{Math Times}

DEPARTMENT OF MATHEMATICS

SUMMER 2020

CHANGING COURSE: GOING REMOTE DURING COVID-19

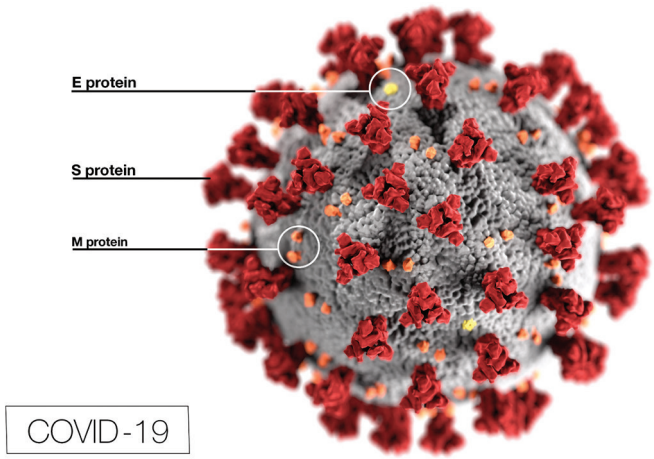
In mid-March, as the number of known COVID-19 cases in Illinois rose into the double digits, Governor JB Pritzker issued a disaster proclamation to respond to the COVID crisis. The state took measures to halt the spread of the disease by ordering all bars and restaurants closed to sit-in diners, restricting large gatherings of people, and closing schools.

On March 16, in response to the growing concerns of the pandemic, the University of Illinois suspended face-to-face instruction for the rest of the spring 2020 semester and moved exclusively to remote instruction for the first time in its 152-year history.

However, the University of Illinois, deemed an essential business, did not close down or cease operations. Residence halls remained open for students who were unable to return to their permanent residence. Business and administrative operations were modified to allow for work to continue remotely. University research offices remained open to allow for crucial research to continue.

Following spring break, which faculty utilized to re-imagine their course delivery and educational processes, students returned to a world of virtual instruction on March 23. Utilizing a variety of technology and tools, faculty and staff innovated education to continuously meet the needs of students and maintain the university's commitment to world-class academic excellence. Lectures were recorded to provide asynchronous

Continued on page 4

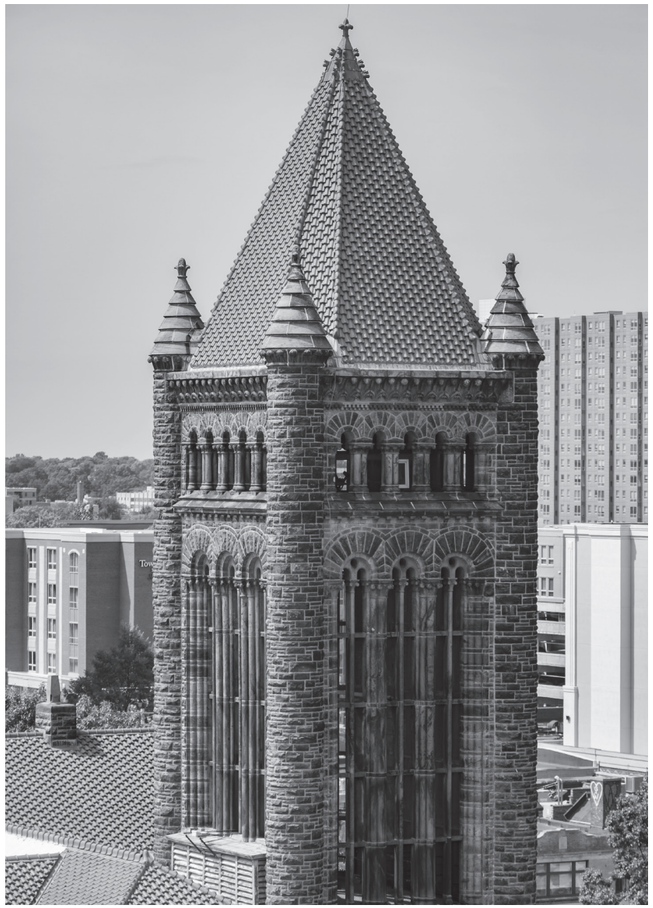


COVID-19

[This illustration, created at the Centers for Disease Control and Prevention (CDC), reveals ultrastructural morphology exhibited by coronaviruses. Note the spikes that adorn the outer surface of the virus, which impart the look of a corona surrounding the virion, when viewed electron microscopically. In this view, the protein particles E, S, and M, also located on the outer surface of the particle, have all been labeled as well. A novel coronavirus, named Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2), was identified as the cause of an outbreak of respiratory illness first detected in Wuhan, China, in 2019. The illness caused by this virus has been named coronavirus disease 2019 (COVID-19).]

{Math Times}

ILLINOIS



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Dear friends,

Welcome to another issue of Math Times! Unexpected challenges delayed our planned Fall 2019 issue of Math Times into the spring semester. As a result of the world-changing events of Spring 2020, we eventually postponed publication to summer, and are now taking this opportunity for a comprehensive look back on a momentous and eventful year.

The past 12 months have been unprecedented in our department's history. Needless to say, the onset of the COVID-19 pandemic impacted all aspects of our operations and the lives of everyone in the department, as it has done worldwide. Spring 2020 witnessed numerous firsts in our history: the first virtual graduation ceremony, the first virtual PhD thesis defense, and many others. Faculty and graduate students worked tirelessly to convert their courses on short notice to an online format, and devoted countless hours to ensure that our students continued to receive high-quality instruction. At the same time, Mathematics faculty rose to the challenge, generating innovative mathematical models addressing numerous societal challenges associated to COVID-19. Explore some of this research in the pages of this newsletter, or look for more on our website.

The past year also saw dramatic progress in the University's ongoing planning for the Altgeld and Illini Halls building project. Architectural design firms CannonDesign and Bailey Edward conducted detailed investigations of Altgeld Hall and conceptualized new spaces for research and teaching in a renovated Altgeld Hall and a new building on the site of Illini Hall. The ongoing design process is expected to lead, over the course of the coming year, to the start of the building project itself. We are eagerly awaiting the outcome of this once-in-a-lifetime project, which will have a profound impact on generations to come.

We're also excited by the participation of our faculty in new campus research institutes focused on applications of the mathematical sciences to grand societal challenges. Read more about these exciting new developments later in this newsletter. The events of the past few months have made crystal clear the relevance of mathematical modelling for prediction and forecasting.

Every year I'm pleased to highlight our faculty and students who have been recognized for their scholarship and teaching, and this year is no exception. The awards and honors which they receive do credit to us all. Congratulations to all of those highlighted in these pages!

We deeply appreciate the support of our alumni and friends. Thank you for investing in the department's success, through financial contributions, through service on our alumni advisory boards, and through ongoing engagement with our students.

I wish all of you the very best in these extraordinary times. Keep in touch!

Jeremy Tyson
Professor and Chair
Department of Mathematics

CHANGING COURSE: MOVING TO REMOTE DURING COVID-19 continued from page 1

lessons to meet the needs of students learning from around the world. Study groups and smaller classes Zoomed in to engage in a more traditional style of learning. The Department of Mathematics became a leader within the College of Liberal Arts & Sciences for its quick and innovative response to the call to remote instruction and providing teaching and learning resources for faculty and students.

Additionally, administrative and business functions moved online. The spring 2020 faculty meeting and Actuarial Science Advisory Board meeting were held via Zoom. Department seminars and lectures also moved to a virtual format, allowing for unique viewership from across the globe.

With the restriction on gatherings in place, university events were put on hold, including traditional annual events, such as the department's annual awards program. On March 17, University of Illinois System President Tim Killeen announced that commencement ceremonies in Urbana-Champaign, Chicago, and Springfield would not take place as scheduled in May due to the global COVID-19 pandemic. A virtual celebration was held on May 16 at noon. Prior to the university's celebration, the Department of Mathematics, in conjunction with the Department of Statistics, premiered a special video message to our 2020 graduates featuring department chairs Jeremy Tyson and Bo Li.

Summer 2020 courses were also held remotely, and summer events through July were also suspended as the pandemic continued to be a threat nationally. Annual student outreach events, such as the annual Summer Illinois Mathematics (SIM) camps, were reinvented as virtual day camps.

On June 18, the university announced it will resume on-campus instruction for the Fall 2020 semester in a modified manner to address the ongoing pandemic concerns. The fall semester will consist of a blend of in-person and remote instruction. At the time of publication, multiple task forces at the university, college, and department levels were hard at work, striving to find a balance between public health, safety, and ensuring the best educational outcomes for University of Illinois students. Regardless of what fall may bring, as Chancellor Robert Jones said in March, "I am confident that when we have come through this, we will look back and see the resiliency of our university community was exceeded only by our care for one another when it mattered most. Wherever you might be today, you are always a member of the Illinois family. "

ANALYZING THE COVID CRISIS: MATHEMATICAL APPROACHES

Since the beginning of the COVID-19 crisis, mathematical analysis has played a critical role in shaping decisions about the transmission of the virus, as well as decisions at all levels of government and business. Researchers in the Illinois Department of Mathematics have begun publishing results of their modeling and simulations on those topics to help guide policy and response:

- Keeping Your Teams Safe | March 14, 2020 | Yuliy Baryshnikov
- Wearing a Face Mask: The New Dress Code | April 29, 2020 | Jan Dhaene, Daniël Linders, and Hamza Hanbali
- Simulating the Reopening of Campus | May 2, 2020 | Yuliy Baryshnikov
- The Effect of Social Distancing, Isolation and Digital Contact Tracing on COVID-19 | May 14, 2020 | Stephen Grice, Richard Laugesen, et al.
- Calculating the Effective Reproduction Number for COVID-19 Using a New Process for Various Countries | May 26, 2020 | P. Grice, S. Grice, and R. S. Laugesen
- A New Method for Calculating the Effective Reproduction Number for COVID-19 | June 1, 2020 | P. Grice, S. Grice, and R. S. Laugesen
- Pandemic Risk Management: Resources Contigency Planning and Allocation (an iRisk Lab project) | Xiaowei Chen, Alfred Chong, Runhuan Feng, and Linfeng Zhang

Read these papers and more at bit.ly/analyzing520covid.

Want to add your COVID-19 research, modeling, and/or simulations to the list?
Contact the Illinois Department of Mathematics Communications Office at math-comm@illinois.edu.

ANNA CHLOPECKI

By Kayleigh Rahn, LAS News

Anna Chlopecki initially chose Illinois for a simple reason—its proximity to her home.

The Niles, Ill., resident was happy to begin her undergraduate studies just a few hours from familiar territory. However, she quickly realized the university's great size.

"Coming in, I was nervous — the school is big," she recalls thinking. But she was not deterred. Ultimately, she discovered a welcoming, supportive community within the department, which led her to find a network of collaborators and her passion within mathematics.

Chlopecki was drawn to math as a teen, because, in her opinion, it's a form of art. Her love of the subject began in high school when the figure skater found problem solving comes from a place of fluid creativity rather than rigid rules.

"It always felt like you can play around with (the problem) and keep going," she said. "I like the critical thinking and the problem solving. There are so many ways of thinking about a problem and approaching a problem."

Determined to find her place within the large university, Chlopecki became involved in the Illinois Combinatorics Lab for Undergraduate Experiences, was elected president of MATRIX (Mathematical Advancement Through Research and Idea eXchange), and is a member of the University of Illinois Student Chapter of the Association for Women in Mathematics (AWM). These clubs helped her to establish her community within the fabric of the department.

"I feel that through MATRIX and AWM, especially, I really like involving students in the math department to create a math community," she said. "When I first came to Illinois, I was a little lost in the department because I felt like it was super big. I feel that through MATRIX I have been able to build a community where I finally feel comfortable in my environment. It doesn't feel so big anymore."

Once she found her footing, she realized she enjoys working in algebraic combinatorics, an area of study she discovered after taking a class led by professor Alexander Yong.

"(Yong) has been super supportive and a mentor figure," she said. "He helped me realize what research I'm interested in."

Despite her busy class schedule and extracurricular activities, Chlopecki still finds time to teach figure skating lessons at the Illinois Ice Arena and to play tennis as a hobby.

"I played [tennis] in high school, but I didn't really want to be super involved in tennis in college. I'm the type of person who needs to focus on my studies."

With that focus, Chlopecki landed a summer research opportunity at Brown University through the Institute for Computational and Experimental Research in Mathematics. She did not work in algebraic combinatorics while there but delved into dynamical systems. She and her team have submitted for publication a paper highlighting their research.

Looking to her next step, with encouragement from her mentors, Chlopecki has decided to attend graduate school. She isn't yet sure if she would rather make a career in academia or private industry, though she is drawn to research, which she believes sounds more like creating and less like work.

For the immediate future, though, she is taking a different approach in selecting her place of study for graduate school. Location is no longer a priority. It's now more important for Chlopecki to find mentors who are interested in her preferred area of research so that she is able to continue algebraic combinatorics. She also hopes to land at a large university where she can continue to build her mathematics network.

As she wrapped her final months as an undergraduate student at Illinois, Chlopecki says she is looking forward to taking a few interesting classes, including a refresher in calculus, in preparation for graduate school.

"I want to dabble in a few different areas of math now, so I can go into grad school with a broad base of knowledge — not just a specialized area," she said. "I'm also looking forward to spending time with the friends I've made here."

In the end, Chlopecki says building her community at Illinois was the right choice.

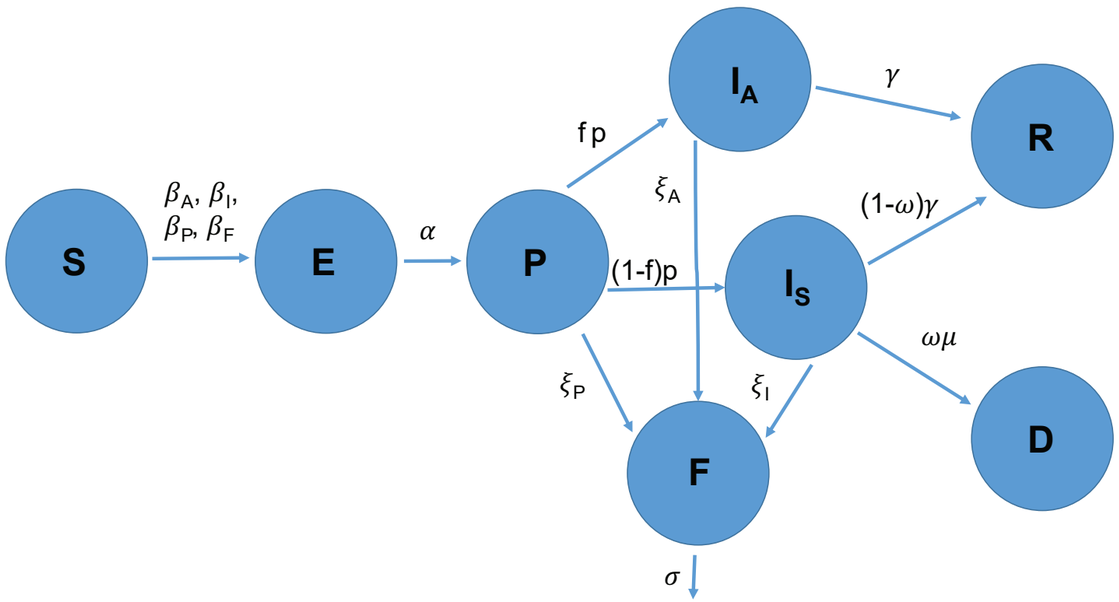
"I feel like, coming in, you're scared of college, but four years transforms you with new people and experiences," she said. "You're surrounded by all these people who are different than you, who you are able to learn from, and Illinois is able to do that well.

THE EFFECT OF MITIGATION MEASURES IN THE SPREAD OF COVID-19

Throughout the spring semester, students and faculty tackled real world challenges in the midst of the COVID-19 crisis, examining the spread of the virus and effects of social distancing, PPE, handwashing, and surface decontamination.

By Katelyn Leisman and Zoi Rapti

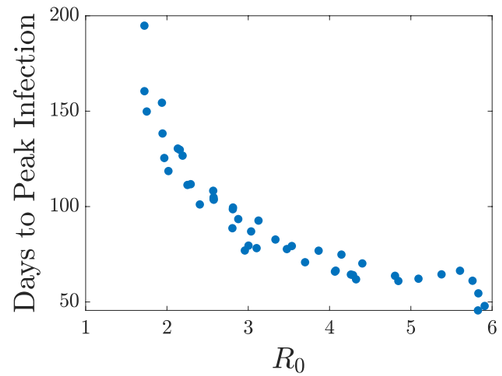
We investigate the role of precautionary measures, such as social distancing, personal protective equipment, frequent handwashing, and surface decontamination in the spread of COVID-19. COVID-19 is the disease caused by the novel coronavirus SARS-CoV-2 and, among others, is transmitted directly from human to human. Since it was found that the virus remains viable on various surfaces for a substantial time, we also include fomite transmission in our model. Examples of fomites (F) are doorknobs, elevator buttons, toys at a daycare center, and handrails in the hallways of nursing homes. We divide the population into compartments depending on infection status: susceptible (S), exposed but not infectious (E), three classes of infectious hosts (pre-symptomatic (P), asymptomatic (I_A), and symptomatic (I_S)), recovered (R), and deceased (D). The model is shown schematically in the figure below.

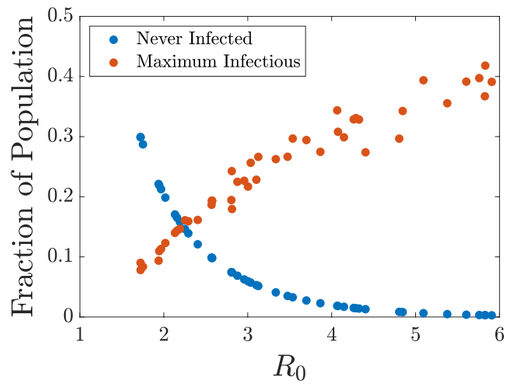


For this model, we have found the basic reproductive number R_0, namely the number of secondary infections generated by an infectious host, when placed in a totally susceptible population. This number depends on most of the parameters in the system in the following way:

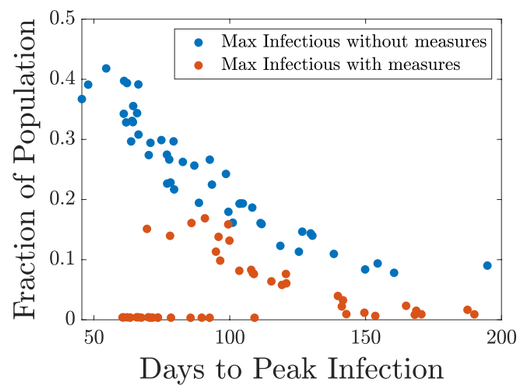
$$R_0 = \frac{\beta_P}{p} + f\frac{\beta_A}{\gamma} + (1-f)\frac{\beta_I}{(1-\omega)\gamma+\omega\mu} + \frac{\beta_F}{\sigma}\left[\frac{\xi_P}{p} + f\frac{\xi_A}{\gamma} + (1-f)\frac{\xi_I}{(1-\omega)\gamma+\omega\mu}\right].$$

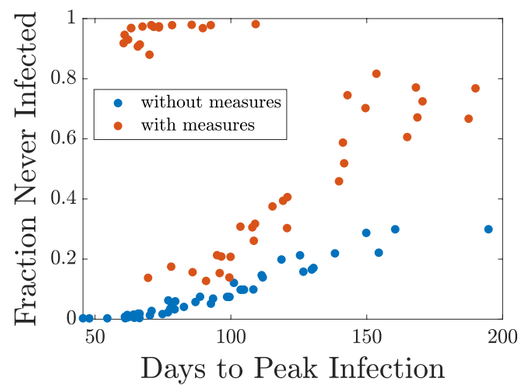
We also found the time it takes to get to peak infection ($P+I_A+I_S$), the number of infected hosts at that time, and the number of hosts remaining in compartment S after the first wave of the outbreak has ended. There is a lot of variation and uncertainty in the parameter ranges, so the dots in the following figures represent different epidemiologically feasible scenarios.





Taking precautionary measures can effectively reduce the basic reproduction number, as well as result in significantly fewer people ever becoming sick. In the following figures, we assume that precautionary measures are implemented once about 0.3% of hosts are infectious. The effective reductions of the β and ξ parameters are about 60% for the asymptomatic and 75% for the symptomatic compartments.



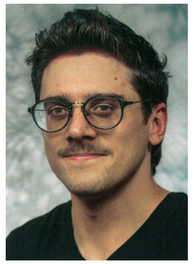


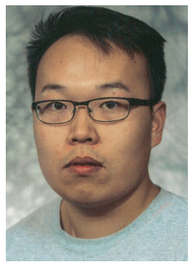

Olivia Beckwith


Reuven Hodges


Daesung Kim


Chandrika Sadanand


Eric Samperton


Zhao Yang


Ran Ji


Laura Placzek

Postdoctoral Faculty

OLIVIA DOROTHEA BECKWITH

J.L. Doob Research Assistant Professor
PhD 2018 Emory University

Olivia is a number theorist and primarily studies modular forms and their connections to classical analytic number theory and combinatorics. Originally from Columbus, Ohio, she has been interested in number theory ever since she attended the Ross Program at The Ohio State University as a teenager. After completing her bachelor's degree at Harvey Mudd College in 2013, she went to Emory University in Atlanta to pursue her graduate studies under the supervision of Ken Ono. After receiving her PhD, she was a postdoc in 2018–19 at the University of Bristol in the United Kingdom. She moved to Urbana this August and lives there with her fiancé, Hudson, and their black labrador, Homer. Outside of math, she enjoys hiking, rock climbing, and taking her dog to the park.

SEAN ENGLISH

J.L. Doob Research Assistant Professor
PhD 2018 Western Michigan University

Sean was born and raised in Royal Oak, Mich. He did both his undergraduate and graduate work at Western Michigan University in Kalamazoo, getting his PhD in 2018 under the advisement of Andrzej Dudek. He then spent a year in Toronto as a postdoc at Ryerson University before coming to the University of Illinois at Urbana-Champaign in 2019. In his PhD, Sean focused primarily on extremal combinatorics and probabilistic combinatorics. While at Ryerson, Sean also began to do research in graph searching and propagation. In his free time, he usually can be found riding his bicycle, playing chess, or collecting vintage video games.

REUVEN M. HODGES

J.L. Doob Research Assistant Professor
PhD 2017 Northeastern University

Reuven was born and raised in northern Haiti. He attended Goshen College for his undergraduate studies and completed his PhD at Northeastern University in 2017. After graduation he spent a year in Germany at the Max Planck Institute for Informatics before joining the University of Illinois at Urbana-Champaign as a J.L. Doob Research Assistant Professor. His research interests are in representation theory, algebraic groups, and algebraic combinatorics. Specifically, his work investigates Levi subgroup actions on Schubert varieties and flag varieties. He also works with straightening laws and studies their application to problems involving multiplicities of irreducible representations in plethysms and to geometric complexity theory.

DAESUNG KIM

J.L. Doob Research Assistant Professor
PhD 2019 Purdue University

Daesung grew up in Seoul, Korea. He completed his bachelor's and master's degrees at Seoul National University. He received his PhD at Purdue University under the supervision of Rodrigo Banuelos in 2019. His research interests lie at the interface of probability and analysis. He is particularly interested in the study of functional and geometric inequalities, stochastic representation of singular integrals and Fourier multipliers, and extremal problems for nonlocal operators.

CHANDRIKA SADANAND

J.L. Doob Research Assistant Professor
PhD 2017 Stony Brook University

Chandrika completed her graduate studies at Stony Brook University, with Dennis Sullivan as her advisor. After that, she held one-year postdocs at the Hebrew University of Jerusalem and at the Technion before coming to the University of Illinois at Urbana-Champaign as a J.L. Doob Research Assistant Professor. Her research interest is low-dimensional topology—in particular, 3-manifolds, curves on surfaces, hyperbolic geometry, billiards, and translation surfaces.

ERIC GRIFFIN SAMPERTON

J.L. Doob Research Assistant Professor
PhD 2018 University of California, Davis

Eric is from Fort Bragg, N.C. He earned his BS in mathematics from Caltech, and his PhD from UC Davis, where his dissertation advisor was Greg Kuperberg. Last year, Eric was a visiting assistant professor at UC Santa Barbara. His research is centered around low-dimensional topology, especially complexity theoretic questions about 3-manifolds. Intrinsic questions about topology and applications to topological quantum computing and condensed matter physics motivate him.

ZHAO YANG

J.L. Doob Research Assistant Professor
PhD 2019 Indiana University, Bloomington

Zhao is from Chengdu, China. He completed his undergraduate degree at Fudan University and his PhD at Indiana University under the supervision of Kevin Zumbrun. He also earned a master's degree in statistics from Indiana. His research mainly focuses on the existence and stability of traveling wave solutions to nonlinear partial differential equations arising from fluid dynamics, detonation, and combustion models—more specifically, stability of Dressler's roll waves and hydraulic shock profiles to the inviscid Saint Venant equations, stability of Richard–Gavrilyuk roll waves, stability of strong detonation waves of inviscid Majda's model with general ignition function, and stability of degenerate profiles.

Instructors

RAN JI

Instructor
MS 2017 University of Illinois at Urbana-Champaign

After receiving her bachelor's degree in mathematics from Wellesley College with honors in 2013, Ran worked at a management consulting firm, followed by a tech start-up. She missed the structure and magic of mathematics while in industry. In 2017, she moved to Champaign-Urbana, where she completed her master's in mathematics. She is excited to join the department's team of instructional staff and looks forward to helping her students expand their understanding and enjoyment of mathematics. During her free time, Ran enjoys reading, spending time with her cat, and exploring the area on her bike.

LAURA PLACZEK

Instructor
MS 2019 Northern Illinois University

In 2015, Laura received her BS in both mathematics and secondary education from Elmhurst College and began her teaching career at J. Sterling Morton West High School in Berwyn, Illinois. Aside from teaching, her position included helping students recover grades through the Incomplete Lab, as well as coaching pre-calculus and calculus students on the Mathletes team. While she enjoyed her work there, she decided to leave after two years to pursue her goal of an MS in pure mathematics at Northern Illinois University. As a full-time student, Laura continued her love for teaching as a graduate teaching assistant, where she worked with several instructors and professors and taught her own section of a college algebra course for incoming freshmen in the CHANCE program. She also kept up with instruction at the college level by teaching as an adjunct faculty member at the College of DuPage for two consecutive summers. Laura is excited to have the opportunity to work alongside the faculty and staff in facilitating student learning within the high-quality educational framework of the University of Illinois.

NEW ARTIFICIAL INTELLIGENCE CONSORTIUM AT U OF I PLEDGES TO FIGHT COVID-19

C3.ai Digital Transformation Institute issued call for research proposals

By C3.ai and Dave Evensen, LAS News

A new artificial intelligence consortium that will include the University of Illinois has made fighting the COVID-19 pandemic its first order of business.

The C3.ai Digital Transformation Institute, chaired by Thomas Siebel (BA '75, history; MBA '83; MS '85, computer science) and co-managed by the U of I and the University of California, Berkeley, aims to accelerate the application of artificial intelligence in business, government, and society. The institute will occupy space in a new building scheduled to be constructed by 2022 on the site of Illini Hall.

The institute has already pledged to fund research proposals related to COVID-19, including applying machine learning and other artificial intelligence methods to mitigate the spread of the pandemic; genome-specific COVID-19 medical protocols, biomedical informatics methods for drug design and repurposing; design and sharing of clinical trials; improving societal resilience in response to the pandemic; data analytics for COVID-19 research harnessing private and sensitive data; and other topics.

"The C3.ai Digital Transformation Institute is a consortium of leading scientists, researchers, innovators, and executives from academia and industry, joining forces to accelerate the social and economic benefits of digital transformation," said Siebel, chairman and CEO of C3.ai, in a release from the company. "We have the opportunity through public–private partnership to change the course of a global pandemic," Siebel continued. "I cannot imagine a more important use of AI."

The institute's Illinois offices will initially be located in the National Center for Supercomputing Applications, but then the institute will be one of several units housed in the new Illini Hall, which is being constructed in conjunction with the renovation of Altgeld Hall to increase capacity, modernize learning spaces, and encourage innovation in data science, mathematics, and statistics. The departments of Mathematics and Statistics will use space in the new building.

"The C3.ai Digital Transformation Institute, with its vision of cross-institutional and multi-disciplinary collaboration, represents an exciting model to help accelerate innovation in this important new field of study," said Robert J. Jones, chancellor of the University of Illinois. "At this time of a global health crisis, the Institute's initial research focus will be on applying AI to mitigate the COVID-19 pandemic and to learn from it how to protect the world from future pandemics. C3.ai DTI is an important addition to the world's fight against this disease and a powerful new resource in developing solutions to all societal challenges."

The institute is a consortium of C3.ai, a leading artificial intelligence software provider, along with the University of Illinois at Urbana-Champaign, the University of California, Berkeley, Princeton University, the University of Chicago, the Massachusetts Institute of Technology, Carnegie Mellon University, Microsoft Corporation, and the National Center for Supercomputing Applications.

Plans for how the institute will take shape on campus are still evolving. R. Srikant, a professor of electrical and computer engineering, is serving as co-director of the institute, and Tandy Warnow, a professor of computer science, is serving as co-chief scientist. Srikant said that more faculty members at Illinois may have their research funded by the institute in the future. Staff members with the National Center for Supercomputing Applications are also involved.

According to an announcement from C3.ai, the company will provide the institute $57,250,000 in cash contributions over the first five years of operation. C3.ai and Microsoft will contribute an additional $310 million in-kind, including use of the C3 AI Suite and Microsoft Azure computing, storage, and technical resources to support the institute.

As part of operations, the institute will provide up to 26 annual research awards, from $100,000 to $500,000 each. It will also provide computing access to free Azure Cloud and C3 AI Suite resources, and provide $750,000 per year to support visiting scholars.

Additionally, the institute will host an elastic cloud, big data, development, and operating platform, including the C3 AI Suite hosted on Microsoft Azure for the purpose of supporting institute research, curriculum development, and teaching. It will also support an annual conference, annual report, newsletters, published research, and website. An industry partners program will be established to ensure that the institute's operations are aligned to the needs of the private sector.

THIS JUST IN: Eight Illinois projects are among 26 to receive the first C3.ai Digital Transformation Institute awards for artificial intelligence techniques to mitigate the COVID-19 pandemic. One of the selected projects, *Spatial Modeling of Covid-19: Optimizing PDE and Metapopulation Models for Prediction and Spread Mitigation,* is led by Associate Professor Zoi Rapti. See related research on pages 6–7 and read the full story at *bit.ly/c3ai-covid*.

To learn more about all the projects, visit *c3dti.ai/research/projects*.

New Faces, continued from page 9

Staff

JENELL ANDERSON HIRONIMUS

Communication Coordinator
MA 2005 University of Illinois at Springfield

Jenell joined the Department of Mathematics as its communication coordinator in January 2020. A central Illinois native, she earned a bachelor's degree in mass communications/journalism from Southeast Missouri State University in 2003 and a master's degree in communications from the University of Illinois at Springfield in 2005. She most recently served as director of alumni and development communications and editor of Millikin Magazine at Millikin University in Decatur, Ill., where she worked for more than 14 years in communications, marketing, and development. Outside of the office, she enjoys spending time with her family and friends, attending mystery dinner theaters, and trying her hand at a friendly game of poker or rummy.

BROCK ESTON MARTIN

Associate Director, Business and Financial Planning
MBA 2015 Western Governors University

Brock grew up in Frankfort, Ky., and graduated from the University of Kentucky with a bachelor's degree in accounting in 1998. He worked as an auditor for several years in Tennessee before taking a job with Purdue University in 2004. He held several positions at Purdue, working at both their main campus and regional campuses, and he completed his MBA from Western Governor's University during that time. In 2019, he joined the Mathematics Department administration staff at Illinois. In his spare time, he coaches soccer and enjoys playing board and card games with his wife and two children.

MURPHY RETIRES FROM UI MATH

A 1989 Illinois mathematics alumnus, Robert "Bob" Murphy began his academic career as a lecturer in the Department of Mathematics for the University of South Carolina, where he worked with Illinois alumnus Michael Filaseta on the factorization of polynomials with small Euclidean norm. After serving the USC for 16 years, where he also completed his master's degree in 2003, Murphy returned to his Alma Mater in 2009 to join the Illinois Department of Mathematics as an instructor.

At Illinois, Murphy has taught various large lecture courses, including Calculus (MATH 220); Theory of Arithmetic (MATH 103); Calculus II (MATH 231); Calculus III (MATH 241) for 11 years. He has served as the course steward for MATH 220 and MATH 221 since Fall 2011.

A dedicated and outstanding educator, Murphy received the Distinguished Teaching Award in Mathematics for Non-Tenure Track Faculty in 2013 and was awarded a Campus Award for Excellence in Undergraduate Teaching by Instructional Staff in 2017. He has consistently been ranked as excellent by his students since he joined the department in 2009. He was nominated for an LAS Award for Excellence in Teaching in 2015 and twice nominated for a Student Senate Teaching Excellence Award in 2013–14 and 2015–16.

During his years at Illinois, Murphy has also contributed to the department through service on several department committees, including the graduate teaching awards committee and teaching awards committee. Additionally, he holds professional memberships in the American Mathematical Society, Mathematical Association of America, and Pi Mu Epsilon.

BRUCE BERNDT HONORED AT NUMBER THEORY CONFERENCE

The Department of Mathematics at Illinois hosted the conference, "Analytic and Combinatorial Number Theory: The Legacy of Ramanujan," on June 6–9, 2019, in honor of Professor Bruce Berndt's 80th birthday and retirement.

The topics for the conference featured all areas of number theory, with a focus on those that were influenced by Srinivasa Ramanujan. For over 20 years, with the help of several of his graduate students, Berndt devoted his research to providing proofs for Ramanujan's many theorems.

The conference featured presentations by 26 invited speakers, including Berndt's public lecture, "Ramanujan—The Ultimate Superhero."

Conference sponsors were the National Science Foundation, the National Security Agency, the Institute for Mathematics and its Applications, the College of Liberal Arts and Sciences at the University of Illinois, the Department of Mathematics at the University of Illinois, and World Scientific.

2019 GROW CONFERENCE COMES TO ILLINOIS

The Department of Mathematics hosted the 2019 Graduate Research Opportunities for Women (GROW) conference Oct. 4–6, 2019. The GROW conference series originated at Northwestern University in 2015, where it was held annually until 2017. It moved to the University of Michigan in 2018 and will take place at the University of Chicago in 2020. The aim of the conference is to increase female representation in the mathematical sciences at the graduate level.

The conference had 68 undergraduate participants from all around the United States, more than ten volunteers from the local chapter of the Association of Women in Mathematics chapter, and plenary talks by Marisa Eisenberg (University of Michigan), Eli Grigsby (Boston College), Colleen Robichaux and Alex Yong (University of Illinois at Urbana-Champaign), and Chelsea Walton (University of Illinois at Urbana-Champaign).

In addition, there were two panels ("How to be a mathematician" and "How to become a math grad student"), along with many informal roundtable discussions and opportunities to network.

The conference received support from the National Science Foundation; the Illinois Mathematics and Science Academy; and the Department of Mathematics, Graduate College, and Provost's Office at Illinois. It was organized by Lee DeVille, Vera Hur, Rinat Kedem, Kay Kirkpatrick, Richard Laugesen, Zoi Rapti, Susan Tolman, and Jeremy Tyson.

NEVINS AND WU IN 2020 CLASS OF AMS FELLOWS

Professor Thomas Nevins and Professor Emeritus Jang-Mei Wu have been selected to the 2020 class of Fellows of the American Mathematical Society (AMS).

Nevins, who passed away in February 2020 (see related article on page 37), was cited for his contributions to noncommutative algebra, representation theory, and algebraic and symplectic geometry.

Wu was cited for her contributions to conformal and quasiconformal mapping theory and potential theory.

The AMS Fellows program recognizes AMS members for outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics. Learn more about the AMS Fellows program at *ams.org/profession/ams-fellows*.

News from NetMath

NEW HIRES

Jason Elliot and Tayyab Nawaz joined NetMath as full-time lecturers in fall 2019. Both are alumni of the mathematics department: Jason received a PhD in 2011, and Tayyab received an MS in 2013 and a PhD in 2017. Jason and Tayyab will support instructional activities in NetMath. Also joining last fall was Nathan Arvan, our new Information Technology Specialist. Nathan provides technical assistance to NetMath, primarily with implementation and maintenance of the CAS-ILE courseware system. Nathan received a BS in Enterprise Systems Engineering from the University of Illinois in 2014.

SUMMER SEMESTER COURSES

Seventeen Summer Session 2 courses were offered through NetMath in 2019, and 20 courses in 2020. These eight-week offerings are intended for UIUC matriculating students who require term-based courses in order to qualify for financial aid. Rising enrollment counts indicate continued interest among students in taking online math courses during the summer.

UHL SCHOLARSHIP AWARDS FOR 2019–20

Funded through an endowment from Professor Jerry Uhl, the NetMath Jerry Uhl Scholarship is awarded to high school students. The scholarship covers tuition and fees for up to two NetMath courses. Award recipients are selected by committee on the basis of academic potential, financial need, and mathematical interest. Winners of the 2019–20 Jerry Uhl Scholarship are Ali Husain, Alexander Matveev, and Rosemary Mascarenhas (Schaumburg High School); Ethan Lin, Ebimobowe Indiamaowei, and Sujay Nanjannavar (Fremd High School); and Marc Trevino (home-schooled). We are currently accepting applications for the 2020-21 Uhl Scholarships.

Members of the NetMath team at the September 2019 retreat (from left) Jin To, Theresa Tucker, Nathan Arvan, Anu Murphy, Dave Watson, Roger Burt, Randy McCarthy, Zac Schoenrock, Amber Holmes, Aaron Wittrig, Paul Kramer, Faisal Whelpley, Kerry Butson, and Bruce Carpenter. On laptop screen are Jason Elliot and Andrew Nygard.

IN RECOGNITION OF EXCELLENCE

Roger Burt's contributions were recognized with the 2020 NetMath Award for Outstanding Service. Eric Hudec and McClelland Kemp received the Spring 2020 award for Excellence in Online Teaching. Mentor Awards were given to Alex Zhen (Outstanding Grading Pool Performance), Alex Morris (Outstanding Grading Feedback), Kayla Sarantakos (Most Positive Student Reviews), Benji Lim (Excellent Mentor Thoughts).

Mukadir Husein received the Fall 2019 TA award for Excellence in Online Instruction. Chris Grattoni received the Academic Hourly Excellence Award. Mentor Awards were given to Claire Hanrahan (Superior Effort in Mentoring), Het Patel (Outstanding Student Reviews), Benji Lim (Outstanding Grading Pool Performance), Mariah Laugesen (Outstanding Mentor Thoughts), Jamie Chen (Excellent Comments in Development Hour Activities), and Megan Altman (Outstanding New Mentor).

ACTUARIAL SCIENCE TO HOST TWO PRESTIGIOUS CONFERENCES

The University of Illinois at Urbana-Champaign has been selected to host two of the most influential international academic conferences in the actuarial community—the 57th Actuarial Research Conference (ARC) to take place in 2022 and the 28th International Congress on Insurance, Mathematics and Economics (IME) in 2024.

The ARC is one of the premier annual events for actuarial scientists in North America to meet and discuss research problems and solutions in all areas of actuarial practice. It appeals to both academic and practicing actuaries. The IME congress is one of the largest and most prominent meeting series in actuarial science across continents. The first meeting took place in Amsterdam in 1997, and this is only the third time it is has been hosted in the United States (previous meetings in the U.S. were State College, Pa., in 2001 and Atlanta in 2016).

The University of Illinois has a long and proud history in actuarial science. It dates back to 1906 when the first actuarial course was created in the Department of Mathematics. Today the program produces close to 7% of our nation's graduates in actuarial science each year and boasts one of the largest actuarial alumni networks in the world. We are very excited about the opportunity to showcase the development of actuarial science at the University of Illinois and to raise the awareness and visibility of actuarial research in American universities at the international stage.

NEWS FROM THE ILLINOIS GEOMETRY LAB

IGL partners with Uni High Students

For the second summer in a row, the Illinois Geometry Lab (IGL) in the Department of Mathematics partnered with University Laboratory High School (Uni High) to provide research projects for some of the school's students. From June 3–28, 2019, 15 high schoolers visited Altgeld Hall to conduct math research, mentored by Illinois mathematics graduate students. The idea was to expose the younger students to math not traditionally taught in school and to give them a taste of what math research is like. In addition, the younger students experienced another aspect of academia: they prepared presentations on their research at a final event on June 27.

IGL director Philipp Hieronymi and Uni High teacher Ioana Boca shed some light on how the IGL/Uni High partnership came about. The school received a gift from Uni High alumnus David Frankel, CEO of ZipDX LLC, to support collaboration between the school and campus units at Illinois.

"We have some students at Uni High who can work way beyond [what] we offer them at school in class," Boca admits, explaining why the partnership was initiated. And because some gifted Uni High students had previously worked with IGL, she was familiar with the lab's work and what it could offer younger students.

It is hoped that the project will continue in the future, pending the availability of funding.

CSL RESEARCHERS LAUNCH NEW INSTITUTE

Department of Mathematics faculty members Yuliy Baryshnikov, Lee DeVille, and Kay Kirkpatrick are involved in a new project that plans to break down the boundaries between the fields of data science and dynamical systems. Housed at the interdisciplinary Coordinated Science Laboratory, the Illinois Institute for Data Science and Dynamical Systems (iDS2) will bring together researchers from across campus to develop new foundational principles, which will allow for better decision making within dynamical systems, such as smart cities or autonomous vehicles.

"Our goal is to establish theoretical foundations at the intersection of data science and dynamical systems, which are only now beginning to be systematically studied and explored," said CSL's Max Raginsky, the institute's principal investigator and an associate professor of electrical and computer engineering. "This will require an incorporation of techniques, theories, and principles from machine learning, control, game theory, optimization, and statistics."

Data science is already a part of many people's daily lives. Whenever a person uses an app on their cell phone, they are providing data, or feedback, to the app creator. This process of data exchange is a dynamical system. As society continues to move into the age of dynamical systems with the addition of autonomous vehicles, smart cities, personalized medicine, and artificial intelligence, dynamical systems will become more ingrained into everyday life.

A dynamical system is any system that changes over time; this might include a chess-playing computer that changes its strategy based on an opponent's move, delivery drones that take feedback from the current weather to change how they fly, or an autonomous vehicle that senses a pothole in the road and maneuvers around it. To improve decision making of these systems, the researchers will use machine learning—which facilitates computers interacting with the world, learning from the interaction, and using that information to influence future decisions—to create better tools.

Raginsky is leading the project along with CSL faculty Niao He (industrial and enterprise systems engineering), Sanmi Koyejo (computer science), and R. Srikant (electrical and computer engineering), in addition to Yuguo Chen, a professor of statistics at Illinois. The multi-disciplinary effort will encourage interaction between scientists in the fields of electrical engineering, mathematics, and theoretical computer science, among others. The institute will need to bring together experts from a variety of disciplines in order get the best collaboration and form new dialogue around data science and dynamical systems.

"The interdisciplinary expertise of our team, as well as the extensive experience in optimization, machine learning, control, statistical simulation and inference, and related topics, makes us uniquely qualified to execute our research and education agenda," said Raginsky. "We are certain that the work supported by the institute will inspire further research both at Illinois and across the Midwest."

During its first phase of research and educational activities, the institute will focus on four themes:

- Data modeling and dynamical systems
- Sampling, interference, and dynamical systems
- Algorithm design and dynamical systems
- Decision-making and dynamical systems

The last two themes are of specific interest to He.

"The institute is not only about learning about dynamical systems in data-intensive applications, but also how we can leverage dynamical system perspectives to better understand data science and decision science," she said. "The rich theory of dynamical systems provides a natural ground to form a principled understanding of lots of decision-making procedures used in data science, such as their stability, robustness, and implicit bias. There are enormous opportunities to design intelligent systems that could benefit the broader communities."

All four themes will guide the research directions of the institute, as well as help member faculty plan their outreach efforts. A workshop set for Fall 2020 will kick off an annual series that aims to position Illinois as a leader in the area of data science and dynamical systems. In addition, the institute will sponsor a bi-weekly seminar series to be held in CSL and plans to integrate education activities through workshops, summer schools, seminars, and curriculum development.

This project is funded by the National Science Foundation through the HDR TRIPODS (Harnessing the Data Revolution: Transdisciplinary Research in Principles of Data Science) program, for three years at the amount of $1.5 million.

DESIGNS APPROVED: ALTGELD AND ILLINI HALL PROJECT

Milestone moment for $192 million construction and renovation plan

By Dave Evensen, LAS News

The Board of Trustees has approved schematic designs for the expansive Altgeld and Illini Hall Project, bringing closer to reality the $192 million plan to modernize and grow spaces devoted to data science and other mathematical sciences.

The project calls for the construction of a new building on the site of Illini Hall by 2023 and the renovation of Altgeld Hall by 2025. Some major project details that the board approved in its May meeting include:

- The construction of a six-floor, 140,000-square-foot building on the site of Illini Hall. The new building will contain activities affiliated with the Illinois Innovation Network, the C3.ai Digital Transformation Institute, and additional classroom and office space for the departments of Mathematics and Statistics. Designs call for Leadership in Energy & Environmental Design (LEED) Platinum certification, which is the highest ranking by the U.S. Green Building Council.
- Restoring the historic nature of Altgeld Hall to its original vibrancy and making spaces more accessible. This includes structural repairs to the exterior—and the bell tower—and rebuilding a glass dome over the library in the same style as the original that was taken down in 1942. A new ADA-accessible entryway will be constructed on the east side of Altgeld Hall.
- Preserving and restoring roughly two-thirds of the library stacks in Altgeld Hall and adding a reading room with a glass wall view of the book collections. Books that are displaced by the renovation will be placed in storage. Students, faculty, and staff will still be able to request items.
- The addition of seven new classrooms, including a large lecture hall in the new building. All undergraduate advising for the departments of Mathematics and Statistics will be located in a new student-centered service area in Altgeld.

Schematic designs are, in effect, an overall visualization of the project. They are based upon conceptual designs that were created in late 2019 by the project's architectural firms, CannonDesign and Bailey Edward. Now, with the board's approval, architects will begin creating detailed blueprints for the project.

[Above: A conceptual rendering of the exterior of the new Illini Hall. Image by CannonDesign.]

[At right: A conceptual rendering displays reconfigured space, restored murals, and a recreated glass dome in the Altgeld Hall library foyer. Image by CannonDesign.]

"It's enormously exciting and significant that the Board of Trustees has approved schematic designs for the Altgeld and Illini Hall Project," said Feng Sheng Hu, the Harry E. Preble Dean of the College of LAS. "The vision for the project is clear. Now it's a matter of making it happen."

Derek Fultz, director of facilities for the College of LAS, said that once blueprints for the project are created, the contract will be granted to a construction firm following a bidding process. Demolition of Illini Hall is scheduled to begin in 2021.

"This building is being designed to accommodate many years of continued growth for the departments," he said.

Support for the project is coming from a mix of state funds, private and corporate donors, and campus funds. Joan Volkmann, associate dean for advancement for the College of LAS, said that naming opportunities will exist for several spaces in the new building and Altgeld Hall.

Visit *altgeldillini.illinois.edu* for more information about the plan and how to be involved.

FIRST CAME CALC, THEN CAME MARRIAGE

Nathan and Betsy Alderman's life together began on the steps of Altgeld Hall

By Samantha Boyle, LAS News

For many students, Altgeld Hall is just a place to learn mathematics, observe historic architecture, and listen to the chimes, but for two alumni it symbolizes the beginning of their very own love story.

Betsy Alderman (BS, '12, mathematics) and Nathan Alderman (BS, '12, engineering mechanics) crossed paths for the first time in Altgeld Hall in 2008, when they were freshmen in the same calculus class. Four years later to the day, Nathan and Betsy, by then graduated and employed, took a walk together on the Main Quad and sat down on the north steps of Altgeld. Nathan had something to say.

Having rehearsed what he was going to say to Betsy over and over again, Nathan hit a series of talking points before ending his speech with a question: "Will you marry me?"

Just about one year later, in June 2013, Betsy and Nathan got married right outside of Danville, Ill. They recounted their story to LAS News after seeing a request for Altgeld Hall–related stories from alumni.

Betsy and Nathan had never met before that fateful calculus class in Altgeld Hall. They came from different towns, and they lived in different dorms. Coming into calculus class on that first day, Betsy sat down and noticed Nathan walk in. Eventually, the teaching assistant for the class arranged a seating chart and sat the two of them next to each other.

"And I was like 'All right! This is cool," Betsy said.

The fates—and even numbers—aligned in a way that perhaps mathematicians would appreciate more than most. The lectures for their class were held in room 314, and the discussions were in room 159. Put together, the room numbers are the first six digits of pi, the irrational number defined as the ratio of a circle's circumference to its diameter.

Outside of calculus class, both Nathan and Betsy got involved with InterVarsity Christian Fellowship, where their friendship continued to blossom, but it didn't become more than friendship until their sophomore year, when once again they crossed paths in a calculus course (this time Calculus 3) in Altgeld Hall. Once again, Betsy was sitting when she saw Nathan walk in. She wrote on his Facebook wall to tell him that he should come sit by her.

"And so, he did," Betsy said. "And then we just started going to lecture together. I would walk, Nathan would ride his bike."

If Nathan would see Betsy on the way to lecture, he would get off his bike and walk the rest of the way with her. One of those times, while Betsy was walking to class, she was on the phone with her sister talking about Nathan when he actually came by on his bike. While trying to stop and get off his bike, Nathan almost crashed, creating one of Betsy's favorite memories of them going to class together.

"So, we would go to class together, but our discussion sections weren't the same time. They were an hour apart," Betsy said. "So, I would be waiting for mine and I would go a little bit early so I could see him leave his and we'd stop and talk for ten minutes."

Because they were becoming pretty close friends at that point, Betsy decided to ask Nathan if he would go to her brother's wedding. It became their first date milestone.

"Yep, first date was going to the wedding and meeting her whole family," Nathan said.

From that point on, Betsy always hoped marriage was in their future.

"In my head I was like 'Oh, it'd be perfect if he proposed in front of where we met,'" Betsy said. "I never told him that, (but) he did figure that out, which was awesome."

Right before the proposal in front of Altgeld Hall, Betsy had started teaching at Centennial High School in Champaign, where she still teaches junior and senior math classes. Nathan works at Henneman Engineering, Inc.

On the day of the proposal, throngs of students were making their way to the Main Quad for Quad Day. Nathan, of course, had other plans. He had already asked Betsy's parents for their blessing, and he even arranged with friends to take photos of the occasion when he asked Betsy to marry him.

"For myself, the big moment was when I realized not only did spending time with Betsy make me happy, she also encouraged me to work harder and be a better person," Nathan said. "It was a large part of what I told her during the proposal, and a main reason why I decided to marry her."

Photo by Jesse Wallace

Because she and Nathan had been dating for quite some time at that point, Betsy said no one was really surprised when they announced their engagement. Betsy said it was still a special moment to go home afterward and call some of their closest friends to tell them the news.

Altgeld Hall and the rest of campus are special places for Nathan and Betsy as a couple. They see the building almost weekly as their church is located right on the edge of campus.

"It's nice that we have the shared memory of the area," Nathan said. "It's a really nice building. I like the architecture of it and it's where we met and it's where we got engaged. And it's just a central point of our relationship that we both share, that part's pretty nice."

Share your Altgeld or Illini Hall story

Have a life-changing moment while the chimes played from the Altgeld Bell Tower? Or a fond memory inside Altgeld or Illini Hall? As the University of Illinois campus works to renovate Altgeld Hall and replace Illini Hall, we're collecting stories of those who have fond memories of these buildings.

Please share a brief description of your story and some information about yourself. The University of Illinois may follow up to learn more about your experience. Your story could be shared on our website or in other materials related to this campaign.

Share it with us at *illinois.edu/fb/sec/7282989*.

DEPARTMENT AWARDS

TEACHING AWARDS

N. Tenney Peck Teaching Award in Mathematics
Jeremiah Heller

Distinguished Teaching Award in Mathematics for Tenured Faculty
Eugene Lerman

Distinguished Teaching Award in Mathematics for Non-Tenure-Track Faculty
Karen Mortensen

NON-INSTRUCTIONAL AWARDS

Exceptional Merit Award in Mathematics for Non-Instructional Staff
Aaron Brewer

NetMath Award for Outstanding Service
Roger Burt

GRADUATE AWARDS

Bateman Prize and Fellowship in Number Theory
Alexander Dunn

Kuo-Tsai Chen Prize in Mathematics
Elliot Kaplan
Terence Harris

Wolfgang Haken Prize in Geometry and Topology
Elizabeth Field

James D. Hogan Memorial Scholarship
Felix Clemen
Tsutomu Okano
Joshua Wen

Irving Reiner Memorial Prize
Colleen Robichaux
Lutian Zhao

Philippe Tondeur Dissertation Prize
Joshua Wen

Brahana TA Instructional Award
Emily Heath
Heejoung Kim

Department TA Instructional Award
Ravi Donepudi
Martino Fassina

CAMPUS AND LAS AWARDS

Zoi Rapti

Associate Professor Zoi Rapti has been awarded both a LAS Dean's Award for Excellence in Undergraduate Teaching and a Campus Award for Excellence in Undergraduate Teaching this year.

Rapti has taught mathematics at Illinois for 14 years. As a professor, she is known as an inspirational teacher and innovator in undergraduate education, having served as director of the university's Biomath program for five years.

Rapti supervises a diverse group of undergraduate students on various research projects nearly every semester, and also leads independent reading courses to help students comprehend the relevant material. She creates "an inviting, nurturing environment where students are encouraged to ask questions, and where she makes every attempt to make the material accessible." Wrote one former student, "Professor Rapti was such an effective instructor that I was able to take what I learned from a biological standpoint and apply it to the United States economic system to estimate impacts on GDP."

Aldo Manfroi

Lecturer Aldo Manfroi has been awarded a 2019–20 Campus Award for Excellence in Undergraduate Teaching. Manfroi has taught mathematics at the University of Illinois for the past 16 years.

Manfroi breaks through barriers to freshman and sophomore students' full participation in class by using a variety of techniques. He makes it a point to relate to his students on a personal level, greeting and conversing with individual students and engaging them throughout the lecture. Manfroi encourages students to ask questions—which he welcomes in a number of formats—and provides ample time to address those questions in a thorough and caring manner.

Additionally, Manfroi has made important recent contributions to both the department's and NetMath's first course in differential equations.

A former student who commented on his superb teaching noted that "Appreciation for Dr. Manfroi can be found everywhere, from raving reviews of previous students to an entire post on the university's subreddit devoted solely to praising him."

Elizabeth Field

Elizabeth Field received both a LAS Award for Excellence in Undergraduate Teaching for Graduate Teaching Assistants and a Campus Award for Excellence in Undergraduate Teaching this year.

Field has studied mathematics at Illinois for five years. As a graduate teaching assistant, Field had oversight of administrative responsibilities in classes of more than 1,500 students and mentored undergraduate students in research projects. Wrote one student, "She helped push me in a way that allowed me to solve problems on my own, as well as developing an interest in the mathematical concepts I was once fearful of."

Additionally, Field designed instructional material and taught students incarcerated at Danville Correctional Facility. As head TA for three semesters, she designed and ran training sessions for over 140 mathematics teaching assistants.

"Elizabeth's dedication to mathematics education inside and out of the classroom and at a variety of levels is unparalleled. She is the embodiment of excellence in undergraduate education."

State Farm Mathematics Doctoral Scholarship
Linfeng Zhang
Yuxuan Li
Yong Xie

UNDERGRADUATE AWARDS

H. Roy Brahana Prize
Xiaomin Li

Most Outstanding Major in Actuarial Science
Vishakh Patel

Most Outstanding Major in Mathematics
Xintong Yu

Most Outstanding Major in Mathematics and Computer Science
Zhengyao Lin

Most Outstanding Major in Teaching of Mathematics
Iris Tong

Salma Wanna Memorial Award
Baihe Duan

Elsie Thomas Fraser Award
Elia Chudov
Ariel Lerman

Dr. Lois M. Lackner Mathematics Scholarship
Yufeng Du

Elizabeth R. Bennett Scholarship
Yuanpu Liang
Yifan Zhang

Charles and Stephanie Dukes Scholarship
Dun Ma

Actuarial Science Alumni Scholarship
Evelyn Lai

Bradley M. and Karen A. Smith Scholarship
Kara Wong

CNA Foundation Scholarship
Alexander Bienduga
Sonia John

Willis Towers Watson Award
Shirley Liu

State Farm Actuarial Science Scholarship
Matthew Becker
Domenic Di Girolamo
Ravi Gandhi
Tina Guo
Luke Janikowski
Michelle Liu
Jaylen Patel
Andrea Wilcox
Jesse Yan
Yi Yuan

ACTUARIAL EXCELLENCE

Armstrong receives 2020 Actuarial Science Alumnus of the Year Award

Steven Armstrong of Chicago has been named the recipient of the 2020 Actuarial Science Alumnus of the Year Award by the Illinois Department of Mathematics for his exceptional career and contributions to the actuarial field and unwavering support of the advancement and continued excellence of the Illinois Actuarial Science Program.

Armstrong has 28 years of actuarial experience within the insurance industry. He has worked at several insurance industry leaders, including Plymouth Rock Assurance Co. in Red Bank, N.J., and QBE North America, and AIG Property and Casualty Co. in New York; however, he has spent the majority of his professional career as a member of the Allstate Insurance Co. team, where he worked from 1992 to 2012, and again from 2017 to present. Over his 25+ years with Allstate, Armstrong has held numerous positions of increasing scope and leadership, and currently serves as vice president of pricing analytics and actuarial services. In this role, he has shared responsibility for pricing more than $20 billion in premiums and has a lead role in improving pricing sophistication through advancing actuarial methods. Notably, Armstrong was one of the first actuaries to be part of a team that brought forward a telematics, usage-based auto insurance program in the U.S., known now as Drivewise by Allstate.

"Steve is a well-regarded leader and is sought out as an expert on topics as varied as regulatory affairs and diversity and inclusion," says Julie Parsons, executive vice president of Allstate Insurance Co. "In addition to Steve's accomplishments within Allstate, he has exhibited exceptional dedication to advancing the actuarial profession broadly."

Armstrong is also the president of the Casualty Actuarial Society (CAS), the premier credentialing organization of casualty actuaries in North America and around the world, where he has been a fellow since 1996. One of the youngest elected presidents, he previously served as president-elect, as a member of the CAS board, and has served and held chairmanships for numerous other CAS committees, including the leadership development committee, examination committee, and strategic planning committee. Additionally, he has been a member of several CAS task forces, including the Automotive Vehicles Task Force, Admissions Technology Task Force, Preliminary Education Task Force, and the Task Force on Educational Balance.

"I have had the pleasure to work with Steve on many occasions, and he has amazed me with his abilities, intelligence, and love of the profession," says Brian Brown, principal and consulting actuary at Milliman and Armstrong's CAS colleague. "He is willing to speak at universities and large employers of actuaries and has traveled the globe to develop relationships with actuaries around the world. He is a vocal supporter of the University of Illinois Actuarial Science Program."

In addition to his years of membership with the CAS, Armstrong holds membership in the American Academy of Actuaries. He has written articles for a variety of publications, including Actuarial Review, Claims Journal, and Insurance Journal, and has spoken at numerous industry engagements, including several Joint Mathematics Meetings, and has contributed his time to his alma mater, most recently serving as a lecturer for the 2019 Distinguished Guest Lecturers in Actuarial Science on campus.

"I want to help put a spotlight on outstanding actuarial programs like the University of Illinois and also promote diversity in the profession by being a role model for LGBTQ actuaries and allies."

Armstrong graduated Summa Cum Laude with a bachelor's degree in actuarial science from Illinois in 1992. He later completed an MBA with a concentration in marketing from the University of Illinois at Chicago in 2003.

The Actuarial Science Program's Alumnus of the Year Award is given to alumni who have made outstanding contributions in one or more of the following ways:

- Exceptional accomplishment in the actuarial profession.
- Exceptional accomplishment in non-traditional areas of actuarial practice.
- Exceptional service in local, state, or national affairs.
- Exceptional service in support of the advancement and continued excellence of the Illinois Actuarial Science Program.

Learn more about the Department of Mathematics Alumni Awards, including how you can nominate yourself or others for our 2021 awards, at *bit.ly/uiuc-math-alum-awards*. **Deadline for nominations is Sunday, Nov. 15!**

QUIBALLO RECEIVES ARL FELLOWSHIP

Senior Kagen Quiballo is one of two undergraduates from the University of Illinois to have been awarded an Association of Research Libraries Fellowship for Digital and Inclusive Excellence.

Quiballo is pursuing a double major in mathematics and statistics, and a minor in informatics. He has also been involved with research through the Illinois Geometry Lab and is a student ambassador for both the Department of Statistics and the Department of Mathematics. Outside of academics, Quiballo is active in several dance groups and is artistic director of ImagiNation Dance Crew.

The Association of Research Libraries fellowship is designed to introduce undergraduate students from many disciplines to the care and management of digital information resources. The fellowship offers a year-long paid internship at a partner library, formal mentorship, and other benefits. The program encourages undergraduates to consider a future in library and information sciences.

UNDERGRADUATE AWARDS, CONTINUED

ILLINOIS GEOMETRY LAB AWARDS

Illinois Geometry Lab Research Award

Project: Problems on Markov chains arising from operator algebras

Faculty mentors: Professor Adam Dor'On, Professor Florin Boca

Graduate student team leader: Christopher Linden

Undergraduate students: Xinxin Chen, Hui Langwen, Yifan Zhang

Runners-up

Project: Pairs of disjoint matchings

Faculty mentor: Professor Anush Tserunyan

Graduate student team lead: Jenna Zomback

Undergraduate students: Ali Guo, Kieran Kaempen, Zhengda Mo, Sam Qunell, Joseph Rogge, Claire Song

Project: Continuous Factorization of the Identity Matrix

Faculty mentor: Professor Pavlos Motakis

Graduate student team lead: Ankush Hore

Undergraduate students: Yuying Dai, Siqi Jiao, Tianxu Lan

MATH CONTESTS

2019 U of I Freshman Math Contest

Alexander Ristich, First Prize
Pavle Vuksanovic, Second Prize tie
Ruzhang Yang, Second Prize tie
Yipeng Yang, Second Prize tie

2019 U of I Mock Putnam Exam

Ziyi Chen, First Prize
Darwin Kim, Second Prize
Hongyi Chen, Third Prize

2020 U of I Undergraduate Math Contest

Kieran Kaempen, First Prize
Alexander Ristich, Second Prize tie
Pavle Vuksanovic, Second Prize tie

A department tradition …

This year's Department Cookie Party, hosted by staff members, was held on the afternoon of Dec. 16. Faculty, staff, postdocs, retirees, friends, and family gathered to enjoy the holiday cheer with cookies, punch, coffee, spiced tea, and live music. The annual event is a great way to welcome the holidays (and herald the end the semester!)

A big thank you to the Mathematics staff for coordinating this special event.

OUR STUDENTS GETTING RECOGNIZED FOR THEIR RESEARCH

Two groups of student researchers were recognized for their excellence in academic research at the 2020 Undergraduate Research Symposium. The annual event, which has grown to over 800 students since its inaugural year in 2008, allows undergraduate students an opportunity to present their work in concurrent oral and poster presentations (including creative performances). Congratulations to our Illinois Geometry Lab (IGL) for placing outstanding in the education category and Illinois Risk Lab (IRisk Lab) for receiving an honorable mention in the social sciences and humanities category:

IGL: Igniting Students' Interest in Mathematics Through Abstract Mathematical Topics (Outstanding, Education)

- Daria Chudnovsky, Freshman, Mathematics, LAS
- Carolyn Janick, Freshman, Mathematics, LAS
- Michael Yun, Junior, Statistics, LAS
- Andrew Chong, Junior, Mathematics, LAS
- Ian Copple, Sophomore, Mathematics, LAS

IRisk Lab: Implied Portfolio Value-at Risk (Honorable Mention, Social Sciences and Humanities)

- Zixuan Wang, Junior, Actuarial Science, LAS
- Xuan Lin, Senior, Statistics, LAS

SIM CAMP GOING VIRTUAL

This year's Summer Illinois Mathematics (SIM) Camp looked a little different this June with campers going online to take part in a virtual experience. With stay-at-home and social distancing restrictions in place, the camp directors and leadership decided to move the two week-long camp sessions online. The virtual day camps, run by graduate students in the math department, focused on fun math topics outside of the K–12 curriculum and was provided free of charge. Within the first week of registration, SIM Camp Epsilon, open to 8th to 10th graders, reached capacity. The SIM Camp directors shared the recordings of the activities online for others to enjoy once the camps concluded. Learn more at *math.illinois.edu/SIM*.

MATH GRADUATES PUTTING THEIR DEGREES TO WORK

A study of the early career paths of University of Illinois graduates reveals strong and steady success among new alumni from the College of LAS.

About 89 percent of new LAS alumni are securing a first destination soon after graduation, according to the Illini Success initiative, a university-wide effort to better understand the early career paths of new alumni. First destinations include employment, continuing education, or volunteer/service positions.

Additionally, the average starting salary of new alumni grew significantly during the past year for mathematics and statistics, from $70,342 in 2017–18 to $77,523 in 2018–19.

The numbers released in the most recent report reflect LAS undergraduates who graduated in August 2018, December 2018, and May 2019. Through the use of direct surveys, employer and college reports, the National Student Clearinghouse, and LinkedIn, the U of I was able to gather data on some 3,258 LAS alumni who graduated in 2018–19—about 72 percent of the total.

JANE BERGMAN WINNING A 2020 PACA AWARD

Jane Bergman, office manager for the Department of Mathematics, has been awarded a Heritage Award from the Preservation and Conservation Association of Champaign County (PACA) for her historical replica of the glass dome that once overlooked the library in Altgeld Hall.

Bergman put more than a decade's worth of work into redesigning the Altgeld Hall library's former stained glass dome. It began in 2008 when Bergman, while employed in Altgeld Hall, learned of the past existence of the dome. Taken down in 1942, the original dome was a bit of a mystery, as Bergman had only a single photo showing a portion of it. She spent the next several years conducting painstaking research and artistry on her own time to create a 50-inch by 33.5-inch foil replica.

"My mission in creating the rendition of the stained glass dome was to bring awareness of its existence and the spectacular beauty and light it previously added to the majesty of Altgeld Hall," she said.

Bergman's efforts could help lead to the restoration of the dome when Altgeld Hall is renovated (the renovation is expected to be complete in 2025).

In her award notification, Phyllis Williams, secretary to the PACA Board of Directors, told Bergman, "We are in awe of your dedication to this project! Agatha Christie would be proud of your sleuthing to achieve a very well-informed design. Your use of interdisciplinary resources represents the highest ideals of the University and the preservation community."

Bergman received her award at PACA's annual Heritage Awards ceremony on Feb. 22, where she also gave a brief presentation of her project.

CONGRATULATIONS, CLASS OF 2020!

"To all of you who remember modeling the spread of disease in a differential equations class, assessing the risk of catastrophe in actuarial science, or developing statistical models, estimating the underlying truth, and quantifying uncertainty: the events of the past few months have demonstrated in real time the importance and relevance of these tools. As you move forward from this day into jobs in a variety of sectors, you will use the skills that you developed here at Illinois for the benefit of society and the welfare of humanity."

– Jeremy Tyson, chair

DOCTOR OF PHILOSOPHY IN MATHEMATICS

Iftikhar Ahmed
Mathematical modeling of infectious diseases
Advisor: Zoi Rapti

Alexander Jason Dunn
Analytic and arithmetic applications of half integral weight automorphic forms
Advisors: Scott Ahlgren and Alexandru Zaharescu

Martino Fassina
Singularities and multiplier algorithms for real hypersurfaces
Advisor: John P. D'Angelo

Elizabeth C. Field
Trees, dendrites, and the Cannon–Thurston map
Advisor: Ilya Kapvoich

Christopher J. Gartland
BiLipschitz embeddings and nonembeddings of metric spaces and related problems
Advisor: Jeremy Tyson

Terence Lee John Harris
Restricted projection families and weighted Fourier restriction
Advisor: Burak Erdogan

Stefanie Klajbor-Goderich
Equivariant dynamics and categories of equivariant vector fields
Advisor: Eugene Lerman

Lina Li
Enumerating combinatorial objects with limited sub-configurations
Advisor: József Balogh

Xiao Li
On error correcting codes for distributed storage
Advisor: Iwan Duursma

Christopher Linden
Continued fractions and representations of graphs
Advisor: Florin Boca

Nigel Adam Pynn-Coates
On asymptotic valued differential fields with small derivation
Advisor: Lou van den Dries

Fernando Yahdiel Roman-Garcia
Projections, slicings and Fourier transforms in the Heisenberg group
Advisor: Jeremy Tyson

Lan Wang
Dynamics on networks
Advisor: Jared Bronski

Ningchuan Zhang
L-functions and J-spectra
Advisor: Matthew Ando

MASTER OF SCIENCE IN ACTUARIAL SCIENCE

Nargiz Alekberova
Supasin Chalermpoonsup
Prathamesh Padhye
Bhanu Sehgal
Ruiqi Sha
Morteza Tavanaie Marvi
Fudi Xu
Zonghao Yang

MASTER OF SCIENCE IN APPLIED MATHEMATICS

Eion Michael Blanchard
Zhoutong Jiang
Haneul Kim
Rohan Sameer Limaye
Alfredo Guillermo Sanchez Rivadeneira
Rui Feng She
Navjot Singh
Han Wei
Haolin Yang

MASTER OF SCIENCE IN MATHEMATICS

Henry G. Carnick
Xiying Du
Jin Won Kim
Christopher Alexander Loa
Nikhil Mertia
Amber Srivastava
Samuel Austin Thompson
Shukun Wu

MASTER OF SCIENCE IN TEACHING OF MATHEMATICS

Paul Thomas Jones

BACHELOR OF SCIENCE IN LIBERAL ARTS AND SCIENCES IN ACTUARIAL SCIENCE

Ahmad I. Abdel-Motaleb
Phillip A. Alpern
Nur Aisyah Azmi
Alexander John Bienduga
Chan Woo Byun
Mark Anthony Cachey
Gianfranco G. Cali
Daniel Brandon Chen
Jiaqi Cheng
Ivy Deng
Norman Dewantoro
Ally Elizabeth Dilcher
Xuancheng Ding
Shaojing Gao
Cameron Marie Groch
Shuyu Guo
Yourui Guo
Abhi Gupta
Andrea Gutierrez
Thuong Huynh Hoai Ha
Moriya Michelle Hale
Kateri A. Hawley
Joseph Charles Hippisley
Antong Hou
ZiQiao Hua
Minke Huang
Beatrice Jacqueline
Kevin Jeffrey Kilrea
Madeline Gabrielle Kimberly
Tianyu Kong
Nicholas Kowalczyk
Jun Kyu Lee
Chuya Li
Yuanzhi Liu
Zixuan Liu
Haoran Luo
Sarah Mei
Emily Elizabeth Moffat
Nurul Nasrin Morshidi
Nico
Muhamad Syaqir Norani
Stephen Grant Olson
Ami Khushbu Patel
Vishakh Kunjvihari Patel
Neeca R. Penaflor
Ramanathan Perianan
Wilson Jonathan Phurwo
Rodion Podlesny
Shide Pu
Jaclyn L. Rachanski
Waffa Farhanah Binti Riza Farouk
Brent William Rodhouse
Sajini Samuel
Jude Perry Uy Sanchez
Liam Michael Shannon
Tyler John Straube
Michael Payton Strohl
Yoganandam Sundar
Casey Z. Tan
Hualiang Tao
Siyuan Teng
Graciela Karin Alexandra Tjen
Hanqing Wang
Jia Qi Wang
Wenbo Wang
Xueyuan Wang
Amy Elizabeth Wedewer
Kara Wenshi Wong
Willa Qian Wu
Qiqing Xu
Spencer S. Zhang
Zhaoyu Zhang
Junxiao Zhao
Michael K. Zhao
Valerie Zhao

BACHELOR OF SCIENCE IN LIBERAL ARTS AND SCIENCES IN MATHEMATICS

Karan Abrol
Bingxue An
Ashna Anil
Siyan Bao
Trevor Hunt Barrow
Bridget K. Burnetti
Yubo Cao
Yuanyang Chang
Hung-Yuan Chen
Xinghan Chen
Yuwen Chen
Zitong Chen
Cheng Cheng
Anna Natalie Chlopecki
Boo-Gyoung Choi
Alice Chudnovsky
Brandon L. Dattomo
Yongjian Deng
Li Ding
Yichen Ding
Huazheng Dong
Zhi Dou
Ningyuan Du
Yufeng Du
Claudia Anna Dudzik
Abbey Mae Egger
Maxwell Tanner Flanagan
Adam Edward Fowler
Jinyu Gu
Yanjun Guo
Seung Hoon Han
JaVion D. Holman
Keyu Hu
Haofu Huang
Mengqi Huang
Quanhua Huang
Zhihan Hui
Ziyi Hui
Jeremy John Iden
Gustav N. Jennetten
Kelly Ann Jezior
Yuan Jia
Zhuoyue Jiang
Siqi Jiao
Krishna Kalki
Gayoung Kim
Caroline Joan Lauschke
Chih Ming Lee
Seulhui Lee
Yeongwook Lee
Philip Z. Li
Wenhao Li
Xiaomin Li
Xinyi Li
Yi Li
Yinghao Li
Zhibin Li
Bingxin Liu
Chengyi Liu
Rui Liu
Yifan Liu
Hanyu Lu
Zixia Luan
Zachary John MacAdam
Corey F. May
Xinyu Mei
Jiaxiang Meng
Hung Woei Neoh
Veronika L. O'Donnell
Daniel Ostrow
Chongjun Peng
Qian Qian
Jiaqi Qin
Kagen Jet Quiballo
Spencer George Rooke
Jamie Jordan Rush
Zixuan Shao
Jonathan Alan Shobrook
Karan Srivastava
Hanze Sun
Ajay Suresh
Xuzhi Tang
Yu Tang
Yanliang Tao
Koby M. Theobald
Iris Yu Tong
Lucas Edward Trojanowski
Joel Taylor Van Dyke
Brett Louis Veitch
Junting Wang
Xingkai Wang
Yilin Wang
Yixuan Wang
Zhihao Wang
Zihan Wang
Zizhou Wu

2020 BRONZE TABLET SCHOLARS

The University Honors designation, the highest academic honor awarded to an undergraduate, is limited to those students who have demonstrated their capacity for sustained academic excellence of a high order. To be eligible for this honor, students must have a cumulative grade-point average of at least 3.5 and must rank on the basis of cumulative grade-point average in the upper 3 percent of their college graduating class on the basis of all work taken through the academic term prior to graduation.

As recipients of this honor, each of the following students will have his or her name inscribed on a bronze tablet that is displayed in the corridor of the University Library. For this reason, University Honors recipients are known informally as "Bronze Tablet Scholars."

- Yufeng Du, Mathematics and Physics
- Langwen Hui, Mathematics and Computer Science
- Tianyu Kong, Actuarial Science
- Yuanzhi Liu, Actuarial Science and Statistics
- Ayush Ranjan, Mathematics and Computer Science
- Zhihao Wang, Mathematics and Economics
- Zecheng Wu, Mathematics and Computer Science
- Enze Xiao, Mathematics
- Xintong Yu, Mathematics
- Yifan Zhang, Mathematics and Statistics

CHANCELLOR'S SCHOLARS

A four-year program open to undergraduates in all curricula, the Campus Honors Program fosters collaborative relationships between exceptional students and distinguished faculty through small courses, a faculty mentor system, and competitive summer research and travel grants. Admission is awarded to only 125 of the approximately 7,000 freshmen entering the University of Illinois at Urbana-Champaign each year, plus approximately 20–25 students admitted after a first successful semester.

The following Chancellor's Scholars are this year's graduates of the Campus Honors Program:

- Claudia Anna Dudzik, Mathematics and Statistics
- Kieran Nicholas Charles Kaempen, Mathematics and Computer Science
- Lucas Trojanowski, Mathematics

Enze Xiao
Chenhan Xu
Jinlin Xu
Yun Xu
Congwei Yang
Luxin Yang
Qingqing Yang
Zhonghang Yang
Wenqian Ye
Xintong Yu
Zihao Yuan
Yunxuan Zeng
Yi Zhan
Haoran Zhang
Juntao Zhang
Liwen Zhang
Tiansu Zhang
Xinyan Zhang
Yifan Zhang
Zhibo Zhou
Jerry Zhu

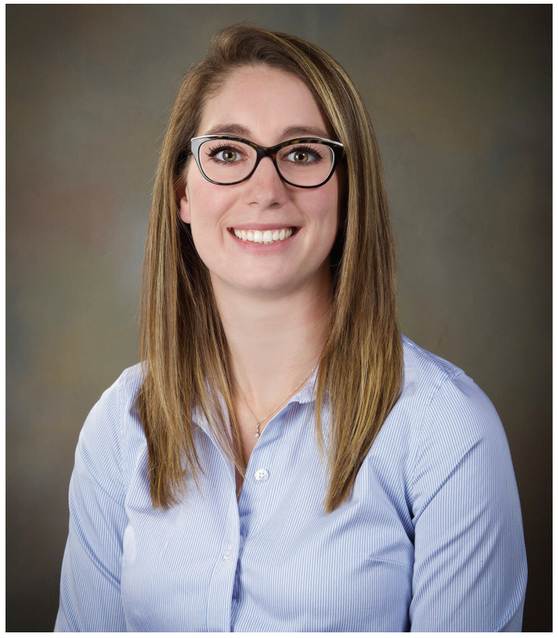
BACHELOR OF SCIENCE IN LIBERAL ARTS AND SCIENCES IN MATHEMATICS AND COMPUTER SCIENCE

Anmol Agarwal
Devin Akman
Jonathan Tyler Alvarez
Sharanya Balaji
Nolan Tyler Barajas
Samantha Lin Barrera
Kyle T. Begovich
Brendon Roger Beyer
Joshua Milton Byster
Andrew Pearson Caldwell
Benjamin D. Cannell
Biswadeep Chatterjee
Ankit Datta
Sagar Arun Desai
Claire M. Gagen
Jeffrey Connor Galiotto
Piotr J. Galusza
Shovik Guha
Botao Han
Langwen Hui
Lucas Saul Isla
Andrew Jiang
Brandon Diyuan Jiang
Caleb Joshua Ju
Kieran N. Kaempen
Mayank Kathuria
Samuel Thomas Kluber
Uma Krishnan
Gajan Sathya Kumar
Katherine Feller Lacy
Jacob William Larocca
Andy C. Lee
Eunsun Lee
George Hua Li
Yankai Li
Zhenyu Li
Simeng Liu
Yiqun Mei
Jinsoo Oh
Justin Connor Peabody
Vincent Persky
Aditya Pillai
Ayush Ranjan
Michael Ilich Sandler
Tongchuan Shen
Srivathsan Subramanian
Rishabh Swarnkar
Ichiro Tai
Abhinav Reddy Tekulapally
Tyson P. Trauger
Haoyu Wang
Yiyi Wang
Yucheng Wang
Davin Widjaja
Mingyuan Wu
Zecheng Wu
Tianrui Xia
Siqi Xiong
Yujia Yan
Changhong Yang
Mingchao Zhang
Minjian Zhang
Shu Hua Zhang
Yichi Zhang
Tianhao Zhu

{View the full video message to our #ILLINOIS 2020 graduates at *bit.ly/ILLINOIS2020-math-stat*.}

MEGHAN GALIARDI

By Kayleigh Rahn, LAS News



Meghan Galiardi is a problem solver—whether it's working through mathematical models, learning to build a tiny home, or researching solutions to national cyber threats.

"I chose to study mathematics because it provides such a priceless set of problem-solving skills and is so widely applicable," the Illinois alumna said. "I chose to study mathematics at Illinois because of the size and diversity of the program, which would allow me to explore many different areas of mathematics."

Galiardi's (PhD, '16, mathematics) dissertation covered stochastic processes in evolutionary biology.

"It involved developing mathematical models, implementing them in simulation to investigate certain behavior, and proving the findings with rigorous mathematical proofs," she explained.

Today, Galiardi is a mathematician at Sandia National Laboratories in Albuquerque, N.M., one of three National Nuclear Security Administration (NNSA) research and development laboratories in the United States.

"We work with other government agencies, industry, and academic institutions to deliver science and technology to resolve the nation's most challenging security issues," she explained. "As a mathematician, I apply various mathematical techniques to model and analyze challenging problems that threaten our national security. I have worked across many of our strategic areas but am currently focusing on national security programs for industrial control systems, with a mission to increase the resilience of critical infrastructure systems against cyberattacks."

Galiardi landed the position after serving as an intern for two years while in graduate school. That's when she became hooked on the national security mission.

"I am motivated by the never-ending set of real-world problems that need solving, and I like seeing the solutions we create being used by our customers, which is not always common within the field of mathematics," she said.

A typical workday consists of a bit of independent research scattered with project meetings involving collaboration with a team. Research activities may range from reading papers to designing and implementing mathematical models and often times writing papers. She frequently gives briefs both internally and to external sponsors, though she says the most interesting aspect of her job is interacting with customers to understand what their national security needs are and then discovering solutions to their problems.

"I most like the interdisciplinary nature of my work," she said. "As a mathematician, I often do not have the subject-matter expertise in the application area we are working in, and I enjoy learning as much as I can throughout the course of the project from my other team members. Currently, my work is mainly in industrial control systems, where I get to work and learn from power engineers, control theorists, cyber security experts, and even economists."

She said her experiences at Illinois prepared her for this career in that it gave her the technical skills to approach a problem in a logical way, identify areas of research to pursue, and effectively communicate findings that have solid scientific evidence.

"I find that as a mathematician, I approach problems much differently than engineers or computer scientists do, and the different viewpoint of a mathematician contributes tremendously to the success of our projects here at Sandia Labs."

When she's not working, Galiardi enjoys the outdoors of New Mexico and likes running, hiking, and camping. She also enjoys continuously learning new things.

NEWS FROM THE MATHEMATICS DEVELOPMENT ADVISORY BOARD

A decade of advisement: MDAB provides guidance for ongoing department efforts

By Sheldon Katz, professor of mathematics

The 10th annual meeting of the Mathematics Development Advisory Board (MDAB) was held Nov. 15, 2019, in the Alice Campbell Alumni Center. The 12 alumni forming the MDAB provide important guidance to the department in its ongoing efforts.

The meeting included an overview of activities, accomplishments, and aspirations of the department's students and faculty. The most significant activity in the years ahead will be the rehabilitation of Altgeld Hall and the replacement of Illini Hall with a new and larger building. The buildings will house the departments of Mathematics and Statistics, as well as a new Data Sciences Center.

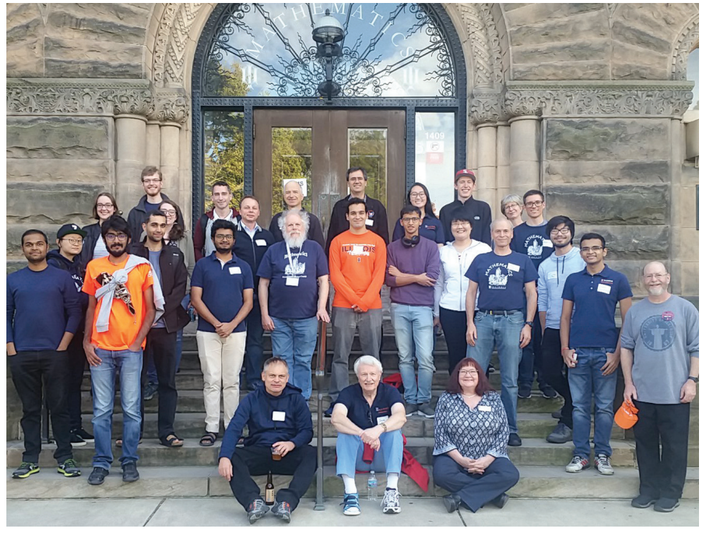
Both the quantity and quality of departmental space will increase, accommodating the dramatic growth in our student population, giving Illinois students the high quality mathematics education that they deserve, and enhancing the already high reputation of our department.

The board's advice and actions have helped the department chart its course and achieve its goals over the past decade. Most of the work of the MDAB is done by four committees, which meet by teleconference throughout the year: Marketing and Solicitation Strategy Committee, Scholarships Committee, Corporate Track Committee, and Undergraduate Research Committee.

HOMECOMING 2019: Always true to the orange and blue

Numerous alumni returned to Altgeld to join Department of Mathematics faculty, staff, and current students at this year's Homecoming Party held Saturday, Oct. 19.

Save the date for Homecoming 2020, Oct. 16–18, featuring our annual department Homecoming Party on Saturday, Oct. 17. Be on the lookout for more details in upcoming issues and on the department's website and Facebook page.



We count on the generosity of alumni and friends to support students as they embark on earning a world-class education and to fund faculty members as they conduct world changing research and train students. Your investment makes a difference.

❑ Yes! I believe in the importance of excellence in mathematics and wish to show my support!

$_____ **Mathematics Partnership Fund** (332346 default)
Your gift to the Partnership Fund will have the widest impact as it supports a range of activities including student awards and travel, distinguished lecturers, the recruitment of excellent faculty, and alumni events.

$_____ **Fund for Altgeld and Illini Halls** (338168)
Support our bold plan to renovate Altgeld Hall and replace Illini Hall to create a collaborative environment for mathematics learning and discovery.

$_____ **Illinois Mathematics Excellence Scholarship Fund** (341016) Scholarships enable the most promising admitted undergraduate mathematics students to pursue their education at Illinois.

$_____ **Actuarial Science Fund** (330225)
Support Actuarial Science through scholarships, fellowships, graderships, and faculty support.

$_____ **Mathematics Research Experience Endowment Fund** (772913)
Support research experiences for undergraduate students (REUs).

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❑ My check for $_____ is enclosed made payable to UIF/Department of Mathematics.

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If you would like more information about giving to the Department of Mathematics, please contact Evan Tammen, associate director of development, College of Liberal Arts and Sciences, 217. 300.5114, etammen2@illinois.edu.

math.illinois.edu/giving

You will receive a receipt issued by the University of Illinois Foundation. Your gift is deductible as allowed by law. Thank you.

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DANCING FOR A LIFETIME

Howard Aizenstein untangles the mysteries of the aging brain

By Doug Peterson, LAS News

In 1906, the German psychiatrist Alois Alzheimer first identified amyloid plaque and neurofibrillary tangles in the brain samples of a deceased woman who had suffered severe memory loss. Today, amyloid plaque and tangles are still indicators of what is now called Alzheimer's disease—the most common form of dementia—but how they act in the brain remains a mystery 113 years later.

Howard Aizenstein (BS, '86, mathematics; MS, '88; PhD, '93, computer science; MD '95) is a psychiatrist at the University of Pittsburgh, and he is helping to unravel this mystery through groundbreaking neuroimaging work.

Aizenstein and his colleagues at Pitt were among the first to measure amyloid plaque in living patients. One of their first papers on living patients showed that 20 percent of adults who didn't show any signs of dementia surprisingly had a significant amount of amyloid plaque in the brain.

Despite these findings, he said, "Amyloid plaque is obviously a huge risk factor. But can someone go 20 years with amyloid plaque in the brain and not get dementia? Possibly."

In addition to the work on dementia, Aizenstein uses neuroimaging to explore depression in older adults. For this pioneering work, he is a winner of the 2019 LAS Alumni Achievement Award.

Growing up in Skokie, Ill., Aizenstein was always fascinated by math. But he was also intrigued by computers because his high school years fell in the midst of the personal computing revolution. His father owned a Radio Shack TRS-80 and let him play with the machine to program games.

In addition to math and computers, he had yet another interest—medicine. His father was a doctor, and he said, "I felt a pull to be a physician."

The University of Illinois allowed him to satisfy all three passions because LAS offered a combined math and computer science degree, and he also majored in biology with medicine in mind. Aizenstein received his dual bachelor's degree in 1986 and then continued on with his graduate work at Illinois.

In fact, Aizenstein is one of those rare academicians who received all of his degrees at the same place. He got his master's degree in computer science in 1988, his PhD in computer science in 1993, and his MD in 1995—all from the U of I.

"I spent 13 years in this community, and I loved it," he said. "I found Illinois to be an idyllic academic community. I'd sit and read on the quad, visit with friends, and talk about ideas."

Aizenstein became fascinated with psychiatry while doing his medical school rotations. "It happened during the patient interviews, especially with older adults," he said. "When I started talking with them about the problem that brought them to the hospital, I became interested in their mental processes."

Conducting psychiatric interviews "fit both sides of my personality," he explains. "It fit the computer science interest in information processing, understanding how people think. But it also has an empathy side, listening to people and understanding their problems.

"I think hearing people's life story is fascinating," he adds. "Older adults tend to be underappreciated, and I'm drawn to that."

At Illinois, he said he also had many supportive faculty members, including his "most amazing" PhD advisor—Leonard Pitt, a computer science professor. The name "Pitt" turned out to be ironically prophetic because Aizenstein went on to spend his entire career at the University of Pittsburgh, or "Pitt."

Aizenstein decided to specialize in geriatric psychiatry, but he said he was challenged to find a way to combine his computer science background and his MD. So, he started doing computer modeling of psychiatric conditions—something that the University of Pittsburgh Medical Center (UPMC) was known for.

It turned out that this was a hot time for neuroimaging, so he used his computer science background to develop algorithms that analyzed functional MRI data on depression and dementia among older adults. His team demonstrated that vascular changes in the brain in older adults can contribute to depression.

"As one ages, there's a breakdown in small vessels in the cardiovascular and cerebrovascular systems," he said. Using fMRI, they were able to spot these "small, silent changes," primarily in the brain's white matter. Aizenstein's lab found that vascular changes, even when they are not identified as clinical strokes, can contribute to depression in older adults. What's more, depression can contribute to some of the cerebrovascular changes, so the two problems feed off of each other.

Aizenstein's team also gained a greater understanding of how medications affect the brains of older adults suffering from depression. One of the challenges of giving antidepressants to patients is the long delay before they see any clinical response. Aizenstein found this to be a greater problem with older adults; it can take up to six weeks to know if an antidepressant is working, but by that time some people will drop out of care or stop treatment, without finding a medication that will help.

Aizenstein's lab used fMRI to look at the brain 12 hours before and 12 hours after someone started an antidepressant. By looking at differences in the two scans, they can predict which patient is going to respond to medication. This scanning method is not yet FDA approved, but it is going through a larger, confirmatory study, which should be complete in three years.

In another study on the aging brain, Aizenstein's team found that older individuals with no signs of dementia, despite having amyloid plaque in the brain, show increased activity in the hippocampus—the part of the brain tied to memory. This increased activity in the hippocampus could be compensating for the amyloid plaque. It could also be an indicator that tells physicians which patients might not be as likely to get dementia, despite the amyloid plaque.

"But we're not there yet," he says.

Today, Aizenstein is director of UPMC's Geriatric Psychiatry Neuroimaging Lab, and he is active in three areas—research, teaching, and clinical work. The majority of his time is in research, but he said he loves seeing patients and training postdocs in geriatric mental health. He recently began managing a new training program for PhD students in bioengineering, while also mentoring one of the PhD students and co-mentoring several others.

Meanwhile, he remains active physically—one the most common ways to ward off mental impairments as we age. He bicycles, swims and kayaks in the Pittsburgh area, with its abundance of rivers.

According to Aizenstein, "As one of my colleagues likes to say, the goal is to have people dancing until the end. So, stay actively engaged."

Dr. Howard Aizenstein was named the 2019 recipient of the Mathematics Alumni Award for Outstanding Professional Achievement.

MATHEMATICS ALUMNUS RECEIVES MENTORSHIP AWARD

Bob Megginson, far right, receives the award in Honolulu.

Robert E. Megginson (PhD, '84, mathematics) received the Distinguished Mentor Award at the 2019 annual conference of the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science. This award, given to one person annually, is the group's highest recognition for excellence in outreach activities and is designed to bring more people from underrepresented groups into the scientific professions. Some of Megginson's earlier work in this arena was highlighted in the November/December 1999 Illinois Alumni magazine article, "A mathematician against the odds." He is currently Arthur F. Thurnau Professor and professor of mathematics at the University of Michigan.

STAY CONNECTED WITH ILLINOIS MATHEMATICS

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bit.ly/il-math-yt

Join our **LinkedIn networking group** and make connections with your fellow #ILLINOIS mathematics alums from around the world.
bit.ly/ILmath

Moved recently? New job? Update your contact information and share your news:
bit.ly/update-my-las-info

REMEMBERING TOM NEVINS

"I will remember Tom's intense commitment to excellence, his unfailing devotion to our department and to mathematics, and his inspiring and friendly presence. He was one of the best, and we will miss him."

– Jeremy Tyson, chair

Professor Thomas (Tom) Nevins passed away peacefully on Feb. 1, 2020, at home in Urbana as a result of a glioblastoma. He was 48.

Nevins passed away at the pinnacle of his academic career. His innovative research focused on the interface between geometry, algebra, and physics. He applied a geometric viewpoint and a strong emphasis on symmetries to a wide range of problems. His recent work helped pioneer the field of symplectic representation theory, which merges the physics of supersymmetric quantum systems with problems in abstract algebra through geometry. This work culminated in the resolution of the celebrated hyperkähler Kirwan surjectivity conjecture.

Known for his openness, Nevins generously shared his enthusiasm and insights through casual conversations, collaborations, and inspiring research seminars. He enjoyed term-long visits to All Souls College (University of Oxford) and the Mathematical Sciences Research Institute (University of California, Berkeley). Nevins was an associate in the Center for Advanced Study in 2014 and received a Simons Fellowship in 2017–18. He was recognized by the American Mathematical Society as a member of the 2020 class of AMS Fellows.

Born in Milwaukee, Nevins received his undergraduate degrees in mathematics and philosophy from Notre Dame in 1993 and his PhD from the University of Chicago in 2000. Following a postdoc at the University of Michigan, Nevins joined the Illinois faculty in 2004. He was promoted to associate professor in 2009 and to professor in 2016. He was a highly regarded mentor and advisor; six PhD students completed their theses under his direction (a seventh defends this summer), and he also mentored two postdoctoral fellows at Illinois, as well as many junior colleagues at other institutions.

Nevins sought mathematical excellence in his own work and for the department, to which he offered unwavering service. He frequently contributed input on faculty hiring decisions and helped lead the building project for the renovation of Altgeld Hall and the construction of a new Illini Hall. One of our department's most accomplished instructors, Nevins was recognized in 2017 with the LAS Dean's Award and the Campus Award for Excellence in Undergraduate Teaching. Most importantly, he was a kind and generous colleague and a good friend.

While passionate about mathematics, music, running, and travel, Nevins was above all devoted to his family. He married his college sweetheart, Stephanie, in 1996, and was a loving and enthusiastically involved father to their sons, Nathaniel and Theodore.

RUN FOR TOM

On Sunday, June 14, on what would have been Tom's 49th birthday, members of the Illini family were invited to join in a virtual memorial run in Tom's honor. More than 250 of his friends, family, and colleagues from around the world participated, clocking over 1,500 miles. For every mile ran, walked, or biked during the virtual event, a tree will be planted as an honorary birthday gift for Professor Nevins. Learn more about the memorial run and other ways to celebrate Tom's life and legacy at *bit.ly/RunForTom*.

JOHN RALPH ALEXANDER (1935–2019)

John Ralph Alexander died on Oct. 27, 2019. Ralph earned his undergraduate degree in mechanical engineering and PhD in mathematics at Purdue University. He was Emeritus Professor of Mathematics at Illinois and published groundbreaking research papers in combinatorial geometry and integral geometry.

After retirement, he became interested in nature photography and undertook many studies of tree branch and leaf patterns, and of the wildlife along the banks of the Sangamon River.

RICHARD BISHOP (1932–2019)

Professor Emeritus Richard Bishop passed away on Dec. 18, 2019. Dick was a prominent figure in differential and Riemannian geometry who made many influential contributions, especially in connection with Riemannian comparison theorems and the study of geodesic metric spaces with synthetic curvature bounds. One of his most well-known results was a volume comparison theorem for geodesic balls in a Riemannian manifold. This result has been referred to by some authors as the Bishop–Gromov Comparison Theorem due to the extensive subsequent use and application of the result by M. Gromov.

Dick wrote two books: "Geometry of Manifolds" (with Crittenden, 1964) and "Tensor Analysis on Manifolds" (with Goldberg, 1968). He was a faculty member at Illinois from 1959 until his retirement in 1997. He was named an AMS Fellow in 2013. Dick remained actively engaged in research and the life of the department for many years after retirement. He was a wonderful colleague and a generous departmental citizen.

JAMES A. DONALDSON (1941–2019)

James A. Donaldson, Illinois mathematics alumnus, died on Oct. 18, 2019. Professor Emeritus at Howard University, James received his master's degree in mathematics at Illinois in 1963 and his PhD in mathematics in 1965. He served as chair of the Department of Mathematics at Howard University from 1972 to 1990.

From 1999 to 2012, James served as dean of the College of Arts and Sciences at Howard University. During his tenure as dean, he ushered in substantial growth in the college curriculum. He expanded special programs, developed new initiatives, and supported faculty members and students' pursuit of excellence.

His scholarly interests encompassed analysis, differential equations, applied mathematics, the history of mathematics, mathematics education, and the training of mathematics teachers. He held national offices in the American Mathematical Society and the Mathematical Association of America, and consulted for the National Science Foundation, the National Research Council, the Sloan Foundation, and the Educational Testing Service. In May 2017, he was awarded an honorary doctoral degree by his undergraduate alma mater, Lincoln University in Pennsylvania. In April 2019, he was honored by the Department of Mathematics at Illinois with its Alumni Award for Outstanding Professional Achievement.

SUE WOOD (1933–2019)

Sue Wood passed away on Oct. 6, 2019. Her lifelong love of music led her to learn and become the chimes master at the university's carillons at Altgeld Hall. In addition, Sue played the chimes at University Lutheran Church and the organ at the Presbyterian Church in Philo. She also mastered the bass balalaika in the university's Russian Orchestra on campus.

Sue was known to have said, "Music is the thing that makes life worth living."

She attended the University of Buffalo, where she earned degrees in biology. After moving to Champaign-Urbana in 1966, she obtained her PhD in plant pathology at Illinois. She spent her career working there and at the Illinois Natural History Survey as a research specialist.

ROBERT J. MCELIECE (1942–2019)

Robert J. McEliece, professor of mathematics and research professor at the Coordinated Science Laboratory from 1978–1982, passed away on May 8, 2019. Bob was a world authority on information theory and the theory and application of error-correcting codes

Bob earned his PhD at Caltech and worked at the Information Processing Group at the Jet Propulsion Laboratory (where he remained a consultant for the Communications Group throughout his career) before moving to Illinois. While at Illinois, he supervised five PhD students and helped design the first faculty photo board. After leaving Illinois, he returned to Caltech as a professor of electrical engineering. He helped many members of the Department of Mathematics at Illinois get tickets in 1984 to watch the Rose Parade, and then see Illinois lose the Rose Bowl to UCLA 45–9.

HOWARD OSBORN (1928–2019)

Howard Osborn, Professor Emeritus of Mathematics at Illinois, died peacefully in his sleep at his home in Champaign on Aug. 21, 2019.

Howard began playing violin at age 7 but switched to viola at age 12. Howard proved to be an excellent violist, and he studied the instrument at Northwestern University throughout junior high and high school.

In 1945, Howard was admitted to Princeton University, where a music professor urged him to audition for the violist William Primrose at the Curtis Institute of Music in Philadelphia. Howard was accepted by the institute, but he decided to stay at Princeton and major in mathematics while continuing to play music. Howard balanced his twin careers in mathematics and music for the rest of his life.

After graduating from Princeton in 1949, Howard enrolled in the mathematics doctoral program at Stanford University, where he received his PhD 1954 and then taught at the University of California, Berkeley, for two years before taking a position in 1956 at Illinois, where he taught until his retirement in 1993. During his tenure at Illinois, Howard published more than 30 journal articles and one book, "Vector Bundles" (1982).

In addition to his mathematical achievements, Howard was a significant presence in the local music scene for more than 60 years. He played in the Champaign-Urbana Symphony from its founding in 1960 until 2007, switching from viola to violin during the 1970s. After Howard switched back to the violin, he played a full recital for about 2,000 mathematicians and families at an annual meeting of the American Mathematical Society.

NANCY D. ANDERSON (1940–2020)

Nancy D. Anderson, librarian for the Department of Mathematics for 32 years, passed away on May 12, 2020.

Nancy was an academic librarian for 35 years, 32 of which were at the University of Illinois at Urbana-Champaign. She worked in technical services at the University of Illinois Library from 1968 to 1972. In 1972, she was appointed mathematics librarian, where she rose to the rank of professor of library administration. During her tenure, the mathematics collection more than doubled to nearly 100,000 volumes and was recognized as one of the preeminent research mathematics collections worldwide.

Nancy served in many leadership positions, including the University Library's Executive Committee and Administrative Council, the American Mathematical Society's Library Committee, both the Physics-Astronomy-Mathematics Division and the Science-Technology Division of the Special Library Association, and the Science and Technology Section of the International Federation of Library Associations and Institutions. She authored three influential books on national and international mathematics research resources. At the time of her retirement in 2000, Nancy was one of the most respected mathematics librarians of her generation.

ILLINOIS

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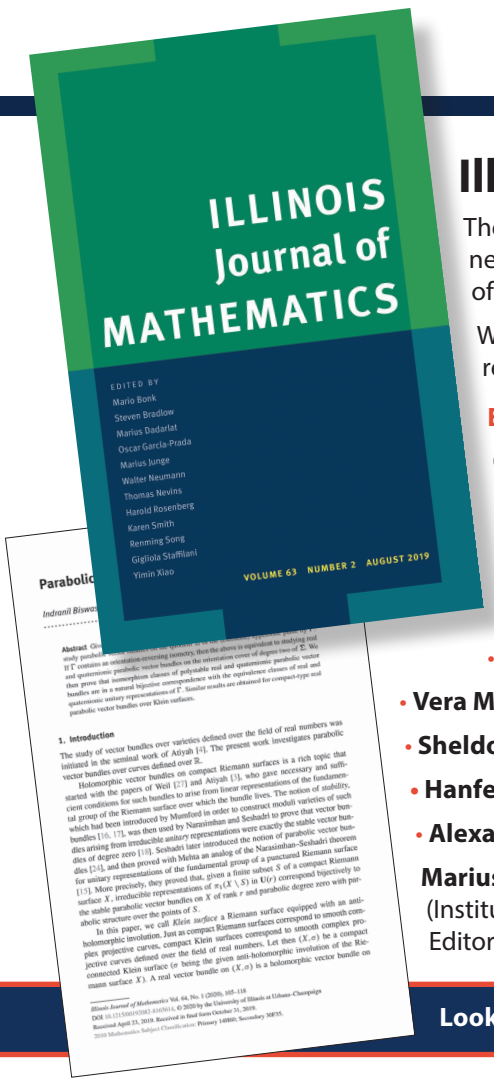

Illinois Journal of Mathematics

The Illinois Journal of Mathematics was redesigned with a new cover and interior pages. The new design premiered with the first issue of Volume 63 (June 2019) to coincide with the start of our new partnership with Duke University Press.

We are happy to report that our partnership with Duke University Press also allowed us to resume a timely publication schedule beginning in 2019.

EDITORIAL BOARD UPDATES

One of the goals of IJM editor-in-chief **Professor Steven Bradlow** was to add a broader, more diverse range of expertise to the Editorial Board. Toward that end, the following new members have recently joined the board:

- **Scott Ahlgren**, University of Illinois at Urbana-Champaign (number theory)
- **Jayadev Athreya**, University of Washington (geometry, ergodic theory, dynamical systems)
- **József Balogh**, University of Illinois at Urbana-Champaign (graph theory, combinatorics)
- **Vera Mikyoung Hur**, University of Illinois at Urbana-Champaign (partial differential equations, applications)
- **Sheldon Katz**, University of Illinois at Urbana-Champaign (algebraic geometry, string theory)
- **Hanfeng Li,** University of Buffalo (operator algebra, ergodic theory)
- **Alexander Scott**, University of Oxford (combinatorics, probability, algorithms)

Marius Dadarlat (Purdue University), **Walter Neumann** (Columbia University), and **Harold Rosenberg** (Instituto Nacional de Matemática Pura e Aplicada) have retired from the board. IJM's editor-in-chief, Editorial Board, and staff thank them for their many years of service to the journal.

Look for the next issue of IJM—Volume 64 (2020), No. 3, in September!

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