

Janusz Konieczny published a research article, *Normal subsemigroups of finite transformation semigroups*, in the journal **Semigroup Forum**.

Leo Lee has been serving as Associate Editor-in-Chief for the KAUPA Letters, the journal of the Korean American University Professors Association (KAUPA). Additionally, he has been working as the Specialty Leader in Mathematics for KAUPA.

Jennifer Magee was elected to a two-year term as New Faculty Coordinator for the MD-DC-VA Section of the Mathematical Association of America.

Suzanne Sumner was invited to present “Environmental, Ecological, and Epidemiological Applications: *Introduction to Mathematical Modeling*” for the Biomathematics & Ecology Education & Research symposium held at Virginia Commonwealth University in November 2023. In January 2024, Dr. Sumner presented the lecture “How Poetry informs the History of Mathematics” for the Joint Mathematics Meetings in San Francisco. [Ω](#)

Alumni Spotlight: Kayla Kippes



Kayla Kippes, class of 2023, graduated with honors in mathematics with thesis *Using a Distributive Approach to Model Insurance Loss*. She also earned a minor in economics and was recipient of the Oscar T. Schultz award. Kayla is currently enrolled in

Masters of Science in statistics program at North Carolina State University and employed by Vericast as a Marketing Scientist.

How did your time at UMW prepare you for your career?

My time at UMW prepared me for my career because it allowed me to explore what I was most interested in while also preparing me for after college. A lot of professors cared about where I was going next which was very helpful in the transition after graduation.

Tell us about your involvement in undergraduate research with math faculty. How did you initiate that experience?

My undergraduate research with Dr. Denhere was my favorite part throughout all of undergrad. It started with me coming to her and asking her to be my advisor on the research and presenting my idea to her. We spent all fall and spring semester meeting with each other, bouncing ideas off of each other and putting together my thesis. The best part was that it was something that really interested me which made it that much more exciting.

What class or UMW experience did you have that has been surprisingly useful to you in your career path?

I think the overall critical thinking that you gain at UMW, specifically in the math department, has been surprisingly useful in my career path. I feel that I’ve accelerated quicker and accomplished more in my job and also in grad school because there were always instances in undergrad where I was challenged to think outside the box or look at something in a different light. I’ve applied that to what I do now, and it has been really helpful. [Ω](#)



SCAN ME

Check out our website
cas.umw.edu/math

View our page devoted to our alumni and, better yet, email Dr. Esunge at jesunge@umw.edu to get yourself included!



Are you a member of our Facebook group? Look up UMW Mathematics and join today!

Mathematics at UMW

a newsletter of the Department of Mathematics at the University of Mary Washington

Welcome from the Chair

My colleagues and I are delighted to welcome you to this new and very exciting academic year. Over the last few years, we have been working hard to position our program and our graduates in high-demand fields rich with growth potentials and rewarding career experiences. As a result, we begin this academic year with a revamped program that offers three amazing tracks for our students. Students pursuing a degree in mathematics can now choose a track in applied mathematics and statistics, data science, or mathematics. Each track plays to the strengths of our faculty and prepares our students to make a meaningful impact wherever they end up.

In addition to programmatic changes, we continue to see a rise in the number of courses and faculty willing to provide uniquely rewarding classroom experiences for our students. The impact of this work has resulted in significant support

from the academic leadership at UMW. This spurs us to do more as we seek to engage our students and strengthen this vibrant community of active learners. I am thrilled to be leading my department at this time as we strive to brighten the paths of our students through our work inside and outside the classroom.

When you return or visit this fall, you will find a stable suite abuzz with excited faculty eager to work with you and help you on your journey. As we tighten our grip on the fundamentals of actuarial science, data science, mathematics, and statistics, we are enthralled by the promise of AI. I look forward to seeing you as the journey evolves.

With best wishes for a fruitful year,
Julius N. Esunge
Professor and Chair, Department of Mathematics, UMW

Honors Projects

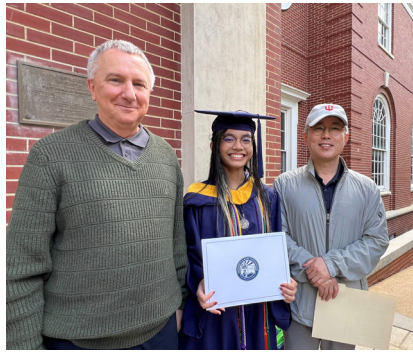
Christopher Hudert completed an honors project entitled *Boolean Group Structure in Class Groups of Positive Definite Quadratic Forms of Primitive Discriminant* under the direction of **Prof. Larry Lehman**. In this thesis, Christopher used notation for quadratic forms developed by Prof. Lehman in his book *Quadratic Number Theory* to consider the question of whether there are any primitive negative discriminants for which the corresponding class group of quadratic forms is Boolean of order 32 (that is, a direct product of five cyclic groups of order two). Using other sources in which upper bounds on discriminants having class group of a particular order are established, Christopher was able to show that no primitive negative discriminant has a Boolean class group of order 32.



University of
Mary Washington

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Catherine Nguyen successfully completed her honors thesis under the guidance of **Dr. Leo Lee**, applying the Susceptible-Infected-Recovered-Susceptible (SIRS) model to the study of COVID-19.

Her research focused on understanding disease trends to inform more effective public health policies. Catherine derived analytical solutions to simplified versions of

the SIRS model, enabling her to capture general trends within a complex epidemiological framework. She then employed numerical methods, including Euler's Method, the Runge-Kutta Method, and the Predictor-Corrector Method, to generate computational approximations of the model. In the final phase of her project, Catherine compared the SIRS model with COVID-19 data from the United States. Her work highlighted the potential of the SIRS model to address the issue of reinfection, which remains a significant concern in the ongoing pandemic. Her dedication and rigorous approach resulted in an outstanding 33-page thesis, marking a significant achievement in her academic journey. [Ω](#)

Irene Piscopo Rodgers '59 Summer Science Institute

Aloysious Kabonge and **Belen Telahun** worked with **Dr. Melody Denhere** on projects to provide key insights into the evolving racial and socioeconomic landscapes in the United States and Virginia from 2010 to 2020. Aloysious's study, "*Diversity Trends in the USA*," used principal component analysis (PCA) and hierarchical clustering to reveal distinct clusters of U.S. states, highlighting significant shifts in ethnic diversity and socioeconomic conditions. For example, the analysis showed increasing diversity in states like California and Texas, coupled with rising socioeconomic disparities. Belen's study, "*Diversity Trends in Virginia*," focused on the state's counties and independent cities, identifying northern Virginia as a region with significant increases in diversity and socioeconomic improvements. Manassas Park City, in particular, saw a notable shift from a predominantly white population in 2010 to a more diverse demographic by 2020. These findings offer valuable guidance for policymakers, residents, and investors in understanding and responding to demographic changes.



Benjamin Plonka and **Sophie Jensen** collaborated on investigating tetration, a lesser-known mathematical operation, under the guidance of **Dr. Leo Lee**. While

Benjamin concentrated on computer programming and Sophie on mathematical analysis, they worked together on all aspects of the project. Benjamin explored tetration's properties, focusing on its behavior, fractal structures, and connections to Euler's identity, uncovering fractal patterns in both real and complex tetration. Sophie analyzed

the growth rates of tetration graphs and derived the interval of convergence.

Sophie also studied Euler's identity to define i^i and visualized the infinite tetration of i , resulting in a spiral structure and a complex limit. Their combined efforts produced computer code that demonstrated which complex numbers converge under infinite tetration, revealing intricate fractal structures. Together, their research not only advanced the understanding of tetration but also opened avenues for further exploration in areas such as negative heights and applications to natural phenomena.

Chasity Beeson and **Hannah Steele** participated in SSI 2024 under the tutelage of **Professor Julius Esunge**. Chasity's project focused on predicting trends in teacher preparation using data from the US Department of Education. Hannah worked on the interplay between differential equations, probability measures, and orthogonal polynomials. [Ω](#)



Math Students Receive Noyce Grant

In April 2024, three mathematics majors, **Chasity Beeson**, **Hannah Steele**, and **Paige Stewart** attended the Signing Ceremony for the Robert Noyce Grant.

The Noyce Grant is a five-year, \$1.4 million National Science Foundation Grant to set up a Noyce Teacher Scholarship program at UMW. This nationally-acclaimed teacher preparation program supports students who want to be high school teachers in one of the STEM (Science, Technology, Engineering & Mathematics) subjects with

up to two years of tuition costs paid. UMW is partnering with Germanna Community College to recruit, train, and retain STEM teachers for high-need secondary schools. [Ω](#)



Abby Swanson Wins Darden Award



two majors. About her work, advisor **Dr. Randall Helmstutler** said "Abby's work interpreted various

Mathematics and Physics double-major **Abby Swanson** received the Colgate W. Darden, Jr. Award at Commencement in May 2024. This award is given to the graduating student(s) with the highest UMW GPA. In her undergraduate career, Abby participated in research blending her

symmetry-breaking phenomena in physics through the lens of homotopy theory and Lie groups. Her work was a careful examination of how certain homotopy groups detect symmetry-breaking. I previously had no experience with the physics side of this story, so I feel that I had to learn from her as much as she to learn from me. It was a lot of fun for me to see how these high-level topological ideas explain these patterns in physics." Abby also won the Oscar T. Schultz award, given by the mathematics department to the student who shows "the desire and potential to master the art of mathematics." Abby is currently pursuing a PhD in Physics at Stony Brook University. [Ω](#)

Faculty Notes

Julius Esunge received a three-year appointment from the American Mathematical Society to the AMS Committee in charge of planning and hosting the annual AMS department chairs' workshop and submitted two research articles for publication.

Randall Helmstutler served for the second time as a program facilitator and mentor in the COPLAC Beard Leadership Circle. This year-long program supports professional development and skills-building for newer department chairs, and culminated in a week-long workshop on the campus of Sonoma State University in California in July. Dr. Helmstutler was also elected to a leadership position within the MAA COMMIT group, a group supporting inquiry-based and active learning instruction in university mathematics courses.

Debra Hydorn gave a presentation at MathFest in Indianapolis in August on the undergrad research projects of students in her STAT 320 class, using data from UVA's BioComplexity Institute. She also had artwork selected for the Mathematics

Art Exhibition at the Joint Mathematics Meetings in January. The artwork is titled CP1, which stands for COVID Puzzle 1, and is a variation on a corner-side matching puzzle that she developed during COVID.

