SUMMER 2023

DEPARTMENT OF MATHEMATICS • UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

MATH TIMES

An iconic building with a storied past begins its transition toward modernity

In this issue

Message from the Chair

As I reflect on my second year as department chair, I am struck by the sheer amount of transition the department has experienced.

Late in the fall semester, we received momentous news: at long last, the initial construction phases of the Altgeld Hall and Illini Hall project were set to begin.

Throughout January, our faculty and staff tuned in to watch live footage of Illini Hall’s demolition. We peeked expectantly out our windows as demolition crews removed the cornerstone of Illini Hall to reveal a time capsule from the year the building was erected: 1907.

Then, early in the spring semester, department members learned that classes would be vacated from Altgeld Hall by next fall, so that the building could be prepared for interior renovations. Shortly thereafter, our staff and administration began planning for a transition to a temporary space, and our home suddenly looked much different.

Steel scaffolding now surrounds the perimeter of the Altgeld Hall bell tower, as does a fence wrap promising a newly renovated building. Materials from the mathematics library are being transferred to Grainger Engineering Library and the main stacks, where they will remain until the renovation is complete. Associate Director of Graduate Studies Karen Mortensen and her husband Peter have been photographing and cataloguing the department’s extensive collection of math models so they can be secured in storage facilities, to await their new display cases in the renovated Altgeld Hall.

Our department changed in other ways this year, too. We hired eight new tenure-stream faculty members, four of whom are women. For the first time in several years, mathematics graduates were honored at their own—rather than a shared—ceremony. And we were deeply saddened to learn of the passing of Professor Emeritus Wolfgang Haken, who will be sorely missed by our department and the mathematics community at large.

Though it is a bit strange to see empty shelves in the library and construction crews all about, we’ve also witnessed the remarkable restoration of Altgeld’s exterior. Seeing the pink sandstone surface return reminds us that even as our world appears to change dramatically, our identity will stand the test of time.

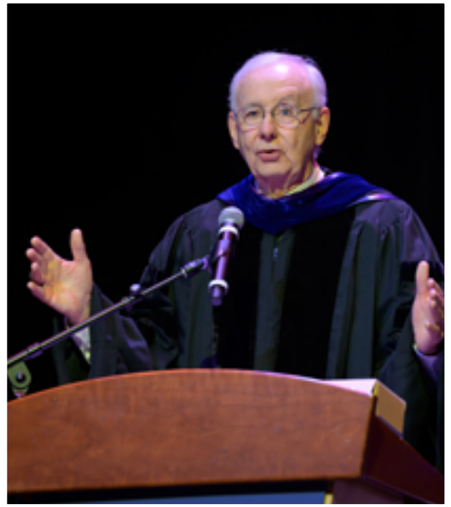
Someday soon, our faculty and staff will transition to a new building. Though we do not yet know where our temporary home will be, we are no stranger to new frontiers, and we eagerly await what the future holds.

Vera Mikyoung Hur
Professor and Department Chair, Mathematics

EDITOR
Shelby Koehne

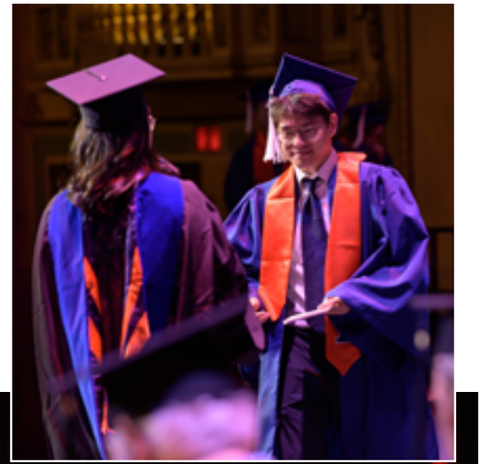
CONTRIBUTORS
Illinois News Bureau
UIUC Public Affairs
LAS News
Richard Laugesen
Lee Deville
Stefanie Klajbor-Goderich
Runhuan Feng
Brock Martin
Chase Driskell
Anu Murphy
Scott Ahlgren
Armgard Haken

Math Times is published by the Department of Mathematics at the University of Illinois Urbana-Champaign. This publication is available online at math.illinois.edu/mathtimes.



William Perry speaks to the Class of 2023.
photo: Della Perone

Prof. Scott Ahlgren hoods PhD candidate Robert Dicks.
photo: Della Perone



(above) Graduates line up outside the theater. (right) A graduate receives their bachelor's degree from Department Chair Vera Hur.
photos: Della Perone

A statue of famed film critic and Urbana native Roger Ebert is decorated in honor of U of I commencement weekend. | photo: Della Perone

Celebrating the class of 2023

On May 14, 2023, the Department of Mathematics welcomed its newest class of alumni with an annual convocation ceremony, held at the historic Virginia Theater in downtown Champaign, Illinois.

The ceremony included remarks from Department Chair Vera Hur and Associate Dean Matt Ando.

William Perry ('74, mathematics) who holds emeritus faculty honors at Texas A&M University and served as president of Eastern Illinois University from 2007–2015, gave the commencement address.

Undergraduate degrees were awarded to 158 students, 14 graduates received masters' degrees, and 17 PhD candidates were hooded at the 2023 ceremony.

This year's ceremony also celebrated the inaugural class of the Predictive Analytics & Risk Management (PARM) program. PARM graduates were presented by assistant professor Wei Wei. ▪

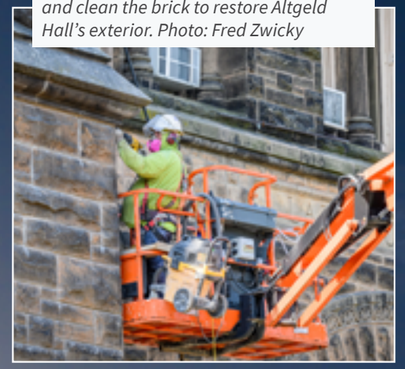
A graduate ducks down so that he can receive a doctoral hood from Prof. Partha Dey. | photo: Della Perone

Graduates look on as Department Chair Vera Hur speaks at the 2023 Mathematics Convocation Ceremony. | photo: Della Perone

DEPARTMENT **NEWS**

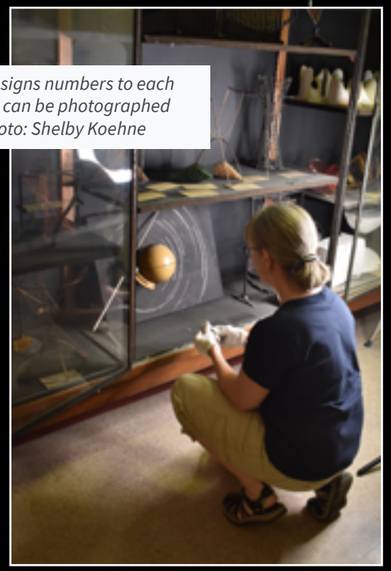
Around Altgeld

Snapshots of the Altgeld Hall & Illini Hall Project



Restoration crews perform tuckpointing and clean the brick to restore Altgeld Hall's exterior. Photo: Fred Zwicky

The Undergraduate Office team set up a "Coffee Nook" for faculty and staff while the common room was closed off for repairs. Photo: Alison Champion



Karen Mortensen assigns numbers to each math model so they can be photographed and catalogued. Photo: Shelby Koehne

Sheldon Katz and Steve Rugg hold the time capsule recovered from the foundation of Illini Hall on Feb. 14, 2023. Photo: Bruce Berndt

2022–2023 Highlights

Balogh named AMS Fellow

Professor **Jozsef Balogh** was among the thirty-nine mathematicians selected for the 2023 class of Fellows of the American Mathematical Society (AMS).

According to AMS, the fellowship recognizes members who have made outstanding contributions to the creation, advancement, or utilization of mathematics. Balogh was cited specifically for his contributions to extremal combinatorics, probability and additive number theory, as well as for graduate mentoring.

Balogh currently leads two NSF-funded projects: one establishing a research training group in combinatorics; the other focused on collaborative research in extremal combinatorics and flag algebras.

Team uses digital cameras, machine learning to predict neurological disease

Story by Diana Yates, Illinois News Bureau

Richard Sowers, professor of mathematics and industrial and enterprise systems engineering, is part of a team that recently developed a new method for identifying symptoms of Parkinson's disease and multiple sclerosis.

Using a treadmill, digital cameras, and a machine learning algorithm, they were able to capture gait changes and detect abnormalities that are associated with these conditions. Their findings are reported in the IEEE Journal of Biomedical and Health Informatics.

Read the full story at **bit.ly/ML-gait-analysis**.

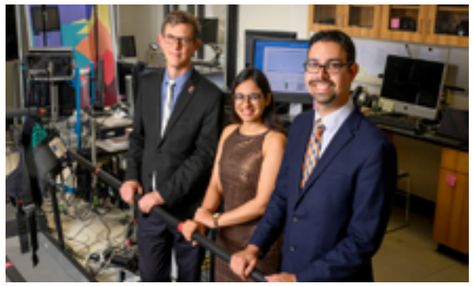


photo by Fred Zwicky

photo by Aaron T. Davis

Celebrating 150 years of mathematics at Illinois

On October 15, 2022, the Department of Mathematics held its homecoming celebration for the first time since 2019.

Attendees were treated to a hot breakfast buffet; afterwards, they played mathematics bingo and trivia for chances to win door prizes.

Participants went home with a lot of free swag, including special t-shirts that were designed in recognition of the 150th anniversary of the department, 3D-printed models of Altgeld Hall, and activity booklets honoring the four-color theorem, which was proven at the University of Illinois by Kenneth Appel and Wolfgang Haken in 1976.

Yuliy Baryshnikov leads the HyDDRA project. Photo provided.

U.S. Department of Defense funds U of I math and engineering project

Story by Jenny Applequist, Grainger Engineering News

The Department of Defense has announced 31 grants totaling $220 million in support of basic research projects as part of its fiscal year 2023 Multidisciplinary University Research Initiative (MURI) program.

One MURI project, titled "HyDDRA: Hybrid Dynamics—Deconstruction and Aggregation," will be led by **Yuliy Baryshnikov**, professor of mathematics and electrical & computer engineering (ECE). Other participating UIUC faculty include **Eugene Lerman** (mathematics) and **Sayan Mitra** (ECE).

The HyDDRA project, housed in the Coordinated Science Lab, will develop mathematical formalisms for examining a class of dynamical systems known as hybrid systems. The result will be richer analysis of the hybrid dynamics found in cyber-physical systems, crowd behavior, and even brain activity.

Read about other MURI grants at **bit.ly/MURI2023**.

Merit project receives continued grant funding

Story by Tricia Barker, LAS News

The College of Liberal Arts & Sciences awarded funding to three teams of faculty and staff to advance innovative ideas that aim to improve student experiences. Projects were eligible for up to $100,000 in funding for one year.

Among the three teams to receive funding is the LAS Merit Program, led by **Elise McCarren** (chemistry), **Lily Arias** (integrative biology), **Jennifer McNeilly** (mathematics), **Alejandra Stenger** (molecular and cellular biology).

To support the success and retention of underrepresented, first-generation, and rural LAS STEM majors, the LAS Merit Program will continue a pilot project launched last year. This effort includes implementing special courses that include a majors-based mentoring network, professional development for LAS Merit students, and sponsorship of paid experiential learning for LAS Merit students, including research, teaching, and other laboratory experiences.

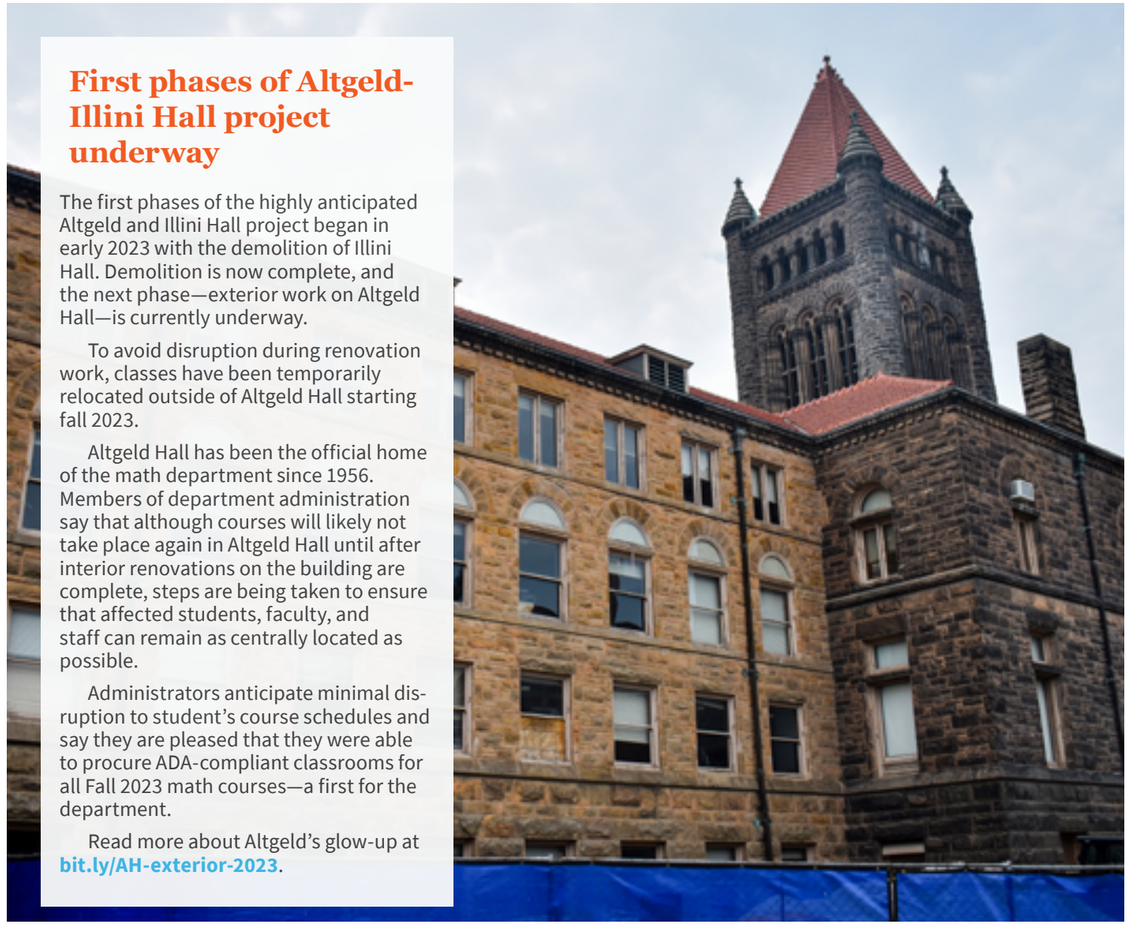
Read the full story **bit.ly/StudentSuccessLAS**.

NetMath program revises five core courses

Members of leadership from NetMath, the department's online self-paced distance learning program, announced this summer that they are in the final stages of a massive project to renovate five core mathematics courses.

The decision to transition to newer teaching methodologies that will align the courses with current standards and departmental policy began last summer. By Fall 2023, MATH 220, 231, 241, and 285 will be offered in a new format, and MATH 415 will be replaced by MATH 257.

The redesign includes updated homework submission and grading procedures and will allow NetMath to accommodate more students while maintaining instructional focus on pedagogy and successful learning outcomes.



Cleaning crews have been working throughout the summer to restore the exterior of Altgeld Hall. This east side view of the building shows the contrast between cleaned and untreated stone. | Photo credit: Shelby Koehne

First phases of Altgeld-Illini Hall project underway

The first phases of the highly anticipated Altgeld and Illini Hall project began in early 2023 with the demolition of Illini Hall. Demolition is now complete, and the next phase—exterior work on Altgeld Hall—is currently underway.

To avoid disruption during renovation work, classes have been temporarily relocated outside of Altgeld Hall starting fall 2023.

Altgeld Hall has been the official home of the math department since 1956. Members of department administration say that although courses will likely not take place again in Altgeld Hall until after interior renovations on the building are complete, steps are being taken to ensure that affected students, faculty, and staff can remain as centrally located as possible.

Administrators anticipate minimal disruption to student's course schedules and say they are pleased that they were able to procure ADA-compliant classrooms for all Fall 2023 math courses—a first for the department.

Read more about Altgeld's glow-up at **bit.ly/AH-exterior-2023**.

Feng named State Farm Companies Foundation® Professor in Actuarial Science

At an investiture ceremony that took place on April 25, 2023, professor Runhuan Feng was named the State Farm Companies Foundation® Professor in Actuarial Science. Feng currently serves as director of the actuarial science program in the Department of Mathematics. He was also awarded the Geoffrey Heywood Prize from the Institute and Faculty of Actuaries in 2022.

To learn more about Feng and the history of actuarial science at Illinois, visit **bit.ly/FengInvestiture**.

Students train for internships in math & statistics

In February, INMAS hosted a training workshop at UIUC for mathematics and statistics graduate students. During the training, students used real world datasets to create high-impact solutions. Students applied mathematical modeling to develop crypto trading strategies, optimize airplane boarding procedures, analyze retail sales, predict movie ratings, identify cancerous tissues, and more.

U of I offers new credentialing opportunities for actuaries

In Fall 2022, the University of Illinois at Urbana-Champaign became one of only 13 universities globally recognized by the Society of Actuaries (SOA) to participate in its University-Earned Credit program. Through this program, degree-seeking students who participate in approved courses can become eligible for specific SOA exam credit.

The Department of Mathematics houses U of I's actuarial science program. Many of the approved courses at Illinois count toward actuarial science degree requirements, allowing students a significant head-start on professional actuarial credentials while pursuing a degree.

To learn more about SOA's University-Earned-Credit program, visit bit.ly/22-UEC-SOA.

Stelzer named NSF Graduate Research Fellow

Ada Stelzer, a second-year mathematics PhD student at Illinois, was recently awarded a graduate research fellowship from the National Science Foundation (NSF) to pursue research in algebra, number theory, and combinatorics.

Stelzer holds baccalaureate degrees in mathematics and anthropology from Lawrence University. In her current research, she uses homological methods from algebraic geometry to answer questions in Schubert calculus.

Stelzer hopes that her work might allow for simpler proofs and new perspectives on prior work, and possibly help people solve more problems in Schubert calculus.

To read more about Stelzer's research, visit bit.ly/StelzerNSF.

Taking math research communities online

Associate professor **Vesna Stojanoksa** is a co-principal investigator for "Electronic Computational Homotopy Theory Research Community," a project that aims to develop online relationships and collaborations, with the goal of creating a self-sustaining online research community in pure mathematics. The major advantages of such a system are that online communities can reach new audiences and take advantage of efficiencies that are not accessible to traditional research communities.

Read more about the project at bit.ly/ECHT22.

Gaining numbers in math

Throughout the spring semester, the department underwent an ambitious hiring season, which culminated in the addition of eight new tenure-stream faculty members to the department's ranks. These new faculty members will expand the department's reserach in the areas of algebraic geometry, low-dimensional geometry and topology, probablity, geometric analysis, actuarial science, and mathematical biology.

"As we are recovering our faculty numbers, we are protecting and expanding our core strengths, as well as engaging in new exciting opportunities," says Vera Hur, department chair.

The department also hired 10 new postdoctoral researchers.

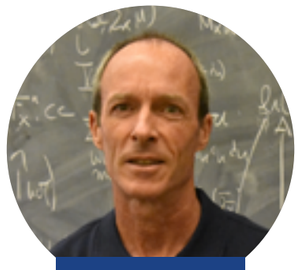
Illinois Journal of Mathematics included in Web of Science

The Illinois Journal of Mathematics has been accepted into Clarivate's Emerging Sources Citation Index, part of the Web of Science. The indexed articles for IJM will begin with the year 2020 (Volume 64).

The Web of Science is a definitive database for journals, books, and conference proceedings. Journals are selected for editorial rigor and best practice.

More information about the journal can be found at ijm.math.illinois.edu.

Florin Boca



Iwan Duursma

Bruce Reznick

Three math faculty members to receive emeritus honors

At the end of the spring 2023 semester, three faculty members announced their retirements from the mathematics department at Illinois. Florin Boca, Iwan Duursma, and Bruce Reznick will receive emeritus faculty honors for their service.

In his 35-year research career, **Florin Boca** worked on problems in operator algebras and on the interface between number theory and dynamics. He is the author of a book and 52 research papers. Boca became faculty at the University of Illinois Urbana-Champaign in 2001. While he taught at Illinois, Boca also supervised 5 PhD theses, served on 27 additional doctoral committees, mentored 4 postdoctoral researchers, and directed 5 Illinois Geometry Lab projects.

Iwan Duursma retired in May 2023 after 23 years at Illinois. He published dozens of research articles and taught courses spanning topics in number theory, arithmetic geometry, coding theory, and cryptography. He supervised two doctoral candidates. Duursma is a member of the Coordinated Science Laboratory and the Information Trust Institute at Illinois.

In 1979, **Bruce Reznick** joined the mathematics department. He has been a Sloan Foundation fellow and chairman of the Problems Committee for the Putnam Competition. His research comprises number theory, algebraic geometry, analysis, and combinatorics. Reznick will retire in July, having served as an adviser to more than a dozen PhD students, the faculty leader of the UIUC graduate chapter of the Association of Women in Mathematics, and chair of the department's Climate, Equity, and Inclusion committee.

David An earned a bachelor's degree in mathematics from the University of Illinois this May. | photo provided

U of I math student raises red flag about popular chatbot

Mathematics major **David An** was featured in Fortune magazine after he discovered something unusual while interacting with the AI chat feature of Snapchat, a mobile app. Though the app's chatbot claimed it did not know its users' locations, An discovered that it actually did.

An says he hopes to raise awareness of the issue so that companies can better evaluate ethical considerations when launching AI chat features and so that users can make more informed decisions about how they interact with chatbots.

Read the story at **bit.ly/An-AI**.

Check out our LinkedIn page!

We added to our presence with a brand new profile. You can now follow us on LinkedIn at **Department of Mathematics @ UIUC**, where we'll post about the exciting things our students and faculty are up to!

FACULTY SPOTLIGHT

Finding new roads to travel

Many people pursue a particular career like it is their destiny, while others feel pulled in different directions over time. Senior mathematics lecturer **Aldo Manfroi** encourages his students not to feel pigeon-holed by any one career path.

All throughout school in Italy, where Aldo Manfroi grew up, he was sure that he would study mathematics in college.

But the summer before college started, Manfroi started to think that perhaps mathematics was too abstract for the career he envisioned.

"I was young and at the age where I thought I would want to do something practical for the world," he says, "so I decided to switch to physics."

Manfroi's undergraduate degree is in physics; his thesis, on chaos and turbulence.

He went on to graduate-level studies at the University of California at San Diego and later he landed a postdoctoral research position at the University of Illinois, but he eventually began to feel that research wasn't for him.

He began to look around for other opportunities. The Department of Mathematics offered him a part-time position teaching, so he decided to try it. The experience helped him discover how much he liked teaching.

"I said to myself, maybe you should have been doing this all along."

Manfroi has since moved on to teaching full time and has become one of the most highly rated instructors in the department among students.

"I get to class, and fifty minutes later, I have done something, something tangible. The students have learned something new."

He found that kind of immediate feedback exciting: "I can make a difference—even if it's not big—every day."

Another important facet of teaching mathematics, he says, is getting feedback from the students in real time and being adaptable with his approach to teaching complex topics. His methodology seems to be effective: since 2019, he's consistently made the List of Teachers Ranked as Excellent by Their Students, as reported by the Center for Innovation in Teaching & Learning.

Among the many practical skills Manfroi imparts to his students, he has this advice to offer: "I try to tell my students, it's nice that some people know what they want to do, and they just follow that line. But for many people, life doesn't work that way. There are many different turns, and it can turn out well even if you end up doing something different from what you planned to do. One needs to be open to many different possibilities." Manfroi says though his life path diverged in ways he didn't quite expect, it took him somewhere satisfying. "It's been an interesting journey." ▪

This article has been edited from its original version for length .

Preserving the sound of the Altgeld chimes

With the imminent closure of the bell tower at Altgeld Hall for major renovation work, Altgeld “ringers” from past and present gathered to record chimes music, to carry on a long-standing Illini tradition until the building restoration is finished.

Former chimes player Liam Flood performs for the recording session. Liam, who taught himself how to read sheet music to get the position, digitized and indexed over four hundred historic works from previous players during his time as a chimes player. | Photo: Fred Zwicky

Early on a sunny Sunday morning, the chimes tower in Altgeld Hall is filling up with people. Students climb the steep staircase to the tower, several of them carrying snacks. They are all chimes players who will perform for a recording of chimes music.

Chimesmaster Michael Broussard, a doctoral student in ethnomusicology at the University of Illinois Urbana-Champaign, is coordinating the recording session. He’s on his cell phone with sound engineer Graham Duncan, who is on the ground outside Altgeld. Duncan and an assistant are setting up studio microphones on stands between the Alma Mater statue and the Illini Union to record the chimes.

Soon, a renovation of Altgeld Hall will begin and the chimes players won’t have access to the tower to play while it and the belfry are updated. Broussard was looking for a project to keep people interested in the bells during the renovation, and he and the other players decided to make a recording of their music.

“It is a preservation project—something for future chimes players and community members to enjoy,” Broussard says.

More than a dozen players agreed to play, and they are here on a Sunday morning to record when fewer extraneous sounds outside, such as traffic or people walking by, might be heard on the recording.

Prior to this recording session, Duncan conducted test recordings of the bells in various spots around Altgeld, finding the best place to capture the sound.

“It’s such a large, unique instrument,” says Duncan, who usually records in a studio or indoor performance space. “We’re listening for a balance of the bell sounds. Once they’re struck, they just keep ringing through the performance. Sometimes the smaller bells can be sort of shadowed acoustically by the larger bells.”

Because the sound of the bells continues to resonate after they are struck, Duncan can’t do the kind of post-production editing he usually does for recordings of performances.

“It has to be a perfect take, because we can’t go back and fix things,” he says.

story continued on page 17

Margot Pierce enthusiastically plays the chimes. Photo: Fred Zwicky

Because the chimes have a limited number of bells, musical arrangements must navigate the missing D# in the lower octave, along with the lack of an F-natural throughout the entire instrument. Photo: Fred Zwicky

Check out Illinois News Bureau's **Behind the Scenes** for short blog posts, photos and videos from Illinois faculty, researchers, students and staff about their work and lives.

Each player has a different style of interacting with the levers that pull a cable to sound the chimes. Joseph Kim releases the key-like levers to let the bells ring. Photo: Fred Zwicky

Sound engineer Graham Duncan and his assistant use several microphone pairs to record the chimes as they ring over campus, while navigating wind gusts and the sound of passing vehicles. | Photo: Fred Zwicky

The wind is another factor to consider, and the day is breezy when the recording begins.

Broussard plays the first song—"Hail to the Orange."

"I like how I play it," he says. "Some players play it really fast, and I like to play it pretty slow."

When Broussard finishes playing, Duncan tells him the wind gusted a bit at the end of the song.

"It reminded me of a crowd roaring," Duncan says.

Broussard says that some environmental noise is desirable with a chimes recording, since the bells are heard from outdoors.

"I'm fine with a little ambient noise in my recordings. It's campus life," says Tina Horton, a former chimesmaster who came down from Chicago to play for the recording.

Even so, Duncan asks the players to wait several times while buses or motorcycles pass by. The recording also pauses while people cheer on a group of runners along Green Street. The wind increases throughout the morning and the musicians must wait through some strong gusts before resuming their playing.

In addition to "Hail to the Orange," the recording also will include "Illinois Loyalty," "Oskee Wow Wow" and the "Three-in-One." Joseph Kim plays the "Three-in-One." He's one of only two current chimes players to attempt the song in recent years. It is quite difficult to play, he says, and it is one of the longest songs recorded today.

Each player selected his or her own music for the recording, including classical pieces and folk tunes.

"We want the students to show their sense of belonging and identity through the music. We're making this for the community, but we want the chimes players to express their individuality," Broussard says.

He and Horton were members of a gamelan group before playing the chimes, and they play a duet of a Balinese song, "Tabuh Selisir," that they adapted for the bells. Their two parts combine to create the melody, with the duet relying heavily on the chemistry between the performers, Broussard says.

Artharv Gudi, a sophomore studying math and German, plays a south Indian piece that was composed in the 11th century. The music wasn't written down, so Gudi wrote out his own improvised version of the song.

Liam Flood, a former chimes player, plays an Irish hornpipe song called "Off to California" – his signature song. He's arranged several traditional Irish music compositions for the chimes. This one is particularly fun for him to play because it's very fast and physical for the player.

"It's a single line of melody, and the exciting part is to play it as fast as you possibly can," he says.

Flood flew in from Washington, D.C., to play for the recording.

"There's no price I wouldn't pay to come back and participate," he says.

Flood is the unofficial historian for the chimes. He says the only other chimes recording is a 1947 vinyl recording by WILL radio that he found archived online.

As the playing and recording go on throughout the morning, more players arrive. Even after they finish playing, many linger in the tower, watching others play, applauding after each song and soaking up their time with the bells. ▪

> **"We want the students to show their sense of belonging and identity through the music. We're making this for the community, but we want the chimes players to express their individuality."**

Jodi Heckel, Illinois News Bureau

2022–23 AWARDS

A record year for scholarships

Thanks to the generosity of our donors, in the 2022–2023 academic year, the Department of Mathematics was able to give out **$146,878** in scholarships, the largest annual amount of scholarships awarded in the last ten years.

More than $60,000 in fellowships were awarded to graduate students in 2022–2023.

The department also gave out **over $15,000** in miscellaneous prizes to students.

Source: Department of Mathematics, Business Office

Farida Segun-Salami
2023 Milliman Scholar

Dylan Roscow
2023 Lewis C. Hack Scholar

Yuxuan Chen
2023 Hoover Mathematical Scholar

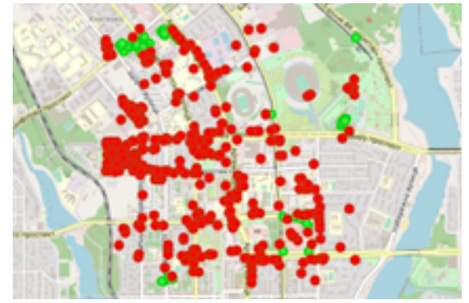
Changyue Hu
2023 Esther Portnoy Scholar

Ukraine data project wins top undergraduate research prize

An Illinois Geometry Lab (IGL) project titled “Data from Ukraine” has been named the first-place winner of the 2023 IGL Research Award.

For this project, student researchers collected and aggregated information from the open-source database OpenStreetMap, then analyzed changesets in the data to visualize the impacts of the ongoing conflict in Ukraine.

The Illinois Geometry Lab is program sponsored by the Department of Mathematics to provide students with early research experience and to promote mathematics outreach with local communities.



Researchers created maps to show changes in geospatial data occuring before and after the invasion of Ukraine.

BY THE **NUMBERS**

34

scholarships established by the mathematics department

333,973

dollars awarded in fellowships over the past five years

90

students who received a math scholarship, fellowship, or award in 2022–2023

Did you know?

Since 2014, the Department of Mathematics has awarded more than 1.6 million dollars to students for academic funding.

We are committed to providing top-tier education to our students, and we rely on the generosity of our donors and friends to help us achieve that mission.

Academic funding can alter the course of a career.

At the Department of Mathematics, we know how pivotal academic funding can be to our students, and we strive to offer as many funding opportunities as possible. Here are some testimonies from former students:

“Receiving a mathematics scholarship made me feel valued for all of my previous hard work and encouraged me to pursue a more rigorous education in mathematics here at the University of Illinois.”

“Many years ago I received scholarship as a teaching assistant from Department of Math so I was able to cover my tuition and living expenses as an international student from a financially disadvantaged family. It changed my life.”

IT’S ALL ABOUT **IMPACT**

Reed Oei was named a Top 10 Outstanding Undergraduate Researcher in 2021 by the Computing Research Association. Photo provided by family.

Parents establish new mathematics scholarship to honor late son

Reed Oei (BS, ’21, math & computer science) wasn’t just good at math and programming languages—he also had a knack for teaching them to others.

Reed had made remarkable progress toward his goal of becoming a university professor when he tragically passed away in the spring of 2022.

So that Reed could still help others learn after his passing, his parents Lori and Charles established a scholarship in his name. The Reed A. Oei Scholarship will support undergraduate math majors like Reed, who are interested in research.

To read more about Reed’s story, and to learn how you can help support his mission, visit **bit.ly/ReedOei**.

Hoffmeister honored for excellence in teaching

At the 2022 Illinois Council of Teachers in Mathematics (ICTM) awards ceremony, held October 29, **April Hoffmeister**, senior lecturer in mathematics, was awarded the Excellence in Post-Secondary Mathematics Teaching Award.

According to ICTM, the award honors one outstanding post-secondary school mathematics teacher each year. Hoffmeister was presented the award along with a short video recorded by her peers and colleagues congratulating her on the achievement.

Hoffmeister has previously received the UIUC Campus Award for Excellence in Undergraduate Teaching by Instructional Staff, the LAS Award for Excellence in Undergraduate Teaching for Instructional Staff, and the Student Alumni Ambassadors’ Unsung Hero Award.

Six individuals honored for academic excellence in graduate-level studies

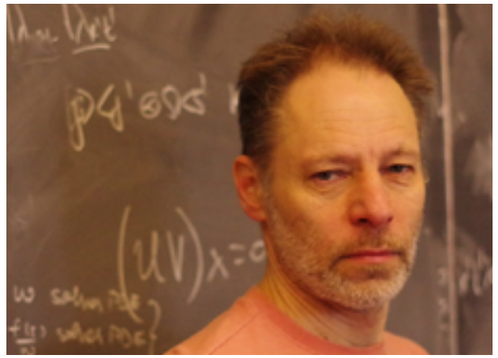
The Department of Mathematics selected six graduate students to receive honors for academic excellence in 2022–2023.

The Phillipe Tondeur Dissertation Prize was awarded to two recipients: **Hung Chu** and **Grigory Terlov**.

Venkata Sai Bavisetty received the Wolfgang Haken Prize in Geometry and Topology, and the Kuo-Tsai Chen Prize in Mathematics went to **Brannon Basilio**.

Robert Dicks and **Maria Siskaki** were jointly awarded the 2023 Bateman Prize in Number Theory.

To read more about these prizes and the students’ work, visit **bit.ly/MathGradAwards2023.**



Prof. Eugene Lerman | photo provided

Lerman wins campus award for instructional excellence

Professor **Eugene Lerman** is a 2023 recipient of the Campus Award for Excellence in Undergraduate Teaching. Lerman also received the 2023 LAS Dean’s Award for Excellence in Undergraduate Teaching.

Testimonies from undergraduate students attest to the significant impact Lerman has had on their overall success and interest in mathematics.

Lerman is currently helping the math department develop a new major, and he has plans to revise more undergraduate courses.

Students shared their thoughts about Lerman’s approach to teaching at **bit.ly/LermanLASExcellence**.

Chesser (left) and Nahvi (right) | photos provided

Math grad students recognized for pedagogical prowess

Two mathematics graduate students, **Marissa Chesser** and **Mina Nahvi**, were named recipients of the LAS Dean’s Award and the Campus Award for Excellence in Undergraduate Teaching by Graduate Teaching Assistants in 2023.

Profiles of Chesser and Nahvi are available at **bit.ly/2023-LAS-TA**.

McNeilly receives Paula Adametz Hays Staff Award

Jennifer McNeilly, director of the Math Merit Program, is the 2023 recipient of the Paula Adametz Hays Staff Award.

The award, established by College of Liberal Arts & Sciences at the University of Illinois Urbana-Champaign (LAS) in 2019, is bestowed annually upon one civil service employee or academic professional who promotes positivity, supports and encourages others, and demonstrates initiative and excellence in their work performance.

McNeilly’s colleagues snd students say that her diligent work and dedication has had significant positive impact on students and her peers alike.

“Jennifer McNeilly is at the heart of the initiatives within the UIUC department of mathematics that work to promote mathematics education, equity, and justice,” says a former PhD student. “Jennifer was just as willing to help and advise me when I wasn’t her TA as when I was,” says another, echoing several other comments about how frequently McNeilly goes out of her way to help others.

To read more about McNeilly’s award and her work with the Merit Program, visit **bit.ly/McNeillyAward.**

Jennifer McNeilly (right) accepts the Paula Adametz Hays Award from Dean Venetria Patton. | photo courtesy of College of Liberal Arts & Sciences

Meet our Most Outstanding Majors

Kaitlyn

Kaitlyn Ho received the 2023 Most Outstanding Major Award in **Teaching of Mathematics**. Kaitlyn plans to pursue a master's degree in business analytics.

Ariel

Ariel "Ari" Lerman is the recipient of the 2023 Most Outstanding Major Award in **Mathematics**. Ari plans to join the mathematics department at Yale University as a PhD student next fall.

Henry

Henry Curcio is the recipient of the 2023 Most Outstanding Major Award in **Actuarial Science**. Henry has completed two summers as an actuarial intern will complete a trading internship this summer.

David

David James is the 2023 Most Outstanding Major in **Mathematics & Computer Science**. David plans to pursue a doctoral degree in mathematics at UIC next fall.

Department Awards, Fellowships, and Scholarships

2022–2023

Contests

U of I Freshman Math Contest
Shreyas Singh, first place
Jinghan Annie Zeng, second place
Sun I, third place

Mock Putnam
Adrian Calinescu, first place
Praneet Rathi, second place
Alex Jin, third place

Undergraduate Math Contest
Tianyue Cao, first place
Adrian Calinescu, second place
Brendan Biernacki, third place

Instructional Awards

Department of Mathematics TA Instructional Award
Abhra Kundu

Distinguished Teaching Award for Mathematics Non-Tenure-Track Faculty
Kim Whittlesey

Distinguished Teaching Award for Mathematics Tenured Faculty
Rui Loja Fernandes

H. Roy Brahana TA Instructional Award
Marissa Chesser

N. Tenney Peck Teaching Award in Mathematics
Daniel Berwick-Evans

Service Awards

Exceptional Merit Award for Mathematics Non-Instructional Staff
Chase Driskell

NetMath Award for Outstanding Service
Dave Watson

Academic Awards

Bateman Prize in Number Theory
Robert Dicks
Maria Siskaki

E.T. Parker Memorial Award
Robert Krueger

H. Roy Brahana Award
Matthew Niemiro

IGL Hoover Mathematical Scholars
Yuxuan Chen
Yiqian Zhang
Runlin Zheng
Paul Ge

IGL Research Awards
First place: "Data from Ukraine"
(Researchers: Luke Peng, Srikar Annapragada, Wenqi Zeng)

Runner-up: "Rumor propagation on a spread-out line graph"
(Researchers: Tianyi Huang, Hansheng Liu, Yongzheng Yang)

Kuo-Tsai Chen Prize in Mathematics
Brannon Basilio

Milliman Mentorship Program Award
Adrian Norcio
Farida Segun-Salami

Phillipe Tondeur Dissertation Award
Girgory Terlov
Hung Chu

Salma Wanna Award
David Wallach

State Farm Actuarial Science Prize
Kenneth Ng
Rodney Tavuringa
Tyler Hecht
Zachary Ryan
Paramveer Singh Dhillon
Henry Yoo
Andres Medina
Jaylen Patel
Caroline Anderson
Yuanqin Zhou

Susan C. Morisato IGL Graduate Student Award
Ada Stelzer
Manisha Garg

Willis Towers Watson Award
Maya Ramahi

Wolfgang Haken Prize in Geometry and Topology
Venkata Sai Bavisetty

Fellowships

Bateman Fellowship in Number Theory
Di Liu
Sun Qihang

David G. Bourgin Mathematics Fellowship
Gayana Jayasinghe
The Nguyen

Dr. Lois M. Lackner Mathematics Fellowship
Hanna Kim
Likun Xie

Franz Hohn and J. P. Nash Fellowship
Langwen Hui

Ruth V. Schaff and Genevie I. Andrews Fellowship
Xinran Yu
Ada Stelzer

Waldemar J., Barbara G., and Juliette Alexandra Trjitzinsky Fellowship
Debmalya Basak
Haoran Luo
Wilmer Smilde

Scholarships

Actuarial Science Alumni Scholarship
Anna Schulz

Bradley M. and Karen A. Smith Scholarship
Pooja Khatri
Anika Chakraborti

CNA Foundation Scholarship
Daniel Polites

Dr. Lois M. Lacker Mathematics Scholarship
Xinyi Wei
Victoria Lee

Elizabeth R. Bennett Scholarship
Casey Appleton
David James

Gail V. Kellogg Scholarship
Ashley Marunde

Graduate Actuarial Science Scholarship in Honor of Professor Emerita Esther Portnoy
Changyue Hu

James D. Hogan Memorial Scholarship
Aerim Si
Jiajie Yang
Jonathan Higgins
Lily Gergle
Ryan Roach
Yigal Kamel
Yuxuan Li
Omar Musleh
Kaijie Cheng

Joseph Landin Memorial Scholarship
Kaijie Cheng

Josephine Chanler Scholarship in Mathematics
Dinglong Wang

Lewis C. Hack Scholarship
Dylan Roscow
Zhuo Zhang

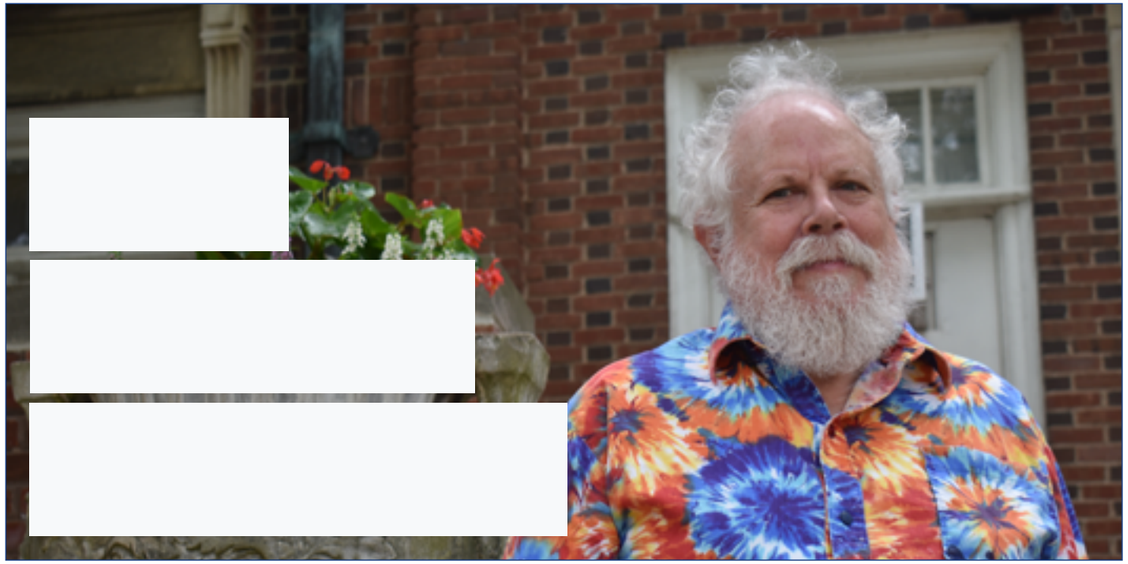
Northwestern Mutual Scholarship
Stephanie Yang

R. H. Schark Scholarship
Bingyan Liu
Haoyuan Li
Wonwoo Kang
Madie Farris

R. Ranga and Shantha Rao Scholarship
Igor Albuquerque Araujo

Reed A. Oei Scholarship in Mathematics
Divij Garg
Sean Le Blanc
Caleb Chiang
Katrina Schideman

Zekai Li Scholarship
Gabe Chua



Prof. Bruce Reznick has a long and impressive list of accomplishments. He has been on a first-place Putnam team twice, authored about 70 research papers, and is an American Mathematical Society fellow. His Erdős number is 1. His work is commemorated on the label of a brut-style beer. As he nears retirement, his former students remember him for something different: the important role he held in their lives.

It was April 2009, and a large grant had just been awarded to the mathematics department, opening several job opportunities for graduate students. Katie Anders, who began her graduate career just the semester prior, was facing the possibility of not having work to get her through the summer. She needed a job. But as she soon realized, placements required a supervisor. More advanced students could just ask their adviser, but for first years like Anders, the process of finding a supervisor was more difficult.

After several of her peers found luck with placements on a project led by Bruce Berndt, Anders decided to meet with him too. Berndt said he could give her a job, but after hearing more about her interests, he suggested she speak with Professor Bruce Reznick.

After only one meeting with Reznick, Anders knew she wanted to work with him.

"He was approachable, patient, and brilliant," says Anders. She went back to Berndt and thanked him for pointing her in the right direction. Reznick officially became Anders's adviser in 2010.

"And I just never stopped working with him," says Anders. Even today, she and Reznick continue to collaborate on research.

For four decades, Professor Bruce Reznick has been a staple of the UIUC mathematics department. His students and colleagues know Bruce as a kind and compassionate teacher and de facto historian of the department. He regularly shares stories about the University of Illinois when he first arrived and the camaraderie he found unique to the mathematics community here. As a mathematician, Reznick seems to have an affinity for people nearly as strong as his kinship with numbers.

> **"He is brilliant, but he never assumed that things which were easy to him would come easily to others."**

Reznick was born in 1953 in New York City. His father Sidney worked as a comedy writer for television, and in 1964, the family moved to Miami so that Sidney could continue writing for Jackie Gleason. Later, Bruce and his family, including his mother Sima and brother Robert, moved to Los Angeles. Bruce stayed in California throughout undergraduate and graduate school, attending Caltech and Stanford University respectively.

Reznick says that numbers felt like friends his entire life: "[Math] was something that felt completely natural, and it was just more interesting to me than anything else."

His favorite book from childhood was Constance Reid's *From Zero to Infinity*, a well-known primer to the history of number systems, Mersenne and Fermat primes, binary representation, and perfect numbers, among other mathematical concepts. (In 2006, Reznick was invited to review the 50th Anniversary Edition of *From Zero to Infinity* for the Notices of the American Mathematical Society—an honor he says still delights him today.)

During the fall semester of his first teaching job, Reznick read two preprint articles on Hilbert's 17th Problem—papers he later cited as the inspiration for much of his own subsequent research. In a footnote in one of the articles, the authors had recorded a suspicion they believed to be true, but Reznick figured out a way to prove that it wasn't.

Later, when Reznick was introduced to one of the authors, T.Y. Lam, at a Joint Math Meeting, he was nervous that Lam might be upset with him for having disproved the note, but the opposite turned out to be true.

"In fact, he was pleased," says Reznick. The two began corresponding shortly thereafter, and in 1978 Reznick was awarded an NSF Postdoctoral Fellowship to work alongside Lam at University of California, Berkeley. "He basically became my step-adviser," says Reznick.

Reznick ranks the experience of collaborating with T.Y. Lam among his favorite professional experiences, right up there with the 2019 Bern "Reznickfest" that his peers organized in his honor. "It was so generous and unexpected," says Bruce.

In his time at Illinois, Reznick has advised on 15 doctoral dissertations. Many of his former advisees recall (with remarkable specificity) the contents of his MATH 597 and MATH 599 course organization guide. "If you want to know about Bruce's approach as an adviser," said Anders, "read that document."

In the general overview of the document, Reznick conveys the text's crucial thesis: "…I recognize (and try to reconcile) the inevitable tension between importance of the dissertation to the student and the power held in this process by the adviser."

A few of Reznick's former PhD students recounted how they felt his actions stacked up against these words.

"As an adviser, Bruce is great about letting students follow their own intuition," said Grace Jaffe, who earned her PhD this May and worked with Reznick on her dissertation. "When I got worried that I wasn't making enough progress or wasn't finding a topic that I felt worth pursuing, Bruce would remind me 'This is *your* graduate experience.'"

Reznick has a particular fascination with Stern's diatomic series, which he notes on the board in this photo.

Jennifer Lansing, (PhD, 2014, mathematics) had similar things to say: "He wanted to push students to succeed, but balanced that with a lot of space. He was good about regular check-ins, but wasn't overbearing."

Ricardo Rojas (PhD, 2008, mathematics) said of Reznick, "He let me become me.…I needed internal motivation to finish the PhD program, and the experience would not have been satisfying had I been pursuing a problem that I hadn't chosen totally on my own."

Perhaps the reason that Reznick opts not to direct his students too far in one direction or another is that he himself refuses to limit his own curiosity.

"There is a classical, extreme dichotomy—which is not realistic—that some mathematicians are theorem builders, and some are problem solvers," he says. "I'm on more of the problem-solver end. I take a problem, and I follow it wherever it leads me. Sometimes it goes into an area I don't know too much about."

His advisees also noted that though Reznick is an extraordinary mathematician, he carefully considers and respects differences between himself and his students.

"I always want to meet students where they are, shaped by their specific experiences (academic, personal, and societal), expectations, and talents," reads his course organization guide. "But these mostly melt away when we are actively doing math together: polynomials don't care about our particularities."

Anders recalled a time when a fellow PhD candidate had been surprised to learn she was working with Reznick on her thesis, citing how different the two were in personality.

"It never mattered," Anders said. "Even when things were difficult, Bruce would always assure me that I could do it. He is brilliant, but he never assumed that things which were easy to him would come easily to others."

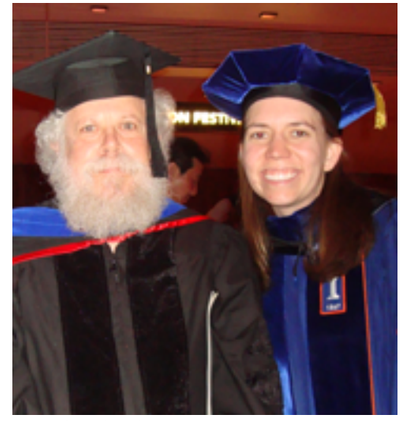
Anders, now an associate professor of mathematics at the University of Texas at Tyler, says she struggles to envision what the trajectory of her career may have looked like had Reznick not been there to support her.

"Mathematicians sometimes talk about adviser/mentee relationships in terms of a family tree. In that sense, Bruce is my mathematical father," she says. "But I also feel that Bruce is my mathematical father in every sense of the word."

Though Reznick has enjoyed his role as a teacher and adviser, after four decades of service, he says it feels like the time has come to shift his focus. He will retire this summer, but he won't be putting down the chalk anytime soon. He has research projects he is excited to work on.

He also hopes to occasionally teach a favorite undergraduate course and is open to advising PhD students in the future—both time-honored traditions for emeritus faculty in the UIUC mathematics department.

"The only thing that I feel like I'm giving up in retirement is my office," he says. ▪



Reznick and Anders at convocation, May 2014. Photo provided by Anders.

ALUMNI NEWS

UIUC mathematics alumni received national recognition throughout the 2022–23 academic year. Here are just a few of their achievements.

U of I alum invited to speak at international math congress

Dimitris Koukoulopoulos (PhD, 2010) gave an invited address at the 2022 International Congress of Mathematicians (ICM) for his paper, joint with James Maynard, solving the Duffin-Schaeffer conjecture. The conjecture was a 80-year old problem in Diophantine approximation. A description of the problem is featured in a Quanta article available at **bit.ly/Duffin-Schaeffer-true**.

Mathematics alum receives top honor from National Academy of Sciences

The National Academy of Sciences (NAS) named **Freeman A. Hrabowski III** (MA, ’71, mathematics; PhD, ‘75, education; honorary PhD, ‘04, education) the 2023 recipient of the Public Welfare Medal. The medal—which recognizes extraordinary use of science for the public good—was established in 1914 and is the Academy’s most prestigious award.

Hrabowski served as president of University of Maryland, Baltimore County from 1992–2022, where he co-founded the Meyerhoff Scholars Program to promote the success of STEM students from underrepresented minorities.

Hrabowski was an advisor to President Barack Obama on higher education policy.

Alexander Dunn is currently a postdoctoral researcher at the California Institue of Technology. | photo provided

Solving a centuries-long mathematical mystery

Alexander Dunn (PhD, ‘20, mathematics), along with mentor Maksym Radziwiłł, have proven Patterson’s conjecture — a theorem that sought to explain strange behaviors involving cubic Gauss sums. Their work brought closure to a long-standing mystery in number theory, with roots leading back to the work of Ernst Eduard Kummer, John von Neumann, and Roger Heath-Brown.

Dunn acknowleged his UIUC advisors Scott Ahlgren and Alexandru Zaharescu for helping him build the skills necessary to prove the conjecture.

Dunn and Radziwiłł’s proof was covered by Quanta Magazine in 2022.

Read the full story at **bit.ly/Dunn-Kummer-sums**.

Mathematics alumni embark on new video series project, seek volunteers

A cohort of UIUC mathematics alumni plan to develop a video series of mathematics-related talks geared toward math graduates, current students, and faculty.

Organizers are currently seeking volunteers to assist with the project.

To learn more about the projet and how you can volunteer, visit **bit.ly/CU-do-the-math**.

Project organizers for the video series want to showcase how U of I mathematics alumni, faculty, and students use math research to solve interesting world problems. | stock photo

Math advisory board sets goals for coming academic year

The Mathematics Development Advisory Board (MDAB) convened on September 30, 2022, for its 13th annual meeting.

This advisory board comprises of Illinois mathematics alumni who help the department with goal setting. The board assembled four subcommittees to help the department strategize alumni engagement, student success initiatives, fundraising, and more.

Matthew Deady, Roger Wolfson, Nancy Balma, and Robert Megginson joined the board in the fall 2022 as the three-year terms of Howard Aizenstein, Matt Byron, Meghan Galiardi, and Mary Lynn Reed came to an end.

Share your news

Are you an Illinois math alum who recently landed a new job? Won an award? Made a breakthrough in your research? Whatever your news, we want to celebrate it with you!

Get in touch at **math@illinois.edu** to tell us what you’re up to. You could be featured in the next newsletter!

Update your contact information

Have you moved or changed your email address? Share updated information for the University of Illinois alumni database.

Get involved with Math @ UIUC

The Department of Mathematics wants to bring current students in contact with alumni working in mathematics, actuarial science, and computer science, to promote networking and generate long-lasting connections through the common experience of an education from the University of Illinois Urbana-Champaign.

Scan the QR code to let us know about your interest in alumni events!

Alumnus Jerrold Levy remembers those who helped him as he receives the LAS Distinguished Service Award

Building the foundations of success for students and alumni

They say numbers tell the story, but if that's true, how do you explain Jerry Levy's story? Levy's long and successful career was defined by numbers and smart financial decisions, but now he's being honored for something beyond the realm of any numerical calculation.

That an actuary's career can run much deeper than the job description is evident once you get to know Levy (BS, '73, actuarial science). He worked for more than 40 years as a consulting actuary and pension consultant, including during the private sector's pivotal shift away from defined benefit retirement plans to defined contribution plans such as 401(k)s.

The new contribution plans shifted the responsibility of saving for retirement to employees. They saved money and time for the companies, but something about them always bothered Levy. Therefore much of his career, particularly in the latter years, was ensuring that the companies created processes that sustained pension payments for retirees who had long relied upon payments under the old plans.

"I was always mindful to advocate that organizations take care of the people that got them to where they were," Levy said.

Is it any surprise, then, that Levy, after leaving U of I in the 1970s with the education necessary to launch his career, returned to campus to help those who helped him? For his volunteer service as an alumnus to the college and the Department of Mathematics, he is receiving the LAS Distinguished Service Award.

His role on campus has been instrumental for the past several years. He served on the LAS Alumni board from 2008 to 2015 and again from 2016 to 2019, including several years as president, and he served on the Mathematics Development Advisory Board from 2013 to 2016. During that time he played a key role in the creation and expansion of a new scholarship program that by the 2021–22 school year was awarding almost $80,000 to talented mathematics students.

Levy also worked with mathematics faculty members to create a new departmental alumni awards program, and he served as a passionate advocate for the renovation of Altgeld Hall—now underway—and led efforts that paved the way for an ongoing capital fundraising campaign for the Altgeld renovation and construction of a new Illini Hall.

"Jerry's devotion to the Department of Mathematics and the College of Liberal Arts & Sciences is without parallel," said Jeremy Tyson, former chair of the Department of Mathematics, in nominating Levy for the distinguished service award. "We are fortunate to have such a passionate and effective alumnus, whose service to the university has improved the welfare of many students. His will be a lasting legacy, and stands as an inspiring example of the impact of a University of Illinois education."

Levy's service to U of I started in the early 2000s when he was approached by Carolyn Pribble, now retired from the LAS Office of Advancement, to participate in LAS Career Night, featuring alumni who returned to campus to speak with students about their jobs. Levy accepted, having already a deep affinity for his college experience and former professors. One of them, J.W. Peters—a "gentleman and a scholar," Levy said—taught actuarial science in an engaging manner, and another, William Ferguson, taught advanced algebra through an innovative old British textbook written in 1898.

"It was all about solving algebraic problems, but in a way that it fostered creativity," Levy recalled. "Being creative is very important later on, when you're faced with business problems that may not have any direct solution."

Levy's involvement with Career Night led to a seat on the college alumni council and later the mathematics advisory board. One of his proudest accomplishments on the mathematics board was co-chairing, along with Peggy Ruff (BS, '75, mathematics and psychology), the alumni awards committee. Their work highlighted several successful and innovative alumni, such as Mary Lynn Reed (MS, '90; PhD, '95; mathematics), who went on to serve as chief of the National Security Agency's mathematics research division and also received an LAS Alumni Achievement Award in 2018.

Even now, as Levy accepts his own award, he uses his moment to highlight the good work of the college and the Department of Mathematics.

"Back in the 1970s, and even today, actuaries had the stereotype of being highly analytical but not very communicative," Levy said. "But all these LAS electives that I took led to being successful in the softer aspects of my profession—the consulting part that has nothing to do with the numbers, but how well you can communicate. Because of that, I've been eternally grateful." ▪

Dave Evensen, LAS News

Mathematics Alumni Awards

Did you know?

Since 2018, the Department of Mathematics has sponsored an awards program to recognize our exceptional alumni.

Our alumni awards include:

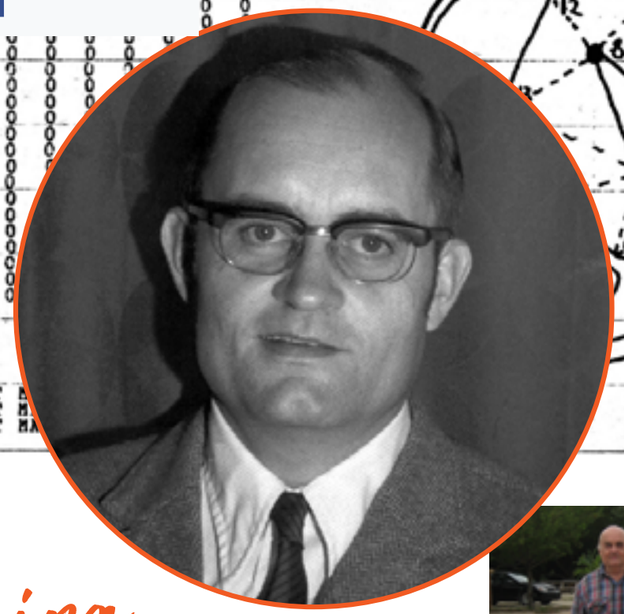
- Outstanding Achievement Award
- Alumni Humanitarian Award
- Outstanding Recent Alumni Award
- Actuarial Science Alumni of the Year

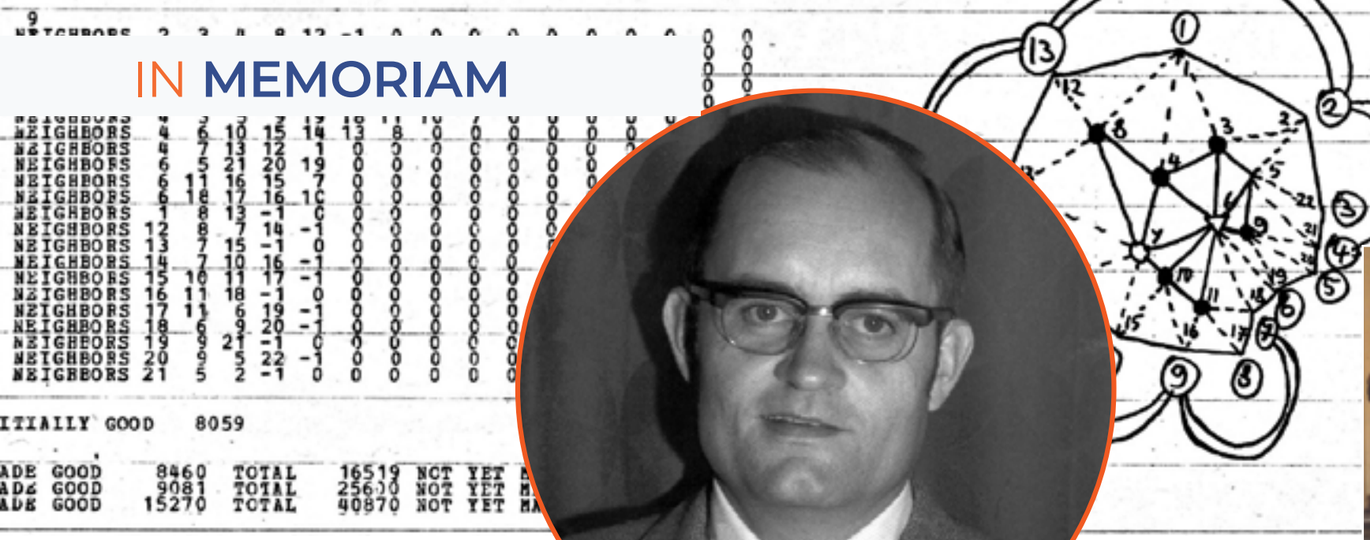
We are accepting nominations for 2024 alumni awards **through November 15, 2023.**

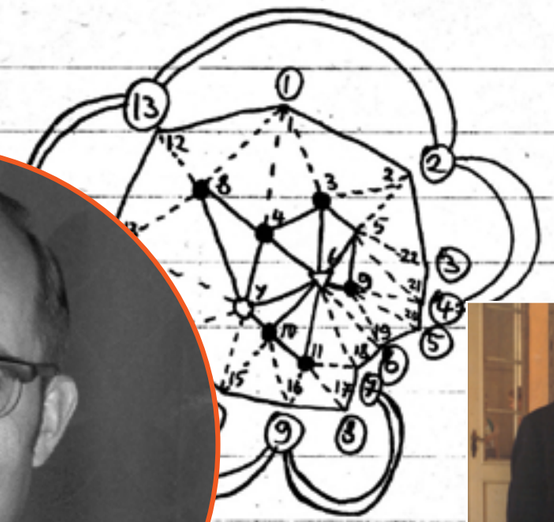
Hail to the orange!
Hail to the blue!
If you know a mathematics alum who is **ever so true...**

nominate them for an alumni award today!

Scan the code to learn more







Remembering Wolfgang Haken

Wolfgang Haken, professor emeritus of mathematics at University of Illinois Urbana-Champaign, passed away at home on October 2, 2022. He was 94 years old. He is survived by 6 children and 12 grandchildren.

Though Haken lived in the U.S. for six decades, he began his life and career elsewhere. Born in Germany in 1928, he was evacuated from Berlin to Poland during World War II, and at the age of 15 he was drafted to serve in a German anti-aircraft battery. When the war ended, he worked as a farmhand until he was able to complete a high school GED exam.

In 1946, he went to study mathematics, physics, and philosophy at the University of Kiel, where he later obtained a doctoral degree in mathematics. At Kiel, he met Anna-Irmgard von Bredow, a fellow mathematics student, whom he married in 1953.

After graduate school, Haken worked for nearly a decade as an electrical engineer for Siemens in Munich, designing microwave devices. While still in Munich, Haken solved a long-standing mathematical puzzle known as the Unknotting Problem. He published his results in *Acta Mathematica* in 1961.

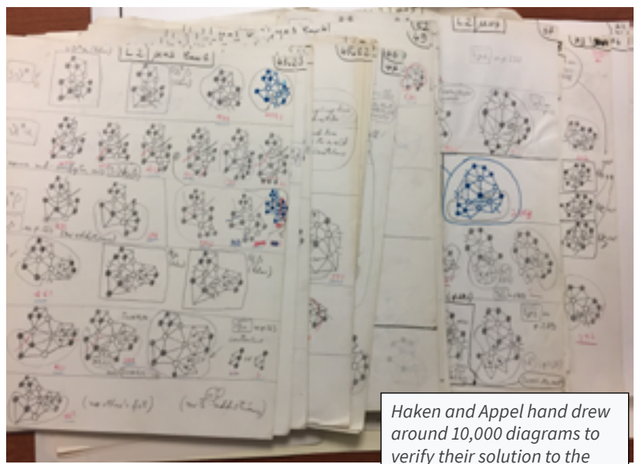
According to Ilya Kapovich, who chronicled Haken's biography in a foreword to the Spring 2016 issue of the *Illinois Journal of Mathematics*, Haken began to garner much attention from mathematicians in the United States following his solving of the Unknotting Problem.

In particular, William Boone, from the University of Illinois Urbana-Champaign, became interested in the unconventional methodology Haken had used to solve the problem. In 1962, Boone invited Haken to work on campus as a visiting professor. In 1965, Haken joined the mathematics faculty at UIUC as a tenured professor.

In the world of mathematics, Haken is perhaps most widely known for proving the Four-Color Theorem with Kenneth Appel in 1976. The Four-Color Theorem answers the question "How few colors are required to color a planar map so that no two adjacent regions contain the same color?"

Haken in Florida, 2009. Photo provided.

Haken in Germany, 1989 Photo provided.



Haken and Appel hand drew around 10,000 diagrams to verify their solution to the Four-Color Theorem.

Before Haken and Appel began working on the problem, mathematicians had conjectured that only four colors would be needed, but the answer to the question—first posed in 1852—had not yet been proven.

A 1976 issue of U of I's alumni magazine details how the pair went about solving the problem: "Haken and Appel drew about 10,000 diagrams which they and their children checked. From these, they selected 1,950 for machine analysis. The computers checked every possible arrangement of four colors for each configuration and a ring of up to 14 neighboring regions—sometimes nearly 200,000 possible combinations." It took around six years for Appel and Haken to complete this work.

> **"Behind his modest and unassuming demeanor...was a tough and fearless man."**

Appel and Haken's proof was notable for being among the first to be solved using a computer, as opposed to traditional hand-computation methods, and the result quickly became national news.

The September 1976 issue of *Time* read, "Up to now, many theorists have been wary of using computers rather than simple, elegant blackboard equations to seek out basic mathematical truths; tedious chores like tracking a spacecraft, which involve no new principles, were left to electronic brains. Now, by dramatically showing that there may be certain fundamental questions that only the high-speed electronic whizzes can answer, Appel and Haken may well have ushered in a new era of computer computation on the frontiers of higher mathematics."

In 1978, Haken gave an invited talk to the International Congress of Mathematicians in Helsinki, Finland—which, for those who conduct mathematics research, might as well be an induction into a hall of fame. In 1979, Haken also jointly received an inaugural Fulkerson Prize for his paper with Appel. Throughout the 1960s and 1970s, Haken's research was pivotal in the development of 3-manifold topology, and his work in this area remains widely influential today.

Haken's interests also strayed outside the area of mathematics. He enjoyed camping and bicycling. He was a talented woodworker, making both furniture and musical instruments. He loved attending the performances of the Champaign-Urbana Symphony Orchestra (CUSO), in which his daughter Armgard is a violinist. "One of his favorite performances was CUSO's performance of Beethoven's Symphony No. 7," says Armgard.

Haken also loved the outdoors. He and his family regularly participated in the "Saturday Hike," a Champaign-Urbana tradition dating back to 1909. In a recent letter to the *Math Times* editor, Kapovich recalled one winter hike when he, Haken, and several other hikers traversed several miles along a creek and over a bridge, eventually finding themselves at a point directly across a creek from their base camp.

"While the rest of us looked at the camp and contemplated an arduous walk back, Wolfgang said 'Well, we'll just have to wade through.'"

As Haken moved into frigid waist-deep water and crossed to the other side, Kapovich realized something: "Behind his modest and unassuming demeanor Wolfgang was a tough and fearless man."

Wolfgang Haken (right) and Kenneth Appel (left) spent six years proving the Four-Color Theorem in 1976. | photo: Illinois News Bureau

The research and contributions of Wolfgang Haken remain an integral part of the history of the University of Illinois Urbana-Champaign. ▪

DEPARTMENT OF MATHEMATICS
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