



Momentum

Newsletter

2024 MSU Physics, Astronomy, and Materials Science Newsletter

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Letter From Department Head



Dear Alumni and Friends of MSU Physics, Astronomy & Materials Science Department,

Greetings from the PAMS department! We are celebrating several notable accomplishments for our faculty and students in 2024. Ridwan Sakidja was awarded the DOE Visiting Faculty Program fellowship in 2024. Ridwan worked with Dr. Mark Asta's group during the summer of 2024 at UC Berkeley Materials Science & Engineering Department. Kartik Ghosh was awarded the USA Air Force Lab fellowship in 2024. Jessica Fink spent the summer of 2024, on the student USA Air Force Lab fellowship, with Dr. Ghosh at the USA Air Force Lab in Dayton, OH.

We had another strong year in outreach events. PAMS held public viewing nights and hosted several group tours at Baker Observatory in 2024. Public viewing nights are a long-held tradition at Baker Observatory whereas group tours are a more recent outreach development. Devon Romine and several of our undergraduate students participated by showing physics demonstrations at the YMCA Seuss Day event for local elementary school students. We continued to host regional and wider reaching high school students for tours of department facilities and Baker observatory.

We are grateful to our PAMS Advisory Board members for their continued advising and support of our department. The PAMS Advisory Board meeting was held during homecoming on October 18th, 2024.

This past year was a record year for presentations made by our undergraduate and graduate students on their research. The conferences that our students presented in 2024 include the American Astronomical Society Meeting, American Physical Society March Meeting, American Physical Society Prairie Section Meeting, and the NASA Space Grant Meeting.

We are also very grateful to our alumni and friends for endowments and gifts to the department during 2024. We presently have 15 scholarships that have been established through generous funding provided by our alumni and friends. These scholarships are a highly valuable resource to our students in their continued pursuit of their higher education goals. In addition, through the continued support of our alumni and friends, we are now very close to our goal of replacing the vehicle for our PhysBiz outreach efforts.

If you would like to provide a gift to the department, please feel free to contact me or you can make a donation online at <https://www.missouristatefoundation.org/colleges-and-departments.htm>.

Bob Mayanovic (Dr.M.)

New Faculty, Staff and Equipment



Michaela West, Administrative Assistant

Michaela West joined the PAMS Department in August 2024, taking over for Jessica Quin who moved to Computer Science and Mathematics. She was born and raised in Joplin, Missouri and graduated from Joplin High School. Michaela received her Bachelor of Fine Arts in Theatre Performance from Missouri Southern State University in May 2022, and worked as the Administrative Assistant for the Department of Performing Arts for 2 years before moving to Springfield. She has loved getting to know all of the wonderful faculty, staff and students at MSU and is eager to learn more and keep growing.

Events

PAMS always has something fun going on! Let's look back at some awesome events that were held this last year....

Public Viewing Night

We held multiple Public Viewing Nights this year that were well attended. Some of the celestial objects seen were the Dumbell and Helix Nebulas.



Dr. Seuss Day 2024

The 13th Annual
Seuss Science Day
was held on
Saturday, March
2nd 2024.



Instructor Devon Romine



Student Armitha Dutta

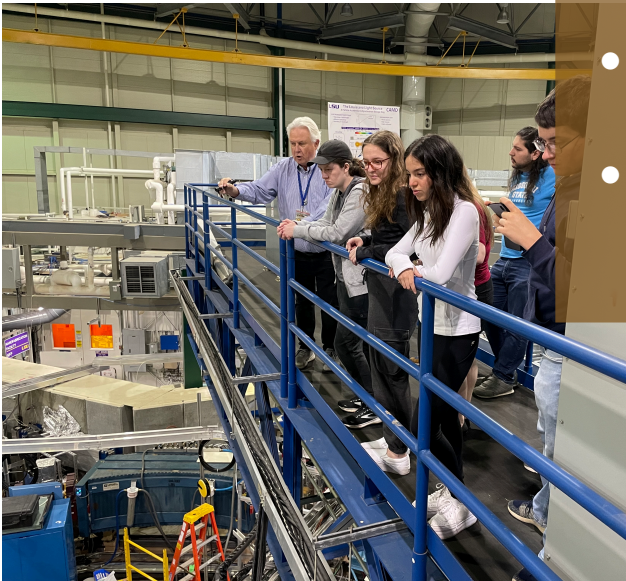
Seuss Science Day is an
event held to spark young
kids' interest in STEM
subjects.

Our students and faculty
presented several physics
demonstrations for the kids
to enjoy and learn from!

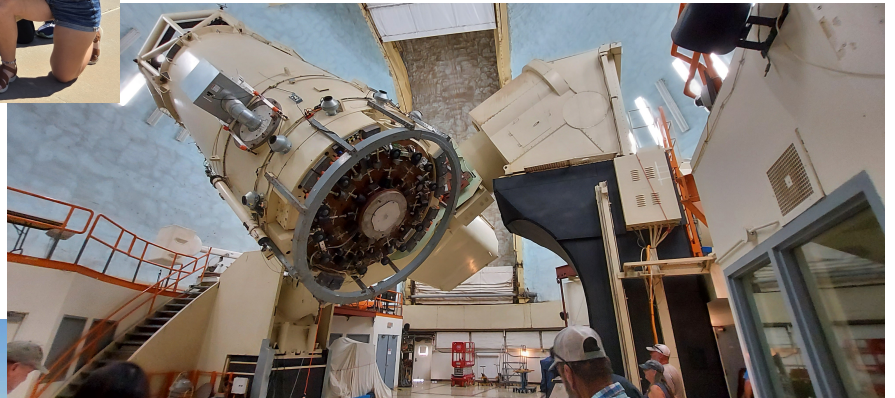
Trips & Visits

The Society of Physics Students led by Dr. Tiglet Besara traveled to Baton Rouge, LA in March and toured:

- Laser Interferometer Gravitational-wave Observatory (LIGO)
- Center for Advanced Microstructures & Devices (CAMD)
- Department of Physics & Astronomy at Louisiana State University



The Ozark Amateur Astronomers Club (OACC) visited McDonald Observatory in West Texas in October of 2024. The club toured the facility, seeing the large telescopes there. The club also went to the Monahans Sandhills, where they used the department's 8-inch telescopes to enjoy a night of astronomical observations.

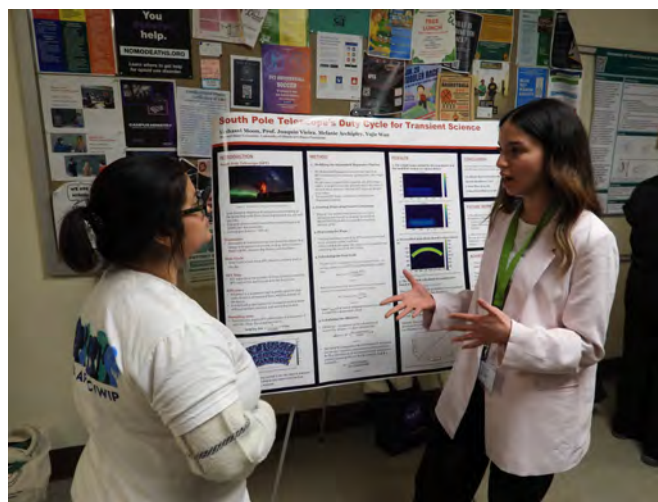


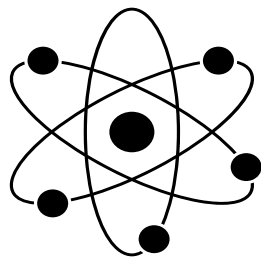
Conferences

In this section, we are celebrating those students who represented PAMS in conferences!

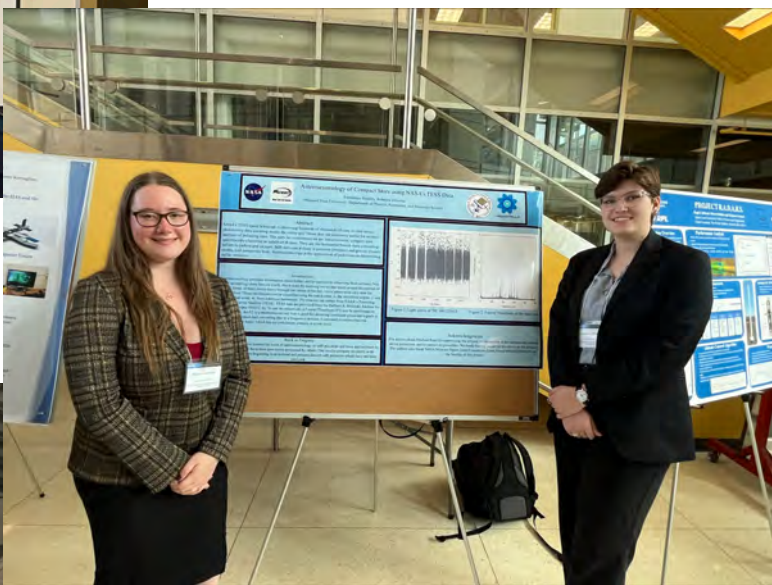


PAMS students annually attend the Conference for Undergraduate Women and Gender Minorities in Physics. Jessica Fink, Yashasvi Moon, Rachel Lee, Stephanie Collins, and Simarpreet Girn attended in 2024. There they met astronaut Dr. Linda Godwin and many other inspiring women in physics. Student Rachel Lee won the award for best poster, and Yashasvi Moon presented at an invited talk session. Simarpreet Girn won 3rd place overall with her poster, Investigating Outcomes of Inner Planet Formation Influenced by a Jupiter-Like Perturber.

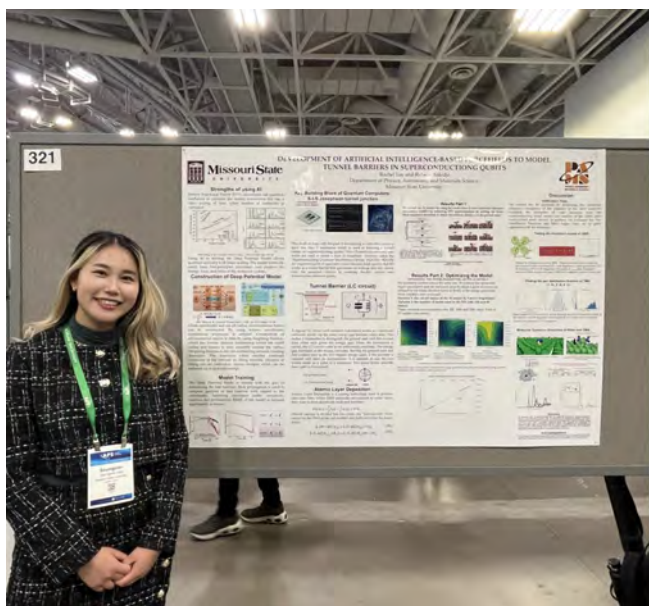




PAMS students presented either poster or oral presentations at the NASA Missouri Space Grant Consortium meeting from April 19th-20th, 2024 at Missouri S&T in Rolla, Missouri.

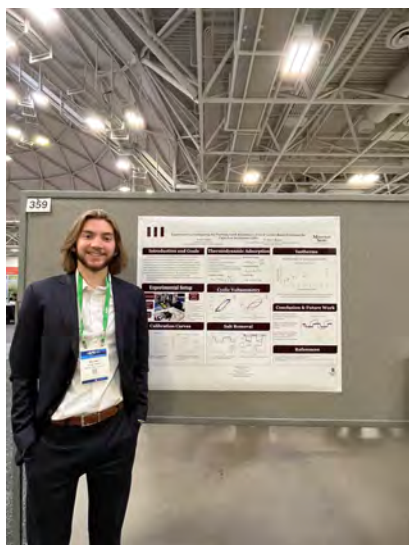


In March 2024, the APS annual meeting was held in Minneapolis, Minnesota. 13,000 people attended, including seven students from PAMS.



Rachel Lee (left), Matthew Bruenning (top right), Gaige Riggs (bottom right)

APS (cont.)



Hunter Nelson

Rachel Lee presented her project "Development of Artificial Intelligence-Based Force fields to Model Tunnel Barriers in Superconducting Qubits".

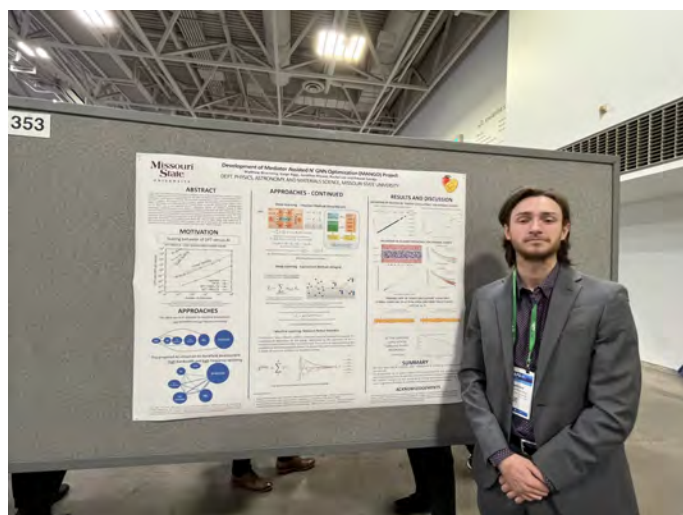
Hunter Nelson presented his project *"Experimentally Investigating the Thermodynamic Adsorption Limits of Carbon-Based Electrodes for Capacitive Deionization (CDI)"*.

Matthew Bruenning presented his project *"Development of Mediator Assisted N' GNN Optimization (MANGO) Project"*. He also gave a presentation on *"Development of MLIP to model corrosion behavior in Molten Salt Reactors"*.

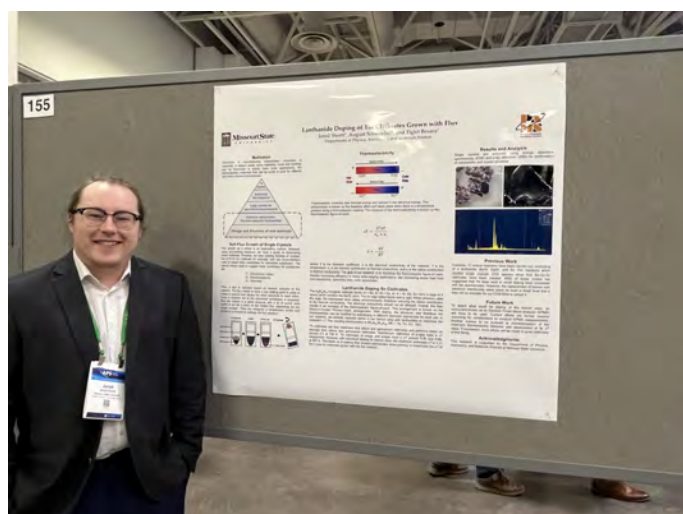
Gaige Riggs gave a presentation on *"Convolutional Neural Network Analysis of Molecular Docking for Cancer Drug Discovery"*.

Jared Shortt presented his project on *"Lanthanide Doping of Tin Clathrates Grown with Flux"*.

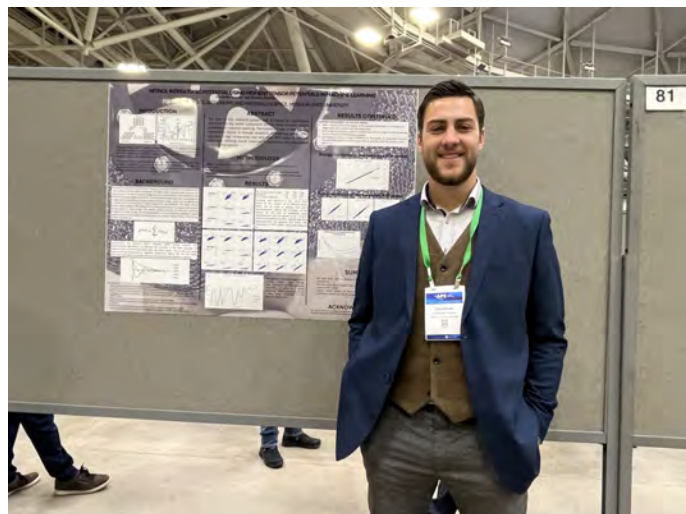
Jonathan Klierer presented his project on *"Nitinol Interatomic Potential Using Moment Tensor Potentials in Machine Learning"*.



Matthew Bruenning



Jared Shortt

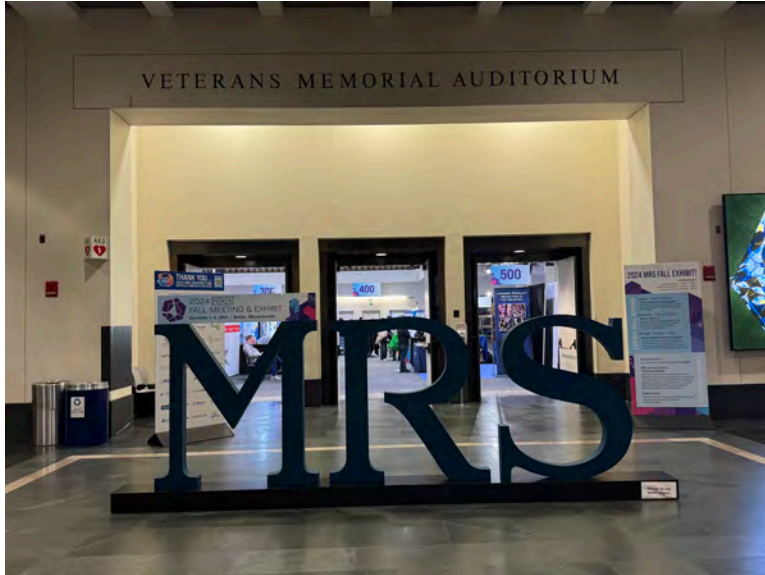


Jonathan Klierer

Several students in PAMS and Co-op Engineering Program attended the Missouri Center for Advanced Power (MOCAP) Summit at the University of Missouri. Students participated in a poster competition at the undergraduate and graduate levels and had the opportunity to network with professionals in the energy industry.



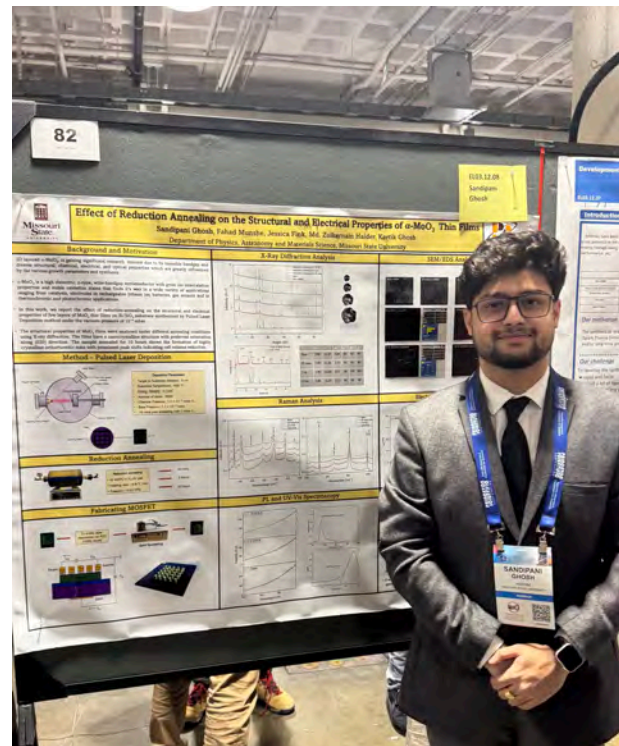
2024 MRS Fall Meeting & Exhibit



The Materials Research Society Fall Meeting & Exhibit took place in Boston, Massachusetts in December. This premier international scientific gathering for materials research brought together the world's leading minds to explore the forefront of scientific discovery.

Sandipani Ghosh (MS Graduate Student) presented his abstract *"Effect of Reduction Annealing on the Structural and Electrical Properties of α -MoO₃ Thin Films"*.

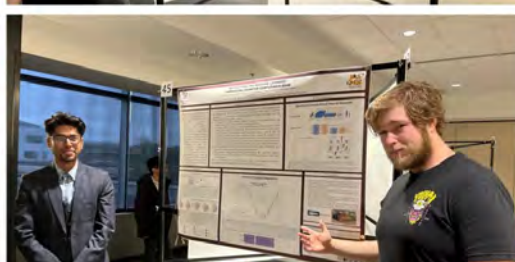
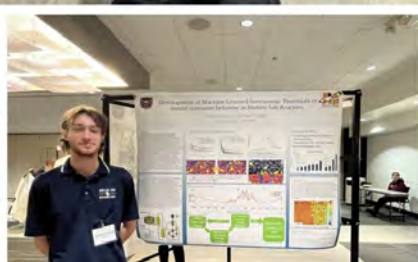
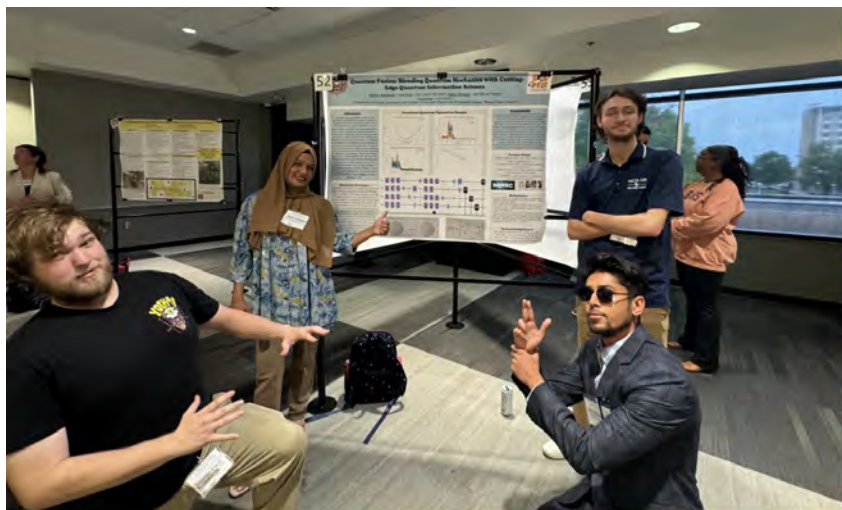
This study looks at how heating MoO₃ thin films in a low-oxygen environment affects their structure and electrical properties.



Sandipani Ghosh

31st Annual Frank Einhellig Interdisciplinary Forum (EIDF) at Missouri State University

We had many of our talented graduate students present at EIDF this year. Anika Tabassum stood out with her poster titled 'Quantum Fusion: Blending Quantum Mechanics with Cutting-Edge Quantum Information Science.'



Congratulations to Simarpreet Girn and Yashasvi Moon who took 1st and 2nd place, respectively, in the Physics, Astronomy, and Materials Science category at this year's CNAS Undergraduate Research Symposium. We had amazing presentations this year. Great job to all who participated.

**1st Place: Simarpreet Girn, Sarah Morrison, Caroline Witt, Mateo Guerra Toro
OUTCOMES OF SUPER-EARTH FORMATION IN THE PRESENCE OF A JUPITER-LIKE PLANET**

Faculty Advisor: Dr. Sarah Morrison

2nd Place: Yashasvi Moon

SOUTH POLE TELESCOPE'S DUTY CYCLE FOR TRANSIENT SCIENCE

Faculty Advisor: Prof. Joaquin Vieira (University of Illinois at Urbana-Champaign)



Internships & REUs

Jonah Vercher - Los Alamos National Lab

"While I was at Los Alamos National Lab, I worked in the Theoretical Division (XTD) and completed the analysis of different methods to approximate the physical parameters of Delta Scuti and Gamma Doradus Variable stars to determine which method would be best to approximate their physical parameters using their pulsation frequencies to approximate their density. I then used their density to approximate their Mass and Radius and compare these with other approximations from the Gaia Catalogue and Tess Catalogue."



Jessica Fink - US Air Force Lab

Jessica participated in a US Air Force Research Laboratory fellowship during the Summer of 2024 in Dayton, Ohio. The Air Force Research Laboratory is the primary research and development center for the Department of the Air Force. Jessica's research during her fellowship involved the study of the electronic, magnetic, and magneto-transport properties of 2D materials, including transition metal oxides.



Yashasvi Moon - IDEAS

Yashasvi Moon participated in the Illinois Developing Equity in Astrophysics Summer School (IDEAS) undergraduate research NASA Space Grant Consortium sponsored internship at the University of Illinois Urbana Champaign. Her work involved making machine learning models for photometric classification of tidal disruption event host galaxies. A paper on this work was authored by Yashasvi and her advisor on the project, Professor Decker French, in Research Notes of the AAS in November 2024.



Internships & REUs

Emily Rapp - University of Notre Dame

Emily Rapp participated in the NSF-REU internship in the Physics Department of the University of Notre Dame in Summer 2024. Her internship involved working on synthesis and characterization of quantum materials.



Samuel Cope - NRAO

Sam Cope participated in an NSF-REU sponsored internship program at the National Radio Astronomy Observatory (NRAO) — Green Bank Observatory (GBO) site in Charlottesville, Virginia. He worked on radio interferometric data of the star forming region W49A from the Very Large Array and Atacama Large Millimeter Array. Using source detection algorithms, he searched for and found compact emission sources in the star forming region and estimated the masses of hot dust cores, as predecessors for stellar objects.



Student Awards



Dr. M (Left) and Jared Shortt (Right)

Outstanding Teaching Assistant Jared Shortt

Jared has been an exemplary Teaching Assistant in 2024. He taught PHY 204 introductory labs. He was always well prepared for the labs and provided clear and enthusiastic instruction to the students. The students in his lab sections said that he was very helpful and organized during class. They also said that he was very understanding when problems arose, and he went out of his way to make sure that the students understood the material. One of the students commented that "He was very clear in his presentations and helped us whenever we needed help."



Dr. M (Left), and Rachel Lee (Right).

Outstanding Undergraduate Student Rachel Lee

Rachel is a double major in Physics and Mathematics, along with obtaining a Computational Science Certificate. Throughout all this, she has maintained a flawless 4.00 GPA. She has performed very well in her research. She has presented on several occasions at scientific meetings and has won several awards for her presentations. She is now a PhD student in Physics at Cornell University.



Outstanding Research Assistant Niklas Landgraff

Thesis Co-Advisors: Drs. Daniel Moreno and David Cornelison

Thesis title: Gas Evolution of a Ni-Zn Cell

His thesis research was based on a collaborative effort between our department and Aesir Technologies, a battery company in Joplin, MO. For this, Niklas built an apparatus for gas measurements on the operating cell. In addition, he designed the LabVIEW program for data acquisition, acquired the data, and modeled the data for the research project. He has presented on his work at national and regional meetings and has been an exemplary mentor to undergraduate students working in Dr. Moreno's lab.



Dr. M (Left) and Niklas Landgraf (Right)



Faculty & Staff Achievements

CNAS Faculty & Staff Excellence Awards

Staff Excellence: Adam Beck

Adam is pro-active in alerting faculty to potential problems that may have arisen and deadlines to follow through. He makes sure that grants and contracts are running smoothly and in order. In addition he is a trained Master Advisor so is very helpful with student issues as they arise.



Excellence in Teaching: Daniel Moreno

Dr. Moreno has consistently received positive comments for his teaching. He records his lectures and gives post-lecture notes for students to go over the subjects on their own. He also provides his students with additional resources such as educational Youtube videos. Dr. Moreno's teaching initiatives have been exemplary and have gone above and beyond of what is typically expected.



Student Nominated for Excellence: Bob Mayanovic

The nominating student said , "Dr. Mayanovic helped me land an internship at one of largest research organizations in the world. He has integrated a partnership with Mercy hospital to see how the concepts in the class extend into the real world and to show the class where the degree itself can take us. I have not met another professor that is more deserving of a faculty honor like this one."



Faculty & Staff Achievements



Dr. Tiglet Besara

We congratulate Dr. Tiglet Besara on being granted tenure and for his promotion to Associate Professor in the department.

Dr. Besara has been with Missouri State University since 2017. His research focuses on X-ray diffraction, crystallography, and magnetization studies of novel quantum crystals.

Alumni News

Our alumni never cease to impress us. Here are just some of our alumni that have been achieving great things lately...

Meredith Vogel (B.S. in Physics and Astronomy '21) went on to earn a Master's of Science in Physics from the University of Florida, and recently accepted a position at Washington University in St. Louis, MO.

During her time at MSU, Meredith worked with Dr. Sarah Morrison as an Undergraduate Research Assistant in her research group.





Mohammad Delower Hossain (M.S. in Materials Science, 2016) was a Graduate Teaching Assistant while receiving his Master's, who worked with Dr. Bob Mayanovic in his lab.

Delower went on to obtain his PhD in Materials Science and Engineering from Penn State University and was a postdoctoral researcher at Pacific Northwest National Laboratory in Richland, WA. He is currently an Assistant Professor at the University of Tennessee Space Institute.



Graduates

Spring 2024

Betime Begzati	UG
Trenton Cathcart	UG
Stephanie Collins	UG
Quinn Coulter	UG
Gabriel Fedynich	UG
Hyrum Harlow	UG
Jacob Henderson	UG
Riley Hochstein	UG
Oluwaseun Iyodo	GR
Jonathan Kliewer	UG
Niklas Landgraf	GR
Rachel Lee	UG
Hunter Nelson	UG
Shawn Thomas	UG
Gregory Vatrano	UG
Parker Widmeyer	UG

Summer 2024

Fahad Munshe	GR
Gaige Riggs	GR

Fall 2024

Jessica Fink	UG
Austyn McIntyre	UG
Benjamin Valdez	UG



Scholarship Winners

Andereck Family Scholarship:

Laurel Foltz
Isabella Grizzle
Emmalein Pendley
Emily Rapp
Betime Begzati

Banks Family Scholarship:

Bishwash Devkota
Simarpreet Girm
Theo Luan

Eugene H. Henderson Memorial Scholarship:

Vadim Grishchuk

Howard Petefish Award:

Yashavi Moon

John W. Northrip Memorial Scholarship:

Yashavi Moon
Emily Rapp

Kenneth A. Soxman Memorial Scholarship:

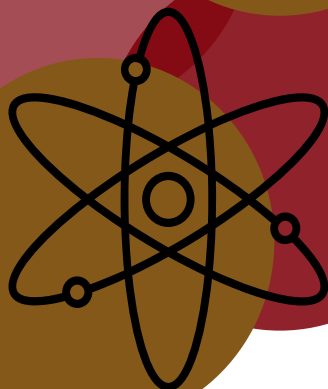
Aili McFall

Physics and Astronomy Department and Friends Scholarship:

Carah Day
Brogan Homburg
Ben Valdez

Pre-engineering/Engineering Physics Scholarship:

Yashasvi Moon



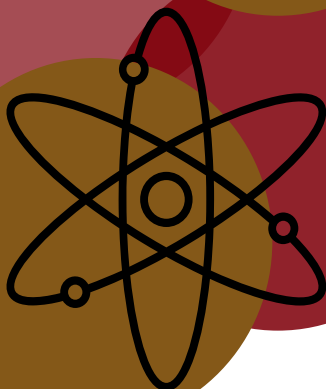
Scholarship Winners

Thomas Cave Endowed Astronomy Scholarship:

Samuel Cope
Sophia Keith
Caroline Witt

Thurman Family Scholarship:

Mick Drecker



Intellectual Contributions

Baran, A., Reed, M. D. (2024). Short–period pulsating hot subdwarf stars observed by TESS. II. Northern ecliptic hemisphere. *Astronomy & Astrophysics*, 686, A65.

Baran, A. (2024). Mode identification and period fitting in six pulsating hot subdwarfs. *Publications of the Astronomical Society of Australia*, 41.

Baran, A. (2024). Period variability in the pulsating Extreme Helium stars V652 Her and BX Cir. *Monthly Notices of the Royal Astronomical Society*, 527, 8402–8408.

Baran, A. (2024). TIC 378898110: A bright, short–period AMCVn binary in TESS. *Monthly Notices of the Royal Astronomical Society*, 527, 3445–3458.

Samantaray, R., Acharya, D., Priyadarshini, A., Rojalin, R., **Besara, T.**, Dalal, N. S. (2024). Understanding the Motional Dynamics of the Ammonium Ion in the Mechanism of Multiferroicity of Cr(V) Peroxychromates: A 1H NMR Study. *Physical Chemistry Chemical Physics*, 26, 24585.

Yasmin, N., Noor, M. F. B., **Besara, T.** (2024). Structural Trends and Itinerant Magnetism of the New Cage–structured Compound HfMn₂Zn₂₀. *Journal of Physics: Condensed Matter*, 36, 275801.

Noor, M. F. B., Yasmin, N., **Besara, T.** (2024). Machine Learning in High–entropy Alloys: Phase Formation Predictions with Artificial Neural Networks. *Future Sustainability*, 2(1), 47–58.

Sundaramoorthy, S., Balijapelly, S., Mohapatra, S., Bhattacharya, S., **Ghosh, K. C.**, Choudhury, A. (2024). Interpenetrated Lattices of Quaternary Chalcogenides Displaying Magnetic Frustration, High Na–Ion Conductivity, and Cation Redox in Na–Ion Batteries. *Inorganic Chemistry*, 63(25).

Sundaramoorthy, S., Gerasimchuk, N. N., Ghosh, K. C., Kelley, S. P., Choudhury, A. (2024). Li₂MP₂S₆: Building–Block Approach to a Family of 2D Non–van der Waals–Layered Materials and Their Water, Ammonia, and Ion Intercalation Properties. *Chemistry of Materials*, 36(8).

Mahmud, Z. U., Munshe, F., Karmakar, S., Sultana, M., Haque, A., **Ghosh, K. C.** (2024). Influence of oxygen vacancies enhances structural, optical, and electrochemical properties of P2 type Na_xMnO₂– δ for high–performance Na–ion cathode materials. 314.

Yuan, X., Yang, Z., **Mayanovic, R. A.**, Hou, Z. (2024). Experimental evidence reveals the mobilization and mineralization processes of rare earth elements in carbonatites. *Science Advances*, 10(27).

Jha, R., Harlow, H., Benamara, M., **Mayanovic, R. A.** (2024). On the Structural and Molecular Properties of PEO and PEO–PPG Functionalized Chitosan Nanoparticles for Drug Delivery. *Bioengineering*, 11(4).

Moreno, D. (2025). Life Cycle Assessment of the Charge Carrier Mediated Electrocatalytic Reduction of Carbon Dioxide to Formic Acid. *Journal of Environmental Chemical Engineering*, 13(1), 115184.

Moreno, D. (2024). Decoupling Charge Carrier Electroreduction and Enzymatic CO₂ Conversion to Formate Using a Dual–Cell Flow Reactor System. 9(38), 39353–39364.

Moreno, D. (2024). Theoretical Performance Optimization of Enzymatic Electrochemical CO₂ Reduction to Formate: Voltage, Concentration, Temperature, Pressure, and Flow Rate. *Journal of CO₂ Utilization*, 83.

Odusanya, A. A., Kumar, D., Schall, J. D., Mayer, J., **Sakidja, R.** (2024). Computational approach to modeling electronic properties of titanium oxynitride systems. *Computational Materials Science*, 245.

Tanji, A., Fan, X., **Sakidja, R.**, Law, P. K., Hermawan, H. (2024). Role of Niobium on the Passivation Mechanisms of TiHfZrNb High–Entropy Alloys in Hanks’ Simulated Body Fluid. *Journal of Functional Biomaterials*, 15(10).

Alumni:

Please take a few minutes to send us an email at: physics@missouristate.edu

Include your current contact information, graduation year and Missouri State degree.

Let us know where you are working now, job title or other career or personal accomplishments so we can include you in our next issue.

Stay current with the MSU Alumni Association at <http://alumni.missouristate.edu>.

Update contact information online and learn about upcoming alumni events, such as MarooNation.

Media and Contact:



<https://www.facebook.com/MSUPAMS2/>



<https://www.instagram.com/msupams2/>



<https://twitter.com/PAMSatMSU>

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Gift Giving:

State universities could not operate without generous contributions from alumni and friends. Your support enables us to provide scholarships, teaching equipment, and more. We hope you will consider making a contribution to the PAMS department or to one of the scholarships; your gift is tax deductible.

To learn more about how you can help, visit <http://physics.missouristate.edu/Alumni.htm>. Please make checks payable to Missouri State University Foundation in support of the PAMS department and mail to:

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Also, donations can be made online at: www.missouristatefoundation.org/waysofgiving.asp.

Select Natural & Applied Sciences/Physics, Astronomy, & Materials Science

Thank you!

Faculty and Staff Information:

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Discrimination:

Missouri State University is a community of people with respect for diversity. The University emphasizes the dignity and equality common to all persons and adheres to a strict non-discrimination policy regarding the treatment of individual faculty, staff, and students. In accord with federal law and applicable Missouri statutes, the University does not discriminate on the basis of race, color, national origin (including ancestry, or any other subcategory of national origin recognized by applicable law), religion, sex (including marital status, family status, pregnancy, sexual orientation, gender identity, gender expression, or any other subcategory of sex recognized by applicable law), age, disability, veteran status, genetic information, or any other basis protected by applicable law in employment or in any program or activity offered or sponsored by the University. Sex discrimination encompasses sexual harassment, which includes sexual violence, and is strictly prohibited by Title IX of the Education Amendments of 1972.

Momentum:

The Newsletter of the Department of Physics, Astronomy, and Materials Science at Missouri State University. To submit information for the next Momentum newsletter, e-mail Michaela West at:
MichaelaWest@Missouristate.edu

