



Math News

A PUBLICATION OF THE NEBRASKA DEPARTMENT OF MATHEMATICS

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Scholarship

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in calculus

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GREG NATHAN | UNIVERSITY COMMUNICATION

Nebraska alumna Joyce Yen of the University of Washington speaks to UNL mathematics faculty and students on Oct. 17, 2019.

‘I like being a connector’

The satisfaction that first came from solving problems in mathematics now fuels Joyce Yen in her pursuit to solve issues in equity, diversity, and inclusion at the faculty level.

Yen is the director of the University of Washington’s ADVANCE Center for Institutional Change, a program funded by the National Science Foundation that works to improve the academic climate for women not only at Washington, but also across the nation. Since 2003, Yen has helped lead 13 grants, worth a total of more than \$6.7 million, to advance women faculty in science, engineering, and mathematics.

“I get to read the most interesting things. I synthesize knowledge across different disciplines and ‘teach out’ that knowledge in many different ways,” said Yen, a 1995 graduate of the University of Nebraska–Lincoln in mathematics. “I like being a connector. A lot of what I do is synthesizing and connecting information to someone else who might not know that information and to whom that information could be perspective-changing.”

After earning her master’s and doctoral degrees in industrial and operations engineering at the

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{ VIEW FROM THE CHAIR }

Dear alumni and friends,

As we bring this year to a close, producing the newsletter allows us to reflect upon the work we have done and look forward to more opportunities for building connections with our students, alumni, faculty, and staff. In many ways, the department is already achieving the goals set forth in the university's new N2025 Strategic Plan, based on the central principle that "Every person and every interaction matters."



Tom Marley

Two of the six aims of this five-year plan are:

- To innovate student experiences that prepare graduates for lifelong learning and contributing to Nebraska's diverse future workforce. The student experience at Nebraska should instill the value that every person and every interaction matters, resulting in alumni who value every person and every interaction.
- To broaden Nebraska's engagement in community, industry, and global partnerships. The university should embrace a culture of engagement and partnership that generates genuine mutual benefits both in Nebraska and across the world, while creating extraordinary opportunities for students, alumni, industry, community partners, faculty, and staff.

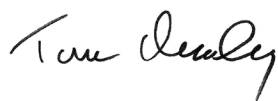
This newsletter showcases the department's relentless focus on student learning and the growth in the outreach that we do with our alumni and our community. You'll find stories on:

- active learning in our pre-calculus and calculus classes, efforts which have made our department a national model (Page 4);
- STEM CONNECT, a new NSF-funded scholarship program at UNL aimed at helping low-income students and students from underrepresented groups pursue careers in mathematics and other STEM fields (Page 3);
- a major gift from alumnus Ernie Haight to fund internships for graduate students (Page 5);
- the creation of several new curricular tracks for math majors to more closely align with their career interests (Page 19); and
- a new program for inmates at Lincoln Correctional Center to earn college credit in mathematics courses (Page 6).

Moreover, you'll find news about cutting-edge research by our faculty and students, awards and honors won by members of our department community, and achievements of our alumni.

Finally, I want to express my extreme gratitude to two of our faculty, Lucho Avramov and Glenn Ledder, who will be retiring at the end of this academic year. Glenn joined the department the same year as I did, in 1989, and we sort of "grew up" together as members of the department. He has been a long-time member of our undergraduate curriculum committee and helped oversee a boom in the number of our majors in recent years. He has also been one of the lead organizers of the Nebraska Conference for Undergraduate Women in Mathematics for many years. Lucho, an internationally renowned algebraist, joined our department in 2002 as the Dale M. Jensen Chair of Mathematics and has been absolutely vital in making our department one of the top places in the world for commutative algebra. He leaves a large legacy on the department's research mission. Both Glenn and Lucho will be sorely missed.

I am immensely proud of the breadth of achievements and new initiatives over the past year that continue to build on a culture of excellence in education and research. Many thanks to Lindsay Augustyn in the Center for Science, Mathematics, and Computer Education, our "editor-in-residence" down the hall in Avery, for 10 years of bringing all of these stories to life for us in our annual Math News.



STEM CONNECT: Scholarship targets low-income, underrepresented students

More than 120 low-income Nebraska students will benefit from a new five-year, \$3.56 million grant from the National Science Foundation while they pursue careers in science, technology, engineering, and math.

The University of Nebraska–Lincoln is partnering with Southeast Community College and Western Nebraska Community College to build out the state’s STEM workforce through a new grant, STEM Career Opportunities in Nebraska: Networks, Experiential-learning and Computation Thinking. Applications are now being accepted from students who will be first- and second-year students in the fall of 2020, and STEM CONNECT hopes to offer up to 62 scholarships between the three institutions.

This funding from NSF’s S-STEM initiative will provide scholarships and academic support for low-income students, specifically targeting underrepresented minorities, women, and rural and first-generation students. Students who begin at a community college in the academic-transfer program will take courses to build their strengths in math and computer science, while the students who begin at Nebraska will major in math, computer science, computer engineering, or software engineering.

“We will be working with academically gifted, low-income students, and help them to successfully enter the workforce or pursue graduate education,” said Jim Lewis, Aaron Douglas Professor of mathematics and STEM CONNECT’s principal investigator. “We know that finances are not the only hindrance to student success. This grant will also allow us to build out academic communities, establish faculty mentors and adapt curricula here and at our partner institutions

that ensure success, based on existing research.”

At Nebraska, Lewis leads a team that includes Amy Goodburn, senior associate vice chancellor and dean of undergraduate education; Brittany Duncan, assistant professor in computer science and engineering; Petronela Radu, Olson Professor in mathematics; and Wendy Smith, research associate professor in the Center for Science, Mathematics, and Computer Education.

Financial need and scholarship amounts will be determined by the FAFSA, and scholarships can be as much as \$8,000 per year. They are renewable for four years at Nebraska, or two years at SCC or WNCC, and then funds will follow students for two more years if they transfer to Nebraska.

The grant also funds a research study, led by Smith and Rebecca Carr, associate director of institutional research at SCC. The study examines which factors affect retention, academic success, and graduation in STEM fields among low-income students, and how those factors differ among students who transfer from a two-year to a four-year institution.



CRAIG CHANDLER | UNIVERSITY COMMUNICATION
Jim Lewis speaks at the Aug. 30 grant announcement.

The program boasts a large interdisciplinary team of researchers, advisers, and administrators from all three institutions, including SCC and WNCC principal investigators Sandeep Holay and William Spurgeon, as well as SCC’s Dean of Arts and Sciences Carolee Ritter and WNCC physics instructor Scott Schaub.

“As we put this program together, we discovered we have a lot of knowledge on these issues in our midst, and we’re going to draw expertise from many domains to ensure the success of these students,” Lewis said.

If you know a talented high school senior who has been successful in mathematics or computer science courses, encourage them to visit <https://scimath.unl.edu/stem-connect> and complete a Free Application for Federal Student Aid, better known as FAFSA, to learn whether they are eligible for financial support.

If you would like STEM CONNECT to send a personal invitation to a student to apply to the scholarship program, send their name and contact information to nebraskamath@unl.edu.

– Deann Gayman of University Communication and Lindsay Augustyn



ACTIVE LEARNING: Math strategies proving integral to calculus success

Active learning is transforming calculus at universities nationwide—and the University of Nebraska–Lincoln is helping to lead the movement.

Active-learning strategies encourage the student-led questioning, reasoning, and communication of key mathematical concepts, with instructors promoting engagement and building on student thinking.

Since 2016, Nebraska's Department of Mathematics has expanded its implementation of active-learning strategies from pre-calculus courses into Calculus I, Calculus II, and business calculus. Moreover, a team of educators, led by Wendy Smith of the Center for Science, Mathematics, and Computer Education, is part of a National Science Foundation-funded effort to support nine other universities in making similar changes.

Depending on the type of institution, one-quarter to half of U.S. college students will fail their first math course, Smith said. Negative experiences in a math course lead about 50 percent of students to switch from a major in science, technology, engineering, or mathematics after their freshman year.

Implementing and sustaining positive changes will require math departments to adopt a culture that values teaching and student success, Smith said.

"It is well established in the literature that active learning improves student learning and therefore grades. It reduces failure rates by a third," said Allan Donsig, chair of the first-year math task force, a faculty committee in mathematics that led the changes to pre-calculus and, more recently, to calculus.

The department also recently mirrored the active-learning setup of its pre-calculus classrooms in Brace Lab by adding movable tables and chairs into five classrooms in Louise Pound Hall for calculus recitations.

Student success in undergraduate calculus is growing alongside the number of classrooms that incorporate



CRAIG CHANDLER | UNIVERSITY COMMUNICATION

Mathematics graduate student Justin Nguyen assists student Briell Redd in Math 106: Calculus I in Fall 2019 in the newly renovated Louise Pound Hall. The active-learning setup includes movable tables and chairs as well as whiteboards on all sides of the room.

active learning. The department measures student success as the percentage of students earning a grade of C or better. By that metric, the success rate of Calculus I has risen from 62% to more than 75%, said Smith. The success rate in Calculus II, meanwhile, has approached 80%.

"Implementing active learning requires many changes: suitable online homework, professional development for recitation leaders, coordination of instructors, classrooms that support active learning, and so on," Donsig said. "We have benefited from a dedicated team of people, including math educators, faculty, and graduate student instructors."

Nathan Wakefield, director of first-year mathematics programs, oversees the training and mentoring of the graduate teaching assistants. For the past five years, Wakefield has taught a pedagogy course to the graduate TAs before they teach their first course, which has greatly contributed to the department's successful transformation.

Alongside the University of

Colorado Boulder, San Diego State University, and the Association of Public and Land-grant Universities, Nebraska has entered the second phase of the five-year, \$3 million NSF project. That second phase involves sharing what worked in the first phase with nine other universities now looking to incorporate active learning into their own calculus instruction. Project leaders have already visited each of the nine additional institutions and are now analyzing data.

"We're actively supporting them in enacting transformational changes to their departments," Smith said. "In 2020, we will go back to see what changes they've managed to make."

"As we share the lessons we've learned from our first phase to help these institutions accelerate transformative changes, we've also been helping them form a networked improvement community with each other, knowing that when you are working on similar problems, you can accelerate your own improvement by collaborating strategically."

Nebraska's own active-learning efforts began in 2012 with a task force that focused on Math 100A through Math 103. Student-success rates in those courses rose from about 65% to 80%.

"At other campuses, they've had similar successes, or they already had high success rates," Smith said. "But they've doubled the enrollment in a subsequent course—such as doubling enrollment in Calculus II after Calculus I—while keeping the same success rate."

Freshmen retention rates correlate strongly with math grades. At Nebraska, roughly two-thirds of freshmen take a math course in their first semester.

"If you're trying to correlate freshman retention with course-taking, it's going to correlate with math," Smith said. "Nebraska does not want a student's experience of failing their first math class to be something that derails their college plans or future STEM careers."

– Lindsay Augustyn

Haight gift will fund graduate internships

The time Ernie Haight spent at Nebraska studying toward a master's degree in mathematics in the early 1950s was among the most meaningful experiences of his life.

"He regarded the education he received at the University of Nebraska to be the foundation for all that he was able to accomplish in his professional life," said the Hights' son Mark Haight about his father's experience.

Over the years, Ernie Haight demonstrated his appreciation by giving more than \$114,000 to the Department of Mathematics. Then, following his death in 2018, he provided a \$208,000 estate gift to the University of Nebraska Foundation to support the Department of Mathematics Emeritus Faculty Fund. The department will use the annual income from the Haight gift to fund one or more graduate student internships in industry or a research lab.

Ernie Haight grew up in Holland, Michigan, during the Great Depression. After high school, he served in the U.S. Army during World War II. He then attended Hope College, in his hometown, where he also met his wife, Kathy. When searching for a graduate school, Ernie was drawn to Nebraska because of a graduate teaching assistantship offer. So, the couple moved to Lincoln in 1951, and Kathy taught for the Lincoln Public Schools.

After Ernie graduated in 1953, he worked for McDonnell Douglas Aircraft in Los Angeles. From there, the family moved to St. Paul, Minnesota, where Ernie worked for Remington Rand/Univac. Finally, in 1964, the

family moved to Orlando, Florida, where Ernie devoted the remainder of his career to the Martin Marietta Corporation, developing real-time software and firmware for weapons and communications systems.

Jim Lewis, chair of the UNL mathematics department from 1988 to 2003, enjoyed the Hights' annual return visits to Nebraska. For many years, until Kathy's health began to fail, Ernie and Kathy would come to see friends and always attend a football game. Ernie had great admiration for coach Tom Osborne and Chancellor Martin Massengale. In turn, each would generously give of his time and meet with the Hights during their visits.

In addition to going to football games, Ernie and Kathy attended several volleyball matches with Jim and Doris Lewis. Ernie really enjoyed watching Nebraska volleyball, Lewis said, and appreciated the commitment to excellence that was continuously exemplified by the coaching staff.

For their 1991 visit, Ernie and Kathy were joined by Mark Haight, and they had a chance to visit with three of Ernie's former professors: Lloyd Jackson, Bill Leavitt, and Ed Halfar. These three professors, together with former department Chair Miguel Basoco and Professor George Seifert, greatly influenced Ernie during his graduate education. The stories that were told in the Haight household regarding these men were numerous and nearly reverential, as these professors set an extremely high standard that stayed with Ernie

throughout his entire professional career, Mark said.

"We had various conversations, and the first thing that became very clear was that Ernie had such a positive memory of his professors," agreed Lewis, Aaron Douglas Professor of mathematics, who is both UNL's director of the Center for Science, Mathematics and Computer Education and of STEM education research initiatives in the Office of Research and Economic Development.

According to Mark, "One of Ernie's biggest concerns regarding the position of the United States in the contemporary world was its seemingly increasing inability to produce employees who were capable of designing and producing products that actually worked."

Not only did Ernie remember his time as a graduate student with great fondness, it also was a time of great stress. It was therefore his desire to provide assistance to graduate students in the field of math, in particular students who have some type of working internship in the real world.

"Graduate students, more and more, are an important part of the technical and scientific workforce, where data science and mathematics skills are needed," Lewis said. "To honor Ernie, his gift will support a non-academic internship and open doors to non-academic employment for graduate students in the Department of Mathematics."

See the list of recent graduate internships on Page 21.

STAFF NEWS



The department is pleased to welcome back **Rachelle Jensen**, who joined the department in August as the administrative

technician. Jensen previously worked for the American Mathematics Competitions for 20 years.

Her general responsibilities now include general office support, supervising student workers, room reservations, website and flyers for seminars and colloquia, travel arrangements and reimbursements, schedule of classes, make-up exams, quizzes, and office supply inventory management.

Throughout her time at the AMC, Rachelle worked with Walter Mientka, Titu Andreescu, and Steve Dunbar, in various roles including registration clerk, office manager, and executive

assistant to the director.

In her free time, Jensen enjoys staying active and spending time with her two sons, Shane and Travis, and her grandkids, Ashlyn and Beckett.

Mathematics advisor **Doug Pellatz** was the 2019 recipient of the Dr. Charles Riedesel Outstanding Academic Advising Award, recognizing an exceptional faculty or staff member who directly delivers advising services to undergraduates.

'I teach differently now because of teaching in a prison'

Twelve students and two instructors are escorted into a classroom.

There is no internet access. Calculators must stay in the room. The background knowledge of the students in the room is highly diverse; for some, this is the first college class they have ever taken, and for others, they could be math majors right now—under different circumstances.

However, most importantly, they are all ready and eager to learn mathematics.

Thanks to a partnership between the University of Nebraska–Lincoln and the Lincoln Correctional Center, inmates at LCC earned college credit in an Intermediate Algebra course in the summer of 2019, taught by Nebraska alumna Professor Kristie Pfabe of Nebraska Wesleyan and Meggan Hass, a UNL mathematics graduate student.

"I have never ever been more convinced that I had made a difference in someone's life than by teaching this class," Hass said. "One thing I learned through this process is that it was more important that I was giving the students what they needed, and not what I wanted."

Not unlike students in math courses across the UNL campus, Hass and Pfabe had to show the LCC students with low self-esteem in mathematics that they were capable. Hass said they were suspicious that the instructors were lowering the difficulty level, but when Pfabe and Hass assured them they were not, it was validating for the students to know they were doing truly college-level work.

"We had some students in the class who were very strong mathematically, and we had some who really struggled. The ones who were strong never made the ones who struggled feel inferior. In fact, they had this strong partnership where the strong students helped the weak students and the weak students felt comfortable asking for help," Pfabe said.

Teaching in a prison setting also means lesson planning on a whole new level. In an environment with no internet communication between instructor and student, or peer to peer, Pfabe and Hass found that everything had to be planned ahead of time. They had to pick a different textbook from what UNL uses, since it could not be an online open resource. They also decided to carpool together to the prison for each class, so they could use that time to prepare on the way there, debrief on the way home, and plan announcements.

"The students couldn't just Google what they didn't know," Hass said.

To be accepted, students needed a GED or high school diploma, and then they took a standardized test, filled out an application, and were interviewed. Pfabe asked the applicants questions such as 'Are you willing to put in the time?' and 'What is the hardest thing you have ever done?'

Pfabe and Hass held office hours before every class for



LINDSAY AUGUSTYN | UNL CSMCE

Kristie Pfabe and Meggan Hass present on Nov. 22, 2019, on teaching Intermediate Algebra together at the Lincoln Correctional Center in the summer of 2019.

45 minutes, and all of the students had to attend, even if they didn't have questions. That was when the instructors got to know the students.

"At the end of the class, I told them what a great experience it was for me, and they reciprocated that and said, 'Nobody ever comes here. Thank you for coming,'" Pfabe said. "It's heart-wrenching to hear those things, but empowering. It makes you want to do it more because they were so eager and excited to learn."

While this was the first time Hass had taught in a prison, Pfabe had developed and taught an eight-week-long course in combinatorics and probability, for two hours per week, at both the penitentiary and LCC. Pfabe taught Algebra 1 at LCC with a different group of students in Fall 2019.

Inspired by the book "Just Mercy" by Bryan Stevenson, Pfabe worked with Wesleyan to invite the author to give a talk in September 2017 and, in anticipation of his visit, reached out to the state penitentiary and LCC to learn how to start teaching mathematics there.

With two instructors this summer, one got to observe the students while the other taught, which was highly beneficial to both Hass and Pfabe.

"There was a lot of frustration but it was visible and because it was out there in the open, we were able to talk about it, we could discuss how they could respond to it, and we could also adjust what we were doing to make things go more smoothly," Hass said.

Pfabe said she learned the importance of making very few assumptions on their background knowledge. The students had excellent penmanship and meticulous homework. The students for whom English was their second language had outstanding math skills.

"Dr. Pfabe said they were super curious and always wanted to know 'why,' and that is awesome. We all want our students to be curious about the 'why,' but sometimes it was extreme," said Hass, who will leave UNL to work at Epic in Madison, Wisconsin, in January. "We couldn't let anything slide. They won't let you move on. They will not give up until something makes sense to them, which I think made me a much better teacher and more careful about how I explained things. But, it was not something I was used to."

LCC { PAGE 13 }

PI MU EPSILON LECTURE: Joseph Gallian

Professor Joseph Gallian of the University of Minnesota–Duluth, a former president of the Mathematical Association of America, gave the 13th annual Pi Mu Epsilon lecture “Using Mathematics to Create Symmetry Patterns” on Oct. 11, 2019, following the induction of five new undergraduate members into the Nebraska Alpha chapter of Pi Mu Epsilon.

The Pi Mu Epsilon lecture series provides an opportunity for undergraduate math majors to meet a distinguished professor from another university who offers a glimpse into their work at an accessible level for students working in undergraduate studies.

This goal is especially pertinent as Gallian is the director of one of the longest running and most renowned summer research programs for undergraduates. As such, his lecture consisted of previous problems his old REU students have worked on, such as finding Hamiltonian cycles and paths in Cayley graphs and creating symmetry patterns.

In the middle of his lecture, Gallian also detailed his experience dealing with the Mathematics Awareness Month. Prior to his meeting, Gallian had printed out his posters in great quality in anticipation of his idea, Mathematics & Art, being accepted. Although it was initially rejected, the quality of work shown, as well as the lack of other suggestions, led to his idea's acceptance. Thus, Gallian called on the audience to



ALYSSA WHITEMORE | UNL MATHEMATICS

Five students were inducted into the Nebraska Alpha Chapter of Pi Mu Epsilon (PME) on Oct. 11, 2019. Pictured left to right: Zach Kerkman, Allie Cruikshank, Jackson Lederer, Jordan Wong, and Elizabeth Griggs, along with Shannyn Bird (PME chapter president), Joseph Gallian (PME lecturer), and Alexandra Seceleanu (PME faculty advisor).

be prepared and confident.

Prior to Gallian's lecture, Pi Mu Epsilon also held a luncheon with Gallian for students to ask questions and listen to him speak in a less formal environment. He spoke about his REU: how he runs it, examples of the students he chooses, and the topics the students work on.

However, a large proportion of his time was dedicated to his love of the Beatles. In addition to being a mathematics professor, Gallian had also taught “The Lives and Music of the Beatles.” He holds a Beatles Night to conclude his REU and detailed one of his most enjoyable experiences: a Beatles-themed show at Las Vegas.

Gallian is the Morse Alumni

Distinguished University Professor of Teaching in the Department of Mathematics and Statistics at the University of Minnesota–Duluth. He won the Haimo Award from the MAA in 1993 for distinguished teaching as well as the MAA's Mary P. Dolciani Award for making a distinguished contribution to the mathematical education of K–16 students.

The Nebraska Alpha chapter of Pi Mu Epsilon is currently celebrating its 91st anniversary and is supported by the Department of Mathematics at the University of Nebraska–Lincoln.

– Derek Chew, senior mathematics major, secretary of the Nebraska Alpha chapter of PME

KUMUNU: Lincoln hosts Algebra conference

The KUMUNU Algebra Conference was held in Lincoln this fall for the first time since 2011.

KUMUNU is an annual gathering, occurring since 1999, of faculty and graduate students in algebra from around the Midwest and beyond for a weekend of talks, a poster session, and informal collaboration. The conference rotates every three to four years among the campuses of University of Missouri–Columbia, the University of Kansas, and

the University of Nebraska–Lincoln.

This year, the conference drew over 90 participants, approximately 60% of whom were graduate students, who traveled from destinations as far away as Riverside, California, and Morgantown, West Virginia.

The main speakers for this year's conference were Federico Castillo (Kansas), Papri Dey (Missouri), Linquan Ma (Purdue University), Hamid Rahmati (UNL), Liana Segal

(University of Missouri–KC), and Gordana Todorov (Northeastern University). In addition, 15 graduate students presented posters.

The conference was organized by Tom Marley and Mark Walker, with logistical support from Marilyn Johnson. Funding for the conference was provided by a grant from the National Science Foundation. The KUMUNU conferences for 2020 and 2021 will be held in Lincoln as well.

2019 AULBACH PRIZE: Al Peterson

The 2019 Bernd Aulbach Prize, the top honor given by the International Society of Difference Equations (ISDE), was awarded to Professor Emeritus Allan Peterson of the Department of Mathematics at the University of Nebraska–Lincoln. The winner delivers a lecture at the annual meeting of ISDE, which Peterson gave at the London meeting in July.

Professor Bernd Aulbach, from the University of Augsburg, Germany, was involved in the early establishment and founding of the ISDE. In his memory, the Aulbach Prize was established and is awarded to someone who has contributed fundamental results to the general area of difference equations.

Peterson has been continuously elected to the Board of Directors of ISDE since its inception in 2001. An ambassador for difference equations and for mathematics, evidenced by his wide outreach appeal to undergraduates and record number of doctoral students, Peterson and his research and teaching contributions span ordinary differential equations, finite difference equations, and, more recently, dynamic equations on time scales.

Peterson received his B.S. and M.S. degrees in mathematics at the South Dakota School of Mines & Tech in 1963 and 1965, respectively, and his Ph.D. in mathematics at the University of Tennessee in 1968 under the guidance

of the well-known Professor John Barrett. Since 1968, he has been a faculty member at Nebraska. He has supervised more than 50 undergraduate REU students and has advised 34 doctoral students. Peterson retired in 2019.

Peterson is the author of eight textbooks and monographs and 205 research articles, accumulating more than 5,000 citations; editor of 17 mathematical journals; and reviewer for numerous scientific journals. He also holds Distinguished Teaching Awards, is the Centennial Alumni Award Winner of the South Dakota School of Mines, received a Certificate of Appreciation from the United States Department of Education, a Professor Pizzaz Teaching Award, and has been the Charles Bessey Distinguished Professor at Nebraska since 2006.

His textbook “Difference Equations: An Introduction with Applications” with Professor Walter Kelley, which arguably set the standard for books in that area, is now in its second edition, as is another more recent textbook with Kelley, “The Theory of Differential Equations.” His 1996 monograph “Discrete Hamiltonian Systems: Difference Equations, Continued Fractions, and Riccati Equations,” co-authored with Professor Calvin Ahlbrandt, was presented as the keynote address at the 1997 Rocky



Mountain Mathematics Consortium Summer Conference at the University of Wyoming.

Influenced greatly by Stefan Hilger and Aulbach and the presence of Professor Lynn Erbe at Nebraska, Peterson directed his research and teaching efforts toward dynamic equations on time scales in 1998. In 2001, he published “Dynamic Equations on Time Scales: An Introduction with Applications,” with Martin Bohner. In the MathSciNet database, out of all items originally published in 2001, this book currently has the second-highest number of citations.

Peterson’s latest book, “Discrete Functional Calculus,” serves as an introduction to the subject, and was co-authored with his Ph.D. student Christopher Goodrich in 2015.

– Lindsay Augustyn and Lynn Erbe

NEW GRANTS

George Avalos, Mathematical Control Theory and Analysis of Partial Differential Equations Coupled Across a Boundary Interface, National Science Foundation

Huijing Du, Mathematical Modeling of Robust Spatiotemporal Dynamics in Epidermal Development, NSF

Mikil Foss, All Girls/All Math (AGAM) 2019, American Mathematical Society

Mikil Foss and Petronela Radu; **Alexandra Seceleanu**, NSF INTERN supplements

Taran Funk, Su Ji Hong, Adolfo Martin, & Mark Walker, URICA-KUMUNUjr 2020-21

Yu Jin, AGAM 2020, Nebraska EPSCoR

Christine Kelley, Glenn Ledder, & Alex Zupan, Nebraska Conference for Undergraduate Women in Mathematics, NSF and National Security Agency

Jim Lewis, Petronela Radu, & Wendy Smith, STEM CONNECT, NSF

Tom Marley and Mark Walker, KUMUNU 2019-21, NSF

Mark Walker, Free resolutions, K -theory, and DG-categories, NSF

Wendy Smith, Innovating Life Sciences Education through Computational Modeling and Simulations (PI: Tomas Helikar) and Noyce Track 4 Persistence, Effectiveness and Retention Studies In STEM Teaching (collaborative), NSF

NEW FACULTY PROFILE: Chris Schafhauser



New faculty member, Assistant Professor Christopher Schafhauser, will have his paper “Subalgebras of simple

approximately finite-algebras” published in a forthcoming issue of the prestigious journal *Annals of Mathematics*, published by Princeton University and the Institute for Advanced Study. The *Annals of Mathematics* is considered by most mathematicians to be one of the top three journals devoted to mathematical research. Having a paper appear in the *Annals of Mathematics* is a rare and significant honor. It is particularly unusual for an assistant professor, at any institution, to publish in this journal.

Schafhauser, who joined the Nebraska Department of Mathematics in 2019, wrote the paper during the 2017–18 academic year as a postdoctoral fellow at the University of Waterloo in Ontario, Canada. Read the abstract at: <https://annals.math.princeton.edu/articles/15519>.

Schafhauser, who already has 13 publications, graduated with his Ph.D. in mathematics from UNL in 2015, completing the program in four years. He joins the UNL faculty as an established leader in operator algebras. As a faculty member, Schafhauser serves on the graduate advisory committee and teaches the graduate functional analysis course, Math 928.

While at UNL as a doctoral student, Schafhauser founded a learning seminar on operator algebras targeted at first- and second-year graduate students, which still runs today. Schafhauser also was in the Graduate Assistants in Areas of National Need (GAANN) program from 2012–14.

“The seminar was initially started by Travis Russell, Derek DeSantis,

His paper “Subalgebras of simple approximately finite-algebras” will be published in an issue of the prestigious journal *Annals of Mathematics*.

and myself in the spring of 2014,” Schafhauser said. “It was modeled off UNL’s commutative algebra reading seminar. One of the goals of the seminar was for it to be run by graduate students, and to not involve faculty, so that asking questions and giving talks would be a bit less intimidating for younger students.”

Schafhauser also co-organized three seminars on C^* -algebras at Waterloo. After completing the postdoc at Waterloo with Professor Kenneth Davidson and Associate Professor Matthew Kennedy, he began a postdoc at York University in Toronto. As a York Science Fellow, he was supported by the Simons Foundation and worked under the supervision of Professor Ilijas Farah and Assistant Professor Paul Skoufranis. He ran a seminar course on the classification theory of C^* -algebras at the nearby Fields Institute for Research in Mathematical Sciences.

Schafhauser’s work is in a branch of functional analysis that deals with the structure and classification theory of C^* -algebras and operator K -theory. C^* -algebras were introduced in the mid-20th century to provide a mathematical framework for quantum mechanics. Schafhauser has recently been studying classification problems in C^* -algebras via their K -theory. His work has led to a new K -theoretic method for constructing homomorphisms between C^* -algebras, which in turn has led to a simplified proof of a fundamental result of Tikuisis, White, and Winter regarding quasidiagonality of C^* -algebras. Quasidiagonal C^* -algebras are a far-reaching generalization of

SCHAFHAUSER { PAGE 10 }

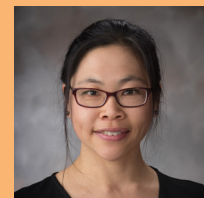
NEW POSTDOC



Edith T. Hitz Postdoctoral Faculty Fellow **Abigail Raz** earned her Ph.D. in mathematics from Rutgers University under

the direction of Jeff Kahn. Her research is focused in extremal and probabilistic combinatorics. She originally hails from the greater Philadelphia area, and received her B.A. from Wellesley College. In addition to research and teaching she also serves on the undergraduate activities committee, helping to organize and run events for the UNL Math Club.

PROMOTIONS



Mikil Foss has been promoted to full professor and **Yvonne Lai** received tenure and a promotion to associate professor in the Department of Mathematics.

AWARDS

Yvonne Lai was named a Teaching Academy Fellow for fall semester 2019 at Nebraska. The initiative engages faculty in local, national, and international conversations about essential issues in higher education, develops teaching expertise, and recognizes and rewards exceptional teachers.

Professor **Petronela Radu** was selected by the UNL Executive Vice Chancellor’s office as one of 28 faculty to participate in the new Faculty Leadership in Academia: From Inspiration to Reality program, which provides professional development to faculty who are considering a leadership role or are on a path to an academic leadership position.

AMS FELLOW: Mark Walker



Mark Walker, Willa Cather Professor in the Department of Mathematics, was named a Fellow of the American Mathematical Society for his

work in developing novel applications of K -theory and using them to prove long-standing conjectures. Walker is one of 52 mathematical scientists from around the world in the AMS Fellows Class of 2020.

This designation recognizes AMS members “who have made outstanding contributions to the creation, exposition, advancement, communication, and utilization of mathematics.”

Fellows present a public face of excellence in mathematics, elect new fellows, and advise the AMS president

and council on public matters. The AMS Fellows Selection Committee accepts nominations for Fellows between Feb. 1 and March 31 each year.

Walker joined Nebraska in 1996. He is an internationally recognized leader in research in algebraic K -theory, making significant contributions to the fields of algebraic geometry and commutative algebra. He has received the College of Arts and Sciences Distinguished Teaching Award and has served as the chair of the department's Teaching Advisory Committee for many years.

Many of his papers have appeared in the top journals in mathematics, such as the *Annals of Mathematics* and *Inventiones Mathematicae*. Recently he has applied techniques from K -theory to resolve a number of long-standing open problems in commutative algebra.

To see the complete list of the AMS Fellows Class of 2020, visit <https://www.ams.org/profession/ams-fellows/new-fellows>.

SCHAFHAUSER { FROM PAGE 9 }

diagonal matrices.

Refined versions of Schafhauser's techniques also lead to new classification results for mappings between C^* -algebras. These techniques have significant structural consequences in C^* -algebra theory. In particular, they give a partial solution to a long-standing question of Blackadar and Kirchberg on the structure of subalgebras of inductive limits of finite-dimensional C^* -algebras.

Originally from Appleton, Wisconsin, Schafhauser earned his B.S. in mathematics from the University of Wisconsin–Platteville. Over the years, he has taught courses in mathematics ranging from College Algebra and Trigonometry to an abstract Measure Theory course, as well as various levels of calculus, linear algebra, and differential equations.

“I look forward to advising master's and Ph.D. students in the near future,” Schafhauser said.

Lewis named director of STEM education research



Jim Lewis, Aaron Douglas Professor of mathematics, became the university's first director of science, technology, engineering,

and mathematics education research initiatives on Jan. 1, 2019.

An award-winning educator with deep experience leading teaching and learning initiatives, Lewis' role bolsters support for Nebraska faculty engaged in STEM research, education, and outreach. The position is under the Office of Research and Economic Development's purview.

He will work closely with faculty and center directors to

- increase extramural funding from the National Science Foundation and other federal agencies;
- increase the number of faculty pursuing NSF-sponsored research and

support their success;

- boost efforts to recognize top faculty through national honors and awards;
- build large-scale research projects and resources for STEM education and its broader impacts; and
- will serve on ORED's senior leadership team.

A veteran faculty member, Lewis brings experience as a center director; principal investigator on major NSF awards, including the Math in the Middle Institute Partnership, NebraskaMATH, and NebraskaNOYCE; and former mathematics department chair. In 2017, he was named a fellow of the American Association for the Advancement of Science, the world's largest general scientific society.

Lewis took a leave of absence from 2015–18 to serve as deputy assistant director—and then acting assistant director—of NSF's Directorate for Education and Human Resources. EHR aims to support excellence in STEM education across the U.S. and

develop the next generation of STEM professionals. He also was co-chair of the P–12 Education Interagency Working Group, which coordinated STEM instructional opportunities across federal agencies.

Lewis is an excellent addition to the ORED leadership team, said Bob Wilhelm, vice chancellor for research and economic development.

“Jim's experience at the National Science Foundation and his longstanding work and reputation in the mathematics field and STEM education are significant assets for the university. I know he will have great impact working with our faculty and partners.”

Lewis remains director of the Center for Science, Mathematics, and Computer Education, a joint effort between the colleges of Arts and Sciences, Education and Human Sciences, and Agricultural Sciences and Natural Resources to improve STEM teaching and learning from pre-K–12 to collegiate levels.

RETIREMENT: Glenn Ledder

Glenn Ledder, known as a national leader in undergraduate education in mathematical biology, will retire from the Nebraska Department of Mathematics at the end of the 2019–20 academic year.

Ledder has written two books, “Mathematical Methods in Biology and Medicine” and “Differential Equations: A Modeling Approach,” and also was the lead editor for “Undergraduate Mathematics for the Life Sciences: Models, Processes, and Opportunities.” His 37 papers include 10 in mathematical biology and three on the movement of contaminants in groundwater in the top hydrology journal, *Water Resources Research*.

He also had a \$900,000 grant from the National Science Foundation, awarded in 2005 for a five-year period, in undergraduate math biology education called Research for Undergraduates in Theoretical Ecology (RUTE). He gave a presentation on Undergraduate Research in Mathematics and Biology at the National Academy of Sciences with UNL’s Brigitte Tenhumberg and undergraduate Chuck Larriue in 2010.

A leader in undergraduate research mentoring as well, Ledder has had:

- six REU groups totaling 23 students, including Chris Flake (Ph.D., mathematics, Maryland); Sam Potter (Ph.D., theoretical meteorology, Princeton); and Brennan Bean (Ph.D., biostatistics, Utah State);

- three honors theses and one UCARE student, including Shel Swenson (Ph.D., mathematics, Texas-Austin) and Nick Gewecke (Ph.D., mathematics, Tennessee-Knoxville); and

- four RUTE groups (co-mentor with Drew Tyre and Diana Pilson, and twice with Sabrina Russo), totaling 16 students.

In addition, he has mentored two REUF (Research Experience of Undergraduate Faculty) groups for the American Institute of Mathematics.

Ledder has served as co-chair of the Nebraska Conference for Undergraduate Women in Mathematics organizing committee with Christine Kelley from 2012 to 2020. He has been a committee member since 2005.

“NCUWM has given me an unparalleled opportunity to provide guidance and encouragement to talented young women interested in mathematical careers,” Ledder said. “Being on the leadership team for almost a decade has been the highlight of my career and is what I will miss most in retirement.”

Ledder wrote the Gateway exam for the department in 2005, and during the transition to the ACE program, he served as chair of the College of Arts and Sciences Curriculum Committee.

Ledder arrived at UNL in 1989, earning his Ph.D. from the Rensselaer Polytechnic Institute. He has advised two Ph.D. students, and a third advisee will graduate in 2020.

IN MEMORIAM: Rao Chivukula

The UNL Department of Mathematics lost a friend and former faculty member on Aug. 13, 2019, when R. Rao Chivukula passed away at age 86 from complications due to pneumonia. At the time, Rao was living in Escondido, California.

Rao joined the UNL faculty in 1963 after earning a Ph.D. at Andhra University (India) in 1960 and a second Ph.D. at the University of Illinois in 1962. After two years at UNL, Rao returned to India for one year and then rejoined the UNL faculty in 1966. During a 35-year career at UNL, he was promoted to associate professor and then professor before retiring in January 1999.

Rao was the Ph.D. advisor for five students, including Randy Heckman, who had a long career at the University of Nebraska at Kearney including serving as chair of his department. From 1975–1979 Rao served as graduate chair of the department. In 1989, Rao and Gordon Woodward were the creators of UNL Math Day and Rao served as co-director until his retirement.

Those of us who had the privilege of being his colleague remember his gentle nature, his warm friendship, and his willingness to volunteer when there was a task that needed doing.

– Jim Lewis

RETIREMENT: Luchezar (Lucho) Avramov

After serving the Nebraska Department of Mathematics for 17 years, Luchezar (Lucho) Avramov will begin a new chapter of retirement in 2020. The sole holder of the Dale M. Jensen Chair of Mathematics since 2002, Avramov was described in the December 2001 Chancellor’s Report as “one of the premier commutative algebraists in the world.”

“He has been a tremendous shot in the arm to the department,” said colleague and long-time friend Roger Wiegand in 2005. “The department

is now regarded as one of the top destinations for those interested in commutative algebra.”

Avramov has been revered as one of the world’s leading experts in algebra over the past 45 years. He was named a Fellow of the American Mathematical Society in its inaugural Class in 2013 and has authored 108 journal articles, including five articles in *Inventiones Mathematicae*, one of the top journals in mathematics. He also served on the editorial board of several prestigious journals, including the *Transactions of*

the American Mathematical Society.

Avramov’s research has been continuously funded by the National Science Foundation since he came to the U.S. in 1991, and he has been invited to speak at more than 150 talks at conferences around the world. Avramov advised or co-advised 18 Ph.D. students, including 10 while at UNL.

He received his Ph.D. from Moscow State University in 1975. He became a professor at the University of Sofia in Bulgaria and subsequently a professor at Purdue University in 1991.



Ten members and two instructors of the Afrimath summer 2019 cohort gather for a photo with Nebraska's Michelle Homp (far left) and program founder Masake Ly (far right).

AFRIMATH ADVENTURE: Michelle Homp returns to expand impact of Primarily Math

Thanks to the Joyce Broady Clark Outreach Fund at the University of Nebraska Foundation, a scholarship to benefit young women and other underrepresented students in mathematics, Michelle Homp's work to bring the Primarily Math program to mathematics teachers in Africa has been expanding.

After Homp's trip to Senegal, Africa, in 2018, she met with fund founder Gwinne Berexa, the great-granddaughter of Broady Clark, a 1907 College of Arts and Sciences alumna, to thank Berexa for her support. They were joined via Zoom from Africa by Masake (Kane) Ly, the founder of Afrimath (<http://www.afrimath.org>), an initiative to strengthen mathematics education for K–12 students and teachers in Senegal and across Africa.

They discussed the positive impact of Primarily Math on the Afrimath initiative at the Senegalese-American Bilingual School (SABS)—and the dozens of thank you notes that the teacher participants had written to Berexa, a successful business woman in the financial industry.

"She was delighted to know that her great-grandmother's fund was used to support Afrimath," Homp said. "It was a perfect partnership. Not only did

Gwinne have a heart for supporting outreach in STEM, but she was fluent in French, the official national language of Senegal, and had actually spent some time living in Africa."

Berexa fully supported Homp's goal of returning to Africa to reach teachers outside of the SABS.

In July of 2019, Homp again visited Dakar, where she and Ly were joined by Moussa Faye and Denis Ndour, teacher participants from 2018, to lead a new group of 12 teachers. The teachers were selected by administrators from three elementary schools in Dakar. They were selected for their leadership potential, but this time, being able to speak English was not a requirement.

Non-French speaker Homp found that Faye was an exceptionally patient interpreter. "We asked Moussa to assist with the instruction because of his solid understanding of the mathematics. What we didn't expect was how deftly he would slip into this role," Homp said. "Moussa did an amazing job of communicating abstract ideas to his fellow elementary teachers and exhibited a remarkable level of confidence and patience in teaching his peers."

The 2019 group of teachers were highly dedicated as well, Homp added.

When one teacher's car broke down on the way to the school, he left it where it was and took a cab the rest of the way so that he wouldn't miss class.

More than 450 teachers in Nebraska have dedicated their time to Primarily Math. This graduate certificate program is a renowned and highly effective set of six courses for elementary teachers (largely of primary grades) who wish to strengthen their mathematical content and pedagogical knowledge while earning UNL's designation as a K-3 Mathematics Specialist. Primarily Math started with the \$9.3 million NebraskaMATH grant, funded by the National Science Foundation until 2015. A new cohort of Primarily Math is starting in the summer of 2020 for Omaha, Nebraska, area teachers, with some funding from school districts.

Homp's adventure with Afrimath started when she met Ly through the Department of Mathematics' online Master of Arts for Teachers (MAT) degree program, <http://math.unl.edu/mat-degree>. Ly began the program in 2014, and Homp was the instructor for two of her online courses. Homp has been helping the department grow the

LCC { FROM PAGE 6 }

Pfabe had a similar experience. She knew that teaching in prison would change her as a person, but she didn't know it would change how she taught.

"What I wasn't expecting from

teaching in prison was that it would change me a lot as a teacher, but it really did because of the different nature of the students there," Pfabe said.

"In Calculus, I teach differently now because of teaching in a prison.

AFRICA { FROM PAGE 12 }

online program since the fall of 2013. Currently, 44 students are pursuing the MAT, with 12 of those from outside the state of Nebraska, including one in Canada.

In the summer of 2016, Ly traveled from Senegal to Hastings, Nebraska, to take one of the MAT courses in person to speed up her time to graduation. In-person summer courses are offered in one- or two-week sessions through the Nebraska Math and Science Summer Institutes, <http://scimath.unl.edu/nmssi>, a program that provides a 20% tuition discount to current Nebraska teachers thanks to the support of the UNL Office of the Chancellor. Often, courses first offered in the summer are developed into online courses for the MAT.

After meeting in Hastings, Homp became Ly's academic advisor. Ly completed her MAT degree in 2017, and, as a result of her passion for mathematics education, launched Afrimath. Ly and Homp continued to correspond and, eventually, this partnership led to an invitation for Homp to join Ly in Senegal to help lead programs for Afrimath.

When Homp first traveled to the SABS in 2018, the seven teacher participants all were fluent in both English and French. The plan was to train these teachers for two consecutive summers, so that they could serve as leaders for future efforts to expand the program. However, the plan soon changed.

After the elementary teachers from SABS shared about the success of the Afrimath/Primarily Math program at the Dakar Forum on Mathematics Education in 2018 (an annual conference organized by Ly and attended by university faculty, teacher leaders, and other stakeholders in mathematics education), the French-speaking teachers in attendance



The 2019 Afrimath instructional team was composed of (from left to right) Moussa Faye, Masake Ly, Michelle Homp, and Denis Ndour.

expressed a strong desire to share in this learning experience. But, they did not want to wait two years, hence the call for continued support from the Broady-Clark funds to expand the program to more teachers in 2019.

Homp is confident that she also will be able to call on Faye to lead more teachers through the Primarily Math curriculum in Afrimath in the future. Both Homp and Ly hope the partnership between UNL and SABS continues. In particular, they hope to find the resources needed to translate a well-known assessment to be able to understand teacher growth and study the impact of the program.

"The most exciting parts about returning to Dakar this past summer were observing more teachers strengthen their knowledge of mathematics, seeing them become more passionate about teaching, and recognizing tremendous leadership potential among some of the participants," Homp said. "This means Afrimath's stated goal of strengthening mathematics education across Dakar, across Senegal, and the rest of Africa, is a giant leap closer to becoming a reality."

Assistant Professor of Practice Michelle Homp also would like to thank Joye Fehringer of the University of Nebraska Foundation. To learn more about Berexa, the Clark family, and the Joyce Broady Clark Women Blazing Trails Mathematics Outreach Fund, visit <https://cas.unl.edu/gwinnmeth-berexa>.

I talk about how we divide fractions, which to some might think you're talking down to them, but I know a lot of the students need that. I add a lot more detail, and I think that's paid off for me with teaching at Wesleyan."

– Lindsay Augustyn



Amber Clausen

MAT DEGREE

Awarded by the Department of Mathematics, the Master of Arts for Teachers degree can be completed entirely online, in person, or as a combination of both. Since 2005, more than 300 teachers have earned our MAT degree. The program is designed for secondary and middle-level mathematics teachers and aims to deepen teachers' mathematical knowledge for teaching by focusing on advanced mathematical concepts that have strong connections to the school curriculum.

This degree can provide considerable value to high school teachers wishing to teach dual credit courses or teach at a community college.

"As a full-time teacher, wife, and mother, I needed a program that I could complete at my own pace," said Amber Clausen, a teacher in Grand Island, Nebraska, who graduated in 2019. "The program has encouraged me to help my students by showing them that there is not always one right way to get an answer, and there is more to math besides formulas and repetitive steps."

For more information, visit <http://math.unl.edu/mat-degree>.

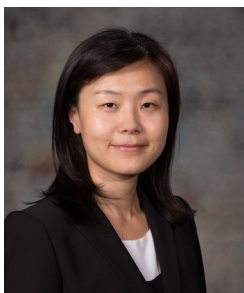
The Nebraska Department of Mathematics has a prominent program in mathematical biology, with current strength in mathematical ecology. The group has significant collaborative relationships with colleagues in the life sciences across campus and at other institutions. Group members have mathematical backgrounds in several areas of pure and applied mathematics, including dynamical systems, partial differential equations, algebraic and differential geometry, topology, control theory, game theory, operations research, and mathematical modeling. Here, we feature some of our faculty and their work.



RICHARD REBARBER

Richard Rebarber's research is in **mathematical control theory, mathematical ecology, and connections between the two**. He has been developing mathematics that extend control theory techniques and concepts to management and analysis of uncertain nonlinear population models. One such project was done in collaboration with Brigitte Tenhumberg from the University of Nebraska-Lincoln's School of Biological Sciences; former Ph.D. student Christina Edholm, a faculty member at Scripps College; and colleagues in the U.K. This project concerns the management of an invasive weevil that is destroying citrus crops in Florida and other southern states. If ecologists are familiar with control theory at all, it is most likely optimal control, where the control goal includes minimizing a cost function. Optimal control is very useful in many circumstances, but it does have the drawback that it might be non-robust (that is, there is no guarantee that it will work well in the presence of uncertainties and disturbances), and requires information that might not be available to managers. An alternate approach is to feedback control techniques, where the control is determined from population information, which is available through monitoring, but does not require an accurate mathematical model. For control of invasive species, we developed a type of high-gain control, where the amount of pesticide or biological control is chosen to be large enough (but not larger than necessary) based on the feedback observation of the system. Such control is robust to the types of uncertainties that might be found in ecology, and only require access to the observable parts of the state. We are currently comparing the cost and robustness of optimal control and feedback control, with the goal of determining when one performs better.

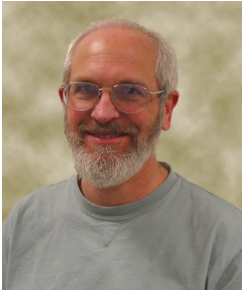
HUIJING DU



Huijing Du's main research develops **computational and mathematical models for studying biological problems in a quantitative manner**. Addressing questions arising from problems related to intestinal crypt structure, embryonic development and epidermal tissue regeneration motivates her modeling research. Mathematical and computational techniques, e.g., ODEs/PDEs and stochastic discrete models, are used to discern fundamental mechanisms leading to the observed experimental observations that are, in general, difficult to quantify. Through working on these projects, she tries to determine how experimental observations can be translated into modeling components and how modeling and simulations can be used to gain new insights into biological problems. One of her current projects is to integrate imaging and clinical data to facilitate cancer treatment. This work is in collaboration with Chi Zhang in the School of Biological Sciences, Hongfeng Yu in Computer Sciences and Engineering, Qi Zhang in Statistics, and Dandan Zheng in Radiation Oncology (UNMC). Pancreatic cancer is among the most deadly cancer types in the United States. Its low survival rate and the lack of effective therapy is partially due to the

heterogeneity of this disease. Radiomics is a recent area of research in personalized precision medicine, tailoring therapy with the best response and highest safety margin to ensure better care for individual patients. However, there exists a critical challenge that often one radiomics model would predict well for the patients on whom the model is developed, but do much poorer on a different group of patients, a problem called lack of generalizability. In this study, we are working to develop a brand-new approach to completely map out the noise, and build generalizable radiomics models by considering and learning from the noise. Within this framework, Du will develop a mathematical model to simulate the growth of tumor volume and its response to radiation therapy incorporating the imaging and clinical data, and analyze the sensitivity under various sources of noise. The model will be applied to simulate pre-treatment growth and post-treatment radiation response of pancreatic tumors.

MATHEMATICAL BIOLOGY

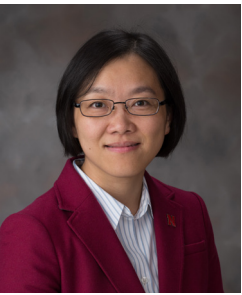


GLENN LEDDER

Glenn Ledder uses mathematical modeling to address broad questions in **theoretical ecology**. His two most recent papers consist of work done primarily while on sabbatical at the National Institute for Mathematical and Biological Synthesis (NIMBioS) at the University of Tennessee-Knoxville. The first of these, funded in part by an international travel grant from Nebraska's College of Arts and Sciences, was joint work with co-authors Sabrina Russo of the School of Biological Sciences and international collaborators Valentin Couvreur, Stefano Manzoni, and Danielle Way. This paper used a new model that Ledder developed for the flow of water in trees to address questions about the

effects of different physiological traits of trees on response to drought. This model could be used as a component in climate change models being developed by the National Oceanic and Atmospheric Administration and similar agencies in other countries. The second of his NIMBioS papers was joint work with Russo and Roger Nisbet of the University of California-Santa Barbara that introduced the "local control" theory of resource allocation in plants developed by Ledder and Nisbet. This work shows that a particularly simple model of plant growth produces the same outcome as the more complicated models in current use. Ledder's current project is to develop and analyze a model that links the foraging behavior of herbivores with the risk of predation incurred by animals moving between resource patches.

YU JIN



Yu Jin's research is in applied mathematics with the main focus on **dynamical systems** and mathematical biology. This includes the establishment of appropriate mathematical models (mainly differential equations and difference equations) for phenomena in spatial ecology, population dynamics, and epidemiology, as well as mathematical and computational analysis for models. In recent years, Jin has been mainly interested in **spatial dynamics of populations in advective environments, such as streams or rivers**, with temporal fluctuations and

spatial heterogeneities, by virtue of studies of reaction-diffusion-advection equations, and aims to develop results to serve as theoretical basis for ecologists and water managers for decision making on biological invasion control and water resource management in complex river systems. One key issue for theory in stream ecology is how much stream flow can be changed while still maintaining an intact stream ecology, which is called instream flow needs (IFNs). The study of determining IFNs is challenging due to the complex and dynamic nature of the interaction between the stream environment and the biological community. One approach that mathematicians use is to develop process-oriented models to describe the dynamics of populations and then investigate how the water flow, together with other biotic and abiotic factors, influences population persistence and spread in the habitat. Mathematical tools can be the principal eigenvalue (or the spectral radius) of a corresponding eigenvalue problem and the asymptotic speeds of spread (or the minimal speeds of traveling waves). Yu also introduces the net reproductive rate into river population models for a single species to represent the average number of offspring that an individual can produce during its lifetime, which predicts population persistence if it's larger than 1 and population extinction if it's smaller than 1.

BO DENG



Bo Deng's research areas are in **dynamical systems** and their applications in mathematical biology. One recent project is in the area of **bioinformatics**. He worked with Brittney N. Keel from USDA's Clay Center in Nebraska, and Etsuko N. Moriyama from the School of Biological Sciences on clustering protein sequences.

They treated protein

sequences from different species as networks and devised a way to cluster them according to their divergence from each other and similarity to each other. Their novel approach is based on Nash's theory on non-cooperative and cooperative games. They assumed that evolution is shaped by forces, one for conservation for what has proven to work for the species and the other for diversification for what would work better for species' new generations. They modeled the species' evolution as a game driven by these two forces and developed a clustering algorithm for protein sequences in network. Deng also published a work in the area of neurosciences this year. He discovered a mechanistic model of neurons that remains invariant under the conductance-to-resistance transformation. He thinks the model should prove useful in the field of artificial intelligence when circuits based on his model are constructed and connected to large networks.



GREG NATHAN | UNIVERSITY COMMUNICATION

Joyce Yen (front, left) speaks to UNL postdoc Amanda Laubmeier (right) and other guests in Avery Hall.

YEN { FROM PAGE 1 }

University of Michigan, Yen first came to Washington as a tenure-track assistant professor. Only a few months afterward, the ADVANCE grant was awarded. Yen joined its team about two years later and was named director in 2015.

The Hastings native returned to Nebraska in October 2019 and spoke to UNL Math Club students about her perspective on the continual impact that identity can have on shaping mathematics.

"You might think math is just math, that it's not something our identities impact, but in this book I just read called 'The Invisible Women,' the author shares a story of a female math professor who saw an analogy between crocheted patterns and the concept of hyperbolic planes," Yen said. "Her experiences with knitting and crocheting informed her mathematical view of the world, and she created models that everybody can use in a way no one else had done before. That's a beautiful example of, even when you think identity is not informing math, it is."

Yen knows what kind of impact she likes to make—with work that is "high touch, high impact." She often partners with administrators in diversity positions at the university level, but she finds herself most useful when she clearly understands the scope of her work and can "push the boundaries."

While she focuses on faculty,

everything she does has a parallel application to students.

"I think diversity positions are incredibly important. You have to have somebody at the table, at the highest level, in all of those important meetings, asking those questions," said Yen, a winner of Washington's College of Engineering Professional Staff Innovator Award in 2007 and the David B. Thorud Leadership Award in 2012.

"Our vice dean says that ADVANCE can start to 'socialize' people. We socialize different conversations, ideas and concepts in a targeted way to science and engineering departments."

Yen recently wrote about diversity and leadership for a blog, <https://blogs.plos.org/collections/advancing-diversity-equity-and-inclusion-is-a-leadership-issue-for-all-of-us>. In her research, she has found that it's not about getting diversity training, but rather it's about receiving leadership training that helps people become informed about how to actively participate and think about their individual roles in either perpetuating or changing the status quo.

"How do we change structures and systems in large, and small, ways?" Yen said. "There are so many smaller things we can do that can positively move us in a positive direction, to start tilting us in a different way. If you're from a well-represented group and all of your people look like you, then reach out and bring others who don't look like you into your group."

Yen's fondest memories of college at Nebraska stem from her freshmen Honors Calculus course with Professor Tom Shores, where she met the highly talented cohort of students who are still her best friends today.

"Everyone knew who I was. I felt seen," said Yen, a 2004 winner of the Outstanding Young Alumni Award from the Nebraska Alumni Association. "The department and the Honors program fostered community building amongst the students. I think the UNL math faculty praised the outstanding female

"There are so many smaller things we can do that can positively move us... to start tilting us in a different way."

Joyce Yen

students so readily that it never felt like they didn't believe in us."

Her senior honors thesis work with Professor Steve Dunbar on graduate student teaching-assistant scheduling also was published in the journal *Mathematica in Education*.

Dunbar, who was vice chair and teaching an operations research course at the time, recalled that before Yen took on this scheduling project, it used to take him three to five hours to make teaching assignments without any time conflicts.

"Once Joyce worked it all out, it got the process down to an hour or an hour and a half," Dunbar said. "It drastically simplified my life and was much more efficient. Publishing her work in the journal made sure she got some credit and attention for the work that she did. We also worked with Jennifer Meyer, faculty in the College of Business, and Jennifer realized it was a version of the 'assignment problem.' Once she told Joyce how to go about it, that unlocked the gate and it went pretty easily from there."

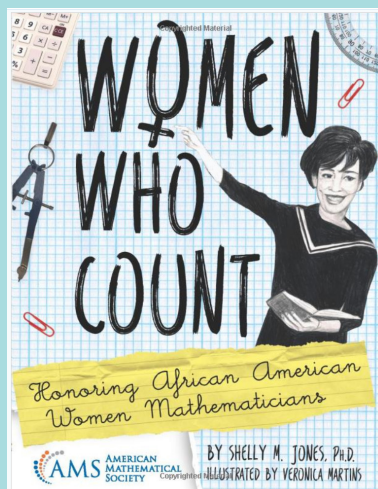
Yen, who also received an Academic All-American honorable mention in USA Today in 1995, can see the influence of pursuing a variety of interests in high school and college on the skills she now possesses. As a workshop facilitator, she credits an experience at Girls State where she watched a fellow classmate give a speech in which she intentionally turned and spoke to both sides of the room, equally, as an example of picking up skills in many different places.

"You just never know when you're getting some nugget somewhere, some information, advice, or skill that you synthesize into who you are today," Yen said.

— Lindsay Augustyn

'WOMEN WHO COUNT'

Nebraska 2008 Ph.D. alumnae **Dr. Christina Eubanks-Turner** of Loyola Marymount University and **Dr. Raegan Higgins** of Texas Tech University are two of the women mathematicians featured in "Women Who Count: Honoring African American Women Mathematicians," a children's activity book. This book by Shelly M. Jones highlights the lives and work of 29 African American women mathematicians, including Dr. Christine Darden, Mary Jackson, Katherine Johnson, and Dorothy Vaughan from the award-winning book and movie "Hidden Figures." Although the book is geared toward children in grades 3-8, it is appropriate for all ages.



American Mathematical Society
Bookstore

WHERE HAS YOUR MATH SHIRT TRAVELED?



The math shirts of current Nebraska graduate students Marla Williams and Vince Longo traveled to Banff, Canada this year. Send your T-shirt photos to nebraskamath@unl.edu.

CLASS NOTES

Johnny Henderson (Ph.D. '81) and Rodica Luca (of the University if Iasi, Romania) were the recipients in December 2018 of the Romanian Academy "Spiru Haret Award" for their monograph "Boundary Value Problems for Systems of Differential, Difference and Fractional Equations: Positive Solutions" (published by Elsevier, copyright 2016, <https://doi.org/10.1016/C2014-0-04797-1>).

Brian Johnson (Ph.D., '12) became the interim director of the Whitaker Center for STEM Education at Florida Gulf Coast University in August 2019.

Anisah Nu'Man (Ph.D., '15) is now an assistant professor of mathematics at Spelman College. She is returning to her undergraduate alma mater.

Drew Wilkerson (MS, '10) accepted a position as associate dean of Academic Affairs at Jefferson Community and Technical College, where he has been a member of the faculty since 2010. He will oversee dual credit and other academic initiatives. Drew jointly holds an appointment as associate professor at the college.

Send us your news at:
go.unl.edu/mathcareerprofile

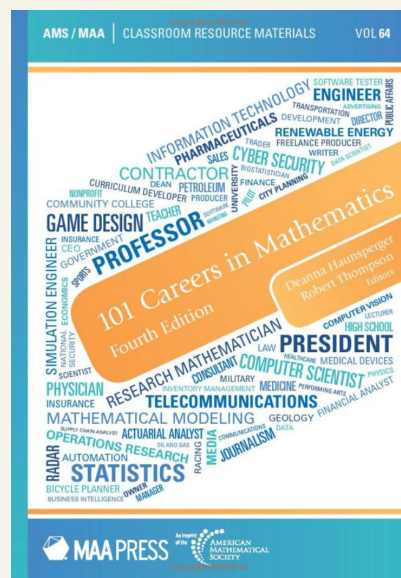
'101 CAREERS'

Four mathematics alumni at the University of Nebraska-Lincoln have been featured in the fourth edition of "101 Careers in Mathematics," produced by the American Mathematical Society.

The book addresses the question 'What can you do with a degree in math?' through 125 career profiles written by people with degrees and backgrounds in mathematics including: Nebraska's **Brian T. Bares** (BS '95) of Bares Capital Management, Inc.; **Stephanie Fitchett** (Ph.D. '97) of Transamerica; **Lucas Sabalka** (BS '02) of Nebraska Global and Ocuvera; and **Joyce Yen** (BS '95) of the University of Washington's ADVANCE Center for Institutional Change.

Edited by Deanna Haunsperger and Robert Thompson of Carleton College, "101 Careers in Mathematics: Fourth Edition" showcases how mathematical education shaped the career choices of these professionals and how mathematics, or the skills acquired in a mathematics education, is used in their daily work.

To purchase the book, visit <https://bookstore.ams.org/clrm-64>. Discounts are available to AMS and MAA members. Use these profiles as a reference for current trends in the job market and as a resource to career service centers and guidance counselors.



STUDENT PROFILE: Miles Davis

When Miles Davis packed his bags for Budapest, he knew that immersing himself in a new, unfamiliar culture would come with obstacles. He did not predict, however, his greatest challenge of all: finding something to eat.

His food allergies presented a major problem in Hungary, a “country steeped in dairy, pork and beef,” said Davis, a senior mathematics major at the University of Nebraska–Lincoln. Once he grew more accustomed to the area, he was able to discern which restaurants could best suit his needs—and focus his attention on the challenging courses of the Budapest Semester in Mathematics (BSM) program.

Davis, a native of Shreveport, Louisiana, spent five months on his adventure in Budapest. BSM is a 15-week program that spans one semester. Students must take two courses taught in English by Hungarian professors. The program emphasizes developing students’ problem-solving skills, creativity and a deep, rather than broad, understanding of the course material.

The BSM courses, such as advanced mathematical problem solving, discrete and convex geometry, and combinatorics, furthered Davis’ passion for mathematics because they allowed him to explore the world of mathematics from a new perspective.

The courses also revealed the rigor of what graduate school could look like.

It was challenges such as this that made Davis’ experience in Budapest worthwhile. Davis described his experience as one that “transformed me into a new person by the time I returned home.”

Surrounded by new faces in an unfamiliar country, all alone, is an eye-opening experience. Davis said this time abroad presented him new opportunities, and his experience with BSM made him realize that taking a gap year after graduation would allow him to pursue other passions before enrolling in graduate school.

“I’d say that my study abroad experience has made me unsure about my career goals, which I think is good, since maybe I was never too sure to begin with,” Davis said.

Davis didn’t always dream of a life dedicated to the study of mathematics. In high school, he and his dad watched a lot of science documentaries about cosmology and quantum physics.

“These ideas truly amazed me, and then I slowly developed the idea that an exploration of the universe was the only course of study I wanted (to) take,” Davis said.

It was only after taking physics courses at UC Berkeley that Davis discovered his passion for math. He quickly found himself regularly lost in thought, pondering mathematical concepts and their meaning. Davis knew that his passion had shifted away



from physics.

Davis’ recent BSM courses allowed him to explore the world of mathematics from a new perspective he’d never seen before, and the experience furthered his love for the subject.

The application process for BSM consists of an online application with several essay prompts outlining academic challenges and reasons the student wishes to be a part of the program, along with two written letters of recommendation from mathematics faculty.

For anyone considering applying for BSM, Davis suggests they apply as soon as they can.

“If anything, by applying early, if they’re not accepted, they’ll know in which ways they could make their application more competitive for the next year,” Davis said.

– *Tori Pedersen, UNL ALEC student*

GET TO KNOW GRADUATE STUDENT:

AURORA MARKS

Where are you from? Sacramento, California

What is the best advice you have been given regarding graduate school or your career? Focus on doing math that I thought was fun, and the rest will (slowly) work out.



What is a goal you have accomplished as a Husker?

Participating in NCUWM as a graduate student. I’ve loved the

opportunities I’ve had that have allowed me to inspire and connect with undergraduate women who want to pursue careers in math.

What types of jobs are you interested in pursuing after graduation?

Professor positions at a smaller university or pursue a career outside of academia.

What do you hope to cross off your “bucket list” in the next few years?

My biggest goal is to earn my Ph.D. in the next two years. Another personal goal of mine is to squat my body weight.

Four new math tracks available to undergrads

Four new tracks are available for the Bachelor of Science in mathematics degree at Nebraska, adding flexibility to the major and allowing students to pursue additional interests in an interdisciplinary setting.

Besides standard, education, and statistics, the new options are: mathematics of physical phenomena, mathematical biology, mathematical finance, and discrete mathematics and cryptography. Nationwide, universities are starting new courses and pathways like these that facilitate interactions between mathematics and the other three STEM departments (science, technology, and engineering).

"This is the age of interdisciplinary mathematics as connections and collaborations among different scientific fields are continuously increasing," said undergraduate mathematics chair Petronela Radu.

"Mathematics is at the center of new models in mathematical finance, designing novel materials, models for populations and climate, and our students are starting to see this interconnectedness and want to know more about careers that use mathematics."

Physics, computer science, and actuarial science students can benefit by pursuing one of the new options. Currently, about half of the university's math majors are dual majors.

Mathematics of physical phenomena is ideal for students interested in math and the physical world. It requires several math courses and a sequence of physics, meteorology, geology, or engineering courses.

Sam Sweeney, a junior math major, said the mathematics and physical phenomena major will allow him to apply his love for math and physics toward a useful degree before he either enters law school or a political science graduate program.

"(The major) gives me the flexibility and applicability of a math program while allowing me to study

physics and political science," Sweeney said.

Students interested in the mathematics of biological science will take various math and biological science courses, while the mathematical finance option meets the needs of students who want a strong body of coursework in actuarial science and finance. This track requires multiple math, accounting and finance courses.

"As a double major in actuarial science, I take a lot of the same classes that are in the mathematical finance requirements, so I decided to switch to this emphasis," said Natalia Koval, a junior math major.

"The other tracks require a lot more extra classes that can be hard to fit in with my honors and business coursework as well as dual matriculation requirements, so this option gives me the chance to still take upper level math classes in addition to my other academic focuses."

Discrete mathematics and cryptography is a track ideal for students who want a coherent body of computer science coursework. In math, students take a combination of multi-level math courses and four computer science courses.

As of Spring 2019, the number of math majors reached 350, an all-time high, and the number of majors has doubled over the last three to four years.

As prospective UNL students and parents learn about the new options, the department expects high demand from current students and therefore an increase in the number of prospective math majors, Radu said.

"We are happy that our graduates will be better prepared for workplaces where applied mathematics degrees and skills are in high demand," Radu added.

For more information about the new tracks and required courses, visit <https://catalog.unl.edu/undergraduate/arts-sciences/mathematics/#majortext>.

GET TO KNOW
UNDERGRADUATE:

FATIMA BARRIGAN



Where are you from? My family and I emigrated from Mexico but I grew up in Grand Island, Nebraska.

What has been your favorite math class? Math in the City gave me the opportunity to apply my analytical and problem-solving skills to a real-world problem. This class is tailored to what is relevant in society. For example, currently we are focusing on gerrymandering and redistricting as the 2020 census is approaching.

What are you excited about doing after graduation? After graduation, I am very excited to take some time off to travel, spend time with family and apply to graduate school!

What is a goal you have accomplished as a Husker? I have been able to study abroad in Argentina for a semester. I also have been able to create meaningful relationships with the faculty and staff at UNL. Through this, I have had the privilege to be mentored by leaders of the university who have supported me along my journey. I also was able to intern with the IEA team and not only apply the skills I have learned in my courses, but also continue to build new skills while continuing to learn. I have learned more about myself and what my opportunities are for my future.

What do you hope to cross off your "bucket list" in the next few years? Within the next few years, I hope to continue to travel outside of the U.S., continue my education through a graduate program, and hopefully find myself by a beach where the sun is out year-round!

Undergraduate awards

Chair's Prize

Awarded to an outstanding senior mathematics major
Elizabeth Spaulding

Special Scholarships Awards

Note: 67 scholarships were awarded for the 2019–20 academic year.

Dean H and Floreen G Eastman Memorial Scholars

For Nebraska high school graduates
Samantha Bannister, Alexander Batelaan, Tomohide Bessho, Charlie Bonk, Zach Cairney, Derek Chew, Allison Cruikshank, Grace Dickas, Collin Dougherty, Stanley Drvol, Anjaneshwar Ganesan, Elizabeth Griggs, Joshua Gromowsky, Andrew Haar, Riley Hayes, Alex Heitzman, Parker Janicek, Zoe Keese, Naomi Kirkvold, Jackson Lederer, Sungjin Lee, Matthew Meacham, Nicholas Nguyen, Ray Nierman, Vida-Michelle Nixon, Leah Olson, Jesse Osnes, Jared Ott, Ana Podariu, Benjamin Praeuner, Lara Quiring, Lexus Root, Amanda Rowley, Isabelle Schmidt, Joshua Schmidt, Simon Schoenbeck, Jarod Schwinck, Joshua Stallbaumer, Erica Steiner, Marc Wade, and Qixuan Yang

Irwin Dubinsky Memorial Scholars

Utkarsh Hardia

Senior Honors Thesis and Graduated with Distinction (directed by):

Elizabeth Spaulding (Alex Larios and Jae Sung Park [MECH])—May 2019

Elizabeth Tyler (Nathan Wakefield and Edmund Hamann [TLTE])—August 2019

Joel Stebbins Fund Scholarship

Fatima Barragan-Herrera, Sanat Bhandari, Clay Christenson, Yiwen Lyu, and Jessica Smith

Renneman/Luebbers Scholarship

Sanat Bhandari, Jake Schmitt, and Michael Schneider

Drusilla Winchester Scholarship

Shannyn Bird and Nick Lennon

Ruby Matzke Wittemore Scholarship

Sawyer Smith

Sylvia and Hans Jeans Mathematics Scholarship

Shannyn Bird, Miles Davis, Kushagra Kapil, Nick Lennon, Meghan Ryan, and Michael Schneider

Dr. Hubert Schneider Memorial Scholarship

Shannyn Bird

Gallup UNL Math Day Scholarship

Lixin Cao, Derek Chew, Alex Heitzman, and Ai Liu

Linda Bors Mathematics Scholarship

Fatima Barragan-Herrera, Michael Hackett, and Calista Humphrey

Bachelor's degrees

December 2018: Nicole Benker, Junzhe Cai, Ge Chai, Noah Hansen, Claire Kamas, Thuan Luong, Mia Nguyen, Hunter Rowen, Hetong Shi, Leonard Tan, An Tran, Brook Verbik, Shikai Wang, Boqing Wu, Qiwen Xu, Fan Yang, Zhongkai Yu, Hanbo Zhan, Xiaotong Zhang, and Yanbin Zhou

May 2019: Kyle Anderson, Derek Baumfalk, Nora Breen, Amber Bridgeford, Marina Cozac, Andrew Daehling, Andrew Fanning, Brandon Geren, Kelly Glaser, Zixuan Hao, Siru Hou, Chutian Jiang, Timothy Knaak, Arich Knaub, Mark Knudsen, Abigail Leuschen, Nicholas Leyden, HaoZhou Li, Jianzhi Lou, Tyler Lowery, Xianyao Lu, Laurel Lund, Lihua Luo, Jiahui Ning, Cameron Pick, Rilee Potter, Ajay Rathore, Nathan Ray, Samantha Rouse, Isabel Safarik, Beau Schindler, Caleb Schmidt, Alexander Schroeck, Jackson Shafer, Zehao Song, Elizabeth Spaulding, John Stobbe, Mary Stuckey, Moriah Tiemann, Maxim van Klinken, Zachary Van Roy, Addison Waller, Xingyun Wang, Zachary Warneke, Jacob Warner, Luke Wilmes, Yang Xiao, Yi Xiao, Fengshu Xu, Jingqian Xu, Tao Yao, Zixin Zhang, Chenyang Zhao, Di Zhao, and Junxia Zhao

Graduate program awards & fellowships

Don Miller Award for Outstanding Teaching by a Graduate Student

Erica Hopkins

Grace Chisholm Young and William Henry Young Award

Austin Eide

Outstanding Qualifying Exam

Kathleen Lee

Walter Mientka Teaching Award

Jason Vander Woude

Outstanding First-Year Student Award

Jason Vander Woude

Bill Leavitt Award

Stephen Becklin

Lloyd Jackson Award

Andrew Hayes

Emeritus Faculty Fellowships

Karina Uhing and Collin Victor

Amy Bouska GTA Leadership Award

Elizabeth Carlson

Linda Bors Fellowships

Erica Hopkins, Stephanie Prah, and Catherine Zimmitti

Doctoral degrees

DeSantis, Derek *Operator algebras generated by left invertibles*, advised by David Pitts

Hamidi, Mitch *Admissibility of C^* -Covers and Crossed Products of Operator Algebras*, Allan Donsig

Hu, Wei *Caputo Nabla Fractional Boundary Value Problems and Integral Inequalities on Time Scales*, Al Peterson

Ismert, Lara *Unbounded Derivations of C^* -algebras and the Heisenberg Commutation Relation*, Allan Donsig and David Pitts

Packauskas, Nicholas *Quasi-polynomial Growth over Complete Intersection Rings*, Lucho Avramov and Mark Walker

Pollitz, Josh *Cohomology of derived complete intersections and an application in local algebra*, Lucho Avramov and Mark Walker

Poppelreiter, Nathan *Dynamic Observers for Unknown Populations*, Richard Rebarber and Brigitte Tenhumberg

Setniker, Ariel *Sequential Differences in Nabla Fractional Calculus*, Al Peterson

Tucker, Katie *The t_3, t_4 conjecture for links*, Mark Brittenham and Susan Hermiller

Master's degrees

MS/MA: Sally Ahrens, Nicole Buczkowski, Michael DeBellevue, Austin Eide, Allison Frideres, Catherine Godfrey, Michelle Haver, Jacob Kettinger, Dylan McKnight, Hayley Olson, Leilani Pai, Alyssa Seideman, Ana Wright, and Frank Zimmitti

MAT: Amber Clausen, Chelsey Grassel

Modeling contest team earns Meritorious honor

The International Mathematical Contest in Modeling (MCM) held in January 2019 drew over 25,000 teams from 1,523 institutions around the world. Three undergraduate students from the University of Nebraska—Lincoln—Izzat Adly, Jianzhi Lou, and Diego Galvan—placed in the top 7% of the competition, which earned them a Meritorious designation, one of the most prestigious MCM awards. Based on the available data, this designation is the highest any UNL team has earned since 2000.

MCM challenges teams of high school and college students to clarify, analyze, and propose solutions to open-ended problems, applying the skills they have gained in their coursework to a real-world research problem. Through research of various science, technology, engineering, and mathematics topics, students gain communication and interpersonal skills.

Graduate student and organizer Elizabeth Carlson said that, according to one undergraduate professor and math modeling competition mentor, “solving big ill- or under-defined questions under the pressure of time is a skill that is hard or impossible to demonstrate from coursework alone.” MCM teaches real-world critical thinking and STEM experience, which can be applied to various internships and careers after the students graduate.

Graduate student Nikki Buczkowski, an MCM alumna, helps undergraduates like Adly, Lou, and Galvan prepare for MCM competitions and find the support and information they need to succeed. She praised the competition’s interesting, open-ended questions that challenge students.

In addition to Carlson, these organizers and coaches were recognized: Huijing Du, Adam Larios, Amanda Laubmeier, and Glenn Ledder.

INTERNSHIPS

The number of mathematics graduate students who recently have received internships has been steadily increasing. Here is a list of our current students and their placements:

Nicole Buczkowski, Sandia National Laboratory, NSF INTERN Program, Summer 2019

Elizabeth Carlson, Los Alamos National Laboratory, Summer 2019

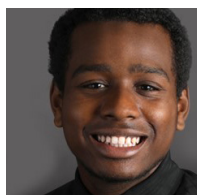
Michael DeBellevue, Ocuvera/Nebraska Global, Summer 2019

Paula Egging, NSF Mathematical Summer Graduate Internship, Argonne National Laboratory, Summer 2018

Robert Huben, NSF Mathematical Summer Graduate Internship, Nevada National Security Site, Summer 2018

Hayley Olson, Sandia National Laboratory, NSF INTERN Program, Summer 2019

STUDENT PROFILE: Geigh Zollicoffer



Geigh Zollicoffer doesn't settle.

When the computer science major saw a need for a new scheduling program for teaching assistants, he made one. When he saw that upper-level mathematics could help him solve more problems in his CS courses, he added a mathematics major.

“Start learning on your own time, and don't just settle for the knowledge you learned in class,” advises Zollicoffer, now a senior at the University of Nebraska–Lincoln. “It is important to be passionate so that things never become a chore—with chores, you lose the aspect of curiosity.”

Zollicoffer's passion for computer science is what initially motivated him to seek direction from his adviser about potential coding projects he could work on, and it is this same passion that

inspired him to create a scheduling program for teaching assistants to better meet students' needs. Though there was an existing framework for the program, Zollicoffer decided to code the entire program from scratch.

“I want to be efficient and fluent in all stages of app development, and I wanted the experience of building something from the ground up in order to better prepare myself for the workforce,” he said.

Zollicoffer first found his place on campus within computer science when he became a TA for Intro to Coding and started making connections with the other TAs and students. Becoming a dual major in mathematics was a natural progression for Zollicoffer.

“The problems got more complex as time went on, and I decided to become a math major because I noticed a lot of the computer science problems could be solved using mathematical

equivalencies,” he said.

Describing himself as a creative student with a proclivity for problem-solving, Zollicoffer also has a passion for music. His musical background led him to minor in music and serves as a creative outlet for him.

“You learn all the rules of music so you can end up breaking them,” he said.

However, studying computer science has helped him ground his creative thinking through logic. By combining his passions for math, computer science, and music, he said he has a foundation that he can use to “create new solutions.”

Zollicoffer is a first-generation student from Lincoln and said he appreciates that his college experience is a shared journey for his family, too.

“You leave your parents, but they're not actually ever gone, because they're learning with you.”

—Gabrielle Cottraux, UNL ADPR student

STUDENT PROFILE: Andrew Haar



Andrew Haar became a teacher of mathematics in kindergarten. He vividly recalls the moment he discovered division on his own and the joy he felt from sharing his discovery with his fellow 5- and 6-year-old classmates.

Haar, a graduate of the International Baccalaureate program at Lincoln High School in Lincoln, Nebraska, is now in his third year at the University of Nebraska–Lincoln and is already taking two graduate-level courses in mathematics.

Haar's strength? He's really good at math.

His weakness? He's really good at math.

"The thing is, when I come across a problem that really stumps me, it is really frustrating for me, and I just

never developed a lot of patience in this respect," Haar said.

But he's grown in patience through his research with faculty member Petronela Radu on developing a nonlocal vector calculus. Haar chose this research topic because it's the type of math he enjoys.

He started discovering his love of math with his dad over cups of coffee on Saturday mornings, in the kitchen with his mom and in middle school with his teacher, Patrick Janike, who helped Haar realize that he wanted to pursue a future in mathematics. Haar liked math not because it was useful or would lead to a great career, but because it was interesting.

"From then on, though, I have always wanted to teach math—to share its beauty with people," Haar said.

He might share that beauty someday in Germany, where he spent five months this year taking math courses and experiencing the culture, thanks to generous scholarships. Haar traveled to the surrounding European countries, making lifelong memories with friends. On Tuesdays, Haar would visit the library to finish his math homework, and then he'd stop for dinner in a little Vietnamese restaurant, where they knew his order by heart.

He said the biggest lesson he

"I have always wanted to teach math—to share its beauty with people."

*Andrew Haar
(shown at left in Bautzen,
Germany in April 2019)*

learned was that change is inevitable. When Haar arrived in Germany, he was confident in his character and identity, and didn't expect to be changed much.

"But my perspective on the world is so different after being in Germany," Haar said. "For that matter, my perspective on math and my math abilities changed so much as a result of my experience. I know who I want to be, but I also know that that will likely change."

Haar plans to graduate next year and pursue a Ph.D. in mathematics so he can become a university professor. He hasn't decided where he'll attend graduate school, but Germany tugs at his heart.

"I just love the culture, people, and location so much. The idea feels totally crazy, but it also feels not crazy at all at the same time. It feels quite natural, to be honest."

– Alli Davis, UNL ADPR/JOUR student

Three math students named Chancellor's Scholars

May 2019 graduates Jianzhi Lou, Elizabeth Spaulding, and Zach Warneke were three of 23 undergraduate students who earned an A in every undergraduate class and were named Chancellor's Scholars, the highest academic award the university offers.

Spaulding was a mathematics

major, and Lou and Warneke were mathematics and computer science majors.

Warneke also was a member of the Huskers 11 student programming team that received second place at the Association for Computing Machinery's regional International Collegiate

Programming Contest, hosted by the University of Nebraska–Lincoln's Department of Computer Science and Engineering. The contest was composed of 27 teams from across the Midwest. Warneke's team members were Jordan Schmitz and Lambros Karkazis.

@HUSKERS EMAIL MIGRATION

Attention students and alumni: If you lost access to your @huskers.unl.edu email in the May 2019 migration, refer to this URL for help:

<https://its.unl.edu/helpcenter/student-email-migration/>

'MATH NEWS' VIA EMAIL

If you would prefer to get this newsletter in your inbox instead of your mailbox, sign up online at <http://math.unl.edu/friends>.

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Please mail this form and your contribution to: University of Nebraska Foundation, 1010 Lincoln Mall, Suite 300, Lincoln, NE 68508

Contributions also can be made at <http://www.math.unl.edu/give>. We invite friends of the Department to contact Chair Tom Marley to discuss creating a new fund for a specific purpose. *Thank you for your support.*



DEPARTMENT OF MATHEMATICS

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Ariel Setniker gets hooded at the May 2019 commencement with her Ph.D. advisor Professor Allan Peterson (at left). Setniker has a tenure-track position at California State University, Maritime Academy. Photo from University Communications.

Math News is a newsletter published for the Nebraska Department of Mathematics community. To receive Math News via email, please register online. Comments regarding newsletter content should be sent to Tom Marley (tmarley1@unl.edu), Chair, Nebraska Department of Mathematics, 203 Avery Hall, Lincoln, NE, 68588-0130.

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