UMKC RooMath News

Program of Mathematics & Statistics Newsletter
For previous issues of *RooMath News* see here.

Volume 16, Issue 1
Fall 2023

2022-2023 UMKC Mathematics and Statistics Highlights
Relocation, Hiring, New Collaborations, Funding and more

Inside this issue:

From the CAM Division Associate Director
Dr. Majid Bani-Yaghoub

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I hope this message finds you well as we embark on another academic year here at the UMKC Computing, Analytics, and Mathematics Division. I wanted to take a moment to reflect on the past year's achievements and share our plans for the current year.

In the past academic year, our division made significant strides. The math and stat faculty members were actively engaged in collaborative efforts, particularly with our esteemed colleagues in the Computer Science Department, which has opened doors to new opportunities and innovative projects.

We're delighted to announce some key additions to our division. We welcomed a talented Assistant Teaching Professor of Mathematics, **Dr. John Sawatzky**, who has already contributed immensely to our academic community. Additionally, we were fortunate to bring on board an Assistant Professor of Statistics, **Dr. Bowen Liu**, whose expertise will undoubtedly enrich our research and teaching.

On the research front, our mathematics faculty has shown remarkable success in securing external funding for their projects. This achievement not only reflects their dedication but also highlights the high-quality research taking place within our division.

As a physical note, in March we moved most of our math and stat faculty offices from Manheim Hall (our location for nearly 25 years) to **Flarsheim Hall** (pictured above).

As we look forward to the current academic year, our primary focus is on enhancing the overall aca-

demic experience. We are committed to elevating the quality of course instruction, ensuring that our students have access to the best resources, and fostering effective networking between our dedicated faculty and our talented student body.

Your feedback is invaluable to us, and we encourage you to reach out with your suggestions and constructive criticism. Your input plays a pivotal role in our continuous efforts to make our division stronger and more vibrant. We are dedicated to creating an inclusive and supportive academic environment where everyone can thrive. As we go through this academic journey, please remember that our doors are always open. We look forward to another year of growth, innovation, and success, and we are excited to share it with each and every one of you.

The UMKC Integration Bee was a Great Success

The **Integration Bee** is an annual contest for undergraduates and high school students with prizes for the best skills in evaluating indefinite integrals. Everyone is welcome. Whether you are a participant or an audience member, there are plenty of snacks and drinks for everyone. More than 35 students participated in the **Integration Bee on Friday April 7, 2023**. There were 25 multiple-choice integral problems (2 points each) and 10 workout integral problems (5 points each). All were indefinite integrals and there was no need for a calculator. The participants had 60 minutes to complete as many problems they could. The competition was followed by a social event with pizza and soft drinks (11:00 AM-12:00 PM).

Top: Picture of some 2023 UMKC Integration Bee participants **Bottom**: The top three winners of the Integration Bee. From left to right **Johnny Diep** (UMKC Physics major, 1st place), **Johnathan Lee** (Blue Springs High School, 2nd place) and **Jay Dawson** (Blue Springs High School, 3rd place)

Math Major Rashid Al Ghailani works an Internship at Oman's National Centre for Statistics and Information (NCSI)

The **National Centre for Statistics and Information** (NCSI) is the official statistical agency in **Oman**. It is responsible for collecting, analyzing, and disseminating data and information about various sectors of the country's economy. The NCSI generates reliable and accurate statistical data that is used for policy-making, planning, and research purposes. It covers a wide range of areas such as demographics, social indicators, economic indicators, the labor market, education, health, environment, and others. The NCSI conducts surveys and censuses to gather data from individuals, households, businesses, and other sources. It also collaborates with various government agencies and international organizations to ensure the availability and accuracy of statistical information. The NCSI plays a crucial role in monitoring and evaluating the country's development progress. It provides regular reports and publications that highlight key statistical indicators and trends, allowing policymakers, researchers, and the general public to make informed decisions and understand the social and economic situation in Oman. By providing reliable and comprehensive statistical data, the NCSI aims to enhance transparency, promote evidence-based decision-making, and support the sustainable development of Oman.

Centre Structure

The centre is divided into **four circles**. The **first circle** is the Department of National Accounts. This department is considered one of the most important of the four circles, which reviews the most important indicators of the national accounts, among which are the Gross Domestic Product (GDP), the production account, the goods and services account, local and national savings, and the gross fixed capital formation. The **second circle** is the Department of Price Statistics and Foreign Trade, which is considered the second most important department after the national accounts. One of the tasks of this department is to monitor the state of the national economy and the extent of its growth and development. It is also the department responsible for monitoring the level of inflation in the country and publishing its monthly report. The **third circle** is the Sectoral Statistics Department, which comes in the third place in terms of importance. The opportunity did not allow me to work in this department, but I know a little about it. From what I know about this circle, it is interested in direct foreign investment as it is a means of financing economic and social development, which is a major goal that governments aspire to achieve, to increase national income, and then increase the average per capita income, and raise the standard of living. The **fourth circle** is the Population and Labor Force Statistics Department. This department is interested in calculating the number of citizens and residents in the country and the percentage of employees and unemployed for reasons that are too long to explain in this article. Also, this department is no less important than the previous departments, but the work in it is not complicated, as is the case in the former departments.

Please introduce yourself and tell us about your high school and college experiences.

I am Rashid. I am 22 years old. In high school, mathematics was a source of happiness for me. The forty minutes in the mathematics class were like five minutes. High schools like ours used to organize competitions at the state level called "genius student" and schools from all regions participated. I participated in this competition and won second place at the state level. My high school years were some of the best of my life. I graduated with a high score, and the opportunity allowed me to get a scholarship. I decided to accept it and devote my time to a new experience in my life. Now I am a senior student majoring in Mathematics and Statistics at the University of Missouri- Kansas City.

Where did your interest in math begin?

My passion and interest in mathematics started in elementary school. At that time my mother was a mathematics teacher, and she was my teacher at the school at the same time. She used to give me problems to solve every day until math became a part of me.

What math and stat courses have you taken?

I have taken **Precalculus, Calculus I, Calculus II, Calculus III, and Math 496** (Internship/Practical Training in Mathematics or Statistics), which I am taking this summer and doing this report for.

What kind of math and stat courses do you prefer?

I love algebra in mathematics. Although algebra has countless laws, it is beautiful in its application. I also love trigonometry because I enjoy calculating distances and extracting angles. In statistics, I have not taken any classes yet, but I like anything that has data analysis or monitoring the growth or decline of a specific thing.

Which courses are more useful for your internship?

There was nothing specific from what I took previously that was useful for training, but in general math was the subject most used in the work assigned to me.

How do I get a math internship?

To pursue a math internship, consider following these steps:

Identify your interests and goals: Determine the specific area of mathematics you are passionate about, such as data analysis, cryptography, finance, or computer science. This will help you narrow down your search for relevant internships.

Research potential internships: Look for organizations, companies, or research institutions that offer internships related to math. Start by checking the websites of corporations, research labs, universities, and government agencies. Utilize resources like internship search engines, job boards, and professional networks to identify opportunities.

Prepare your resume: Tailor your resume to highlight your mathematical skills, coursework, projects, and any relevant experience or certifications. Emphasize your problem-solving abilities, critical thinking skills, and any programming languages you are proficient in.

Prepare for interviews: Research the organization or institution you have applied to, familiarize yourself with their work, and be ready to showcase your mathematical skills during interviews. Prepare to answer technical questions and problem-solving scenarios.

Follow up: After applying or interviewing, send a follow-up email expressing your gratitude for the opportunity to apply or interview. This shows professionalism and can keep you on their radar.

Considering that math internships can be highly competitive, so persistence and continuous effort are essential. Even if you are unsuccessful initially, keep trying and exploring alternative opportunities.

You obtained an internship this year and worked full time during the summer. Could you tell us how you obtained the internship and how many other internships you applied for?

At the beginning, it wasn't my plan to return to my home country of Oman during the summer vacation until I found an account specialized in posting job and training advertisements there. I found several advertisements in various government agencies about vacancies to train students in the summer period. I applied to 5 authorities that are related to my major. After the spring 2023 semester exams, I got a response from the National Centre for Statistics and Information, which I was interested in the most. At the same time all my friends were going back to Oman, so I decided to take the opportunity of the internship and at the same time I didn't want to sit alone in Kansas.

What kind of questions can we expect in an internship interview?

In my internship, I got asked the following questions:

Tell me about yourself.
Why do you want to work at this agency?
Why did you apply for this position?
What do you know about the agency “NCSI”?
Why did you choose this agency to have an internship in?

Name a few specific skills needed for a math or stat internship.

Excel and SQL were most needed skills in my job, and I asked my supervisor to put me in a team where I would have to solve real problems using those skills. I wanted to practice them and wanted to be good at using the programs and languages. Besides that, you should have a good background about the **R-studio app**. Other than technical skills, what my managers found of most value in my work was my being able to come up with formulas for certain measures and to explain why it would be applicable in the project.

Tell us about the company that you worked for and its clients.

The entity in which I worked is considered a governmental entity responsible for national statistics and it is not for profit. It is an independent entity that has no clients. The staff were very nice. I also noticed their mastery and accuracy in completing the work assigned to them. They were flexible in their interactions and understanding of our situation as students. They even welcomed any question that came to my mind and gave me the answer in detail. I formed a strong relationship with them, especially after I got the recommendation from the department director, because they were the ones who were the reason I got it.

What are the career expectations and characteristics of your internship?

Those may include the following:

1. Data Analysis and Interpretation: NCSI professionals are expected to have strong analytical skills to process and interpret statistical data accurately. They should be proficient in data analysis software and possess the ability to identify trends, patterns, and insights from complex datasets.

2. Research and Methodology: NCSI personnel are responsible for conducting research and developing statistical methodologies. They should have a solid understanding of statistical techniques, survey methodologies, sampling procedures, and data collection methods.

3. Technical Skills: Individuals associated with NCSI are expected to be proficient in statistical software, data management tools, and database systems. They should have knowledge of programming languages like R or Python and be able to utilize these tools for data manipulation, visualization, and modelling.

4. Attention to Detail: Accuracy is crucial in statistical analysis. NCSI professionals must have exceptional attention to detail to ensure data quality, eliminate errors, and maintain data integrity.

5. Communication Skills: Effective communication is important for presenting statistical findings to various stakeholders. NCSI personnel should possess strong written and verbal communication skills to convey complex statistical information in a clear and understandable manner.

6. Domain Knowledge: Depending on the specific area of statistical analysis within NCSI, professionals may be expected to possess domain knowledge in sectors such as economics, demography, labor market, tourism, or agriculture. Understanding the relevant industry or sector helps in accurate data interpretation and contextualizing statistical information.

7. Collaboration and Teamwork: NCSI personnel often work in teams to collect, analyze, and report statistical data. They should demonstrate the ability to collaborate effectively, share ideas, and work collectively to achieve organizational objectives.

8. Continuous Learning: The field of statistics constantly evolves, with new data collection methods and emerging technologies. NCSI professionals are expected to engage in continuous learning and professional development to stay updated with the latest statistical techniques and industry best practices.

9. Ethical Conduct: NCSI personnel should adhere to ethical standards, maintaining confidentiality and ensuring the privacy of collected data. They must follow ethical guidelines and respect the sensitivity of statistical information.

10. Adaptability: The field of statistics is dynamic, and professionals associated with NCSI should be adaptable to changing demands, technologies, and methodologies. They should be able to quickly learn and adapt to new statistical tools and techniques.

These expectations and characteristics may vary based on specific roles within NCSI, such as statisticians, data analysts, researchers, or database administrators.

Do you consider the same company and job as a future career?

Logistics was fun. It was like playing computer games. At the end of my internship, I was offered the chance to extend my internship through the next semester, and I accepted it. I liked the people I worked with and the type of job I was doing day to day. They were flexible with my schedule and accommodating to my requests.

What are the most satisfying and most frustrating parts of your job as an intern?

1) Ease of forming good relationships with employees.
2) Teamwork as one cell.
3) How the staff treated me.
4) As much as I liked the work, I used to work the same as employees until I forgot that I was a trainee.
5) The manager's humility and responsiveness to the staff.
6) The work environment in general was very comfortable for me.

There were no frustrating points, but dealing directly with the numbers needed strong focus. In addition to that, the project that we were undertaking was enormous, but that is not one of the negative points due to the distribution of the task among all employees. On the contrary, I saw it as a challenge with time. I did not complete the project with them because the project ends at the end of this year, but according to what I saw as single cell work and in cooperation, I am full of confidence that the project will be completed before the due date.

In what ways have you benefitted from having a summer internship?

1. Gaining corporate experience beneficial for future job searching.
2. Learning the necessary skills in job performance from experienced people.
3. Being able to work from home efficiently, which will be a key qualification post-pandemic.
4. Earning credit hours toward graduation.

Where and how did you use mathematics or statistics in your internship?

Within my internship, I worked on unloading the financial statements of more than 100 out of 2000 companies distributed to employees working in emptying the financial statements. I also checked the annual accounts of major companies, which made me deal a lot with numbers. All this for the sake of a huge project that the National Centre for Statistics and Information is working on under the umbrella of the Department of National Accounts, which is monitoring the development of the gross domestic product.

If you were not a Math and Stat major, you would be …?

Prior to choosing mathematics as my degree, I switched from mechanical engineering to business administration to accounting. So, if I was not a math major, I would either major in Business, Finance, or Mechanical Engineering. All the majors

provide their own challenges. What I love about mathematics is solving new problems.

Tell us about the Math and Stat professors at UMKC.

They are passionate in teaching and sharing their expertise. They care about students' successes. I think I will miss dropping by professors' offices to ask questions and connecting with them after I graduate.

Where do you see yourself in the next 5 years?

In next 5 years, I see myself as an employee at the National Centre for Statistics and Information as a data analyst or auditor because I got a recommendation from the department manager, and this recommendation means that my job is guaranteed in this entity.

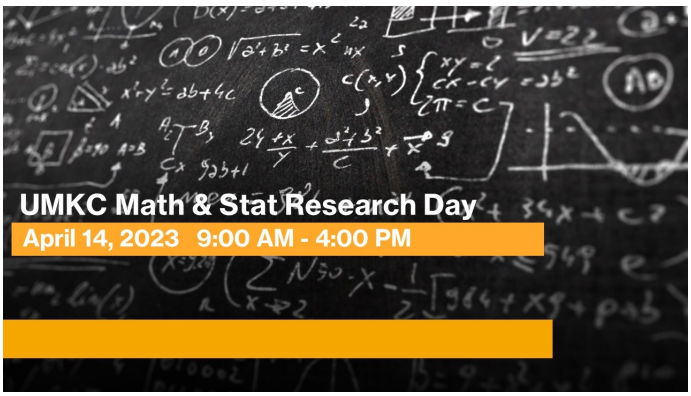
What kind of hobbies do you have?

I love reading novels, swimming, and solving puzzles. I also love riding Arabian horses very much, and I aspire to own one. I love drawing even though I'm not a great painter. I also discovered that I am a good cook, especially in Arabic dishes. I discovered this skill only when I started studying in the US because there is no one who cooks for me. I will not say mathematics from solving problems is one of my hobbies because it has become a part of me.

Math & Stat Research Day

The **UMKC Math and Stat Research Day** is an annual one-day event celebrating student and faculty research and creative and scholarly activities. The event promotes research in mathematics, statistics, and applications in various fields, and is open to the public. This is an excellent opportunity for graduate students to present their research in applied mathematics, statistics, and biostatistics.

For this year, the theme of the research day on April 14, 2023, was "**Mathematical & Statistical Modeling of Natural and Biological Systems**". There were 11 speakers with research topics ranging from infectious disease modeling to finite element methods for phase field models. See here.



Congratulations to Recent Math and Stat Graduates

The Department of Mathematics and Statistics congratulates the following recent graduates with a bachelor's, master's or PhD degree in mathematics or statistics. In Academic Year 2022-2023, a total of 350 Math & Stat degrees were awarded including 23 graduate degrees.

Fall 2022

David	Wagner	Statistics MS
Ignacio	Ramirez Cisneros	Mathematics Co-iPHD
Rafed	Al-Huq	Mathematics Co-iPHD
Nursema	Efe	Statistics MS
Yousef	Alharbi	Mathematics iPhD
Zhiheng	Zhang	Mathematics iPhD
Ainoa	Rohaut	Mathematics & Statistics BS
Allyson	Jenkins	Mathematics & Statistics BS
Ivan	Velasquez	Mathematics Co-iPHD

Spring/Summer 2023

Kelly	Lee	Mathematics Co-iPHD
Mohan	Gajendran	Mathematics Co-iPHD
Alan	Scalzi	Mathematics & Statistics BA
Kathryn	Menta	Mathematics MS
Kathryn	Menta	Statistics MS
Alex	Schaeffer	Mathematics MS
Mohammed	Alanazi	Mathematics MS
Breanna	Monroe	Statistics MS
Seth	Kacich	Mathematics & Statistics BS
Maggie	White	Mathematics MS
Gregory	Isaac	Statistics MS
Zanderz	McCluer	Mathematics & Statistics BS

Zacharya	Bright	Mathematics & Statistics BS
Riley	Ledford	Mathematics & Statistics BS
Maxwell	Griffith	Mathematics & Statistics BS
Adriana	Martinez Cappello	Mathematics & Statistics BS
Joseph	Rogers	Mathematics & Statistics BS
Arman	Nokhosteen	Mathematics Co-iPHD
Md	Arif	Mathematics Co-iPHD
Long	Dang	Mathematics & Statistics BS

The After-Story of My JPMorgan Chase Data Science Internship: Grad School, Moving Cities, Work Begins

by Zack Bright, BS Mathematics and Statistics 2023

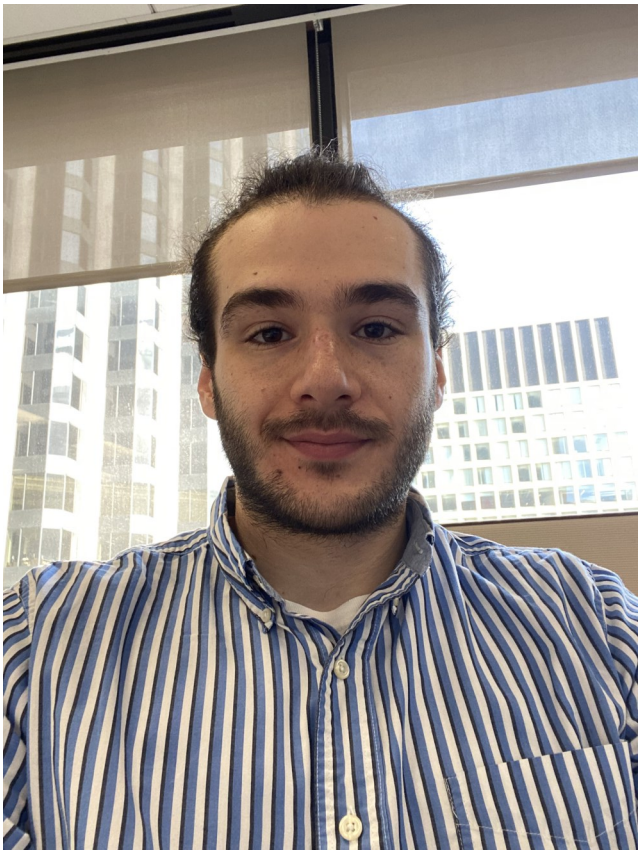
About a year ago I completed a *RooMath News* write-up of my experience of applying for and completing an internship with one of the largest companies in the USA. Having now graduated from UMKC, I have the opportunity to look back at the summer and look forward to what comes next.

I graduated in May 2023 with a Bachelors of Science in Mathematics and Statistics and a Minor in Computer Science. At that time I thought my academic career was more or less complete. After a long and arduous journey, I had the degree that would get me an amazing start to my career. I had thought about graduate school in the past, especially when talking with other interns from last summer. But I had been thinking I wasn't going to end up going anytime soon.

After I graduated, it was hard for my brain to accept that the way my life had been for the last five years was over. I had gotten so good at going to school, and I had put in so much effort to get this far. When I first began my degree I thought I would be burnt out by the time I got to the end, but in reality I was more fired up than ever before. About three weeks into the summer I decided to start looking at grad schools. I didn't really have a plan other than to look around and see what options I might have if I did want to pursue another degree while working full time. I looked mostly at Data Science master's degree programs. Since seeing what the day-to-day life of a data analyst is at the internship I knew I wanted to continue working in this field.

I found an online program offered by Northwestern University. I didn't know much about Northwestern at the time other than it was a well-respected school near Chicago. There was an information session being offered via Zoom. I was beginning to get excited about the idea of this program before the information session, and afterward I was more than convinced and decided to apply. It seemed to me that the program would offer exactly what I was looking for, both extremely applicable to my career while also offering courses that truly sounded like something I was interested in learning about.

The application wasn't too hard but did require multiple references and a personal essay, among all the usually required academic and personal information. I was in somewhat of a rush to get the application completed. I needed to submit



by July 15th, about three weeks from starting my application, in order to be considered for the Fall 2023 semester. I didn't really think I would get accepted for the program, given the university's reputation and how close to the deadline I was submitting, but I decided I would give the application my best shot, just like I had done in the past with the internship application. With much appreciation to those who wrote me recommendations, I was able to complete my application in time. The advisor I had been in contact with informed me that I would hear about a decision, either way, 4-6 weeks from the deadline.

On August 24th much to my surprise, I received my acceptance letter into **Northwestern's Data Science Master's Degree program**. After doing all the celebrating and phone calls to family, I felt something deep inside me was set right. Something I had lost had been regained. My academic journey was far from over, and I am more excited than ever. It's worth noting that Northwestern uses a quarter system for its calendar rather than semesters. There are four quarters, each 10 weeks long. The Fall, Winter, and Spring quarters comprise the regular academic year, and Summer is optionally offered. For my first quarter, Fall 2023, I am only taking one class.

My first class will be 'Math for Modelers'. I couldn't have gotten luckier. I am somewhat concerned that the difficulty increase from undergraduate to graduate level studies will take time to adjust to. So to be able to come fresh off of a Mathematics degree and start with a math class feels like landing on "Go" in Monopoly. This should be the perfect start to the next leg of this journey. The quarter begins September 19th (also my 27th birthday), and I'm eagerly awaiting my first class.

Although getting into grad school is a successful summer in and of itself, I also moved from Overland Park, KS to **Chicago**, IL in early July. This was an exciting move I had been looking forward to since I had returned from Chicago almost a year prior. I have lived on my own before, but this felt like more than living alone. This felt like the start to my life. I decided to bring as little with me as possible. I wanted to metaphorically start fresh. So I packed two suitcases and got on a one-way flight to Chicago's O'Hare airport.

I'm now living in a downtown high-rise apartment with a gorgeous view of the city, a starkly different environment than my quiet suburb back home. The constant sounds of the city dur-

ing the day and the uncountably many lights in the night are unlike anything in Overland Park.

I use the subway system and buses to get around any place I can't walk to. My start date with **JPMorgan Chase** was September 11th, so I had almost two months of free time when I got to Chicago. I have spent the summer enjoying some of the best of what Chicago has to offer.

My first week of work was not unlike what the first week of classes feels like. There were a lot of introductions, setting expectations, and looking ahead. The department I work under specializes in training new data analysts. While myself and my coworkers are making the transition from academia to the professional world we will be guided over the next two years. In that time I will move between different lines of business within the bank to gain a more complete understanding of how the firm operates.

As I contemplate the last six months of my life I am truly astounded at how much has changed in such a short time. I have accomplished so much of what I have been working so hard for and yet there is still so much left to do. It has been said that the journey is more important than the destination. As I look to what comes next, I am more inclined to believe that the destination does matter but how I get there will be what defines me.

Catastrophe Analyst

by Rye Ledford, B.S. Mathematics and Statistics 2023

After graduating from UMKC this last spring (2023), I transitioned into my role as a **Catastrophe Analyst at Aon** in June. Aon is a professional services firm that provides risk, retirement, and health solutions. My position, as a catastrophe analyst, is in the risk department. I apply mathematical models to significant events like hurricanes, tornadoes, and earthquakes to compare projected impacts with actual outcomes of loss on large insurance portfolios.

The shift from university to a professional career was both exciting and a bit frightening. I began applying for post-

graduation positions in August of 2022 and secured my current role by October, which allowed me ample time for preparation. My position required my relocation to **Chicago** from Kansas City. Having nearly nine months to plan allowed for a relatively easy move and lots of time to do research on neighborhoods, apartments, and commute times. I moved to Chicago in March and had a whole month of exploring the city before I started my new position, which allowed me to feel more at home here, in Chicago, and much more prepared for my first day.

Aon's onboarding process included assigning me a colleague who had recently joined the previous year, she has been invaluable for questions and guidance as she went through the onboarding process not too long ago herself. Adapting from the

homework mindset was initially challenging as many tasks lack black-and-white answers. I have learned that asking questions is integral to being successful. Looking back, I would encourage myself to ask every single question; there truly are no bad ones. Overall, the transition has taken me out of my comfort zone, and I've really enjoyed the experience. By letting myself be curious, ask questions, listen, and do my best every day, I've gotten more comfortable with my work, colleagues, and the city.

Neutrinos and my Ph.D. Path

by recent graduate student Grace Reesman

Back in the 2020 issue of the *RooMath News*, I wrote about my summer internship in which I did research involving particles called neutrinos. Neutrinos, a type of sub-atomic particle rightfully nicknamed the "ghost particle", are notoriously difficult to detect as they almost never interact with ordinary matter. In fact, every second, about 100 *trillion* neutrinos pass through your body, yet there is only a 1 in 4 chance that you will interact with one throughout *your entire life*; even if you did interact with a neutrino in your lifetime, you wouldn't notice. Because they interact so rarely, are extremely light, and can oscillate (or change something we call "flavor" as they propagate through space), there is still a lot we don't know about neutrinos!

My neutrino-focused internship confirmed my desire to pursue research as a career and helped solidify my path there. After the summer of 2020, I was preparing to apply to graduate school (for physics research) and finishing my coursework in mathematics and physics at UMKC. Having finished my undergraduate mathematics coursework, I decided to take **graduate mathematics courses**. I took courses in **Algebra, Real & Complex Analysis, and Data Science** through the "fast track" program. Not only did I learn a lot that would be important to my graduate work later (there are *so* many complex integrals in quantum field theory and group theory is fundamental to particle physics), I also got experience taking graduate level courses.

I am currently a rising third year Ph.D. student at **Northwestern University**, located in a suburb just north of Chicago, studying theoretical particle physics. In the first two years of graduate school, coursework was my primary focus. My first year, I got my "core courses" out of the way. This included courses in Classical and Quantum Mechanics, Electricity and Magnetism, **Mathematical Methods**, and Statistical Mechanics.

In my second year, while I did have more time for research compared to my first year, a significant amount of my time was still taken up by coursework and teaching. The courses I took in my second year were ones that would be important in my research, such as **Data Analysis/Statistical Methods** and a year-long course in Quantum Field Theory. In the coming year, I have fewer (elective) courses to take. Therefore, research and teaching will be my primary focus.

More specifically, my research is in **neutrino phenomenology**. This means that I spend a lot of time thinking about how we can connect theory to experiment and differentiate between different models via experiment (to see which one is "more correct"). Questions I frequently ask myself include, "Are there physical predictions made by this theory we could see in an experiment?" and "What (type of) experiment would we need to do to distinguish between these models?". Answering these types of questions typically involves a decent amount of **coding and running simulations, as well as doing pen-to-paper (or chalkboard) calculations**. My current main research project involves simulating a research set-up called a "Neutrino Factory", a type of particle accelerator experiment that includes circulating muons in a storage ring and then allowing them to decay via one of two channels depending on the charge of the muons in the storage ring. Each of these decay channels has two neutrinos in the final state, resulting in a neutrino beam aimed at a detector a distance usually between a few hundred and a couple thousand kilometers away. We then count the number of neutrinos of each flavor at the far detector and infer information about neutrino oscillation parameters through comparison of the initial composition of the neutrino beam. Therefore, neutrino factories provide a powerful tool to measure neutrino transition probabilities.

With around three years remaining in my Ph.D. program, I am looking forward to studying more about how neutrinos help make up the universe around us!

After the iPh.D.

by Sara Sony (Dilek Soysal) , iPh.D. UMKC 2022

I received my **iPh.D. in Applied Mathematics and Curriculum and Instruction** in 2022 and am now an **Assistant Professor of Mathematics** at **Northwest Missouri State University**. My research interests include mathematical modeling, math anxiety, and active and engaging mathematics classrooms.

I have always been passionate about mathematics. I remember being in elementary school and being fascinated by the way

numbers worked. I loved solving puzzles and figuring out how they worked. As I got older, my passion for mathematics only grew stronger. I knew that I wanted to make a career out of it.

I started my academic journey at UMKC in 2018. I was fortunate to have excellent mentors who helped me to develop my research skills. I completed my **iPh.D. thesis on a mathematical model of math anxiety**. This research project was an important step in my journey to becoming a mathematics educator.

I am committed to using my research and teaching to help students overcome math anxiety and to succeed in mathematics. I believe that everyone can learn mathematics, and I am dedicated to creating a learning environment where all students feel comfortable and confident.

In addition to my research and teaching, I am also active in professional organizations. I am a member of the Mathematical Association of America and the National Council of Teachers of Mathematics. I am also a reviewer for several mathematics journals. I am excited to be an Assistant Professor and look forward to working with students and to making a difference in their lives.

During my iPh.D. studies: I received the Preparing Future Faculty Fellowship and Award from UMKC in 2020-2022; I published two articles in mathematics education journals; I presented my research at several conferences; I had a book chapter accepted on active and engaging mathematics classrooms.

For students who want to follow in my footsteps, here are some tips: Find a mentor who can support you and help you achieve your goals; Get involved in research and other extra-curricular activities; Don't be afraid to ask for help when you need it; Never give up on your dreams.

I believe that anything is possible if you set your mind to it. I encourage you to pursue your passion for mathematics.

First Job After Graduation

by Allyson Jenkins, BS Mathematics and Statistics 2022

Applying for a first job is hard. Getting hired is even more difficult. I spent around 6 months applying for jobs before I eventually got hired to my current position. At first, I wasn't too concerned about finding a job immediately after college. I finished my degree a semester early, and I was looking forward to some downtime before getting started in the real world. However, I wasn't used to being unproductive for months at a time. The longer I was unemployed, the more worried I was for my future.

Before graduating, I made an appointment on Handshake to review my resume, and I was provided with resources for creating both a resume and cover letter. Since we had gone over my resume during the appointment, I was confident that it was ready to send out into the world. As for the cover letter, I didn't think it sounded too difficult. I assumed I could figure it out on my own if it was ever necessary. Unfortunately, that was not the case.

I started applying for jobs during my last semester. After spending a couple months making up cover letters and sending out a basic resume, I hadn't received many positive responses. Not long after graduation, I was contacted by one of my professors with a link to a position that interested me. I decided to put forward my best effort in completing that application. For the first time, I opened the cover letter resources I had been given. I was astounded by how much I had been doing wrong. Following the provided guidelines, I created my first real cover letter. I also reorganized my resume to include items related to the position for which I was applying. I received my first positive response from a potential employer.

I didn't accept that position, but I learned a lot about applications and interviews. I wish I could say that everything worked

out and I was never rejected again, but I spent many months after that unsuccessfully applying for jobs. The most surprising part was the number of applications that required me to provide a writing sample or take a test.

Math & Stat Fast Track programs

The Mathematics and Statistics fast track programs offer students an opportunity to meet the full requirements of the BS and MS in Mathematics and Statistics in a shorter time period than the separate degree programs.

It was a difficult period, but the final result was worth the wait. I eventually found success by applying for a specific position through a local staffing agency. The position turned out to be a good offer, and I have been employed since then. Applying for jobs is hard, but the most important part of the process is making sure you find a position that is right for you.

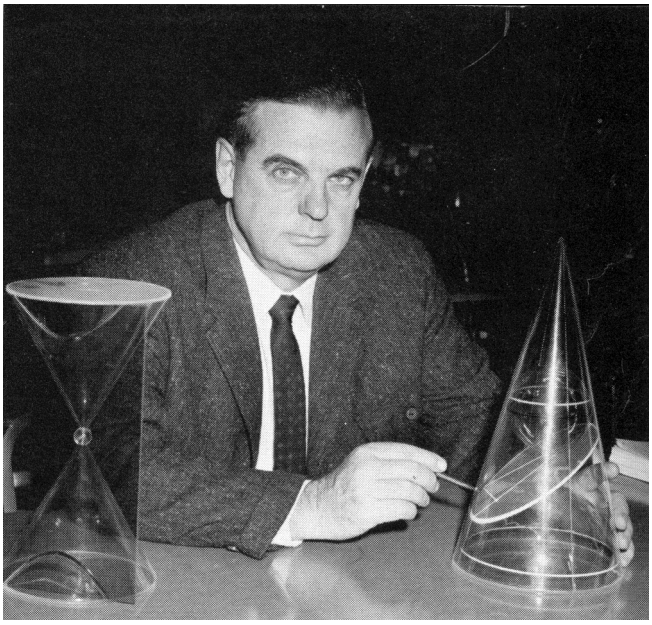
SIAM
Society for Industrial and Applied Mathematics

MAA
MATHEMATICAL ASSOCIATION OF AMERICA

Digitizing the Films of Dr. Norman N. Royall, Jr.

Dr. Norman N. Royall, Jr. (1908-1983) was a celebrated UMKC faculty member in Mathematics and Physical Science 1947-1975, Dean of the College of Arts and Sciences 1947-1953, winner of the UM System Thomas Jefferson Award in 1974, and for whom Royall Hall was named in 1983. Between 1958 and 1961 he recorded **49 short films** (each about 30 min.) on College Algebra (20), Trigonometry (21), and Logarithms and the Slide Rule (8) for the United States Armed Forces Institute, to educate American servicemen around the world.

Those films, now over 60 years old, reside in our UMKC Archives in the Miller Nichols Library. Mathematics Teaching Professor **Dr. Richard Delaware** has been working with University Archivist Becky Briggs Becker since fall 2022 to get them all digitized and has now in 2023 funded from his research account the digitization of five of those films. They can be seen on the Internet Archive - **Moving Image Archive** site here .



Norman N. Royall, Jr., 1963 ↑

Dr. Delaware is now working with the UMKC Foundation to generate interest among alumni (and others) for helping to fund the other 44 digitizations. A plan is to introduce the project on the next annual UMKC Giving Day in March 2024.

Anyone interested in funding the digitization of one or more of the films should contact Dr. Delaware at delawarer@umkc.edu.

AMS AMERICAN MATHEMATICAL SOCIETY
Advancing research. Creating connections.

Praise for the RooMath News

Past issues of the *RooMath News* can be found here. We emailed copies of our October 2022 issue of *RooMath News* to various people and received praise from across the country:

Thanks, Richard! That's awesome and so professional looking! Great work. (**Cynthia Huffman**, Ph.D., Mathematics Professor, **Pittsburg State University, Kansas**, HOM SIGMAA Sec/Treas)

Wow, that is comprehensive! Well done! (**Dr. Amy Shell-Gellasch,** Department of Mathematics **Eastern Michigan University**, Past Chair HOM SIGMAA, CSHPM council, Chair, Michigan Section of the MAA, Associate Editor, Convergence, Prison Mathematics Project)

This is very cool! This is something I think more departments should do more of. Hopefully we can maybe start something like this at our institution. (**Brent Wessel**, Ph.D., Assistant Professor of Mathematics, Department of Mathematics and Applied Sciences, **Harris-Stowe State University**)

Thank you! I appreciate seeing the student responses! (**Sarah Greenwald**, Ph.D., Polya Speaker, MAA Missouri Section Meeting at UMKC, 2022, Professor, Mathematical Sciences, **Appalachian State University**)

What a fantastic newsletter! It has such a warm and inviting look and feel!!! Thank you for sharing. It was fun to see the segment on Sarah and my involvement in the meeting. (**Tim Chartier**, Ph.D., Keynote Speaker, MAA Missouri Section Meeting at UMKC, 2022, Joseph R. Morton Professor of Mathematics and Computer Science, **Davidson College**)

Thanks Richard! It's nice to see what y'all are up to these days. (**Robert Talbert**, Ph.D., Professor, Department of Mathematics, Presidential Fellow for the Advancement of Learning, **Grand Valley State University**, co-author "**Grading for Growth**" 2023)

Very cool! Way over here in Biology and Biomedical Systems, we don't hear much about what Math and Stats students and faculty are up to; it looks like a lot of exciting things are going on! Also, it's a very well-designed newsletter. Thanks for thinking of me! (**Jess Magaña**, Ph.D., Associate Teaching Professor, School of Science and Engineering, Department of Biological and Biomedical Systems, **UMKC**)

Wow, Richard, what an informative and impressive newsletter! I would send the newsletter to John Martellaro in Mcom [UMKC Marketing and Communications] and suggest there are plenty of story ideas for wider circulation. Best, Henri.

(**Henrietta Rix Wood**, Ph.D., Teaching Professor, Honors Program **UMKC**)

This newsletter is amazing! How often do you publish it? There is so much great content in this. It was great to see **Allyson Jenkins** (great student) and the math team. I also love how you have math puzzles at the end. This is so rich in content and positivity; you should use this in your recruitment efforts if you haven't already done so. (**Ricardo Marte**, Ph.D., Associate Teaching Professor, Psi Chi & Psychology Club Advisor, **UMKC**, Department of Psychology)

I think you did a FANTASTIC job. I found the articles – especially the ones about the students – extremely interesting and well written. I hope you have a wide distribution of the newsletter. It seems to me that it could be a way to entice other worthy students into a career in mathematics. Thanks for sending me the newsletter. I hope you'll send me the next one when it's published. (**Rita Barger**, Associate Professor Emerita, Mathematics Education, School of Education, Social Work and Psychological Sciences, **UMKC**)

Thank you very much for sending this over! It was a joy to see some familiar faces (and names) and all of the exciting news and experiences they had to share. I liked that there was a very nice spread of topics covered in the newsletter, and I especially enjoy the idea behind the "Day-in-the-Life of a Mathematics Graduate after College" section! If that section is continued in future issues, it would be an excellent insight into possible careers open to students following graduation. Best, (**Dominic Guillen**, recent department BS graduate, Actuarial Technician, Americo Financial Life and Annuity)

Thank you for sharing! Too many school traditions have gone extinct, and it makes me sad, so I'm really glad you still make these. :) (**Ryann McIntosh,** Mathematics Adjunct Instructor and department BS graduate, MS Biostatistics KU Med, UERC)

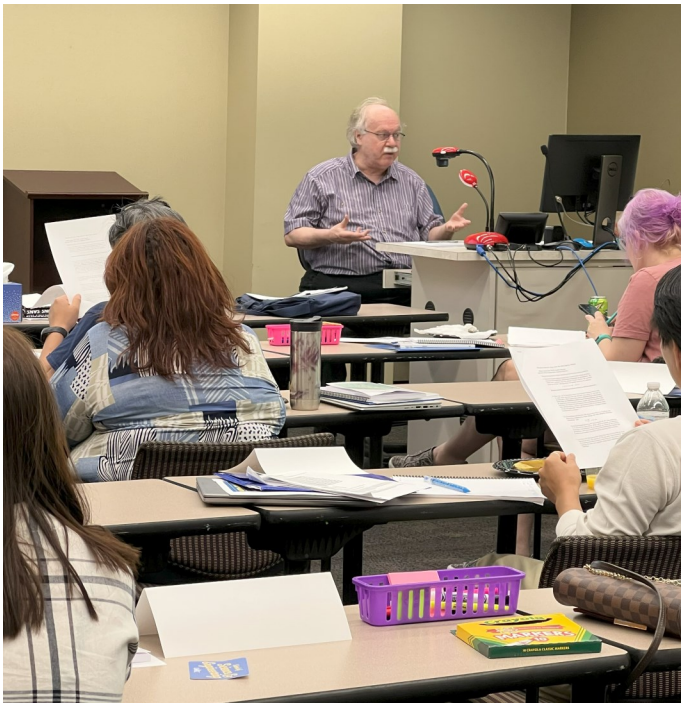
The Math and Stat Department will host the SIAM Central Section Meeting in Fall 2024

The Society for Industrial and Applied Mathematics (SIAM) is a professional society dedicated to applied mathematics, computational science, and data science through research, publications, and community. **The UMKC Mathematics & Statistics Department will host the 9th Annual Meeting of the SIAM Central States Section in October 2024**. This year, the eighth SIAM Central States Section Annual Meeting will be held on Oct. 7-8, 2023, on the campus of the University of Nebraska-Lincoln. For more information see here. (Side note: One of our BS graduates has a SIAM profile!)

The UMKC Math Academy

Joe Morse (morsejo@umkc.edu, Flarsheim room 336B) took over as Director of the School of Science and Engineering **Math Academy** in summer 2022. It's designed to offer academic mathematics enrichment opportunities to pre-college students and their teachers. Since then, the Academy has taught two dual credit courses in the Kansas City Public Schools (KCPS) over the 2022-2023 academic year, offered a **Summer 2023 Teacher Professional Development Class** for 14 middle and high school teachers featuring the teaching of **Dr. Majid Bani-Yaghoub** and **Dr. Richard Delaware** in Mathematics as well as **Dr. Rita Barger** in Mathematics Education and Joe Morse and Melanie Fender of the Math Academy.

It also offered a Summer 2023 Student Mathematics Bootcamp for 14 incoming dual credit students (↓), and hosted the KCPS Lincoln College Preparatory Academy 2023 Summer Student Mathematics Bootcamp for 24 incoming ninth graders.



The Math Academy plans to offer another teacher class and student bootcamps in **summer 2024**. Before then, it will hold on **November 3** a KCPS High School Mathematics Teachers Professional Development (PD) day onsite at UMKC, on **November 4** a KCATM (Kansas City Area Teachers of Mathematics) PD day for middle school teachers, sometime **in November** hold Plaster Center Tours for KCPS middle school students and faculty, and in **February or March 2024** hold a KCATM Mathematics Contest. Plans are also being made for a **fall 2024** Mathematics Carnival Day for Students at UMKC hoping to involve many SSE departments. The Math Academy aims to bring in more school districts and increase dual credit mathematics enrollments.

Rachel Crowell, B.S. Mathematics and Statistics 2014, who was awarded the 2015 AMS-AAAS Mass Media Fellowship, has continued her career as a **free-lance STEM journalist** with a **SIAM** (Society for Industrial and Applied Mathematics) profile on their website, and has published mathematics articles for:

Science News, Science News Explores, Scientific American, Quanta magazine, Eos, Fermilab, Real Clear Science, Nature (Careers), and Fatherly, the last a magazine about neurodiversity, autism, and ADHD in children.

May 2018 graduate **Shelby Bell-Glenn** just earned her **Ph.D. in Biostatistics** in summer 2023 at the University of Kansas Medical Center. She has accepted a remote position with **AbbVie**.

Olivia Rippee, May 2022 triple-major graduate (Mathematics, Biology, Chemistry) who is now a **Research Assistant** in the Bose and Pritchard Labs and studying for an **M.S. in Biostatistics** at the Department of Microbiology, Molecular Genetics & Immunology of the University of Kansas Medical Center, in April 2023 generously created a short video (under 2 min.) to recruit students for the **Honors Program Mathematics Discussion Groups**. See here.

Undergraduate **Allyson Jenkins** wrote an expository paper for Math 464 WI (taught by **Dr. Richard Delaware**), titled "**The Development of the Normal Distribution**", based on the work of de Moivre, Adrain, and Gauss, which was published (pp. 47-64) in the Honors Program research journal ***Lucerna*** in March 2023.

Recent graduate **Rye Ledford** wrote an expository paper for Math 464 WI History of Mathematics (taught by **Dr. Richard Delaware**), titled "**The Spanish Inquisition and its Impact on Mathematics in Spain during the 17th Century: A translation of excerpts from J. Zaragozá's *Trigonometria, Española, Resolucion De Los Triangulos Planos, Y Esfericos, Fabrica, y uso de los Senos, y Logarithmos***", which will be published in the Honors Program research journal ***Lucerna*** in March 2024.

Current undergraduate major **Monica Kelne** wrote an expository paper for Math 464 WI History of Mathematics (taught by **Dr. Richard Delaware**), titled "**Maria Gaetana Agnesi and her direct influence as a woman on Mathematics in the eighteenth century**", which was published (pp. 114-127) in ***The Sosland Journal*** in fall 2023, and was a Runner-up for the Ilus W. Davis Writing Competition, Advanced Level.

Amber Hubbard (B.S. Mathematics and Statistics 2015, Master of Arts in Curriculum and Instruction, Middle School Mathematics 2019) wrote on September 19, 2023:

"I am currently working with an engineering group [AEG] that works with Optic Fiber and Telecom companies to aid in installations as a Make Ready Coordinator and Make Ready Engineer."

The American Mathematical Society (AMS) since 2019 has sponsored the **AMS Math Poetry Contest** for middle school, high school, and undergraduate students. The 2023 awards were presented in January 2023. Our recent graduate **Rye Ledford** [see picture above] won an **Honorable Mention** for her poem below:

Categories

They told me I was an artist,
Sentimental and true,
That I could only do artsy things,
Like the other artsy people do.
They told me my brother was more suited,
For mathematical thought,
He's the analytical one,
So, go on,
Paint and brush.
But I ignored what they had to say,
Went out and did things my own way,
I pursued the long-lost arts,
Of math and stats and charts.
I, like many others here,
Are not just of one kind,
You can be left *and* right brained,
All at the same time.

Recent Faculty and Staff News

Dr. Bowen Liu joins us this Fall as an **Assistant Professor**. He is a statistician who is passionate about developing statistical models and applying his statistical knowledge to different areas. His research interests include biostatistics, statistical inference, statistical distribution theory with applications, statistical methods for meta-analysis, and factor analysis. A wide range of applications has been found for his research, including reliability engineering, survival analysis, infectious disease count modeling, and insurance data modeling. Bowen is also interested in developing packages for **R**, an open-source software for statistical computing.

Apart from his scholarly activities, he enjoys playing sports including soccer, badminton, racquetball, table tennis, and basketball. He's currently an active member of the Kansas City Table Tennis club and occasionally participates in the local tournaments. He also loves to watch sports in person, on TV, or in a sports bar. Aside from sports, he is also a big fan of Oasis, Coldplay, and Radiohead.

Dr. Liana Sega is preparing for some exciting travel. In October, she will travel to **Trento, Italy** for a week to lead a group of women researchers as part of a workshop dedicated to fostering a research network among women commutative algebraists. She will then be on a research leave in **Spring 2024**, and will spend 6 weeks as a research member at the **Simons Laufer Mathematical Institute** (former MSRI) in Berkeley, California.

Dr. John Sawatzky joined UMKC as an **Assistant Teaching Professor** this fall, fresh off of defending his PhD at the University of Waterloo in Canada. His doctoral research focused on investigating problems in functional analysis that lay in the intersection of abstract algebra, real analysis, topology, and linear algebra using computational tools. John is no stranger to the Midwest as he spent the 2020-2021 academic year teaching at Cornell College in Mount Vernon, IA and also received his BS from Iowa State University. In his free time you can find him either rock climbing, prepping a D&D session, or playing Tears of the Kingdom.

Dr. Majid Bani-Yaghoub, Dr. Billie Anderson, Assistant Professor of Applied Statistics at the Bloch School, and Scott Curtis of Miller Nichols Library developed a corpus of full-text journal articles related to the Spanish flu of 1918 with the support of undergraduate Medical student **Vagmi Kantheti** using her Summer Undergraduate Research Opportunity grant in summer 2022. The first part of the project, which focused on developing a methodology for using the statistical language **R**, was presented at the Mathematical Association of America Missouri Section meeting at UMKC in April 2022, and published in the *Journal of Information Science*. The second part, which applied a text-mining algorithm to determine any connections or "lessons learned" from the 1918 flu that could be applied to the COVID-19 pandemic, was presented at the Joint Statistical Meetings of the American Statistical Association in Washington, D.C. in August 2022. See source article here.

Dr. Majid Bani-Yaghoub received the following email message on May 25, 2023, from our MS Statistics graduate **David Wagner**: "While it took months longer than I thought, I have finally landed at a new company. I'm working at genhealth.ai as a **machine learning engineer** training large transformer models on medical data. Certainly different from the traditional statistics I focused on during the degree, but already in reading many of the papers for this company and during interviewing, the level of mathematics that I was able to work up to during the degree has helped in being able to work with the math that is in these papers both in defining the model, loss function, etc. but also the statistics that goes into the evaluations. I have a long way to go in these things but **have the foundation I needed** to take on more technical work than I was before."

Dr. Eric Hall was elected Mathematics and Statistics **Faculty Lead**, to act as the point person to coordinate faculty activities which may include providing input on workload, evaluations, teaching assignments, and resource requests.

Dr. Shuhao Cao was awarded **$156k by the National Science Foundation** to shed light on the mathematical properties of the attention mechanism, the backbone of state-of-the-art DNN Transformers, such as those in GPT and AlphaFold 2. Furthermore, the project will examine the flexibility of attention neural architectures, enabling the fusion of attention mechanisms with important methodologies in applied mathematics, such as Galerkin projection or Fredholm integral equations, in accordance with the a priori mathematical structure of a problem. See the NSF award page for more information.

Dr. Majid Bani-Yaghoub was awarded **$265k by the National Science Foundation** to enhance mathematical models to investigate the influences of climate change on the transmission of infection from animals to humans. By enhancing the modeling approaches, the researchers of this multidisciplinary project seek to understand what challenges zoonotic pathogens must overcome to transmit from animal hosts to humans or other animals, how climate change can reduce these challenges and make it more plausible for zoonotic pathogens to live within and between new species, and what kinds of environments have a higher likelihood of zoonotic spillover in the view of climate change. For more information see the NSF award page

Dr. Larry Eifler, Professor of Mathematics who retired in 2002, now lives in **Thailand**. On February 1, 2023 he sent us this picture of him near their (he and his wife's) **shophouse**.

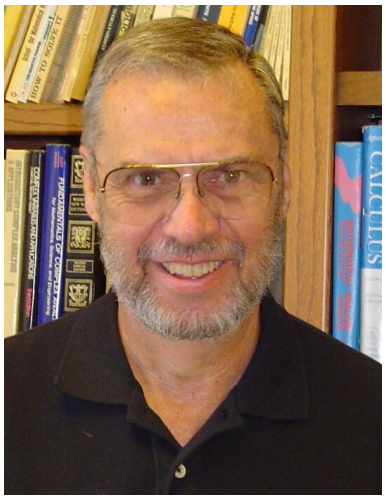
In Southeast Asia, a "shophouse" is a store ("shop") opening onto the sidewalk, which is also used as the owner's residence ("house").

Dr. Bruce Wenner, former department Chair and Professor of Mathematics died on October 27, 2022 at the age of 84. He retired in 2002 but stayed on as Interim Chair until early 2004. The following lightly edited excerpt is from his posted obituary here: "Bruce Richard Wenner is survived by his wife of 57 years, Francie, his three children, Kathleen, Brian and Thomas, six grandchildren, and by his brother, Reverend Fred Wenner of Frederick, MD and sister Louise McKinney of Cleveland, OH.

He was born in Lancaster, PA on April 25, 1938, and graduated from the College of Wooster in Wooster, OH, spent a year in Germany on a Fulbright Scholarship and received his **Ph.D. in Mathematics from Duke University** in Durham, NC.

Bruce was a passionate civil rights activist. He was a **Freedom Rider**, a participant in the March on Washington and, while at Duke in the early 60's, helped organize rallies, marches and sit-ins. He was jailed on numerous occasions and even shot at during this time.

He was Professor of Mathematics at the University of Vermont, where he would play folk songs on the guitar at get-togethers and Francie, his future wife, would sing. **In 1968, he joined the Mathematics Department at UMKC**, where he rose to the rank of Professor and later was Chair of the department. He played a major leadership role at UMKC, being elected repeatedly as Chairman of the College of Arts and Science and later, President of the campus-wide Faculty Senate.



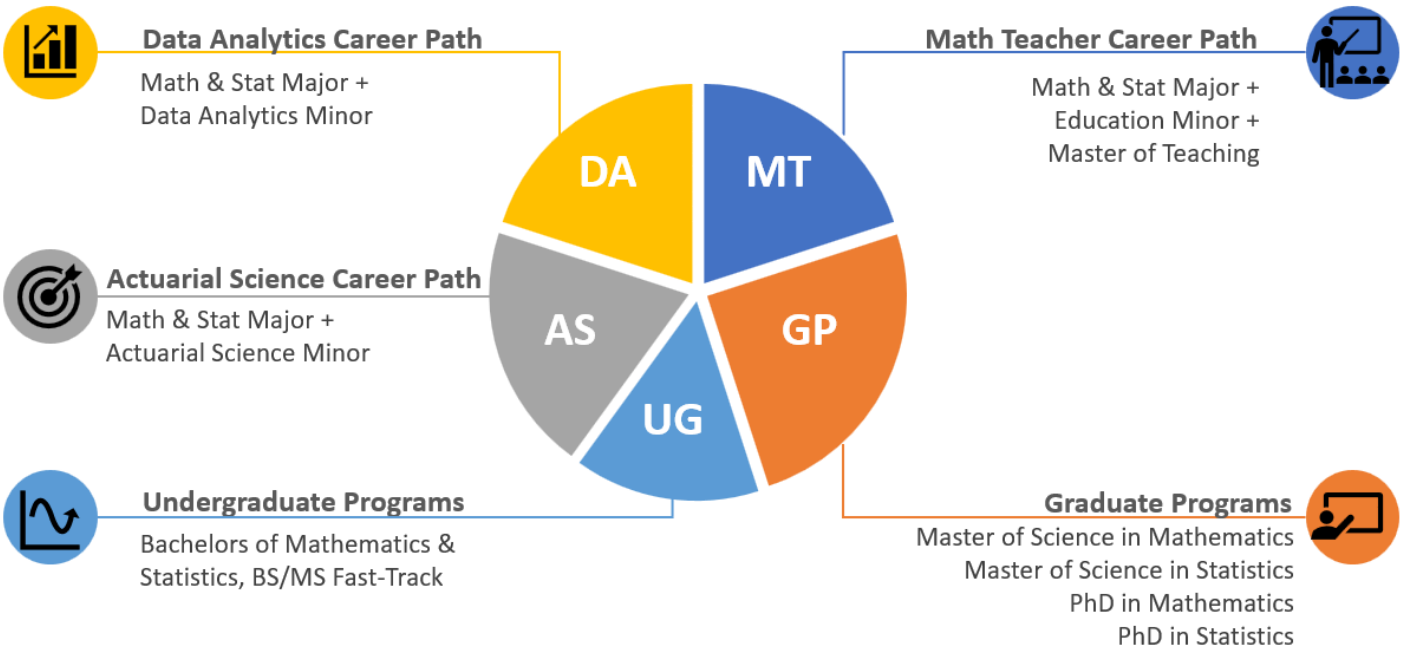
Bruce loved history and read avidly on historical subjects, particularly about this country's military conflicts and had encyclopedic knowledge in this area, including about the Civil War. Once, touring the battlefield at Antietam, he politely corrected the guide on a few minor points. With Francie, Bruce traveled in the U.S. and internationally to England, Ireland and New Zealand (among others) and cruised the Mediterranean from Barcelona to Istanbul.

Bruce loved music and, growing up, played the violin and later the timpani in his college orchestra. While at Wooster, he participated in a fraternity sing, performing, for the first time, in **barbershop harmony**. He instantly fell in love with this style of music, joined the Burlington, VT barbershop chapter of S.P.E.B.S.Q.S.A and, upon moving to Kansas City, the Heart of America chapter where he was a member for 54 years. He was baritone section leader, chapter President, served on the Music Committee, arranged music for the chapter and for his and other quartets, and was a society music judge. He sang baritone in several quartets over the years, the last being Tonehenge, a comedy quartet, where he sang with three old friends."

CAM Division Staff: Daphne Hunter joined the CAM Division in 2022. She has been at the university since 1985, holding roles in Physics, Nursing and the Bloch School. In her new role, she helps Mathematics and Statistics and CS faculty.

UMKC Math & Stat Department

Graduate Programs, Undergraduate Programs, and Career Paths



Minor in Actuarial Science

Actuary job growth between 2018-2028 is expected to be about 20%, with a median salary of $102,880 per year, according to the Bureau of Labor Statistics. Actuary jobs were rated in 2019 in the top 10 jobs by Career-cast and have continually placed near or at the top of the rankings for the past 10 years. The minor in actuarial science prepares students for the first two actuary exams and provides them credit for validation by educational experience in accounting, economics, and statistics courses. The following diagram shows the career path in actuarial science. All UMKC students can add the actuarial science minor to their degree plan.

Student Organizations affiliated with Mathematics and Statistics

The purpose of the **UMKC Chess Club** is to provide a friendly environment in which its members may play, instruct, and discuss chess. The Chess Club will supply chess sets and clocks for its members. It also holds at least one open tournament annually, for all interested UMKC Students and future potential students. The Chess Club is dedicated to advancing chess by offering instruction to all UMKC students and future potential students.

Find out **Chess Club** meetings and activities here.

The **UMKC Math Club** promotes interactions between faculty and undergraduate students; provides math-related activities such as problem of the week, math movie nights, and math contests; invites math alumni and various employers to give insight into the current math job market; facilitates communication between math graduate and undergraduate students.

You can learn about **Math Club** meetings and activities here.

The purpose of **MSGSO** is to represent the graduate student body of the UMKC program of Mathematics and Statistics; to provide a forum for graduate student opinion; to act as a voice for the graduate students in matters of mutual interest to graduate faculty and students; and to promote professional interest and fellowship among the graduate students.

You can learn about **MSGSO** meetings and activities here.

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RooMath News published **Oct. 2023**. See previous issues here.

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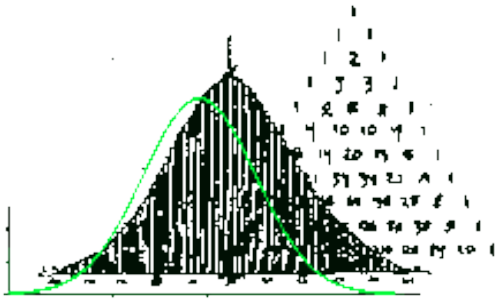

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Become a Member!

We encourage you to register as a member of the **UMKC Alumni Association**. Just go to the UMKC alumni website, click on the tab at the top of screen called "My Profile/Logon", and follow the instructions.

If you would like to donate to UMKC, please visit the **UMKC Foundation** web pages where you will find links to Gift Planning, the Alumni Fund, creating a scholarship, and so on. **Our department is one of the few with no department scholarships for our undergraduate majors, and you might be the first to initiate one.**

Send Us Your News!

We're always happy to hear from you. Send a paragraph or two and let us know what you have been up to. Pictures are welcome.
Please include your name, mailing address, and email address so we can contact you.

Send to: **Dr. Richard Delaware** at delawarer@umkc.edu
or

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