



Southern University
SCHOOL OF MATHEMATICS AND NATURAL SCIENCES



The Quantum Quill

A semi-annual newsletter from the School of Mathematics and Natural Sciences at Southern Miss.

Fall 2024 Edition

Three Become One: Introducing the New School of Mathematics and Natural Sciences



Welcome to the inaugural newsletter for the School of Mathematics and Natural Sciences! Never heard of that name before? Let us explain how the school originated. In late 2017, Southern Miss Provost Dr. Stephen Moser introduced Vision 2020, an ambitious initiative to restructure the university's academic divisions. The plan called for the dissolution of traditional departmental boundaries in favor of more integrated schools, transforming the role of Department Chair into School Director. This reorganization led to the creation of the School of Mathematics and Natural Sciences, bringing together the formerly independent Departments of Chemistry and Biochemistry, Mathematics, and Physics and Astronomy under one unified umbrella.

While the organizational structure has evolved, the School's commitment to academic excellence remains unchanged. Students continue to benefit from the same robust programs and scholarship opportunities that have long been hallmarks of these disciplines at Southern Miss. The merger, designed to break down traditional departmental silos, has opened new avenues for interdisciplinary research and collaboration while maintaining the integrity of each program. Under the leadership of its inaugural Director, Professor of Mathematics Dr. Bernd

Schroeder, who served for four years before returning to faculty duties, the School found its footing and began to chart new paths. In February 2023, the School welcomed Dr. Theofanis Kitsopoulos, a distinguished Theoretical Chemist from the University of Crete in Greece, as its new Director, bringing fresh perspective to guide the School's continued evolution and growth.

A Message from the Director



Hello, alumni of the School of Mathematics and Natural Sciences at Southern Miss! I'm Dr. Theo Kitsopoulos, Director of the School.

I'm reaching out today to share some exciting updates and recent accomplishments from our school in the fields of Chemistry and Biochemistry, Mathematics, Astronomy and Physics.

We want to keep you connected to our ongoing journey and the remarkable strides we are making together.

This newsletter highlights the outstanding achievements of our students, staff, and faculty, keeping you informed about our initiatives and offering a glimpse of our vision and exciting plans for the future.

We take great pride in celebrating these successes with you, and we are excited to continue building on this momentum together.

As we move forward, your support remains invaluable, and your engagement serves as a shining testament to the strength of our mutual appreciation and shared commitment.

Through this letter, you can stay up-to-date on upcoming events, our accomplishments, and opportunities for collaboration on initiatives that promote not only the growth of our academic institution but also the well-being of our broader society.

Thank you for being an essential part of the Southern Miss family. We're proud of our roots and excited about the future of the School of Mathematics and Natural Sciences. Southern Miss...to the top!

-Theo

Faculty Spotlight: *Dr. Jiu Ding*



[Dr. Jiu Ding](#), Professor of Mathematics at Southern Miss, continues to make significant contributions to the field of mathematics while maintaining strong connections to his academic roots. His elegant proof of the Matrix Determinant Lemma, a fundamental formula in matrix theory, has become the standard in the field and is featured in Wikipedia's article on the topic. The lemma, which efficiently computes the determinant of a rank-one perturbation of an invertible matrix, has wide-ranging applications in mathematics, science, and engineering. Dr. Ding discovered this remarkably concise proof during his research on the Google matrix, using an innovative block matrix multiplication approach. His original paper has garnered 237 citations across various fields as of October 2024, demonstrating its broad impact.

Recently, Dr. Ding's accomplishments were recognized by his alma mater, Nanjing University, one of China's most prestigious institutions. He was invited to participate in the celebration of their newly established School of Mathematics and deliver a lecture at The First Mathematics Alumni Academic Development Forum in November 2024. During his time as a student at Nanjing University from 1978 to 1982, Dr. Ding was a classmate and dormitory roommate of renowned mathematician Gang Tian, who later won the 1994 Alan T. Waterman Award and the 1996 Oswald Veblen Prize in Geometry. Beyond his mathematical contributions, Dr. Ding has also made a significant impact through his series of articles about his Nanjing University computational mathematics classmates and teachers. Published between December 2023 and September 2024, these articles have reached hundreds of thousands of readers in the global Chinese community and have inspired students worldwide to pursue mathematics and science.

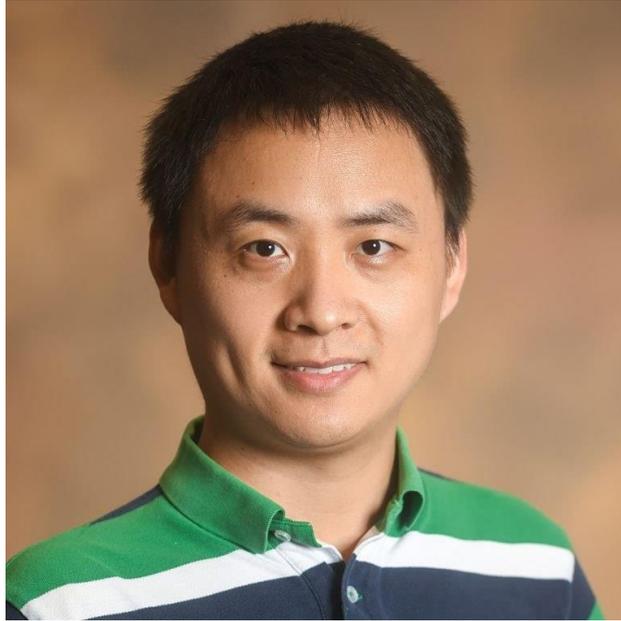
New Faces



2 - [Dr. Katja Biswas](#) is the newest addition to the discipline of physics and astronomy, joining in 2022. Originally from Germany, she earned her undergraduate degree in physics from Leipzig University and completed her Ph.D. in the United States at Mississippi State University. Following her Ph.D., she served as a visiting assistant professor at Loyola University New Orleans for four years, then as an assistant professor at the University of North Georgia for two years, and later as a senior postdoctoral research assistant in computational physics under Dr. Katzgraber at Texas A&M University. At USM, she currently teaches Mechanics I and II, as well as graduate-level Electrodynamics, and will begin teaching General Physics II with Calculus next semester. Her research focuses on computational and statistical physics, specifically the optimization and energy landscapes of spin glasses, and she has a robust record of independent publications. Dr. Biswas values USM's dedication to providing ample research opportunities for students, particularly those at the undergraduate level.



3 - [Dr. Shohreh Hemmati](#) is the newest addition to the discipline of chemistry and biochemistry. Dr. Hemmati's academic journey began with a bachelor's and master's degree in chemical engineering, followed by a Ph.D. from the University of New Hampshire in 2016. She did her post-doc at Purdue University where she strengthened her focus on environmentally conscious practices in nanotechnology. After graduating, she worked at Oklahoma State University for six years. Dr. Hemmati's research, primarily funded by the National Science Foundation, centers on the synthesis and biosynthesis of nanowires. In her lab, she's developing versatile reactors that support a range of biological applications. Beyond research, Dr. Hemmati brings a dynamic teaching philosophy that emphasizes active learning through flipped classroom methods. She believes in a transparent and supportive environment where students feel comfortable engaging and asking questions. In her personal time, Dr. Hemmati enjoys cooking, a process she compares to lab work due to its mix of creativity and precision. She and her husband have a young son, and she is committed to health, family, and continuous learning.



4 - [Dr. Qingguang Guan](#) has joined our faculty in the discipline of mathematics. Hired in 2022, Dr. Guan brings a wealth of knowledge and expertise to our department. He earned his Bachelor of Science and Master of Science degrees from Jilin University in 2009 and 2011, respectively. He then pursued and received his Ph.D. in Computational Science in 2016, under the guidance of Professor Max Gunzburger. Please join us in welcoming Dr. Guan to our community and celebrating the valuable contributions he is sure to make.



5 - [Dr. Sarah Wright](#) joined the school in 2023 as an Assistant Teaching Professor of Mathematics. She is a three-time alumna of The University of Southern Mississippi, receiving her B.S. in Mathematics and B.A. in Spanish in May of 2017 and her M.S. in Mathematics in December of 2020, where she was a Graduate Teaching Assistant. Her Master's research was in the field of

Numerical Analysis, working under Dr. James Lambers to complete her master's thesis, which she would later extend into a publication titled, "Diagonalization of 1-D Differential Operators with Piecewise Constant Coefficients Using the Uncertainty Principle." Finally, she completed her Ph.D. in Computational Sciences (Mathematics), with a research specialty in Numerical Analysis, in July of 2023.



6 - Kris Sullivan, M.S. is our new Professional Academic Advisor. With extensive experience in higher education and a genuine passion for student learning, Kris is here to support students every step of the way. We're thrilled to welcome him to the School of Mathematics and Natural Sciences family!



7 - Thomas Owens, A.B.D., is the new General and Organic Chemistry Laboratory Coordinator. Thomas is a native of Decatur, Alabama and received his Bachelor's of Science from the University of Northern Alabama. He is joining the school staff from the lab of Dr. Douglas Masterson, Professor of Chemistry. Thomas is a musician, involved in church ministry, was once a podcast host, and enjoys listening to true crime podcasts.

School Faculty and Students Receive STEMontheGO Grants

STEMontheGO is an outreach initiative by the University of Southern Mississippi's Center for STEM Education (formerly the Center for Science and Mathematics Education), designed to make science concepts and research accessible to the public. The program equips faculty and students with mobile 'go kits' to demonstrate their research at K-12 schools, public events, and university functions. Funded by a \$1.5 million U.S. Department of Education grant, STEMontheGO aims to expand the university's STEM ecosystem and enhance science communication. The program has supported various projects at Southern Miss, including the American Chemical Society's outreach (ACS) STEMontheGO Chemistry Demos and new purchases for physics demonstrations for use by the Society of Physics Students.

In the physics department, Dr. Vera and Dr. Scott both applied for and received a STEMontheGO grant to make new purchases for physics demonstrations, especially for use by Society of Physics Students (SPS) members. At the SMAC Kids' Halloween Carnival on campus, SPS members captivated attendees with engaging, hands-on physics demonstrations. One highlight

featured high-power lasers, newly purchased by Dr. Vera through the STEMontheGO grant. Balloons of varying colors were inflated and then popped using lasers of a contrasting color. This striking effect illustrates the principles of light, absorption, energy, and wavelengths of visible light. The demonstration offered a fun and visually memorable way to teach fundamental concepts of optics and spectroscopy, sparking curiosity and excitement for attendees of all ages. SPS members have also used this equipment recently at a Petal Middle School visit. At the STEM Carnival celebrating the Center for STEM Education's 60th anniversary, Dr. Scott and a few SPS members showcased a new electromagnetic apparatus. Through this demonstration, they illustrated how a magnetic field influences an electron beam—an experiment that not only confirms the electron's negative charge but also provides a way to measure the e/m constant, similar to J.J. Thomson's original discovery of the electron. Younger children connected the demo to their understanding of magnets, charges, and Thomson's discovery, while older students engaged in critical thinking about how the magnetic field deflects the electron beam in a circular path, laying groundwork for further exploration of the Lorentz force.



8 - At the STEM Carnival celebrating the Center for STEM Education's 60th anniversary, Dr. Jeremy Scott, Associate Teaching Professor of Physics, and Margaret Brune, the Society of Physics Students Historian, highlighted a new electromagnetic apparatus.

In 2024, the University of Southern Mississippi's ACS Student Affiliates Chapter of the American Chemical Society launched a STEMontheGO outreach program, an initiative aimed at boosting STEM retention and sparking an early interest in chemistry. It was designed to interact with students from K-12 schools and aftercare programs and promote chemistry knowledge by providing fun and interactive lectures on chemical compounds and bonding. STEMontheGO features interactive, one-hour chemistry demonstrations led by enthusiastic ACS undergraduate members. The goal? To transform complex concepts into hands-on, memorable experiences that inspire the next generation of scientists. As of October 2024, the program had successfully delivered 37 demos, reaching 899 students in Forrest and neighboring countries.



9 - Left to Right: Autumn Westmoreland and Samantha Vickery present at a local school.



10 - ACS Student Affiliates and the Chemistry Graduate Student Organization at the STEM Carnival highlighting molecular structure using Snatoms modeling kits.



11 - ACS Student Affiliates member, Sophia Schmidt, talks to elementary students at [SCHOOL] about the structure of small molecules.

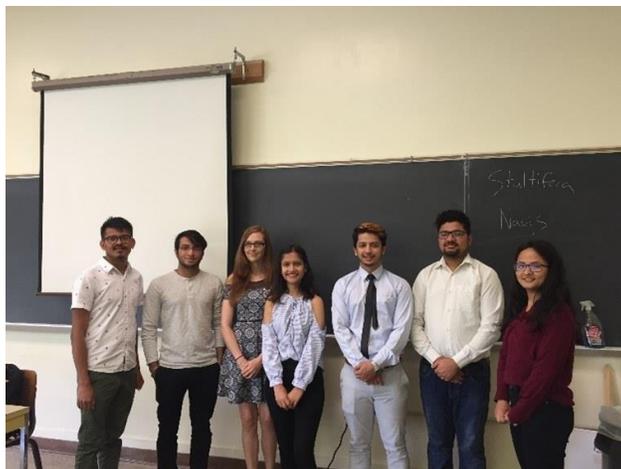


12 - Left to Right: Yishia Watson, Trey Bower, Sophia Schmidt, Marina Goupalova

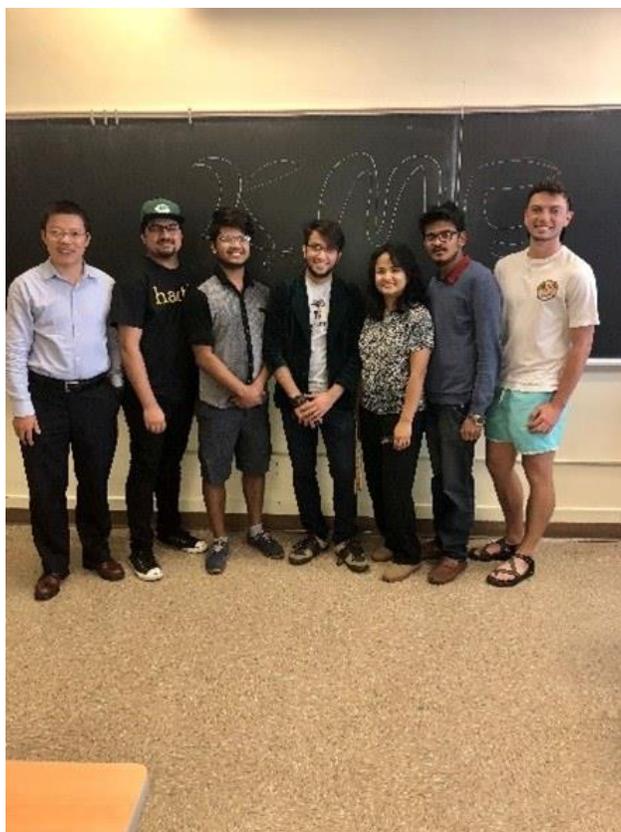
Introducing Our Student Organizations

Kappa Mu Epsilon

The University of Southern Mississippi became the third institution nationwide to adopt a chapter of Kappa Mu Epsilon, an undergraduate mathematics honors society, in the spring of 1949. Despite several periods of inactivity, 1,145 USM students have been members since our chapter's founding. The chapter disappeared in the early 2000's before reactivating in 2017, and 5-10 new members have been inducted every spring since. Led by Dr. Zhifu Xie, Professor of Mathematics, actively involved in undergraduate math activities, the organization serves to reward and recognize well-achieved students for their hard work, as well as create a platform for them to explore mathematics deeper in meetings, connect with other like-minded individuals, and give back to their community through tutoring general education math courses. USM's chapter hopes to raise funds to attend a regional meeting for Kappa Mu Epsilon in the future, where members can meet students from other schools in the southeastern US.



13 - Left to Right: Amit Tripathi, Hamas Tahir, Shradha Bhatta, Sanjan Adhikari, Gokul Bhusal, and Yumi Maharjan



14 - Left to Right: Dr. Zhifu Xie, Gokul Bhusal, Aaditya Paudel, Hamas Tahir, Yumi Maharajan, Amit Tripathi, and Jesse Robinson

American Chemical Society Student Affiliates Chapter

The American Chemical Society Student Affiliates, advised by Dr. Matthew G. Donahue, at the University of Southern Mississippi focuses on creating engaging opportunities for chemistry students. This year, they have recruited over 100 members. The organization has hosted guest speakers such as Dr. Cathy Middlecamp, a renowned educator in sustainable chemistry, and

Scott Bagley, a chemist at Pfizer. Additionally, they have organized hands-on activities led by faculty members, including making slime, exploring the effects of the miracle berry, hosting a LinkedIn workshop, and creating lava lamps. Moreover, the group has hosted several profit shares with local businesses, including Pyro's Pizza, Ed's Burger Joint, and Mo'Bay Beignets, to fund student activities and travel expenses for conferences. Their efforts earned them the Mississippi American Chemical Society "Student Chapter of the Year" award in November 2024.

[Follow the ACS Student Affiliates on Instagram!](#)



15 - Left to Right: Ria Malhotra, Danya Abouzaid, and Sophia Schmidt



16 - Left to Right: Gracie Barlow, Suzanna Haddox, and Ella King



17 - Left to Right: Sophia Schmidt and Ria Malhotra make slime.



18 - Left to right: DeAnthony Clayborn, Audrey Brust, Laci Cartwright, and Emily Allen



19 - ACS student members visit with Dr. Cathy Middlecamp, Professor Emeritus of Chemistry and Environmental Science at the University of Wisconsin-Madison



20 - Drew Rowell (left), Danya Abouzaid (center), and Sophia Schmidt (right) pose at a ACS-Student Chapter event.



21 - ACS student members attend a general body meeting.

Society of Physics Students

The University of Southern Mississippi chartered a chapter for the Society of Physics Students, or SPS, in 1968. SPS, advised by Dr. Michael Vera, is an organization that focuses on promoting physics throughout each chapter's community, state, and region. Members can be found doing demonstrations and outreach at high schools, middle schools, and community events throughout any given year! These demonstrations highlight the interesting and bizarre ways that physics works in a comprehensible manner to spark curiosity from young students and inspire them to consider studying science in the future. The USM chapter of SPS also holds meetings and guest lectures for the undergraduate students that compose its membership, both of which help members prepare for a future in academia and research.

[Follow their Instagram Page here.](#)



22 - Richard Richardson (left) and Braden Hudson (right) do a demonstration at a local middle school.



23 - Sidney Gautrau presents to SPS.



24 - SPS students with peers in their zone in 2024.

[Association of Women in Mathematics](#)

The Association of Women in Mathematics, advised by Dr. Haiyan Tian, promotes gender-inclusivity and supports gender minorities throughout the mathematical sciences. Between AWM national and the student chapters, student members are granted occasional travel support, invited to present, and publish research, and eligible to enroll in specialized mentorship programs that connect students or new career professionals with more experienced researchers with similar backgrounds.

[Follow their Instagram page here!](#)



25 - AWM member presents at a conference



26 - AWM member presents at a conference

Society for Industrial and Applied Mathematics

SIAM is the world's largest organization of applied mathematicians, with over 14,000 members intending to build cooperation between mathematics, science, and technology through publications, research, and community. The SIAM student chapter at USM, under the advisement of Dr. James Lambers, provides students with free access to the benefits of the national organization. They host various events, including research presentations by students and visiting faculty. The chapter regularly supports student travel to present the Annual SIAM Meeting, which was most recently held in Spokane, Washington.

[Follow their Instagram page here!](#)



27 - SIAM members pose at the SIAM Conference.



28 - Two AWM members and McNair Scholars pose with Dr. Jim Lambers.



29 - SIAM members join to Jim Lambers for a meal.

Undergraduate Research

The Southern Miss Cross Scholarship Program

The School of Mathematics and Natural Sciences proudly continues offering The Wright W. and Annie Rea Cross Undergraduate Research Scholarships to support talented undergraduate students in conducting research in Mathematics. Established by Wright Wilson Cross and his wife Annie in 1994, the scholarships benefit students excelling in their mathematics courses, allowing them to work under faculty guidance on research projects. According to Dr. Zhifu Xie, the program enhances students' presentation and critical thinking skills. The scholarship has significantly impacted recipients, aiding their educational and career goals, and leading to achievements at The Mathematical Association of America conferences. The program has grown steadily, increasing support and interest among Mathematics students. The 2024 Cross Scholarship Recipients are listed in the Scholarship Recipients Section.

McNair Scholars Program



30 - Left to right: Margaret Brune, a mathematics and physics major, Rachel Wince, a chemistry major, Sadie Pitre, a chemistry major, and Teyanna Monroe, a biochemistry major.



31 - The McNair Scholars Banquet



32 - Margaret Brune (left) and Dr. Daleana Philips, the Director of the McNair Scholars Program



33 - Sadie Pitre (left) and Dr. Daleana Philips, the Director of the McNair Scholars Program



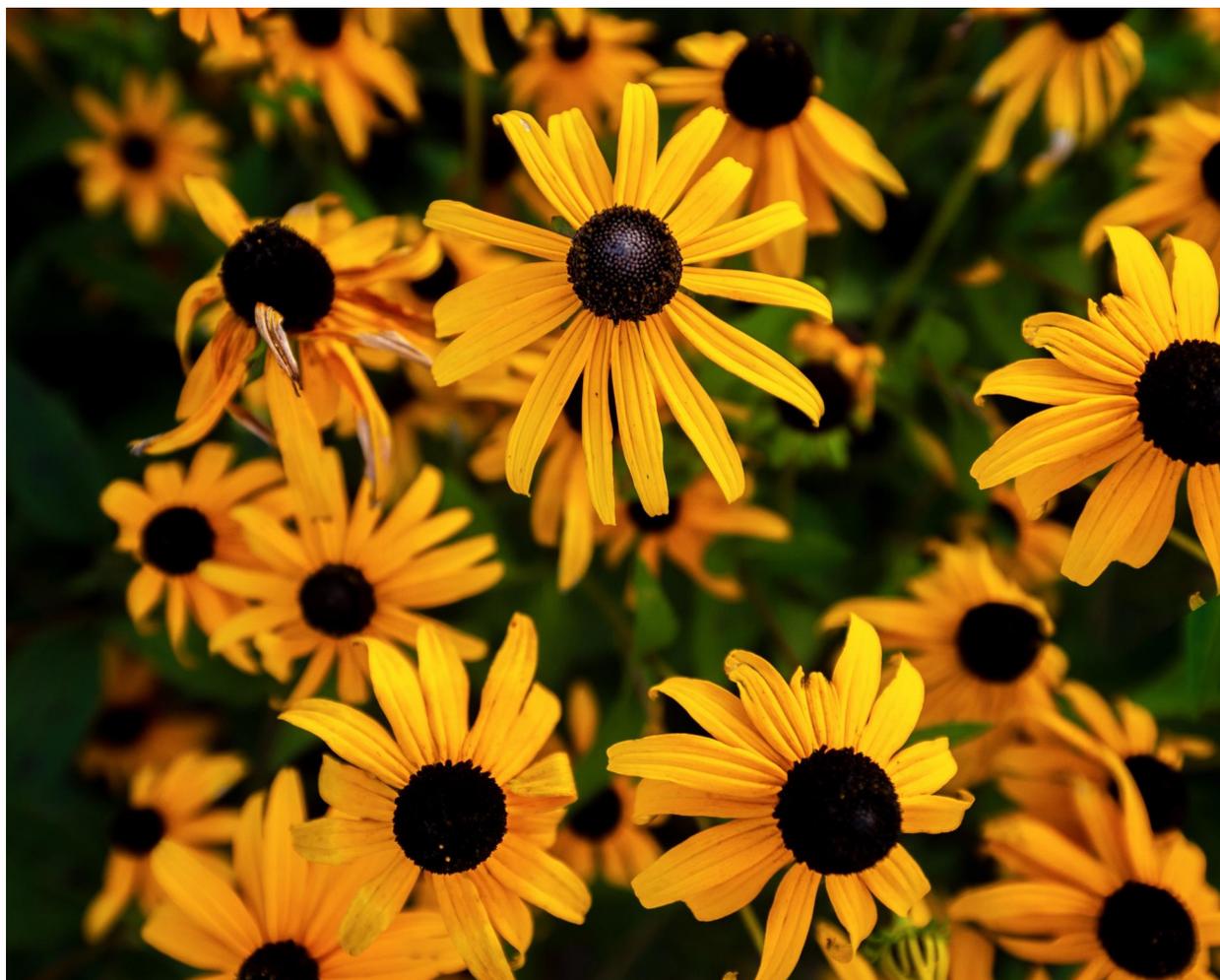
34 - Teyanna Monroe (left) and Dr. Daleana Philips, the Director of the McNair Scholars Program

The [McNair Scholars Program](#) is housed in the [Southern Miss Graduate School](#), and our school is proud to have four undergraduate students (pictured above) who were selected as McNair Scholars. The primary goal of the program is to increase the number of doctoral degrees amongst minority populations and underrepresented groups in the academy. We prioritize the realities of each Scholar to help chart individualized pipelines to their desired Ph.D. goal. The

unique experiences of our Scholars demonstrate our committed fight to expand the impact of minorities in the field of research and beyond.

The School is proud to have four students who are McNair Scholars: Margaret Brune, a mathematics and physics major, Rachel Wince, a chemistry major, Sadie Pitre, a chemistry major, and Teyanna Monroe, a biochemistry major.

Scholarship Recipients



Chemistry

Bobby R. Thornton Memorial Endowment for Scholarship - *Destiny Waldo*

Charles and Carolyn Brent Endowed Scholarship in Chemistry - *Natalie Deer*

Chemistry 50th Anniversary Scholarship Endowment - *Natalie Deer and Benjamin Wood*

Chemistry and Biochemistry Endowed Scholarship - *Nishrenika Pokhrel*

Chemistry Emeritus Faculty Endowment - *Piyush Kumar*

Dr. Rajive K. Khanna Endowed Memorial Scholarship - *Brooke Warren*

Frank Woodruff Chemistry Scholarship Endowment - *Sadie Pitre*

John and Janice Wells Addison Chemistry Endowment - *Macy Sproles*

Jordan Scholarship Endowment - *Emilie Hayes*

Sharp Chemistry Scholarship - *Gracyn Fike*

Stella D. Elakovich Undergraduate Chemistry and Biochemistry Scholarship Endowment -
Marina Goupalova

Thomas Burks Campbell Family Chemistry Scholarship Endowment - *Rachel Wince and Danya Abouzaid*

Mathematics

A.E. and Rachel E. Bradley Memorial Mathematics Scholarship Endowment - *Abigail Blevins and Justice Sears*

Debra Rene' Slay Memorial Mathematics Scholarship Endowment - *Hayden Reed*

Francis G. Casserly Scholarship Endowment - *Claire Cresswell*

Jack D. Munn Memorial Scholarship - *Lillian Purvis*

Wright W. and Annie Rea Cross Endowed Chair in Mathematics and Undergraduate Research -
Bimarsh Bhusal, Matthew Miller, Prajwal Neupane, Luke Fontan, Morgan Wilson, Anzhelika Vasilyeva, Rupak Raut, Nishan Poudel, Franissa Simon, Courtney Francois

Wright W. Cross Endowment - *Matthew Miller and Hayden Reed*

Physics

Brooks-Winstead Physics Scholarship Endowment - *Eva Chalona and Dwayne Prosperie*

E. Alan Coats Physics Scholarship Endowment - *Dwayne Prosperie and Phoenix Ellis*

William F. St. Clair Physics Scholarship Endowment - *Bedar Bukht, Prajwal Neupane, Nirupam Khanal, Margaret Brune, Dwayne Prosperie, Pritesh Thakur, Eva Chalona, and Bradford Smith*

Awards



35 - Dr. Sarah Wright, Assistant Teaching Professor of Mathematics

Dr. Sarah Wright, a three-time USM Alumnus and Assistant Teaching Professor of Mathematics, recently won the Student Athletics Faculty of the Year Award.



36 - Left to Right: Danya Abouzaid, Sophia Schmidt, and Sadie Pitre



37 - Left to Right: Tina Masterson and Local Section Chair, Mine Ucak-Astarlioglu



38 - Left to Right: Dr. Hugh Broome, Danya Abouzaid, Sophia Schmidt, Tina Masterson, Dr. Douglas Masterson, and Sadie Pitre

Chemistry and Biochemistry staff and students won multiple awards at the American Chemical Society Mississippi Local Section's 2024 Awards Banquet. Sadie Pitre won one of the Outstanding Undergraduate Poster Awards, Tina Masterson (Senior Laboratory Coordinator and

Instrumentation Manager) won the Johnnie-Marie Whitfield Service Award, and the USM ACS Student Chapter won the 2024 Student Chapter of the Year Award.



39 - Dr. Hugh Broome, Associate Teaching Professor of Chemistry

Dr. Hugh Broome was selected as the inaugural 2023-2024 Student Accessibility Advocate Awardee by the Office of Student Accessibility Services at Southern Miss

In the News



[Drs. Cannon and Heinhorst Retire from USM after 30+ Years of Service to Chemistry and Biochemistry and Southern Miss.](#)

[Former Chemistry Professor, Dr. David Wertz, Passes Away](#)

[Southern Miss Mathematics Student Organizations to Host Mississippi Council of Teachers of Mathematics Conference](#)

[Dr. Hugh Broome and Ms. Mary Gray Chosen to Participate in the American Chemical Society Science Coaches Program.](#)

[Dr. Vijay Rangachari Publishes Research in the Prestigious *Journal of the American Chemical Society \(JACS\)*](#)

[Southern Miss's Eagle Maker Hub, ran by Dr. Anna Wan, hosted Summer Camps](#)

[The Annual Rayborn Lecture hosted by Physics and Astronomy Featured an Expert in Ocean Sound](#)

[The Biochemistry Emphasis Chemistry Degree Earned ASBMB Reaccreditation](#)

Want to Help Students?

Your contributions can make a significant difference for students in the School. To make a charitable gift to support the School of Mathematics and Natural Sciences, visit <https://www.usmfoundation.com/mathandnatscience>. The USM Foundation is a 501(c)(3) nonprofit organization, and gifts are tax-deductible to the extent of current IRS regulations. All contributions at any level are welcome and may be paid outright or pledged over five years.

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Newsletter Student Editorial Board



40 - Left to Right: Chandler Shimp, Luke Fontan, Danya Abouzaid, Dr. Hugh Broome, Sophia Schmidt, Margaret Brune, and Franissa Simon