



Graham Leuschke



John Meakin



Jane Meza



Michael Parks



Gopi Shah Goda



Judy Walker

MATH 125

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Abstracts and Biosketches

Plenary Talks

Graham Leuschke, Professor and Chair, Syracuse University
Climbing the chimney

Abstract: I spent five years as a graduate student in the UNL Math Department, but it has been inextricably intertwined with my life – professionally, mathematically, and personally – for nearly three decades, before and after my time here. If a career or a life is like climbing a mountainside, or a chimney, UNL Math has many times provided me a handhold or a foothold, not to mention a constant protective belay. I will tell some stories about times UNL Math has played a pivotal role in my experience. Many of those experiences were mathematical, so there will be some mathematics, but every effort will be made to have the talk accessible to a general audience.

Bio: Graham Leuschke is a Professor of Mathematics and Chair of the Department of Mathematics at Syracuse University. He earned his Ph.D. in Mathematics from UNL in 2000 under the supervision of Roger Wiegand. After postdocs at Kansas and Toronto, he joined Syracuse in 2004 and has been there ever since. His research is in commutative algebra, especially its connections with representation theory and with non-commutative algebraic geometry.

John Meakin, Milton Mohr Emeritus Professor, University of Nebraska-Lincoln
Research and graduate education in mathematics at UNL: A pocket history

Abstract: The Department of Mathematics was formed when the university first opened its doors in 1871. This talk will trace the development of the department and its evolution from its modest beginnings to a modern department that is nationally recognized for the strength of its research program and its graduate program. I will discuss some of the key players and focus areas of the program as the department undertook its journey from 1871 to the 21st century.

Bio: John Meakin is the Milton Mohr Professor Emeritus of Mathematics at the University of Nebraska-Lincoln. He was a member of the department's faculty from 1970 until 2015 and was department

chair from 2003 to 2011. His primary research interests are in the algebraic theory of semigroups and its connections with other fields of mathematics, including geometric group theory, algebraic topology, operator algebras and Leavitt path algebras. He has published over 75 research papers in semigroup theory and related fields and has given well over 200 invited talks at conferences and seminars in around 30 different countries around the world. He was honored with the university's Burlington-Northern Outstanding Teacher-Scholar award in 1988 and was selected as a Fellow of the American Mathematical Society in 2014.

Jane Meza, UNMC Associate Vice Chancellor, Office of Global Engagement and Professor, Department of Biostatistics

What I learned from the question I asked as an undergraduate: What can I do with a math degree?

Abstract: Dr. Jane Meza is Associate Vice Chancellor for Global Engagement and Strategic Planning and Interim Executive Director for the Office of Health Security at the University of Nebraska Medical Center. Dr. Meza will discuss her math and statistics education at the University of Nebraska-Lincoln, her work in clinical trials and how those experiences led to leadership opportunities at an academic health science campus.

Bio: Dr. Meza serves as the Associate Vice Chancellor for Global Engagement, Associate Vice Chancellor for Strategic Planning and Interim Executive Director for the Office of Health Security at the University of Nebraska Medical Center (UNMC). She serves as a senior international officer and works with the diverse array of activities including education abroad, global partnerships and other areas of global engagement. She works with faculty and staff across our community to build a framework for global partnerships that promote robust global engagement including student and faculty exchanges. Dr. Meza and the global engagement team work collaboratively across UNMC to support our international student and scholar community to engage them with our campus and broader community.

Dr. Meza has served as Co-Director of the Biostatistics Shared Resource for the Fred & Pamela Buffett Cancer Center and Director of the Biostatistics Core for the Cancer Center's Specialized Program of Research Excellence in pancreatic cancer. Dr. Meza served as Chair of the Department of Biostatistics from 2010 to 2017 and Senior Associate Dean of the College of Public Health from 2014-2018.

Dr. Meza has over 150 peer-reviewed publications. Her methodological research focuses on statistical issues related to clinical trials and small-area estimation. These methods have been extended to disease mapping applications and combining national and state data to estimate the probability of a rare event. The interdisciplinary nature of Dr. Meza's work has resulted in research in a wide variety of public health-related topics, including rhabdomyosarcoma, breast cancer, pancreatic cancer, prostate cancer, lymphoma, smoking, COPD, health insurance and medication errors.

Michael Parks, Director, Computer Science and Mathematics Division, Oak Ridge National Laboratory

Real-world impacts of mathematics

Abstract: Mathematics is the language of science. It is separate and distinct from fields such as computer science, engineering, and the physical sciences, but is the common bridge that crosses the boundaries separating traditional fields of research from each other. In this talk, I survey the relationship between mathematics and computer science, engineering, and the physical sciences, and highlight several examples where mathematics was foundational to tackling important real-world applications.

Bio: Michael Parks is the Director of the Computer Science and Mathematics Division at Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee. Prior to moving to ORNL, he was the manager of the Computational Mathematics department in the Center for Computing Research at Sandia National Laboratories in Albuquerque, New Mexico. His research interests include nonlocal models, especially peridynamics, multiscale modeling and simulation, domain decomposition methods, and iterative solvers. He serves as an editor for the SIAM Journal on Numerical Analysis and the Journal of Peridynamics and Nonlocal Modeling. He holds bachelor's degrees in computer science and physics as well as a master's degree in computer science from Virginia Tech. He earned his Ph.D. in computer science with the scientific computing group at the University of Illinois.

Gopi Shah Goda, Senior Fellow, Stanford Institute for Economic Policy Research, Stanford University

Lessons learned from Math 107H to the White House

Abstract: When Gopi arrived on UNL's campus as a freshman, she thought she had it all figured out: She would double major in math and actuarial science, complete her actuarial exams while working at an insurance company, and have a fulfilling life as an actuary. While things didn't quite turn out as she had planned, she was able to use her training to obtain a Ph.D. in economics, conduct policy-relevant research in the economics of aging, and serve as a senior economist in the White House Council of Economic Advisers.

Bio: Gopi Shah Goda is a Senior Fellow at the Stanford Institute for Economic Policy Research (SIEPR) at Stanford University, a Faculty Research Fellow at the National Bureau of Economic Research and a Fellow of the Society of Actuaries. From July 2021 to July 2022, Gopi served as a senior economist at the White House Council of Economic Advisers. Gopi conducts research that informs how policy can best serve aging populations. She studies the sustainability of public programs serving the elderly, how individuals make healthcare, saving and retirement decisions as they age, and the broader implications of the COVID-19 pandemic on health, labor supply and entitlement programs. Prior to joining SIEPR in 2009, Gopi was a Robert Wood Johnson Scholar in Health Policy Research at Harvard University. She earned her Ph.D. in economics from Stanford University in 2007 and her B.S. in mathematics and actuarial science from the University of Nebraska–Lincoln in 2000.

Judy Walker, Aaron Douglas Professor of Mathematics and UNL Associate Vice Chancellor for Faculty and Academic Affairs

Women in math at Nebraska

Abstract: During the 1980s, the UNL math department had three women faculty members (one of whom was only here for one year) and awarded 23 Ph.Ds., none of which went to women. In the first three years of the 2020s, the department has employed 12 women faculty members and awarded 26 Ph.Ds., 12 of which went to women. This talk will explore this dramatic shift – how it came about, how it is maintained, and what happens next.

Bio: Judy Walker is Associate Vice Chancellor for Faculty and Academic Affairs at the University of Nebraska-Lincoln and Aaron Douglas Professor of Mathematics. Walker obtained her B.S. in mathematics (with honors) from the University of Michigan in 1990, her M.S. in mathematics from the University of Illinois at Urbana-Champaign in 1992, and her Ph.D. in mathematics, also from the University of Illinois at Urbana-Champaign, in 1996. She joined the faculty of Nebraska as assistant professor in 1996. Walker’s research is in algebraic coding theory, including algebraic geometry codes, codes over rings, and graph-based codes. She has given numerous lectures on her work around the country and internationally, including serving as the Mathematical Association of America’s George Pólya Lecturer for 2009-2011. Her short book “Codes and Curves,” published by the American Mathematical Society and based on a lecture series she gave for the Institute for Advanced Studies Women and Math program, has become a popular text for students and researchers new to the field of algebraic geometry codes. She is a co-founder of the Nebraska Conference for Undergraduate Women in Mathematics, an annual conference funded by the National Science Foundation and the National Security Agency. Walker served on the Board of Trustees for the Mathematical Sciences Research Institute from 2014 through 2020, began her second elected five-year term on the Board of Trustees of the American Mathematical Society in 2023, and was recently appointed to the National Academies’ Board on Mathematical Sciences and Analytics. Among Walker’s professional honors are the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching from the Mathematical Association of America, the Louise Hay Award for Contributions to Mathematics Education from the Association for Women in Mathematics, and the Outstanding Alumni Achievement Award from the Department of Mathematics at the University of Illinois at Urbana-Champaign. She is an inaugural Fellow of the American Mathematical Society and was elected a Fellow of the Association for Women in Mathematics in 2019 and of the American Association for the Advancement of Science in 2022.

Theme: UNL Faculty Research

Mark Brittenham, Professor of Mathematics, University of Nebraska-Lincoln

Topological conjecture-busting

Abstract: Conjectures are an integral part of mathematics; they provide a picture of the limits of current knowledge and help to guide future research. Some of them are even worth a million dollars! This talk will highlight some of the research in Groups/Semigroups/Topology in our department, focusing on “conjecture-busting”: finding counterexamples to a range of conjectures. Most of these conjectures fit the model of “Things are not as weird as we might have feared.” Essentially, our work shows that, well, yes, they are!

Bio: Mark Brittenham is a Professor working with the GST group in our department. He arrived at UNL in the spring of 1999, having previously worked at the Institute for Advanced Study, the University of Texas at Austin, New Mexico State University, Vassar College, and the University of North Texas.

Mikil Foss, Professor of Mathematics, University of Nebraska-Lincoln

Some of us have gone nonlocal

Abstract: It sounds crazy, but there has been an explosion of interest in recasting local models with nonlocal operators. Many classical models use (local) differential operators which implicitly require a certain amount of regularity. There has been incredible success in employing nonlocal frameworks to model and predict behavior in irregular and collective phenomena. This has led the mathematical community to conduct varied investigations of systems of integrodifferential equations. The work done at UNL has potential impact in many fields such as dynamic fracture, machine learning, diffusion processes, image processing, and population models. In this talk, I will highlight some of our research achievements, collaborations in academia and national labs, as well as the successful careers that some of our graduates have embarked on.

Bio: Mikil Foss is a Professor in the Department of Mathematics with research interests in Applied Analysis, Calculus of Variations, Continuum Mechanics, and more recently Machine Learning. He received his Ph.D. from Carnegie Mellon University and joined the UNL faculty in 2005. During his career, he has advised over a dozen undergraduate and graduate students and has given numerous talks at national and international meetings, including visits to the University of Oxford, Camille Jordan Institute, University of Parma, and Trinity College in Dublin. He is engaged in interdisciplinary research with faculty from engineering, computer science, and physics, as well as researchers from national laboratories. His work has been funded by several NSF awards in mathematics and engineering. Professor Foss has taught a wide variety of undergraduate and graduate courses and has been recognized with multiple teaching awards.

Yu Jin, Associate Professor of Mathematics, University of Nebraska-Lincoln

Mathematical modeling and analysis in population dynamics

Abstract: Mathematical modeling and analysis have been powerful in discovering novel dynamics and understanding driving mechanisms for observed phenomena in the real world. Recently, emerging ecological or epidemiological challenges such as those in the context of climate changes or disease outbreaks need increasing attention and lead to new demanding and tough mathematical problems. In this talk, I will discuss some recent work on mathematical modeling of problems in ecology and epidemiology and analysis via the theories of differential equations and dynamical systems as well as computational tools.

Bio: Dr. Yu Jin is an associate professor in the Department of Mathematics at University of Nebraska-Lincoln. Her research interests are in the areas of mathematical biology, applied mathematics, differential equations and dynamical systems. Currently, her research mainly focuses on long-term dynamics such as persistence and spatial spread of differential or difference equations in ecology and epidemiology.

Yvonne Lai, Milton Mohr Associate Professor of Mathematics, University of Nebraska-Lincoln

115 years since Felix Klein's naming of the double discontinuity

Abstract: In 1908, Felix Klein (also of Klein bottle fame) observed that prospective high school mathematics teachers experience a "double discontinuity". The first discontinuity is upon entrance to tertiary education, wherein there is a shock of different expectations between high school and tertiary mathematical practice. The second discontinuity is upon entering high school as a mathematics teacher, wherein they wonder how university mathematics have anything to do with high school mathematics teaching. In this talk, I will focus on the second discontinuity, and how policy and practice of university mathematics departments in the US have addressed this problem. I will conclude with an overview of recent work that shows promise for mending the second discontinuity (at least for now).

Bio: Yvonne Lai is the Milton E. Mohr Associate Professor of Mathematics at the University of Nebraska-Lincoln. Her Ph.D. from the University of California, Davis, was in hyperbolic geometry and geometric group theory, and she held postdoctoral positions in the Department of Mathematics and subsequently the School of Education at the University of Michigan. Her current research program, in mathematics education, seeks to improve the education of secondary mathematics teachers and early mathematics majors by bridging disciplinary perspectives from mathematics and education. She has been an investigator or co-investigator on projects receiving a total of nearly \$8M in funding. Her collaborators include those from The Algebra Project, the Educational Testing Service, and the Association of Public and Land-Grant Universities. Lai currently chairs the MAA's Committee on the Mathematical Education of Teachers. She is Vice Chair of the Board of the Mathematical Foundation of America, which oversees the Canada/USA Mathcamp for high school students, where she was previously an instructor and a student in this program. She founded the SIGMAA-MKT, an organization with over 200 members, which aims to support mathematics faculty invested in teacher education. She received, with Aron Samkoff and Keith Weber, the 2012 Janet Duffin Award from the British Society for Research into Learning Mathematics.

Tom Marley, Professor of Mathematics, University of Nebraska-Lincoln

From Prüfer rings to geproci sets: A history of commutative algebra and algebraic geometry at Nebraska

Abstract: Commutative algebra and algebraic geometry have a rich history in our department, dating from the late 1960s to the present day. In this talk I will highlight the people, research, events and other notable achievements during this golden era.

Bio: Tom Marley has been a member of our faculty since 1989. His research interests in commutative algebra include Hilbert functions, applications of the Frobenius map, and homological algebra. He has supervised 12 PhD students. He has served as the Department's Vice Chair (2001-2005), Undergraduate Chair (2013-2016), and Chair (2016-2022).

**Xavier Pérez Giménez, Associate Professor of Mathematics and Undergraduate Chair,
University of Nebraska-Lincoln**

Finding spanning structures in random graphs - a brief survey

Abstract: The classical models of random graphs were introduced by Erdős, Rényi and Gilbert approximately 60 years after the first Ph.D. degree was awarded by our math department at UNL. One of the initial motivations for these random models was to provide a new source of examples or counterexamples in the theory of graphs that had remained elusive to other deterministic approaches. Over the past decades, random graphs have become a subject of active research on their own merit due to their fascinating properties, the beauty of the mathematical methods involved and also the applications and connections to computer science and statistical physics. As a result, the field has seen a dramatic explosion in the number of papers, new models and open questions. In this talk I will focus on the existence of spanning structures (such as perfect matchings or Hamilton cycles) in random graphs, which is one the main themes of my research, and will give a gentle overview on some of the main ideas and tools in this field.

Bio: Xavier Pérez-Giménez is an associate professor working in probabilistic combinatorics. He joined UNL in 2016 after holding postdoctoral positions at the University of Waterloo, the Max Planck Institute and the Toronto Metropolitan University (then called Ryerson University).

Chris Schafhauser, Assistant Professor of Mathematics, University of Nebraska-Lincoln

Approximate finite-dimensional representations of groups

Abstract: The theory unitary representations of finite groups is well-established and mostly understood. One of motivations for the introduction of operator algebras was to build a theory of unitary representations of infinite groups, and in various forms, such group representations still have a central role in the subject today. I will discuss some result from the last couple decades related to the problem of approximating infinite-dimensional group representations by finite-dimensional ones.

Bio: Chris is an assistant professor working in operator algebras. Chris completed his Ph.D. at UNL in 2015 under the supervision of Allan Donsig and David Pitts, and spent four years as a postdoc in Canada (University of Waterloo 2015-2018 and York University 2018-2019) before returning to UNL in 2019.

Theme: Achievements of our Graduates

Paula Egging, Data Scientist, Bryan Health

One mathematician's experience of data science in healthcare

Abstract: The term “data science” seems to have myriad different meanings, depending on whom you ask. This talk illustrates one mathematician’s journey into the land of data science, particularly in the healthcare setting. Given the sheer volume of data that is collected in today’s world, it should be no surprise that there is ample opportunity to leverage that information to drive decisions in virtually all facets of an organization. Within a hospital system subject to more complexities than a wee mathematician imagined, we highlight a few of the ways that data science and mathematics blend together to meet critical needs of the organization, from improving patient care to workforce retention and everything in between.

Bio: Paula Egging (Ph.D., '22) is a data scientist at Bryan Health in Lincoln, Nebraska. She has been with the data analytics team since 2022, focused on some of the organization's most complex challenges. Paula's main work is in developing predictive models using machine learning, with additional roles in many of the advanced analytics projects.

Jesse Moeller, Software Engineer, SpaceX

After grad school: from low-dimensional topology to network topology

Abstract and Bio not available.

Katie Morrison, Associate Professor and Associate Chair, University of Northern Colorado

Graphs, neural networks, and emergent dynamics in the brain

Abstract: Networks of neurons in the brain often exhibit complex patterns of activity that are shaped by the intrinsic structure of the network. For example, spontaneous sequences of neural activity have been observed in cortex and hippocampus, and patterned motor activity arises in central pattern generators for locomotion. In this talk, we will focus on a simplified neural network model known as Combinatorial Threshold-Linear Networks (CTLNs) in order to understand how the pattern of neural connectivity shapes the resultant neural activity. Specifically, the connectivity of these networks is encoded in a directed graph, and we will develop a series of graph rules characterizing how the graph structure shapes the neural dynamics by way of controlling the stable and unstable fixed points of the network.

Bio: Dr. Katie Morrison is an associate professor and the associate chair of the Department of Mathematical Sciences at the University of Northern Colorado. She received her B.A. from Swarthmore College (2005), double majoring in mathematics and psychology, and then her Ph.D. in mathematics from the University of Nebraska (2012). Her dissertation work was in algebraic coding theory, but she has since transitioned into mathematical neuroscience. Dr. Morrison's current research focus is on the mathematical theory and analysis of neural networks and neural codes, using tools from algebra, discrete mathematics, and topology.

Jennifer Mueller, Professor Laureate and Graduate Chair, Colorado State University

Inverse problems and pulmonary imaging

Abstract: Behind every medical image lies sophisticated mathematical algorithms. These algorithms solve an inverse problem: the problem of recovering information about the inaccessible interior of the human body from data collected externally. I have spent most of my career developing algorithms, hardware, and clinical applications for an emerging medical imaging technique known as electrical impedance tomography (EIT), which I first learned about as a graduate student at UNL. I have founded the EIT lab at Colorado State University, and in this talk I will discuss what it's like to be a mathematician with a lab and collaborate closely with engineers and physicians. I will give an introduction to EIT and the applications I am working on with doctors in Colorado including patients with cystic fibrosis, neuromuscular disease, and premature infants with lung disease. Of course, I will show reconstructed images!

Bio: Jennifer Mueller is a Professor of Mathematics and Biomedical Engineering at Colorado State University (CSU) and a Professor Laureate in the College of Natural Sciences at CSU and

currently serves as the Graduate Director in the Department of Mathematics and as an Associate Chair. She received her Ph.D. from UNL in 1997, and was an NSF Postdoctoral Fellow at Rensselaer Polytechnic Institute before joining the faculty at CSU. Her research encompasses development of new hardware, reconstruction algorithms, and clinical applications for electrical impedance tomography (EIT) and acoustic tomography. Supported by the NIH, her work involves close collaborations with mathematicians, engineers, and physicians in the U.S. and abroad. She serves as an Associate Editor for IEEE Transactions on Medical Imaging and Inverse Problems, and is co-founding-editor of the journal Applied Mathematics for Modern Challenges. She is also co-author with Samuli Siltanen of the book “Linear and Nonlinear Inverse Problems with Practical Applications,” SIAM, 2012.

Anisah Nu'man, Assistant Professor, Spelman College

My mathematical journey (so far)

Abstract: Within this talk, I will discuss my mathematical journey beginning as an undergraduate, my years as a graduate student at UNL, and my current position as an Assistant Professor of Mathematics at Spelman College.

Bio: Dr. Anisah Nu'Man is an Assistant Professor of Mathematics at Spelman College. Originally from Atlanta, GA, Dr. Nu'Man obtained her B.S. in Mathematics from Spelman College and her Ph.D. in Mathematics from the University of Nebraska-Lincoln. Her research interests are in geometric group theory, anti-Ramsey theory, and topics in mathematics education. Dr. Nu'Man serves as a director for the MSRI-ADJOINT program and a contributor for the NAM-MAA Math Values Blog.

Josh Pollitz, NSF Postdoctoral Fellow, University of Utah

Structural results in commutative algebra

Abstract: In this talk, I will discuss some of my research accomplishments and how my time at UNL has profoundly shaped me as a researcher. I will mention what I have been up to during my time as an NSF postdoc at the University of Utah, and soon-to-be tenure track professor at Syracuse University, while trying to touch on some of the specific ways my time at UNL laid the foundation for many of my research successes.

Bio: Josh Pollitz is an NSF postdoctoral research fellow at the University of Utah. In 2019, he received his Ph.D. at UNL where his advisors were Lucho Avramov and Mark Walker. His research interests are primarily in the homological aspects of commutative algebra. Josh will be starting a new job as a tenure track professor at Syracuse University next fall.

Karina Uhing, Assistant Professor, University of Nebraska at Omaha

Innovations in first year mathematics courses: Using research to inform practice

Abstract: In this talk, I'll briefly discuss some of my experiences from graduate school including serving as a co-convener for Trigonometry, developing course curriculum, being a research assistant on the SEMINAL grant, and conducting my dissertation research on pedagogical empathy. I will explain how these experiences helped prepare me for my current position as an Assistant Professor at the University of Nebraska at Omaha, where we have been working to improve our first-year mathematics courses. I'll give a broad overview of some of the efforts I

have been involved in at UNO, and share my current research on students' experiences in these courses including their perceptions of classroom community and standards-based grading. Finally, I will discuss how our team of first-year mathematics faculty has formed a community of practice around using research to inform our teaching practices.

Bio: Karina Uhing is an Assistant Professor in the Department of Mathematical and Statistical Sciences at the University of Nebraska at Omaha. For the last three years, she has been a team member of a large-scale course redesign effort to improve first-year mathematics courses at UNO. Her research focuses on the cultural shifts involved in implementing evidence-based teaching practices in undergraduate mathematics courses. She is especially interested in how emotions and relationships affect students' learning.

Theme: Mathematics Outside Academia

Amy Bouska, Former managing director, Tillinghast
Becoming the 'Spreadsheet Lady'

Abstract: Is a college and graduate mathematics (and statistics) education worth anything if you never use it? I vote "yes" even though, for most of my career, I specialized in work that required reading legal decisions rather than math or stats. Now in my fourth term on our City Council and deep into volunteer work on energy efficiency and solar, I'm sometimes called the Spreadsheet Lady. That's a fine post-retirement "next act" for a numbers-oriented but non-theoretical-math-filled career.

Bio: After receiving an undergraduate degree in mathematics (UNL '69) and master's degrees in mathematics (Duke University '71) and statistics (Virginia Tech '79), Amy discovered casualty actuarial science. She specialized in the analysis of mass torts (pollution, asbestos, lead paint, etc.) and worked on the development of state insurance pools for LUST (Leaking Underground Storage Tanks) and the reform of Lloyd's of London. She also served as Vice President – International of the Casualty Actuarial Society and a US representative to the International Actuarial Association and retired as a senior partner at Towers Perrin (now Willis Towers Watson). She is now active in local government and climate / energy efficiency work.

Josh Brown Kramer and Lucas Sabalka, Ocuvra
Fall prevention with AI at Ocuvra

Abstract: Ocuvra is an AI computer vision system that monitors fall risk patients in hospital rooms. In this talk we will give an overview of the company and the results we've achieved. We will also discuss some of the technology and math underlying the system.

Josh Brown Kramer's Bio: Josh Brown Kramer received bachelor's degrees in Math and Computer Science in 2001 and a Ph.D. in Math in 2007, all at UNL. His advisor was Jamie Radcliffe. He was an assistant professor at Illinois Wesleyan University for four years, before returning to Lincoln in 2011 to help create startups at Nebraska Global. He is currently the lead in computer vision R&D at Ocuvra, a health care AI company.

Lucas Sabalka's Bio: Lucas Sabalka attended UNL for his bachelor's degree, graduating in 2002 with majors in mathematics, computer science, and history. He completed his undergraduate thesis in mathematics under the mentorship of Susan Hermiller and John Meakin. He went on to get his Ph.D. in mathematics from the University of Illinois at Urbana-Champaign in 2006. He moved from academia to industry in 2013. He is currently Chief Data and Analytics Officer at Ocuvera.

Lisa Davis, RAND Corporation

Oh, the places you can go!

Abstract: A major in mathematics provides a student with a versatile and solid foundation for navigating a successful and sometimes undetermined career path. A bonus is that, even years later, everyone thinks you are really smart. Hear about my unconventional wanderings as I realized my passions and what is most important to me.

Bio: Originally from Lincoln, Lisa (Schkade) Davis set off from UNL with her math degree, totally uncertain about what she wanted to do with her life. After a few years of working, she found her way to graduate school at the University of Michigan, studying operations research, and then to business school at Emory University. Lisa has worked at Hallmark Cards, UPS, The Home Depot, IBM, and the Department of Defense. Now, she loves her work for the RAND Corporation, a nonprofit and nonpartisan think tank, doing projects in support of national security.

Derek DeSantis, Staff Scientist, Los Alamos National Laboratory

A glimpse of mathematics research at the national labs

Abstract: The US National Laboratories, such as Los Alamos National Laboratory (LANL), are large research institutions engaged in diverse, multidisciplinary scientific research. For mathematicians outside the laboratory system, it may be unclear whether the research conducted is interesting or relevant to their skillset. In this presentation, we will highlight some of the research I have been conducting in mathematics, machine learning (ML), Earth system sciences (ESS), and their intersection at LANL.

Our discussion will begin with a focus on some work in robust and interpretable unsupervised ML for ESS. We will then delve into the mathematical theory of tensor factorizations before concluding with a discussion of Koopman operator theory methods for dynamical systems, and how this framework can be leveraged to better understand the climate system. The goal of this talk is to provide one perspective on mathematics research at the national labs.

Bio: Derek DeSantis is a Staff Scientist at Los Alamos National Laboratory (LANL) in the Computational Physics and Methods Division (CCS-2), where he specializes in the mathematical theory of machine learning for its application in the climate sciences. He earned his Ph.D. in operator algebras from the University of Nebraska in 2019 and subsequently pursued a postdoctoral research position at LANL's Center for Nonlinear Studies, where he focused on the intersection of machine learning and Earth System Sciences. He is currently in his second year as a staff scientist at LANL in CCS-2.

Levi Heath, Postdoctoral Associate, UNL, and Gabe Payson, Undergraduate , UNL
Math in the City: Comparing neural network and regression models in predicting Lancaster County housing prices

Abstract: Math in the City is an advanced undergraduate course at UNL. The course partners students with a local business, government agency, or research lab to create and analyze mathematical models using real data. In the first five minutes of this talk, Levi Heath will give a short summary of the class. Then Gabe Payson will present the work he and his group members, Mitch Finocchiaro, Xuan Le, Eric Liu, and Yashaswi Mehra, completed while taking Math in the City in the fall of 2022.

Gabe Payson's Bio: Gabe Payson is a junior majoring in Mathematics with a minor in Japanese at the University of Nebraska-Lincoln. He expects to graduate in the fall of 2024 and is considering attending graduate school after graduation.

Levi Heath's Bio: Levi Heath is a postdoctoral associate in the Department of Mathematics at the University of Nebraska-Lincoln. He studies Gromov-Witten theory, Mori dream spaces, and geproci sets. Though he is a newcomer to UNL, his mathematical journey was heavily influenced by UNL alumni. At Northern Arizona University, he worked on an undergraduate research project with Jeff Rushall (B.A. 1984, M.S. 1992), and in graduate school at Colorado State University, he received early academic counseling from Dr. Jennifer Mueller (B.S. 1991, M.S. 1993, Ph.D. 1997).

Brittney Keel-Mercer, Research Geneticist, USDA

Development of online systems for monitoring behaviors of individual animals in livestock production.

Abstract: Disease control, animal welfare, and production efficiency are important factors in ensuring sustainable livestock production. Precision livestock farming (PLF) is an innovative approach that uses modern technology to gather data about every animal on a farm, which can be used by the farmer to make production decisions. Technologies commonly used in PLF systems include cameras, microphones, GPS, accelerometers, or other sensors on or around the animal. One of the major challenges to the successful implementation of PLF stems from an unprecedented abundance of data streams. This challenge can be tackled by using techniques from machine learning and data mining. Here, we present a broad overview of research activity related to PLF systems being conducted at the U.S. Meat Animal Research Center. USDA is an equal opportunity provider and employer.

Bio: Dr. Keel completed her Ph.D. in May 2015 under the supervision of Drs. Bo Deng and Etsuko Moriyama. Immediately following graduation, she joined the staff of at the U.S. Meat Animal Research Center (USMARC) in Clay Center, NE, as a Postdoctoral Research Associate. In January 2016, she received her appointment at USMARC as a Research Geneticist. Dr. Keel's research program focuses on the application of artificial intelligence and machine learning technologies to livestock production. She has co-authored over 40 peer-reviewed publications and supervised several post-docs, undergraduate and graduate students. Dr. Keel collaborates with researchers around the world and routinely gives research presentations and industry and professional meetings. In 2021, she received the USDA Plains Area Early Career Research Scientist Award, one of the top honors within the USDA Agricultural Research Service.

Laura White, Aerospace Engineer, NASA Langley Research Center

The day in the life of a NASA mathematician

Abstract: Dr. White has been working with NASA Langley Research Center for six years. Her work consists of various ways to statistically measure uncertainties that exist in aerospace applications. Applications of her work include modeling heat shield for planetary re-entry, low-boom analysis for X-59 Quest mission, and wind tunnel testing. For this talk, Dr. White will describe her current work at NASA and how she applies mathematical techniques to real world applications. She will also provide various ways people can pursue a NASA career.

Bio: Laura White is an Aerospace Engineer at NASA Langley Research Center. She received a bachelor's degree in mathematics from Arkansas State University in 2013. In 2018, she received her doctorate in mathematics from the University of Nebraska-Lincoln. Upon completion of her doctoral program, she entered the government workforce at NASA Langley Research Center where she applies knowledge from both her undergraduate and graduate studies. She currently works on statistical applications of quantifying uncertainties that exist within the governing mathematical equations of fluid flow around aerospace vehicles. She spends her days trying to answer the question: "Given the assumptions we make to describe this aerodynamic flow; how do we quantify the discrepancy between reality and the mathematical model?" Other areas of interest are in-space robotic assembly and surrogate modeling for database management. She is also passionate about women equality in the workforce and currently serves as the lead of the women's employee resource group at Langley.

Theme: A Commitment to Mathematics Education

Delise Andrews, 3-5 Mathematics Coordinator, Lincoln Public Schools

My mathematics learning journey: The power of sense-making

Abstract: As a lover of learning, I dreamed of being a teacher from an early age. I've taught a variety of subjects and grade levels in a variety of settings. I've also been fortunate to have opportunities to continue my education throughout my career. Rich experiences including a book study on Liping Ma's "Knowing and Teaching Elementary Mathematics," participation in UNL's Math in the Middle Institute Partnership, and other continuing education programs have taught me to appreciate the great power of sense-making in learning and teaching mathematics. This talk will highlight ways my instructional practice has shifted over the course of my professional learning journey.

Bio: Delise is the 3-5 Mathematics Coordinator for Lincoln Public Schools in Lincoln, Nebraska. During her career, she has worked in both rural and urban districts and has taught mathematics to students at every age from kindergarten through the 8th grade, undergraduate math methods, and graduate level courses for teachers of mathematics. Delise is a recipient of the Presidential Award for Excellence in Mathematics and Science Teaching and a Robert Noyce Master Teaching Fellow. She is also an active member of NCTM, serving as a past member and chair of the Professional Development Services Committee, member of regional conference committees and chair of the St. Louis annual conference committee, NCTM Professional Services facilitator, and manuscript referee for NCTM journals. Delise has had articles published in NCTM journals

and co-authored two books in the “Classroom Ready Rich Math Tasks: Engaging Students in Doing Math” series published in 2021 by Corwin press.

Allan Donsig, Professor, University of Nebraska-Lincoln

Student success in first year courses

Abstract: Two-thirds of incoming students take a math course in their first semester at UNL. First-year courses are more than half of the math department’s teaching, in terms of students and of credit hours. These courses play a crucial role in preparing our students for careers in STEM fields, in business, and in many other majors. Since 2012, the department has completely overhauled how we teach these courses, increasing support for both students and instructors. The results include increased student success in the courses and dramatically reduced costs for students. We will outline the changes, the motivation for them, and their impact on both students and instructors.

Bio: Allan Donsig joined the department in 1997, after completing his Ph.D. at Texas A&M in 1993 and holding two postdoctoral positions. His research is in Operator Algebras, including supervising seven doctoral dissertations, and, more recently, in Mathematics Education. He has been a co-PI on over \$8,000,000 in federal grants. He became Vice Chair in 2012 and chaired the First Year Math Task Force, which has led the effort to increase student success in first year courses, from 2012 until 2021.

Raegan Higgins, Associate Professor and Assistant Vice Provost for Faculty Success, Texas Tech University

Reach back and go forward

Abstract: Dr. Martin Luther King, Jr said, “Life’s most persistent and urgent question is: What are you doing for others?” This speaks to my service mission of supporting communities historically excluded from STEM. In this talk, I will share my journey to mathematics, how others support me, and what I am doing to call others into the field.

Bio: Dr. Raegan Higgins is excited to participate in MATH 125. As an alumna of UNL, she served as a graduate student representative on the Nebraska Conference for Undergraduate Women in Mathematics organizing committee, a co-instructor for Math in the Middle, and a graduate student mentor for Nebraska IMMERSE. While her current research focuses on developing time scale models for intermittent androgen deprivation therapy, she has a keen interest in increasing the number of women, especially those underrepresented, in STEM and improving the undergraduate preparation of mathematics majors. Nationally, Raegan is a 2023 Association for Women in Mathematics Fellow, co-founder of the website Mathematically Gifted and Black, and a co-director of the Enhancing Diversity in Graduate Education (EDGE) Program, which is a Presidential Award for STEM Mentoring recipient. In addition, Raegan is an Assistant Vice Provost for Faculty Success and a newly promoted Full Professor at Texas Tech University.

Michelle Homp, Associate Professor of Practice, University of Nebraska-Lincoln

NebraskaMATH goes to Africa

Abstract: Through connections formed during the NebraskaMATH grant, in 2018 and 2019, I had the privilege of traveling to Senegal, Africa to help lead a summer math camp for students and a professional development workshop for elementary teachers at the Senegalese American Bilingual School. I learned a great deal about the elementary mathematics curriculum in Senegal, about the dedication of their teachers, and about the overwhelming hospitality of the Senegalese culture. In this presentation I will summarize the highlights of the experience.

Bio: Michelle Homp earned her Ph.D. in applied mathematics from UNL in 1991. Previously she completed an undergraduate degree in secondary mathematics education at Concordia University in Seward, NE (CUNE). Dr. Homp taught at CUNE and worked for the Lincoln Public Schools prior to joining the Center for Science, Mathematics & Computer Education in 2005. At UNL she has focused her efforts on K-12 mathematical teacher preparation and professional development. She played a lead role in launching the Department's online MAT degree program, continues to serve as a member of the MAT committee and directs the Nebraska Math & Science Summer Institutes professional development program for teachers.

Matt Larson, Associate Superintendent for Instruction, Lincoln Public Schools

Serving the needs of K-12 mathematics teachers in the post-COVID era

Abstract: Post-Covid, the K-12 educational landscape has changed dramatically. In this session, some of the forces impacting K-12 mathematics education today will be shared and strategies for how the mathematics department might address these forces will be recommended.

Bio: Matt Larson served as President of the National Council of Teachers of Mathematics from 2016-2018. Prior to serving as president of NCTM, he was the K-12 mathematics curriculum specialist for the Lincoln Public Schools, where he currently serves as the Associate Superintendent for Instruction. He is the co-author of more than 20 professional books and textbook series. He held an appointment as an honorary visiting associate professor at Columbia University, NY.

Kristie Pfabe, Professor and Chair, Mathematics and Computer Science, Nebraska Wesleyan University

The transformative experience of teaching math in prison

Abstract: Bryan Stevenson's book, *Just Mercy*, changed my life. After reading the book, I knew I could not put it on my bookshelf and forget it. It was a call to get proximate, get uncomfortable and to see myself as part of a larger, complicated community. My first volunteer teaching experience in Nebraska prisons was part of my 2018 sabbatical for my job at Nebraska Wesleyan University. The diverse educational backgrounds of my students challenged me as a teacher more than I have ever been challenged. It made me a better teacher. It was fun, rewarding, and eye-opening. Since then, I have had other meaningful teaching opportunities, including teaching UNL's Intermediate Algebra with a mathematics graduate student at the Lincoln Correctional Center. In my talk, I will share this voyage with you. It has transformed me and how I see the world.

Bio: Kristie Pfabe is a professor of Mathematics and Computer Science at Nebraska Wesleyan University, where she has taught since 2000. After earning a Ph.D. in mathematics from UNL in 1995, she taught for 4 years at Northern Kentucky University, with these years being separated by a year-long volunteer position in Nicaragua. She has a strong interest in the role that mathematics plays in civic life. Her most recent venture into this area is a strong collaboration with Dr. Steve Dunbar, professor emeritus at UNL, in the area of gerrymandering and redistricting. Her passion for teaching mathematics in prison was inspired by the book “Just Mercy” by Bryan Stevenson. In 2018, she created and taught the course, Combinatorics and Probability, in two Nebraska state prisons. Through a partnership between UNL and a private donor, she co-taught Math 100A, Intermediate Algebra, in the summer of 2019 at the Lincoln Correctional Center. These experiences were the beginning of a rewarding journey that shaped both her teaching and her life in meaningful ways.

Katie Soto, Professional Development Specialist, Educational Service Unit 9

From student to educator: A mathematical journey

Abstract: Join me on a 20-minute journey through my experiences in math education where I will share the individuals, teachers, and mentors who have inspired me and challenged me. As a former math student, I was inspired and encouraged to join this profession and I am grateful for the opportunities that the University of Nebraska-Lincoln has provided me to grow and succeed. Through this talk, I will highlight the key moments and people that shaped my path, and how their influence has helped me become the educator I am today.

Bio: Dr. Katie Soto is a Professional Development Specialist at Educational Service Unit 9 in Hastings, Nebraska. She earned a bachelor’s degree in Elementary Education in 2006, a Master of Arts for Teachers in Mathematics in 2010, and a Doctorate in Educational Studies four days ago! She has been in education for 17 years and has an endorsement in both Elementary K-6 and 7-12 mathematics. She earned National Board Certification in 2014. Katie has been a teacher in both the Lincoln Public Schools and the Grand Island Public Schools. She is a passionate instructional leader dedicated to the support of professional collaboration to improve student achievement in K-12 schools.