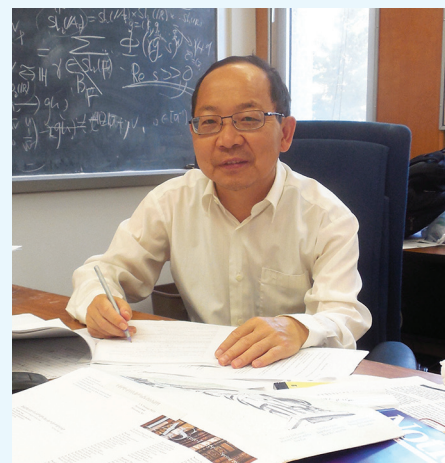
The global pandemic has certainly changed our work, as we switched to online instruction right after Spring Break and quickly converted almost 100 courses to remote instruction. We have all had to switch to video conferencing instead of face-to-face meetings, and have adapted our seminars to online as well. Our faculty, staff, and graduate students deserve acknowledgement for the high standard of work we performed, which is exactly what we expect in the face of such challenges.

We have packed this newsletter full of news of innovative research, student excellence, interesting alumni news, and award-winning faculty, all that exemplify the high standards our department has always held dear.

This is my last year as chair of this department and I'm happy to be leaving the department in capable hands, those of Timo Seppäläinen. I'm confident he'll continue to steer us in the correct direction.

On, Wisconsin!

Tonghai Yang
Department Chair



Dear Friends of the UW-Madison Math Department,
I am pleased to introduce myself as the new chair of the Math Department. Officially my term began June 1. I am grateful for the job that Tonghai has completed, and I hope to continue his calm stewardship of the department.

Our new environment has certainly been a challenge for faculty, staff, and students at all levels, as it has been for the entire global community. I anticipate working with our technology experts, graduate students, and faculty to ensure that our mission is carried out to our traditional high expectations, no matter what the future looks like. Our path forward is presently uncertain and success will require strong leadership and committed partners.

I am very much looking forward to working with all of you out there who care about the future of the UW-Madison Math Department.

Timo Seppäläinen
Department Chair

Outstanding Students

2017 TALENT SEARCH WINNER WINS MULTIPLE AWARDS



Mostafa Hassan

Mostafa Hassan, of Greenfield, Wisconsin, has been named as one of the four Goldwater Scholars for UW–Madison this year. He will graduate in May 2021 with a bachelor's degree in mathematics and computer engineering. He is a 2017 winner of the Wisconsin Math, Science, and Engineering Talent Search, a proctored competitive written examination, and a recipient of the prestigious Van Vleck Scholarship at UW–Madison.

This same year, Mostafa also has won a 2020–21 Hildale Undergraduate/Faculty Research Fellowship. The Hildale fellowship provides research training and support to undergraduates. Students have the opportunity to undertake their own research project in collaboration with UW–Madison faculty or research/instructional academic staff.

His freshman year, Hassan completed a theoretical physical chemistry project with Professor **Edwin Sibert**. The following summer, he completed a number-theory project with **Naser Talebizadeh Sardari**, a postdoctoral fellow. The collaboration resulted in a co-authored paper that is in the process of being submitted for publication. Hassan is currently working on a tensor-rank project with Professor **Jordan Ellenberg**, and he is completing directed reading on dispersive partial differential equations with Professor **Mihaela Ifrim** in preparation for future research. Hassan plans to pursue a PhD in mathematics, with an interest in partial differential equations and harmonic analysis.

Link: <https://go.wisc.edu/266614>

CLAIRE EVENSEN WINS MULTIPLE HONORS



Claire Evensen

Claire Evensen is a comprehensive honors candidate from Verona, Wisconsin, completing majors in math and biochemistry as well as a Biocore certificate. A Marshall and Goldwater scholar and a Rhodes scholar finalist, Evensen has published and presented research, mentored and tutored other students, facilitated service opportunities for Women in STEM areas, and is an accomplished musician. She has also been an outspoken advocate for liberal arts education.

“Claire is outstanding in all respects, ranking as one of the very best undergraduates I have had the pleasure of mentoring in my five decades at UW–Madison,” says Tom Record, professor of chemistry. “She is committed to a career in academic research and demonstrates great promise of becoming one of the nation’s research leaders.”

In the fall, Evensen will travel to the United Kingdom as a Marshall Scholar to pursue a graduate degree in mathematical modelling and scientific computing at the University of Oxford. Afterwards, she plans to pursue a PhD in evolutionary biology and disease ecology at the University of California–Berkeley. Her future goals include a career in academia that combines teaching, research and science, technology, engineering, arts, and math (STEAM) advocacy.



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
<http://supportuw.org/giveto/math>

If you have any questions or would like information on other giving options, please contact Rebekah Sherman at (608) 572-2077 or rebekah.sherman@supportuw.org

Teaching Math in a New Era



Professor Jean-Luc Thiffeault converted his dining room into an impromptu studio to film his lectures.

The Spring semester of 2020 was certainly notable. During the month of February, as the COVID-19 pandemic was actively spreading through the globe and our country, a number of members of the department had already begun planning for the possibility that our instruction would need to move online. Three days before Spring Break (March 10) we finally got the word: classes would move online after the break and students would not return to campus after Spring Break. At that point, the Mathematics Department had less than two weeks to finalize our preparations for this monumental transition.

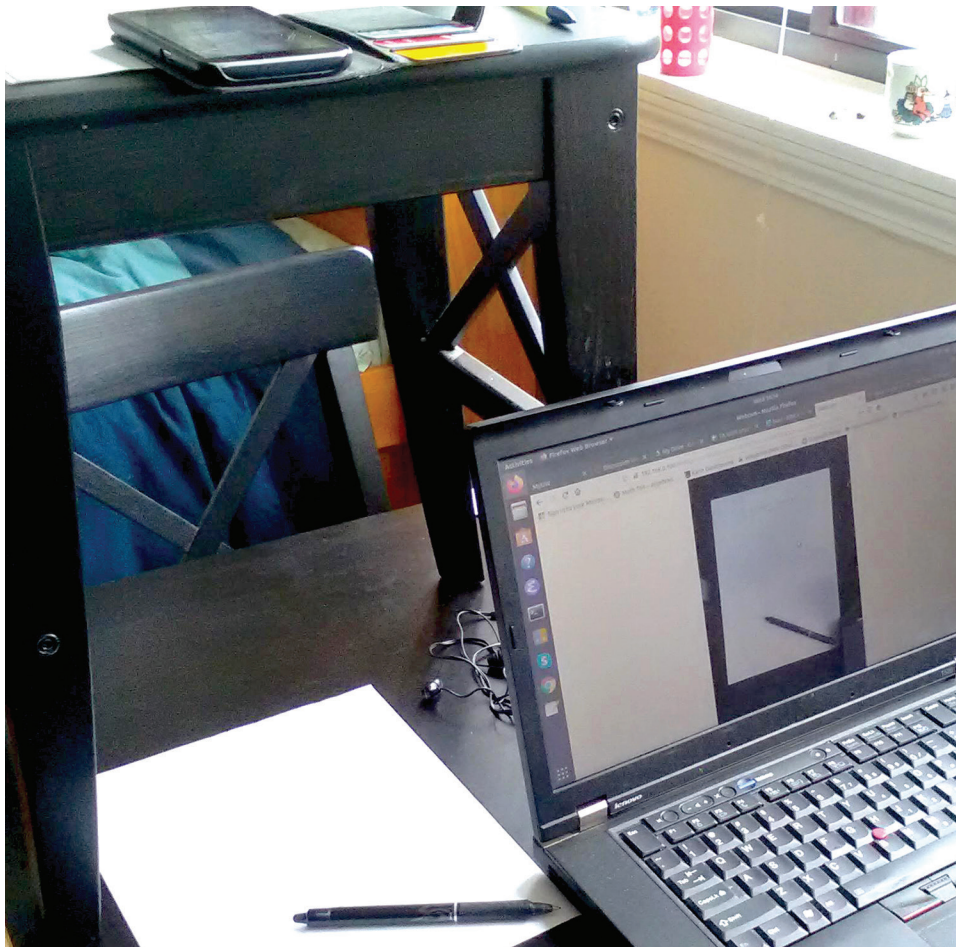
We decided that there was no reason to force a top-down approach to instruction and instead allowed each instructor to choose the best method for themselves. Each instructor was therefore provided the technical support they required (IT support, iPads, stylus pens, and any other needed technology) and lots of guidance on different options available to them, but was left to determine their own educational methods.

There were two major decisions each instructor had to make (along with dozens of smaller ones, of course).

The first major choice each instructor had to make was whether to provide lectures synchronously, meaning they would lecture live to students, or asynchronously, meaning they would record lectures and upload them for students to watch on their own time. The ultimate choice depended on the personality of the instructor and on the particular course they were teaching.

Justin Sukiennik, instructor of Math 112 (Algebra), had already been converting that course to an all-online course using an iPad. “I recorded my lectures on an iPad Pro using handwritten lecture slides by using screen capture. After completing the lecture, I would upload it to a laptop and use video editing software to polish it up. Then I would post the finished video to Canvas so students could access the lecture anytime. Many students liked the ability to access the lecture anytime, and others liked the fact that they could pause the video to figure out a concept. Students were so understanding while making the switch to online learning.”

Gloria Mari-Beffa, teaching Math 561 (Differential Geometry), noted her process as, “I had lectures on



Graduate student Erika Pirnes got creative when creating videos for her class, using a cell phone, a chair, and filming herself writing on paper from above.

Powerpoint...with students asking questions via the chat. I recorded all lectures in three parts, taking a break every 20–30 minute...each lecture had an introduction about what the day will be like, and each theorem had an intuition attached to it. One always does that, but putting it on paper makes a difference. It was good, and I think it worked quite well. Students liked it, they asked more questions than they did in class and they gave me hints for improvement: wait a little longer for answers when you ask a question to the class; we do not see your mouse, make marks. Otherwise, they really liked the strict structure.”

However, some instructors noted the difficulty of presenting to a camera versus presenting to a live class. “I felt disconnected during the lecture. I couldn't see my students and couldn't tell how engaged or confused they were. It's just not the same as being in person,” reported **Joe Miller**, teaching Math 873 (Advanced Topics in Foundations). **Jean-Luc Thiffeault** (Math 322, Applied Mathematical Analysis) agreed, saying, “I pre-recorded my lectures (using a camera and a whiteboard) but it's

so dull I gave live teaching a try.” He also observed more students showing up for the live sessions than watching the recorded sessions, and said, “We can conclude that students are somewhat hungry for live content, and find it more motivating.”

The second major decision each person had to make was how to assess students' work in a manner that was fair to students but also minimized the possibility of academic dishonesty. This was a non-trivial endeavor for any class, but especially those with hundreds of students!

Saverio Spagnolie (Math 222, Calculus 2) decided to run his exams exactly as normal, just online, but had concerns that there was collaboration occurring. “The second midterm (the first after going online) we tried to run like a normal midterm, but with a lot of extra time (12 hours!). Usually the average on such an exam is 70 or so. My section had an extremely high average, close to 90, I think... On the final, all the instructors put a huge amount of work into

writing multiple problems for each question, and we sent out exams with random selections from among those problems, and we also reduced the time to five hours. My section's average on the final exam was 72.”

Joris Roos (Math 629, Introduction to Measure and Integration) took a different tact. “The final exam was held live in a Google Hangouts Meet session. I shared my screen with the exam problems and they had two hours of time to write up their answers. Then they had extra time to return the answers by email. It was an open book exam and I tried to design questions that wouldn't be easy to look up.”

These experiences and ideas are helping us build the structure for future remote teaching. Unfortunately, COVID-19 is still spreading (as of the publication of this article) and it seems clear that at least some of our classes will not return to a face-to-face format for at least another semester. However, we are proud of the results we achieved during the Spring semester and are confident in the lessons we learned in this “trial by fire” period.



Qin Li Joins in Coronavirus Fight

Qin Li has been working with other researchers here at UW-Madison to combat coronavirus. She is part of a group of researchers, led by Geography Professor Song Gao, using cell phone-tracking data to model traveling and the spread of the coronavirus. Li will use the team's data to inform mathematical models of the spread of COVID-19.

"We want people to take action to further prevent or mitigate the threat of the virus," Gao says. "Our development of a COVID-19 spread model will be community-centered, which incorporates community responses into both the model development and the model interpretation process." Link: <https://go.wisc.edu/732nz1>



Qin Li

COVID-19 Impacts

MOVING TO A VIRTUAL VISIT DAY

Each year, the Math Department invites a group of likely graduate students to visit our department to get a sense of what life might look like for a Math graduate student. This year, the pandemic forced us early on to explore a virtual alternative to our regular in-person visit day, which was scheduled for March 24, 2020.

Kathie Brohaugh, our Graduate Student Coordinator, had already set up virtual alternatives for long-distance or immunocompromised students, so the switch to a virtual visit day was less of an issue than it might have been otherwise. Troubling as it was to set aside all of our preparations for the in-person event, we embraced the virtual visit day.

Harry Main-Luu, a graduate student in the department, collected pictures from current graduate students to create a YouTube video showcasing graduate student community (available here: <https://youtu.be/cOXMgMxDvTk>) and to give a sense of what life is like in Madison.

The traditional event with faculty presentations was cut back to a simple welcome and introductions. A forum of current graduate students was offered and prepared for any question, whether it was how to be prepared as a new math graduate student, or working with an advisor, or how to maneuver around downtown Madison or campus in general.

In addition, a prospective student could meet with faculty via a Google Meet in a one-to-one manner, just like if they were talking in an office.

Kathie suggested it might be something we'll continue to do for future visitor visit days, as the world becomes more virtual, and to provide options for students unable or unwilling to travel to Madison prior to making their important decisions. It might also allow us to showcase things that students would not otherwise be able to experience, such as video tours of Van Vleck Hall or student office arrangements.

The virtual visit day may have been a deciding choice for many graduate students, and we did hit our target of 22 students who committed to join us next fall.

Talking about COVID-19

Much of the discussion about the coronavirus comes from mathematical models about how they expect the coronavirus to behave. Professor Jordan Ellenberg has been discussing mathematical models of coronavirus and online testing in several online forums.

Slate podcast
<https://go.wisc.edu/1yh9z4>

WID Crossroads of Ideas
<https://go.wisc.edu/48wras>

Jordan's Twitter account: @jsellenberg

May 7, 2020, Op-Ed for *The New York Times*
<https://go.wisc.edu/i5jxfb>

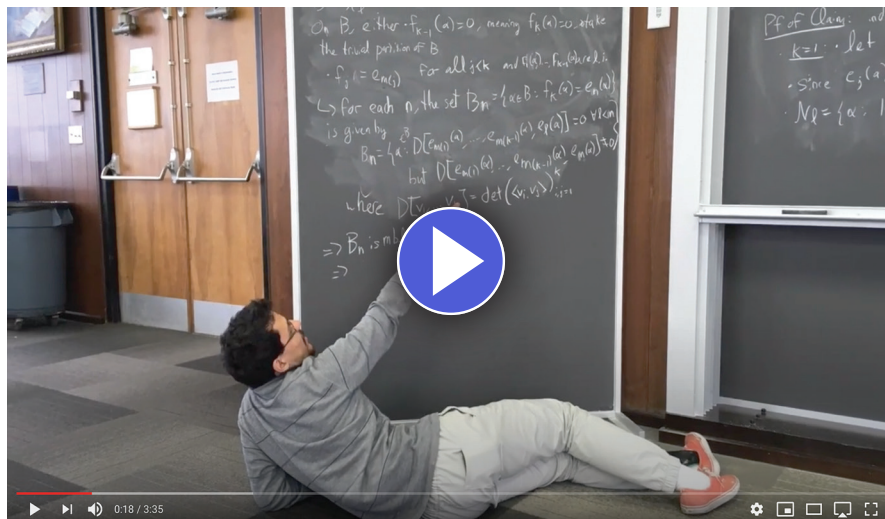
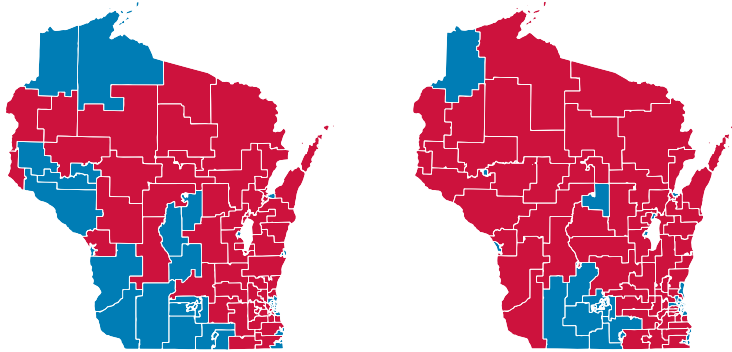
Is a District Gerrymandered or Not?

Graduate student **Lorenzo Najt** studies algorithms that can build a large group of maps for a state, predict their outcomes, then compare those to the map that legislators selected. He works with UW–Madison mathematics Professor Jordan Ellenberg as well as Associate Professor Justin Solomon and postdoctoral associate Daryl DeFord at MIT.

“What if we had a big bag of all the different maps that you could have?” Najt explained. “If we reached our hand in and took out maps randomly and then compared them to the one that you proposed, maybe your map would look extremely unusual in terms of its partisan advantage.”

Using a bag of maps to compare districts is better than an eyeball test, but even a computer-generated group of maps can be biased. Najt analyzes the processes that algorithms use to construct the bag of maps, called an ensemble, and what factors influence which maps end up in the ensemble. There are many methods people can use to build an ensemble.

Najt has looked closely at two methods that, when applied in different scenarios, may lead to different outcomes. One is based on a method for moving incrementally through the space of maps by randomly reassigning small census units to different districts, an example of a more general algorithmic technique called a Markov chain. The other method is based on a related combinatorial structure called a spanning tree. Link: <https://go.wisc.edu/n14y5w>



UW–Madison graduate students created a video of graduate student life for potential graduate students to experience virtually: <https://youtu.be/cOXMgMxDvTk>

Shusterman Jointly Publishes Proof of Twin Primes Problem

Two mathematicians, Will Sawin of Columbia University and **Mark Shusterman** of UW–Madison, recently posted a proof of a version of one of the most famous open problems in mathematics. The result opens a new front in the study of the twin primes conjecture, which has bedeviled mathematicians for more than a century and has implications for some of the deepest features of arithmetic.

The twin primes conjecture concerns pairs of prime numbers with a difference of 2. The numbers 5 and 7 are twin primes. So are 17 and 19. The conjecture predicts that there are infinitely many such pairs among the counting numbers, or integers. Mathematicians made a burst of progress on the problem in the last decade, but they remain far from solving it.

The new proof solves the twin primes conjecture in a smaller but still salient mathematical world. They prove the conjecture is true in the setting of finite number systems, in which you might only have a handful of numbers to work with. Read more: <https://go.wisc.edu/n3romj>



Mark Shusterman



FORMER TALENT SEARCH WINNER, NOW PROFESSOR, UNVEILS FLAW IN EULER'S FLUID EQUATIONS

Tarek Elgindi was a winner of UW–Madison's Talent Search competition in 2008 and went on to receive a PhD in mathematics at the Courant Institute of Mathematical Sciences at NYU in 2014. He is now a junior faculty member at the University of California–San Diego, and has done some striking research, which was described in an article in *Quanta Magazine*, regarding how Euler's famous fluid equations might fail in certain conditions.

Elgindi's work is not a death knell for the Euler equations. Rather, he proves that under a very particular set of circumstances, the equations overheat, as it were, and start to output nonsense. Under more realistic conditions, the equations are still, for now, invulnerable.

Link: <https://go.wisc.edu/2n2iq6>

Girls Night Out: Then and Now

Fourteen years ago, Assistant Professor **Gloria Mari-Beffa** had a dream: to create a space where young women mathematicians could gather to experiment, discuss, and generally immerse themselves in math. Within this space, Gloria foresaw a group of women, composed of mixed pairs of high schoolers and graduate students, which would meet regularly over the course of several weeks in order to establish genuine connections.

Assisted by funding from the department's VIGRE grant, a pilot program launched in September 2004 and continued through April 2006. The young women gathered for evening sessions, working in groups with faculty, graduate students, and undergraduates. That first year they focused on three projects in chaos and complexity, fractals, and combinatorics, which introduced the students (ranging from sophomores to seniors) to more advanced ideas, such as ordinary differential equations, as well as to ways of thinking mathematically.

Today, the program lives on under the supervision of Associate Professor **Tullia Dymarz**, as Gloria has moved on to become the Associate Dean for Physical Sciences with the College of Letters & Science. Graduate and high school students, along with the occasional undergrad, meet, eat, and discuss everything from classes offered here at UW–Madison to what math fields might pique their interest. Later, they break off into pairs to work on projects previously collected by Gloria, as well as new projects created by the students. They still may work on the same projects about knots or fractals as in prior years, but there's also room for new discussions, such as a recent one on robotics.

While the program has historically been promoted only by word of mouth, Girls Night Out hopes to welcome new members. If you or someone you know would be interested in participating, please visit our website for information on the program and how to get involved: math.wisc.edu/wimm.



A high school and a UW–Madison student discuss knots at a Girls Night Out meeting in February.

Improving Driverless Cars by Improving mmWave

Rachel Alisha Zachariah's paper, "Efficient Estimation of a Sparse Delay-Doppler Channel," was featured as part of an engineering conference, Conference on Information Systems and Sciences, at Princeton in March 2020.

Alisha is a PhD student in applied algebra, anticipating her graduation this spring. She works with her advisor, **Shamgar Gurevich**, to examine ways to improve the efficiency of the signal processing of millimeter waves.

The millimeter wave (mmWave) spectrum is the band of spectrum between 30 GHz and 300 GHz, which is also part of the 5G band used by some cellular signals. Autonomous vehicles are one of the users of mmWave technologies, which use it to determine how cars might drive themselves. As you can imagine, knowing the speed of the objects around you is important to making choices on how to react.

Zachariah's algorithm uses the Doppler effect to give good estimates of range and radial velocity. Most of the time, the effect is negligible and often ignored, but "in the mmWave setting, it may be on the order of megahertz (Mhz)—even for slow-moving objects like cars." In her paper, Zachariah notes, "State-of-the-art radars aim to resolve objects at a distance of as little as centimeters apart. This calls for a resolution of 10-9s, even for a signal duration on the order of milliseconds."

Link: <https://go.wisc.edu/6gx041>



Rachel Alisha Zachariah
PhD student in applied algebra



Associate Professor
Shamgar Gurevich



Graduate students embraced winter during a snowman-building event held in early February outside Van Vleck Hall.



WELCOME to new faculty and staff

New Administrative Staff

Tori Cooper joined the department on August 30, 2019, as our Events Coordinator. She comes to the department directly after graduating from UW–Madison with a BA in English Literature. In her spare time, Tori enjoys kayaking, reading, and exploring new places.

Xin Cui-Dowling started her new role as the VISP-MA Program Coordinator in the department on April 30, 2020. Xin came to the United States as an international student and received her graduate degree in Global Higher Education from UW–Madison. Xin started her professional career at UW–Madison as an International Student Advisor at ISS (International Student Services) after working in Chicago, Beijing, and Washington, DC. She then transitioned to the career advising community to support the professional development of international students. Xin enjoys cooking and trying cuisine from different places.

Lauren Levey started in her position as Payroll and Benefits Specialist on May 11, 2020. She holds a BS in Human Services Leadership from UW–Oshkosh and a Human Resources Management certificate from Moraine Park Technical College. Lauren previously worked at a benefits outsourcing company, where she worked with day-to-day operations of two large companies' 401(k). Outside of work, Lauren enjoys snowmobiling, bow fishing, and ice fishing with her husband and their lab/border collie mix, Gauge.

Alex Schaefer joined the department on October 9, 2019, as the new Timetable Coordinator. He holds degrees in Psychology and Neuroscience from UNCA. Previously, he worked as an equipment manager at NCA&T State University. In his free time, Alex enjoys playing bass, coding, weightlifting, and reading.

New Faculty

Alex Poltoratski joined the department in January after having previously taught at Texas A&M University since 1998 and MIT from 1995 to 1998. Alex also gained valuable instruction experience from his time at California Institute of Technology from 1992 to 1995, where he completed his PhD under the supervision of Nikolai Makarov, focusing on Cauchy integrals.

Michael Kemeny began working at UW–Madison at the start of the Fall 2019 semester. Previously, Michael taught at Stanford from 2016 to 2019, and at Humboldt-Universität zu Berlin from 2014 to 2016. He earned his PhD in pure mathematics from Humboldt-Universität zu Berlin in 2015 with Daniel Huybrechts as his advisor. Michael's research interests include moduli theory and commutative algebra—particularly moduli spaces of curves, stable maps, K3 surfaces or Abelian varieties and syzygies of coordinate rings of varieties, respectively.

Vadim Gorin came to the department last fall from MIT, where he had taught since 2015. Vadim earned his PhD from Moscow State University in 2011, with Grigori Olshanski, Boris Gurevich, Erik P. van den Ban, and Alexander Gnedenin as his advisors. Vadim's two main areas of research include

the asymptotic analysis of integrable stochastic systems through exact formulas and algebraic techniques and the development of robust methods for proving the universality of the known asymptotic behaviors.

Leonardo Zepeda-Núñez started working at UW–Madison last fall. Previously, Leonardo taught at the University of California-Irvine (2015–2017). He holds a PhD in Applied Mathematics from MIT, where Laurent Demanet served as his advisor. Leonardo's current projects are applications of deep learning to scientific computing, using neural networks to accelerate molecular dynamics, and second order optimization methods for machine learning; fast solvers for the Helmholtz equation, and new numerical methods for quantum chemistry, in particular, numerical methods for bath parametrization within the DMFT framework.

Gao Chen joined the department at the beginning of the Fall 2019 semester after having previously taught at the Institute for Advanced Study (2017–2019) and Stony Brook University (2012–2017). Gao holds a PhD from Stony Brook University, where Xiuxiong Chen served as his advisor. Gao is interested in complex geometry, quaternionic geometry, and octonionic geometry.

New Faculty and Staff

NAME	PHD	SPECIALTY
Albert Ai	2019, University of California-Berkeley Advisor: Daniel Tataru	Nonlinear dispersive partial differential equations, fluid dynamics, harmonic analysis
David Beltran	2017, University of Birmingham Advisor: Jonathan Bennett	Geometric control of oscillatory integrals
Jun Le Goh	2019, Cornell University Advisor: Richard A. Shore	Mathematical logic, computability theory, reverse mathematics, Weihrauch reducibility, computable analysis, set theory
Brian Hepler	2019, Northeastern University Advisor: David B. Massey	The local topology of complex analytic spaces, perverse sheaves, and microlocal sheaf theory
Xiaoqin Guo	2012, University of Minnesota Advisor: Ofer Zeitoun	Probability theory, random motions in random media, stochastic homogenization
Yousheng Shi	2019, University of Maryland Advisor: John Millson	Arithmetic algebraic geometry, Locally symmetric spaces
Scott Smith	2016, University of Maryland Advisors: Sandra Cerrai and Konstantina Trivisa	Stochastic Partial Differential Equations
Balazs Boros	2013, Eötvös Loránd University Advisor: Gyorgy Michaletzky	Sign vector conditions in chemical reaction network theory, qualitative theory of differential equations, dynamic aspects of mass-action systems
Yu-Chan Chang	2019, Louisiana State University Advisor: Pallavi Dani	Bestvina-Brady Groups with Polynomial Dehn Functions,
Siddesh Wagh	2019, University of Oklahoma Advisor: Ameya Pitale	Number theory, automorphic forms, representation theory.



student AWARDS

Graduate Awards

EXCELLENCE IN MATHEMATICAL RESEARCH AWARD

Juliette Bruce, Yunbai Cao, Bingyang Hu, Bobby Laudone, and Polly Yu

received the Excellence in Mathematical Research Award. The Department of Mathematics has an annual competition for awards, ultimately recognizing students making significant and substantial contributions to research in pure or applied mathematics, as part of their thesis work toward a PhD.

JOHN NOHEL PRIZE IN APPLIED MATHEMATICS

Zhiyan Ding, David Marsico, Chaojie Yuan, and Kit Newton

have been awarded the John Nohel Prize in Applied Mathematics, which recognizes graduate students who write outstanding PhD theses in applied mathematics at UW–Madison.

ELIZABETH HIRSCHFELDER PRIZE

Kit Newton was also awarded the Elizabeth Hirschfelder Prize, alongside **Soumya Sankar, Rajula Srivastava, and Polly Yu**. The Elizabeth Hirschfelder Prize is given to outstanding female graduate students who are making exemplary progress toward their PhDs.

HENRY SCHAEF MATHEMATICS GRADUATE AWARD

The Henry Schaerf Mathematics Graduate Award is given to graduate students who have demonstrated promise in their academic work. This year, **Vefa Goksel, Xiaocheng Li, and Ziming Shi** received the award.

Undergraduate Awards

IMPRESSIVE PUTNAM EXAM RESULTS FOR UW UNDERGRADUATES

UW–Madison has scored 15th nationwide in the annual Putnam competition. Sivakorn Sanguanmoo received an honorable mention. Two undergrads, Sivakorn Sanguanmoo and Ruiting Tong, made the top 200.

The William Lowell Putnam Mathematical Competition is the preeminent mathematics competition for undergraduate college students in the United States and Canada.

The Putnam began in 1938 as a competition between mathematics departments at colleges and universities. Now the competition has grown to be the leading university-level mathematics examination in the world. Although participants work independently on the problems, there is a team aspect to the competition as well.

The Putnam Competition takes place annually on the first Saturday of December. The competition consists of two 3-hour sessions, one in the morning and one in the afternoon. During each session, participants work individually on six challenging mathematical problems.

Link: <https://www.maa.org/math-competitions/putnam-competition>

COMAP MATHEMATICAL CONTEST IN MODELING

The **COMAP Mathematical Contest in Modeling** results are out! This contest is a great experience for undergraduates: a grueling, exciting, 96-hour team research effort. Real-world problems (some continuous in nature, some discrete) are released worldwide at the same moment. Teams of up to three undergraduates choose one of these problems and have only 96 hours to develop a mathematical model, derive and/or compute solutions, and present the results in a formal paper. Problems are designed to be open-ended and are unlikely to have a unique solution. Clarity, analysis, and design are of critical importance.

One of our UW–Madison teams (Mengzi Li, Yanfei Li, and Xiaoyang Song) scored an honorable mention, which is quite an accomplishment!

Link: <https://go.wisc.edu/myxy92>

TA Awards

POLLY YU AND GEOFF BENTSEN HONORED FOR TEACHING

Congratulations to Polly Yu, our distinguished graduate student, for being selected to be a teaching fellow of L&S, and to Geoff Bentsen for being an alternate to receive this award.

Fellowship in the Teaching Academy is an honor bestowed on individuals who have demonstrated teaching excellence, are recognized and nominated by their peers, and are committed to advancing the mission of the Academy.

SERVICE AWARD

Michel Alexis

EARLY EXCELLENCE AWARD

Colin Crowley, Evan Sorensen

OUTSTANDING TA AWARD

Jeffrey Covington, Johnnie Han, Yunfan He, Yu Huang, Sid Jennings, Jaeun Park, Xiao Shen, Rajula Srivastava, Son Tu, Shuqi Yu

CONGRATULATIONS to our graduates

PhD Graduates 2019–2020

Ivan Ongay Valverde (2020, J. Miller) Relations Between Set Theory and Computability Theory: the Case for Localization Numbers and Sets Closed Under Turing Equivalence

Jeremy Schwend (2020, Stovall)

Chaojie Yuan (2020, D. Anderson) Stochastic Models for Chemical Reaction Network

David Marsico (2020, Stechmann) Atmospheric Dynamics with Moisture and Phase Changes

Robert Laudone (2020, Sam and Erman) Representation Stability and Combinatorial Approaches to Noetherianity up to Symmetry: Applications to 0-Hecke Modules and Plucker-Embedded Grassmannians

Bingyang Hu (2020, Street) Sparse Dominations of Singular Radon Transforms

Ziming Shi (2020, Gong) Oblique Derivative Problems on Families of Planar Domains

Yunbai Cao (2020, Kim) The Vlasov-Poisson-Boltzmann System in Bounded Domains

Vefa Goksel (2020, Boston) Thesis: Post-Critically Finite Polynomials in Arithmetic Dynamics

Kurt Ehlert (2019, Anderson) Numerical Methods for Stochastic Reaction Network Models

Michael Powers (2019, Arinkin) A Theory of Difference Modules in Algebraic Geometry

John Lynch (2019, Thiffeault) Pseudo-Anosov Homeomorphisms with Large Topological Entropy

MA GRADUATES

Benjamin Bai

Yunhui Cai

Shengze Duan

Liancheng Fang

Jiaqi Hou

Yuchen Li

Tairan Ma

Zi Qi Ma

Bingyu Mao

Yifan Peng

Daqin Sun

Lizhe Wan

Jiacheng Wang

Junyu Wang

Senghao Wang

Xinpeng Wang

Yipei Wang

Yixian Wang

Leo Wu

David Xia

Feiyu Yue

Chuanqi Zhang

Lexin Zhang

Sitao Zhang

Tianyu Zhu

Where do our graduates go?

John Lynch (PhD, 2020, Thiffeault), Research Data Scientist, Ordinal Sciences

Kurt Ehlert (PhD, 2020, Anderson), Quantitative strategist, Virtu Financial

Robert Laudone (PhD, 2020, Sam, Erman), Postdoctoral Fellow, University of Michigan

Bingyang Hu (PhD, 2020, Street) Postdoctoral Fellow, Purdue University

Chunaqi Zhang (MA, 2020) MS program in Statistics, Georgia State University

Bingyu Mao (MA, 2020) PhD program, University of Texas Health Science Center at Houston

Chaojie Yuan (PhD, 2020, Anderson), Postdoctoral Fellow, Indiana University-Bloomington

Ivan Ongay Valverde (PhD, 2020, J Miller, Kunen), Postdoctoral Fellow, York University

Ziming Shi (PhD, 2020, Gong), Hill Assistant Professor, Rutgers University

Daqin Sun (MA, 2020), Software Engineer, Huawei

Yunbai Cao (PhD, 2020, C. Kim), Hill Assistant Professor, Rutgers University-New Brunswick

Vefa Goksel (PhD, 2020, Boston), Marshall Stone Visiting Professor, University of Massachusetts-Amherst

Xinpeng Wang (MA, 2020), Consulting Assistant, Ernst and Young

Jingwei Liu (MA, 2020) PhD program, University of California-San Diego

Jane Davis (MA, 2020) Server Systems Engineer, Epic Systems

Faculty Updates

Andrei Caldararu has been selected for an appointment as 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.

Jordan Ellenberg joins a Nobel Prize-winning physicist, another bestselling author, and a leader in global sustainable agriculture in being elected as one of the six newly elected Andrew Dickson White Professors-at-Large at Cornell. The professors-at-large program at Cornell sponsors up to 20 outstanding scholars and public intellectuals at one time, in the life sciences, physical sciences, humanities, social sciences, and the arts. In each three-year period during their term, professors-at-large visit campus for about a week while classes are in session, to interact with students and faculty and enliven the intellectual and cultural life of the university. The program sponsors up to six visits per academic year, and activities such as public lectures and seminars. Their six-year terms are effective July 1, 2019, through June 30, 2025. Candidates are nominated by Cornell faculty members; appointments are considered following review and recommendation by a faculty selection committee. Link: <https://go.wisc.edu/w7fu0n>

In *The Guardian*, Jordan Ellenberg explains his own way of calculating a book's unreadability, which he dubbed the Hawking Index. Ellenberg looked at the sections that readers have highlighted on Amazon's Kindle e-readers, and infers that after they've stopped highlighting, they've probably stopped reading. Link: <https://go.wisc.edu/mg0mz9>

Former UW–Madison Math Professor **Franz Forstneric** (1990–2001) has been awarded one of the 2019 Stefan Bergman prizes of the American Mathematical Society.

Franz is awarded the Bergman Prize for his many contributions to several complex variables (SCV), as well as complex geometry and geometric analysis. He is being recognized for his foundational work on mapping problems for domains in complex spaces and more general complex manifolds, approximation theory in SCV, the development of the Oka principle, and complex analysis methods in the theory of minimal surfaces.

Link: <https://go.wisc.edu/tbz747>

Autumn Kent offered a perspective of research in terms of Atari, doughnuts, and geometry in the April 2020 "Fueling Discovery" insert for the Wisconsin State Journal. Link: <https://go.wisc.edu/xfo3oq>

Likewise, Autumn was also featured in "Mathematics as a Team Sport" in Quanta Magazine. The article showcases a week in the life of the Oberwolfach Research Institute for Mathematics (mfo.de) in Germany. During that week, Autumn was part of a group of mathematicians who visited to discuss low-dimensional topology. Link: <https://go.wisc.edu/7l72kx>

Congratulations to Professor Emeritus **Thomas Kurtz**, who has been named as a member of the 2020 Class of AMS Fellows! He is specifically mentioned for "research in probability and its applications, especially for contributions to the study of Markov processes."

Former Van Vleck Assistant Professor **Malabika Pramanik** has been appointed as Director of the Banff International Research Station as of July 1, 2020. She was in Madison between 2001 and 2004. She joined the University of British Columbia in 2006. A mathematical analyst, her research interests cover Euclidean harmonic analysis, geometric measure theory, partial differential equations, and several complex variables. Link: <https://go.wisc.edu/334r1j>
Link: <https://go.wisc.edu/8675f3>

PROFESSOR SERGEY BOLOTIN RETIRES



Professor **Sergey Bolotin** is retiring this fall after nineteen years. He started with the Math Department in 2001 as an associate professor, achieving full professor status in 2002.

He received the D.Sc. from Moscow State University in 1997 with a thesis "Variational methods in Hamiltonian systems." His advisor was V. V. Kozlov.

He had been a visiting faculty member in our department in 1996 and 2000; he had also been a visiting faculty member at the University of Trento (Italy). He gave an invited

address at the International Congress of Mathematicians in Zurich in 1994.

Sergey's research interests include variational methods in Hamiltonian systems, conditions for nonintegrability and chaotic behavior of Hamilton systems, billiards, rigid body dynamics, and celestial mechanics and inertial navigation.

He's looking forward to returning to his native Russia and spending time with his wife's grandchildren, but hasn't ruled out a return to Madison and the possibility of a return to teaching. Of Madison, he said he'd miss the wonderful and kind people, who seem to thrive in the cold winters we experience here.

Alumni Updates

ALUMNA BECOMES NEXT PRESIDENT OF MAA

Jennifer (Massey) Quinn, (PhD, 1993, Brualdi) was elected as the next President of the Mathematical Association of America (MAA). She is currently with the University of Washington-Tacoma. She was elected president-elect and began her term Feb. 1, 2020, and will serve as president during 2021–2022, and past president in 2023. Link: <https://www.maa.org/election>

ALUMNA TEACHES MATH THROUGH KNITTING

The *Milwaukee Journal Sentinel* features **Sara Jensen**, a UW–Madison alumna and professor at Carthage College (PhD, 2014, Isaacs), who teaches students math through knitting. And we're not just talking potholders. Someone actually knitted a working Rubik's cube, Jensen says. "This class is a way for math to be creative." Link: <https://go.wisc.edu/0eg1m5>

MATH ALUMNUS NAMED UNIVERSITY OF DENVER CHANCELLOR

The University of Denver has chosen **Jeremy Haefner** as its 19th chancellor.

Haefner, who earned a master's degree and PhD in mathematics from the University of Wisconsin–Madison in 1983 and 1986, respectively, joined the University of Denver in 2018, serving as provost and executive vice chancellor. He previously held the positions of provost and senior vice president for academic affairs at Rochester Institute of Technology for 10 years.

As a mathematician, Haefner studied integral representation and module theory, and his research has been published in *Communications in Algebra*, *Journal of Algebra*, and *Transactions of the American Mathematical Society*, among other journals. He has also written on topics in higher education, such as supporting diversity in leadership and enhancing the student experience.

Denise O'Leary, chair of the University of Denver Board of Trustees, stated that Haefner has done remarkable work in the past year, including championing transparency and respect for shared governance, spearheading efforts to share more regular and thorough updates on budget processes, and improving lines of communication.

"Our community has, in Jeremy, a national thought leader in student and academic success, a great communicator and an individual personally committed to advancing the university and further expanding our diverse and inclusive community and shared values," she wrote.

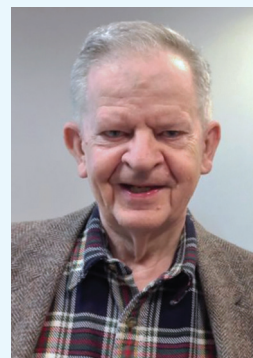
More News

Chris Janjigian (PhD, 2016, advisor Valkó) begins a tenure track position at Purdue University in Fall 2020, after postdoctoral time spent in Paris and Salt Lake City. His big year was topped off by winning a three-year National Science Foundation research grant in probability for a project titled Random Walks in Random Potentials.

Kathryn Hess (BA, 1985) is a full professor of mathematics and life sciences at EPFL (Lausanne, Switzerland) She is an algebraic topologist, specialized in homotopy theory and category theory, as well as in application of algebraic topology, particularly in the life sciences.

Alison Lynch (PhD, 2015, Terwilliger) has been promoted to Associate Professor at Cal State Monterey Bay.

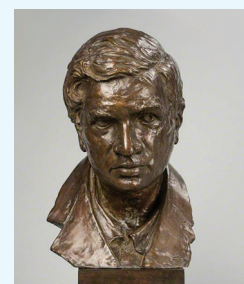
In Memoriam



RICHARD ASKEY

Richard Allen "Dick" Askey, of Madison, passed away on Oct. 9, 2019, at age 86. Dick devoted his life's work to mathematics and improving K-12 math education. He joined the University of Wisconsin Mathematics Department in 1963 and retired in 2003.

Dick was the world's foremost authority on Special Functions. He traveled the world giving talks on mathematics and teaching the work of the mathematician Srinivasa Ramanujan. Dick was a member of the National Academy of Sciences and an Honorary Fellow of the Indian Mathematical Society. He was named Gabor Szego Professor of Mathematics in 1986 and was awarded a John Bascom Professorship in 1995. He had thirteen PhD students, but his influence went far beyond his students. Professor Askey was passionate about mathematics and mathematics education. He excelled in research, teaching, and service to the university and to the mathematics community.



THE ROYAL SOCIETY

Dick Askey left the Math Department a bronze bust of the famed Indian mathematician, Srinivasa Ramanujan. It has now been installed in 911 Van Vleck Hall.



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CREDIT?

Girls Night Out

Girls Night Out, held each year for high school-aged women to learn from undergraduate and graduate women math students, is a great opportunity to discuss math, to network, and to learn more about opportunities that exist for women interested in studying math. See story on Girls Night Out on page 8.