



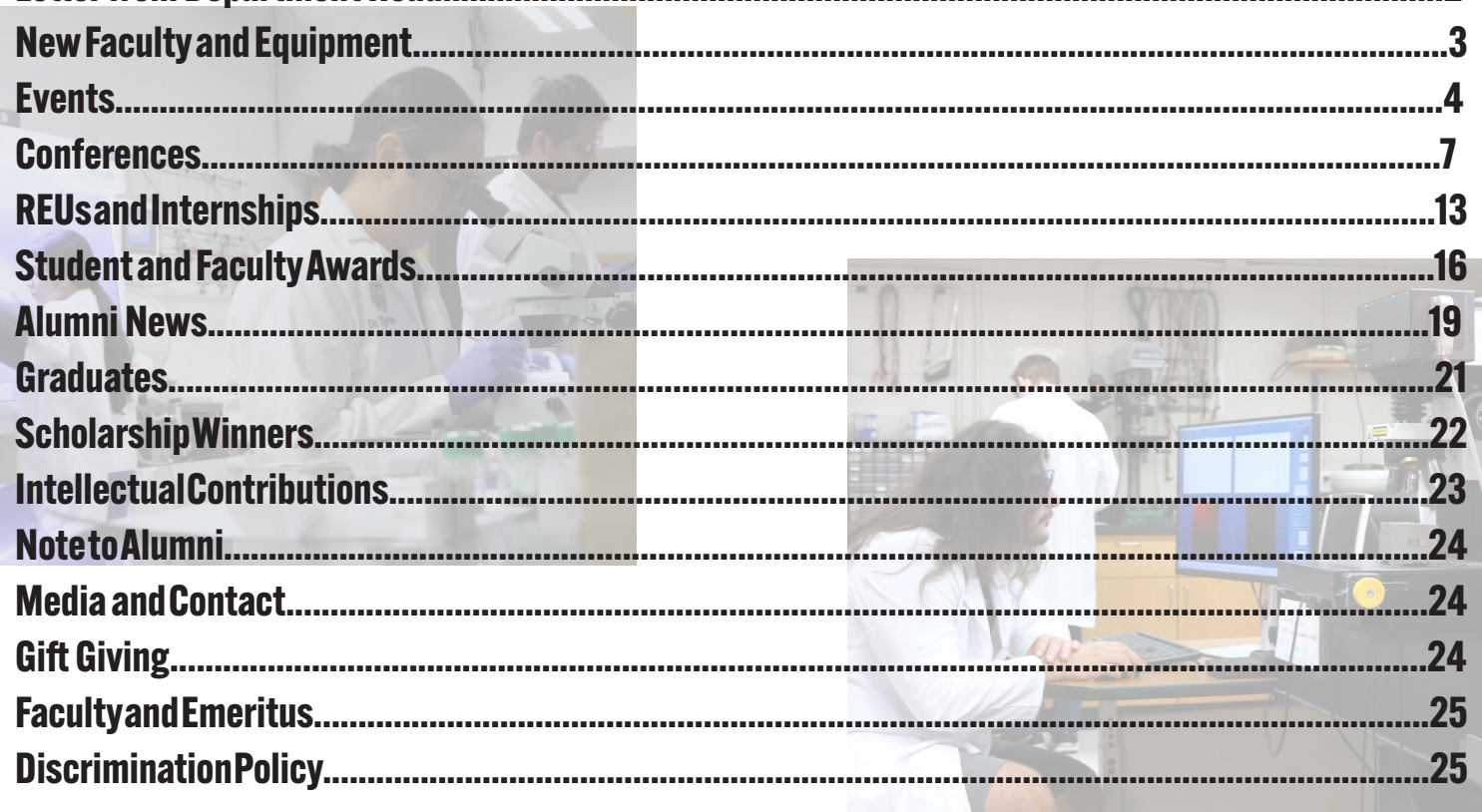
Momentum

Newsletter

2023 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,

There were a number of notable accomplishments for both faculty and students in the department in 2023. Dr. Kartik Ghosh was again awarded the USAFL Air Force Lab fellowship working in their facilities in Dayton, OH, during the Summer of 2023. Jared Shortt, who is currently an MS Materials Science graduate student, was granted the student USAFL Air Force Lab fellowship and also worked in their laboratories over the Summer of 2023.

We had another strong year in outreach events. Students from Carthage High School visited the department and spent time with our faculty and students in talking about physics and astronomy research. The astronomy class from Warrenton High School also visited the department and learned about astrophysics research. In addition, several other high

school groups visited the department during 2023. We held several public viewing nights at Baker Observatory during the Spring and Fall semesters in 2023. The public viewing nights continue to be very popular with the public.

We thank our board members for a successful PAMS Advisory Board meeting that was held during homecoming on October 20, 2023. Our undergraduate and graduate students made presentations on their research during the poster session that was held during the advisory board meeting.

We highly appreciate our alumni and friends for their endowments and for gift giving during 2023. The scholarships that we are able to offer to our students provide a much needed resource that enables continuing study and progress toward degree completion. We also received generous gifts that will enable future growth in the department in terms of facilities and faculty funding. 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

New Faculty and Equipment



Dr. Andrzej Baran - Assistant Professor of Astrophysics

Dr. Andrzej Baran joined us in fall semester 2023. He received his PhD in Astrophysics from Nicolaus Copernicus University and habilitation from Wroclaw University in Poland. For both of his degrees, he worked on asteroseismology of compact pulsating stars. Dr. Andrzej Baran has published more than 100 peer-reviewed articles of international standing, presented more than 40 scientific presentations and conducted tens of astronomical observing runs around the world, including best weather-wise sites, i.e. Hawaii, Chile, Canary Islands. Currently, Dr. Andrzej Baran continues his research of pulsating stars, open clusters and exoplanets.

Dr. Andrzej Baran enjoys teaching courses, working with research students and traveling. The best places he visited are Hong Kong and Cook Islands, just to name two.



Devon Romine

Devon received his M.S. in Materials Science from Missouri State University in the year 2022. His thesis was on “The Review of Current Reactive Force Field Potentials for Use in Simulating the Atomic Layer Deposition of Alumina on Aluminum”. Devon enjoys working with students and helping them understand the phenomenon that go on everyday in the universe around them.

Events

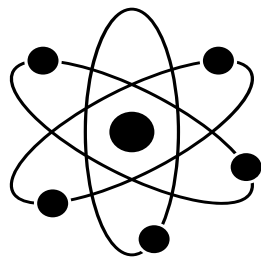
PAMS always has something fun going on! Let's look back at some awesome events that were held this last year....

Public Viewing Night

We held multiple Public Viewing Nights this year that were well attended. Some of the celestial objects seen were the Milky Way, nebulas, and much more. One Facebook commenter said:

**“As always this was a lot of fun”
-Facebook commenter**

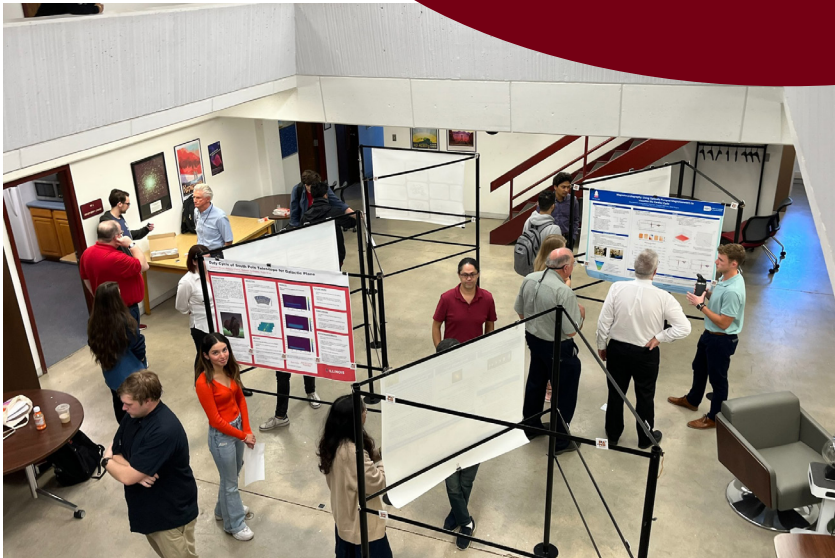




PAMS students in the SPS and OAAC clubs visited Fermilab, Argonne National Laboratory, and the University of Chicago in the Chicago area during March 12 to 14. Dr. Tiglet Besara joined the students on their trip, where they learned about particle accelerators, particle and nuclear physics, cold-trap atomic physics experiments, and other fun science topics.



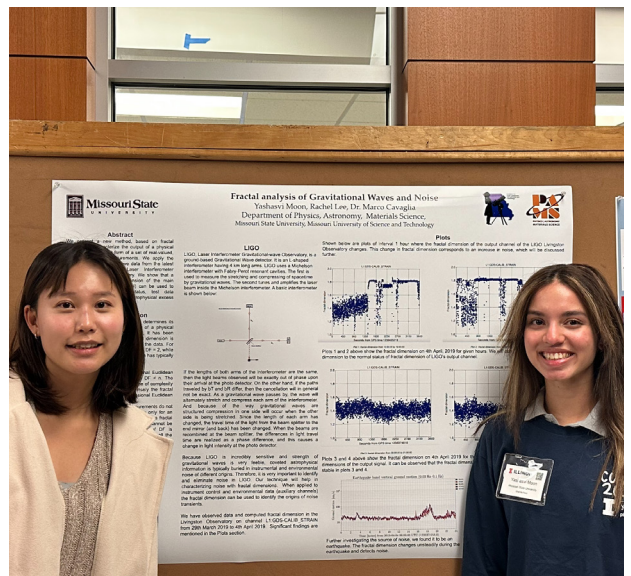
Students presented all the awesome research that they had completed this year at the 2023 Advisory Board Meeting.



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



The Conferences for Undergraduate Women in Physics celebrates undergraduate women and other gender minorities in physics. Out of our students that attended, Simarpreet Girn, Caroline Witt, Rachel Lee, and Yashasvi Moon presented amazing poster presentations. Jessica Fink, Stephanie Collins, and Emily Rapp also attended the conference. Simarpreet Girn won 3rd place overall with her poster *Investigating Outcomes of Inner Planet Formation Influenced by a Jupiter-Like Perturber*.



Rachel Lee (left) and Yashasvi Moon (right)

In March this year, the APS annual meeting was held in Las Vegas, Nevada. 13,000 people attended, including 12 students from PAMS.



APS VEGAS



Md Fahel Bin Noor

Md Fahel Bin Noor presented his research on Heusler alloys as potential catalysts. Fahel Bin Noor's research at this event revolved around the creation of Heusler alloy samples using mechanical alloying, a traditional method that involves mechanical grinding and post-annealing. The study's focus was on their potential as catalysts, particularly in hydrogenation reactions. Through techniques like X-ray diffraction and Raman spectroscopy, he explored the dependency of their catalytic activity on various factors.



Marium Mostafiz Mou

Marium Mostafiz Mou presented her project "Machine learning strategies for potential development in high-entropy driven nickel-based superalloys". Mou told CNAS Newswatch:

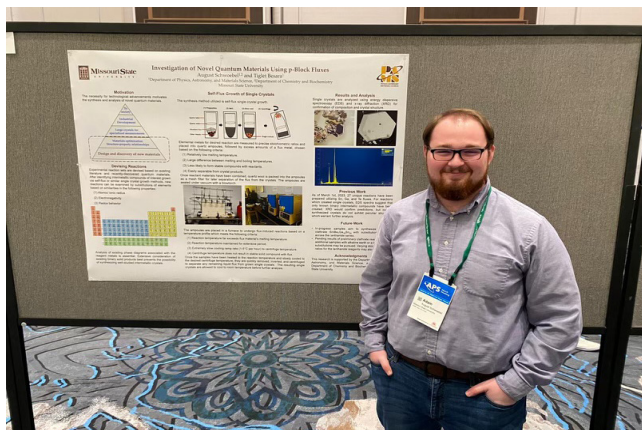
"Conferences like APS are a great way to meet with researchers who thrive for knowledge. I met with the inventors whose code I use for my research, which was very exciting and thrilling for me. I also met others who are also working with AI and got to know their opinions. It was a great learning experience for me." - Marium Mostafiz Mou



Nusrat Yasmin

Nusrat Yasmin presentation at the APS March Meeting centered around the successful synthesis and characterization of these crystals within the $\text{MM}'_2\text{Zn}_{20}$ family. The research, conducted through the self-flux method, showcases the potential of these compounds for converting waste heat into electricity.

Other students that presented at the APS March Meeting in Vegas...



August Schwoebel



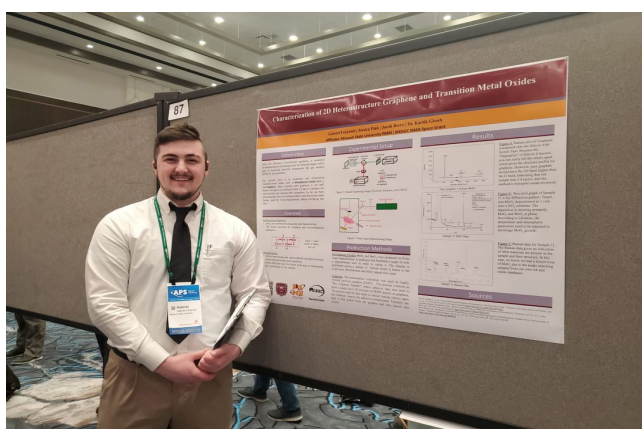
Ummay Honey



(Emon) Md Shaihan Bin Iqbal



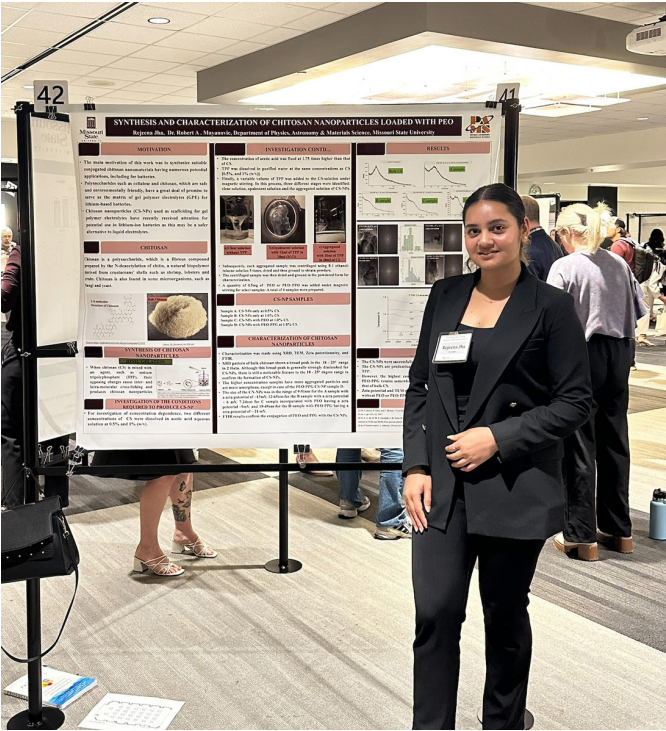
Jessica Fink



Gabriel J. Fedynich

APS presenters not pictured:
Aziz Octoviawan
Austyn McIntyre

30th Annual Frank Einhellig Interdisciplinary Forum
(EIDF) at Missouri State University

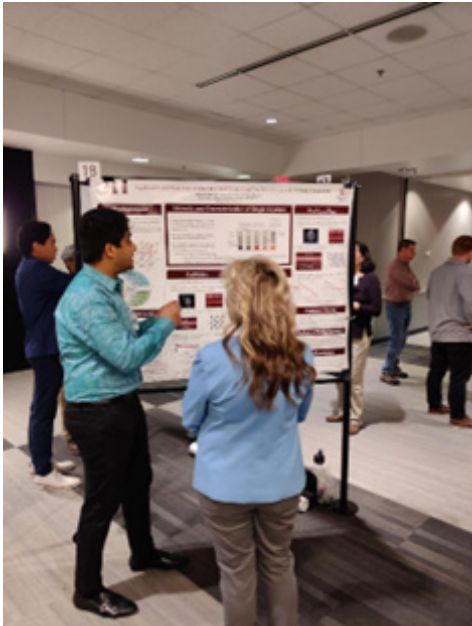


Rejeena Jha

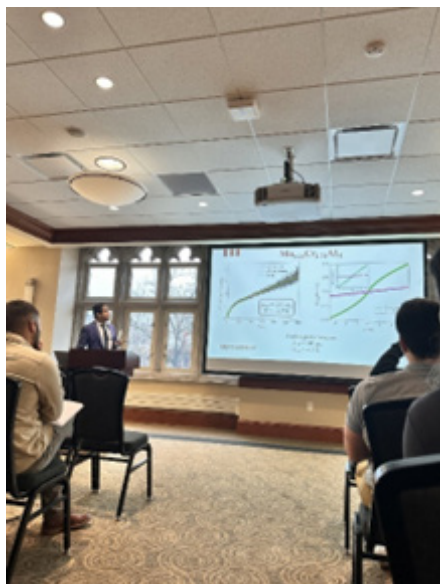
We had many of our talented graduate students present at EIDF this year. Rejeena Jha stood out with her poster titled “Synthesis and Characterization of Chitosan Nanoparticles Loaded with PEO” She was one of the top 20 Best Poster Presenters for the second year in a row.



Rejeena Jha along with her fellow winners of Best Poster



Md Fahel Bin Noor



The following students presented at the APS Prairie Section Fall meeting in Columbia:

(Emon) Md Shaihan Bin Iqbal
Nusrat Yasmin
Gaige Riggs
Matthew Bruenning
Seungmin Lee

Fahel Bin Noor presenting at APS.

MS&T23: Materials Science & Technology, Columbus, OH



Nusrat Yasmin at the MS&T conference where she presented her research entitled “Growth and Characterization of Novel Single Crystals as Potential Thermoelectric Materials”

The Materials Science & Technology meeting took place in Columbus, OH this year. Dr. Ridwan Sakidja gave an invited talk titled “Development of Machine Learning Interatomic Potentials to Model Materials Processing & Performance in Multicomponent Systems”. Students Nusrat Yasmin and Md Shaihan Bin Iqbal presented as well.



Fahel Bin Noor explains the synthesis and properties of half-Heusler and ternary intermetallic single crystal

REUs and Internships

Emily Rapp

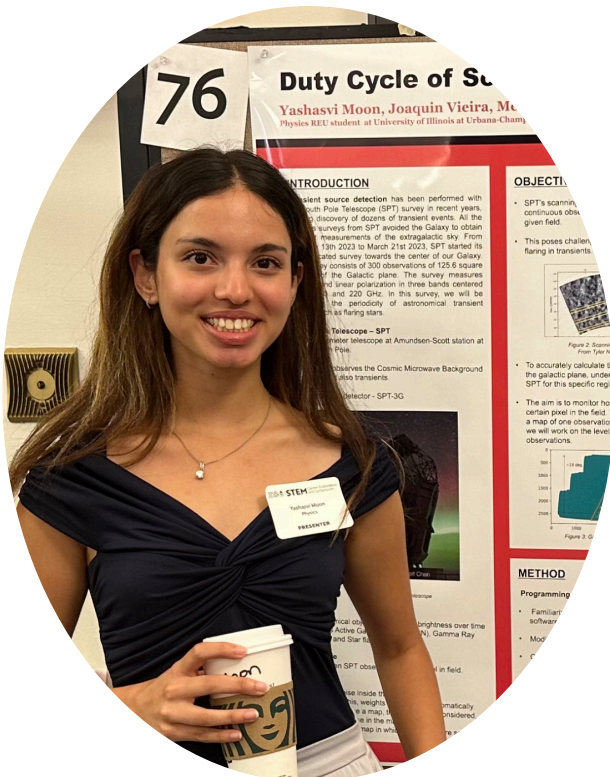
Emily Rapp speaking on her REU at Cornell:

"I participated in an REU at the Cornell Laboratory for Accelerator Based Sciences. My project involved writing code that detects and categorizes quenches in superconducting radio frequency cavities. SRF cavities are what accelerate particles in a particle accelerator and a quench occurs when they lose superconductivity."

-Emily Rapp



Yashasvi Moon also completed an REU this past summer at the University of Illinois Urbana-Champaign. Here is what she had to say about her time there:



Student Yashasvi Moon

"I did my REU at the Physics Department of the University of Illinois Urbana-Champaign in the Observational Cosmology group. My project, titled 'Duty Cycle of the South Pole Telescope for Transient Science', aimed to calculate how often the South Pole Telescope (SPT) observes certain pixels in the sky, also known as its duty cycle. The importance of knowing the duty cycle is to accurately constrain the frequency of transient events found by SPT."

-Yashasvi Moon

Jessica Fink completed her 2nd REU this summer and won an award for her poster presentation! She is quoted below:

“The NSF-REU is a research internship for undergraduate students that is funded by the National Science Foundation. My REU was at the University of Texas-Dallas in the department Material Science and Engineering. I worked under the Young/Quevedo group and my immediate advisor was Dr. Rodriguez. I won the Graduate College Award for my poster presentation on thin film transistors.” - Jessica Fink



Student Jessica Fink (left middle) with her fellow reserachers at UT- Dallas.

Riley Hochstein was awarded an NIH internship during the summer of 2023. He interned at the National Institutes of Mental Health (NIMH) with Dr. Allison Nugent’s team in Bethesda, MD. He helped to work on a project developing a novel magnetocardiography technique. This involved using optically pumped magnetometers to image cardiac cycles.

While using 56 extremely sensitive lasers, Hochstein and his team created computer models to investigate these signals. He oversaw taking measurements, writing computer code and interpreting results.



Riley Hochstein

Graduate student **Jared Shortt** joined Dr. Ghosh this summer at the Wright-Patterson Air Force Base in Dayton, Ohio to do Materials Science research. Here is what Jared had to say about his internship:

“We did some interesting things with femto-second, titanium-sapphire lasers, with the research primarily focusing on relaxation dynamics of excitons, or paired electron-holes that travel in a crystal lattice. I helped set up a machine known as a 2D coherent spectrometer. In simpler terms, the research consisted of hitting 2D materials with light, then measuring the response of surface electrons in femto-second pulses.” - Jared Shortt



Faculty and Student Awards



Dr. M (Left) and Zia Uddin Mahmud (Right)

Outstanding Teaching Assistant Zia Uddin Mahmud

Zia Uddin Mahmud was adored by his students during his teaching assistantship. Zia is attending the University of Michigan for PhD studies Materials Science and Engineering.

Outstanding Undergraduate Students (Co-winners) Noah Singer and August Schwoebel

Dr. Mike Reed, Noah's research project advisor said, "Noah is doing essentially high-level Masters work in that he has developed a process (with Python code) for spectral energy fitting using Gaia parallaxes, archival photometry, and our collaboration's spectroscopy, essentially all on his own!" Noah presented on his research at the 10th Annual Meeting on Hot Subdwarfs and Related Objects in Belgium as well as the American Astronomical Society Meeting in Seattle, in 2022.

Noah will be taking a sabbatical year during the next academic year, prior to entering PhD studies.



Noah Singer (Left), Dr. M (Middle), and August Schwoebel (Right).

August has been president of the SPS this past year and helped organize the SPS-OAAC trip to Fermilab and Argonne National Lab earlier this year. Dr. Tig Besara, his PHY 386/486 project advisor said of August, "August has done computational research with Ridwan Sakidja and experimental research with me, both with a NASA Missouri Space Grant Consortium Internship. He has presented on his research at the international level at the American Physical Society's March Meeting and at the state level at the annual meeting of the NASA Missouri Space Grant Consortium." August started attending the U. of Illinois in Physics Fall 2023.



Outstanding Research Assistant (Co-winners) Kali Shoaf-Laughlin and Md Shaihan Bin Iqbal (Emon)

Kali's thesis title: Reflective Freewriting as a Strategy to Improve Pre-Service Teacher's Physics Content Knowledge and Overall Attitude Toward Physics and Physics Teaching

Thesis Advisor: Dr. David Cornelison; she worked on the CODERS grant project. She is attending Kansas State University for PhD studies in Physics Education.

Emon's thesis title: *STRUCTURAL AND MAGNETIC STUDY OF EPITAXIAL NI/NIO THIN FILMS ON VARIOUS SINGLE CRYSTALLINE SUBSTRATES USING PULSED LASER DEPOSITION*

Thesis Advisor: Dr. Kartik Ghosh. Emon is currently attending the University of California - Davis for PhD studies in Materials Science and Engineering.



Dr. M (Left), Md Shaihan Bin Iqbal (Right)
Kali Shoaf-Laughlin (Not Pictured)

Great job to Matthew Bruenning and Rachel Lee who took 1st and 2nd place in the Physics, Astronomy, and Materials Science category at this years CNAS Undergraduate Research Symposium. We had 5 so amazing presentations this year, great job to all who participated.

1st Place: Matthew Bruenning

IMPLEMENTATION OF A HOUGH TRANSFORM ON A FIELD PROGRAMMABLE GATE ARRAY

Faculty Advisor: Dr. Tiglet Besara

2nd Place: Rachel Lee

DEVELOPMENT OF ARTIFICIAL INTELLIGENCE-BASED FORCEFIELDS TO MODEL TUNNEL BARRIERS IN SUPERCONDUCTIONG QUBITS

Faculty Advisor: Dr. Ridwan Sakidja



Alumni News

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

Claire Geneser was awarded the College of Arts and Sciences Outstanding Graduate Student Overall and the Hall of Fame Scholar awards for the 2022-2023 academic year at Mississippi State University. Claire has had a positive impact on her fellow graduate students and has co-authored over ten publications, including one detailing the discovery of planets around AU Mic which was published in the journal Nature. Claire received a B.S. in Physics in 2016 from PAMS, and continues to make the department proud.





This fall, former student **Austin Shearin** came back to MSU to give a seminar titled “What I Thought I Learned, What I Actually Learned, and What I Wished I Learned from Getting a Bachelors in Physics”. Austin graduated from the accelerated masters program in physics and materials science. He graduated in 2016 and has worked in industry on semiconductors, and is now the director of data science working in the haptics industry.



Jacob Swett gave the convocation speech in the fall here at MSU. He gave a great motivational speech filled with several mentions of our department. Jacob got his BS physics and BS applied mathematics, minor in German from MSU in 2012. He then completed his PhD at the University of Oxford in 2020 in Quantum Electronic Devices from the Department of Materials. Jacob is presently very active in biosecurity (one of the leading global experts).



Graduates

Spring 2023

Matthew Bruenning UG
Mateo Guerra UG
Ummay Honey GR
Md Shaihan Bin Iqbal GR
Sol Kieschnick UG
Justin Leuthauser UG
Marium Mostafiz Mou GR
Nur Aziz Octoviawan GR
Garrett Reinke UG
August Schwoebel UG
Kali Shoaf-Laughlin GR
Jared Shortt UG
Blake Smith UG
Hayden Stricklin GR

Summer 2023

Aiden Cobb
Rejeena Jha
Zia Uddin Mahmud
Noah Singer
Maverick Stover

Fall 2023

Jacob Berry GR
Mathew Boeser GR
Patrick Lambdin GR
Md Fahel Bin Noor GR
Alexander Urbani UG
Nusrat Yasmin GR



Scholarship Winners

Andereck Family Scholarship:

Mick Frecker
Yashasvi Moon
Gavin Reese
Emily Rapp
Betime Begzati

Banks Family Scholarship:

Theo Luan
Brogan Homburg

Dale Blankenship Memorial Scholarship:

Michael Hardesty

Eugene H. Henderson Memorial Scholarship:

Quinn Coulter

Howard Petefish Award:

Riley Hochstein

John W. Northrip Memorial Scholarship:

Gavin Reese

Kenneth A. Soxman Memorial Scholarship:

Mick Drecker

Physics and Astronomy Department and Friends Scholarship:

Betime Begzati

Pre-engineering/Engineering Physics Scholarship:

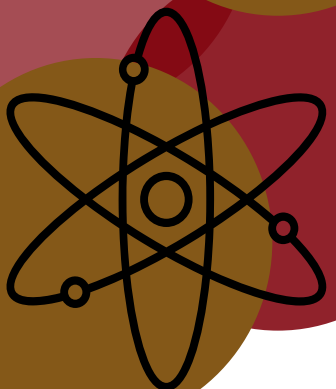
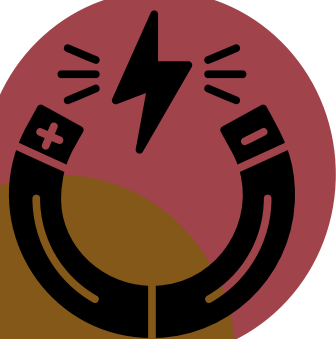
Yashasvi Moon

Thomas Cave Endowed Astronomy Scholarship:

Erin Smith
Caroline Witt

Thurman Family Scholarship:

Sam Cope



Intellectual Contributions

Gillenwaters, A., Iqbal, R., Piccolo, D. L., Davis, T. R., Franklin, K., **Cornelison, D. M.**, Martinez Diaz, J. B., Homburg, A. H., Cottrell, J., Page, M., Semantic Analyses of Open-Ended Responses From Professional Development Workshop Promoting Computational Thinking in Rural Schools. *International Journal of Computer Science Education in Schools*, **2023**, 6(1), 59-78.

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ZU Mahmud, S Karmakar, A Haque, **KC Ghosh**. A study of fabrication and characterization of Na_xMnO₂ as a cathode material for sodium-ion battery. *MRS Advances*, **2023**, 8, 828-834.

A. Al Shafe, M.D. Hossain, Mourad Benamara, V. Roddatis, **R.A. Mayanovic**. Defects and surface chemistry of novel pH-tunable NiO-Mn_{304±x}Ni_{1-x}O heterostructured nanocrystals as determined using X-Ray photoemission spectroscopy. *Journal of Electronic Materials*, **2023**, 52, 1193-1202. DOI: <https://doi.org/10.1007/s11664-022-10047-5>.

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R. Jha, **R.A. Mayanovic**. A Review of the Preparation, Characterization, and Applications of Chitosan Nanoparticles in Nanomedicine. *Nanomaterials*, **2023**, 13, 1302 DOI: <https://doi.org/10.3390/nano13081302>.

Reed, M. D., Baran, A., Telting, J.H., Ostensen, R.H. TESS photometry of the pulsating hot subdwarf star V585 Peg. *Monthly Notices of the Royal Astronomical Society*, **2023**, 525(1), 1342-1352.

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Porosity modeling in a TiNbTaZrMo high-entropy alloy for biomedical applications. *RSC Advances*, **2023**, 13, 36468-36476.

A. I. Duff, **R. Sakidja**, H.C. Walker, R. A. Ewings, D. Voneshen. Automated potential development workflow: Application to BaZrO₃. *Computer Physics Communications*, **2023**, 293, 108896.

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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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By mail:

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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:

The PAMS department

Kemper Hall 101

901 S. National Ave.

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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!

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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 Jessica Quin at: JQuin@Missouristate.edu

