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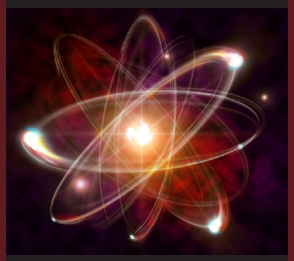
PHYSICS | ASTRONOMY MATERIALS SCIENCE

2019 Newsletter



A Note from the Department Head

This year saw a number of important developments in the department. Among the more notable ones is the completion of a renovation of KEM 105 laboratory. Dr. Tiglet Besara moved his temporary lab from KEM 119 to a permanent location in KEM 105 in the Fall of 2019. The lab features a complete floor renovation, new cabinets and lab benches, two new chemical hoods, a state-of-the-art working environmental glove box and various other lab instruments. Dr. Besara will be sharing KEM 105 with Dr. Fei Wang from the Chemistry department and on occasion, with Drs. Kartik Ghosh and Dave Cornelison. Dr. Wang's research area is in inorganic crystal growth and aligns well with Dr. Besara's research efforts.

Dr. Sarah Morrison officially joined the department in Fall of 2019. Dr. Morrison finalized her NASA Postdoctoral Fellowship at Penn State University just prior to starting at MSU. Her research interests include orbital dynamics and evolution of extrasolar planetary systems, planetary formation and migration, disk-planet interactions, orbital dynamics and its impact on planetary and small body surfaces. She is also interested in science education, data science, and women/minority involvement in STEM fields. Look for an article dedicated to Dr. Morrison further in the newsletter for more information.

Ms. Becky Baker retired after 28 years of service from MSU and the PAMS department in December of 2019. The department thanks Ms. Baker for her many years of dedicated teaching and service to our department and MSU and especially to her skilled guidance of science and physics education students. A retirement party was held in Becky's honor at the Plaster Student Union in December of 2019. I would like to offer my congratulations to Dr. Kartik Ghosh for being promoted to the rank of Distinguished Professor and Dr. Ridwan Sakidja for being promoted to full Professor rank in 2019. Drs. Ghosh and Sakidja have been highly productive in research while providing an excellent education to our undergraduate and graduate majors. In addition, both Drs. Ghosh and Sakidja have advised a remarkable number of students in research thus far in the PAMS department.

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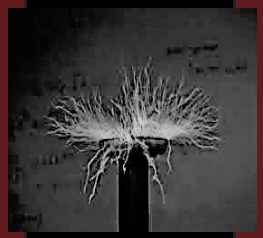

PAMS held several eventful public viewing nights and one special event at Baker Observatory during 2019. The special event was held on May 4, 2019 for President Clif Smart's Leadership Circle. President Smart and many of the members of the Leadership Circle attended the event. Short talks were given by Drs. Michael Reed and Sarah Morrison and the attendees were treated to a lovely night of viewing of celestial objects using the telescopes at the observatory. We are in much need of a new small classroom building at Baker observatory. The building is needed for classroom teaching as well as for public instruction during the viewing nights. If you know of anyone that would like to make a donation to the department specifically for this purpose, please put them in touch with me or with the MSU Foundation office.

The PAMS Advisory Board held its annual meeting during Homecoming Weekend, Oct. 25, 2019. This year, we implemented two new formats: A panel discussion comprised of Advisory Board members to discuss career planning and similar considerations with our students and a research poster presentation made by our undergraduate and graduate students. Both events were a big hit with our students.

The department's Society of Physics Students visited the Johnson Space Center in Houston in early April of 2019. The students were accompanied by Dr. Dave Cornelison, who is the faculty advisor for the club, on the trip. The SPS students participated in a guided tour of the Space Center, coordinated by our alumnus and former staff-member of the Center Charlie Armstrong. In addition, several students attended the Conference for Undergraduate Women in Physics in Corpus Christy, TX, in January, 2019. The students attending the meeting were Hayden Stricklin and Alyssa Aumann and Becky Baker accompanied the students as our faculty representative. More details on these student events can be found within the newsletter.

Dr. Robert Mayanovic

New PAMS Lab in Kemper 105

In his new lab, Dr. Tiglet Besara focuses on crystal growths of new metal oxides and intermetallics using a flux method: starting materials get embedded in a hot molten metal liquid, resulting in millimeter-sized crystals upon cooling. The target is to find new compounds and materials and explore their structures and properties. We have, e.g., grown a new candidate for a topological, magnetic semimetal, new cage-structured thermoelectrics, and new disordered magnetic materials.

The lab has an oxygen-hydrogen torch sealing station for sealing off reactions under vacuum, an inert atmosphere glovebox, two fume hoods, and various equipment typically found in a materials physics/chemistry laboratory: scale, microscope, sonicator. In addition, four box furnaces and one tube furnace are available (located in 119B) that can reach 1000 degrees Celsius.

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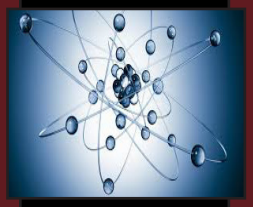
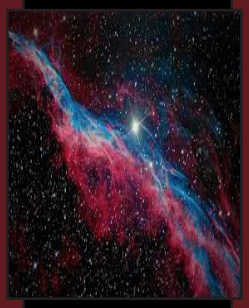
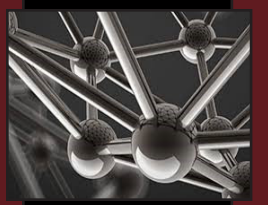
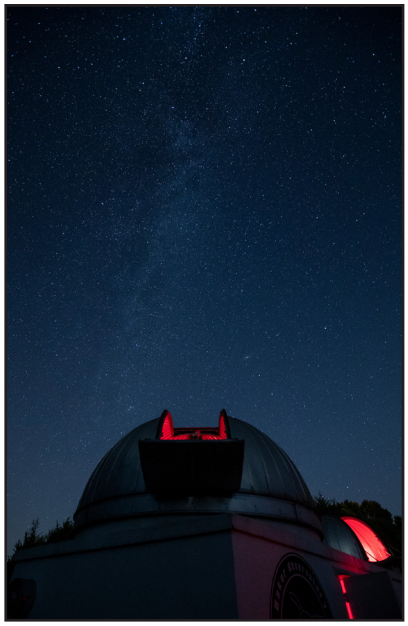






Baker Observatory News and Updates



The PAMS department held several general public viewing nights at the observatory during 2019. The use of the new 20" telescope located at the observatory has been received very enthusiastically by the public. The 20" telescope is being used for research on exoplanets. You can read about some of the work Shania Wolf is doing in the article below.

In addition, there were further renovations and improvements made at the observatory to the facilities and grounds.

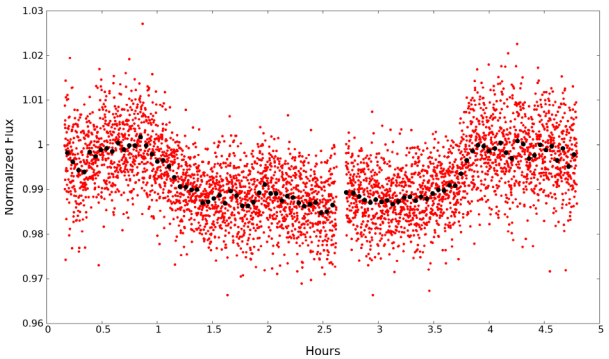
The department has an ongoing goal of attracting funding for a new small classroom building at the observatory that would be used for classroom teaching and public instruction during public events. A special event was held May 4, 2019 with President Clif Smart and his Leadership Circle at the observatory. Also in attendance were Dave Cornelison, Bob Patterson, Bob Mayanovic, Michael Reed, and Sarah Morrison from PAMS, and alums Charlie Armstrong and Stephanie Blake. Bob Mayanovic gave a short talk about the history of the observatory, Mike Reed gave a short talk about use of the observatory for research, teaching and outreach and Sarah Morrison gave a brief talk about her research on solar system and planetary formation. Everyone had a great night of viewing of celestial objects using the telescopes at the observatory.

Observing Exoplanetary Transits with Shania Wolf

PAMS student Shania Wolf used the new 20-inch telescope at Baker Observatory to observe exoplanetary transits in hopes of finding a transit timing variation (TTV).

The difference between the calculated start time of a transit and the transit's actual start time, significant TTVs are indicative of another planet in the system.

Essentially, we used planets whose effects we could see to discover those we couldn't.



Top Left: Shania Wolf and Ryan Markovic at Baker Observatory.

Middle Left: Public Observing Night at Baker Observatory.

Bottom Left: A light curve reading from one of the transits observed during research.

Top and Bottom Right: The new, automated, 20-inch telescope and controller at Baker Observatory.

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Dr. Michael Reed
417 Biz Think Summit

Professor Mike Reed was invited to join the best local visionaries, creators, leaders, and founders for a day of thought-provoking presentations, networking, and interactive participation designed to move our region forward.

Dr. Reed shared information about 'Planet Hunting in Southwest Missouri' at Missouri State University's newly updated Baker Observatory. He discussed the processes taken to examine other galaxies from a field in Missouri and the discoveries and successes they have made so far.

You can watch the video of Dr. Reed's talk at: **https://youtube/iZVSzYYCjUI**

Intellectual Contributions 2019

Department of Physics, Astronomy, and Materials Science

Ghosh, Kartik C. (Distinguished Professor)
Mayanovic, Robert A. (Distinguished Professor)
Mitra, Saibal (Full Professor)
Morrison, Sarah (Assistant Professor)
Redd, Emmett (Full Professor)
Reed, Michael D. (Full Professor)
Sakidja, Ridwan (Full Professor)

The 2019 Academic Year was another banner year for the publication of scholarly works by the faculty and students of the department, having published 32 peer reviewed articles in scientific journals. Among the published works is an article by Dr. Tig Besara and his collaborators on their discovery of a magnetic field induced topological phase transition in TaAs, in Physical Review B. Dr. Mike Reed, along with two of PAMS's students, Laura Ketzer and John Crooke, and several international collaborators recently published their work on evolved (subdwarf) stars in the Monthly Notices of the Royal Astronomical Society (MNRAS). Their paper, entitled, "Two p-mode dominated subdwarf B pulsators in binaries with F-star companions observed with K2" reported on the analysis of seismic reading of stars found with the Kepler space telescope. Dr. Kartik Ghosh and our graduate students Bithi Paul, Mahmoud Abdullah-Al Mamun, and Ariful Haque, along with a collaborator, published an article in the IEEE Transaction on Nanobioscience on surface tailoring of ZnO nanoparticles decorated with glucose molecules. Dr. Ridwan Sakidja and his collaborators published an article in Advanced Functional Materials on the fabrication, characterization and modeling of highly sensitive shortwave infrared photodetectors.

Please follow our link to see all of the many outstanding intellectual contributions made by our faculty and students in the last year.
https://physics.missouristate.edu/nwsltr2019refs.htm

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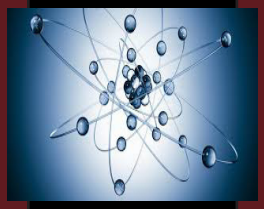

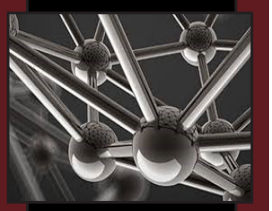

Dr. Saibal Mitra Traveled to the International Iberian Nanotechnology Laboratory in Portugal

Dr. Saibal Mitra spent his sabbatical in Portugal at the International Iberian Nanotechnology Laboratory (INL). The laboratory is a joint collaboration between governments of Portugal and Spain under an international legal framework to perform interdisciplinary research in the area of nanomaterials and nanotechnology for the benefits of society.

Dr. Mitra worked on two projects during his time at INL.

The first project was with photovoltaic materials. Essentially, Mitra was turning light into energy with outside materials. Mitra worked with students to set up and characterize a magnetron sputtering system for solar cell fabrication. Solar cells capture the energy from the sun. He also worked with optical measurement of materials.

The second project Mitra worked on was setting up a thermal chemical vapor deposition (CVD) system. A sub stance is added, the machine is heated up and then chemicals are introduced to test the reaction. This was to fabricate two-dimensional electronic materials. One example is molybdenum diselenide.

Dr. Sarah Morrison

Dr. Sarah Morrison officially joined the department in August of 2019. Prior to joining the faculty in the PAMS department at Missouri State University, Dr. Morrison was a postdoctoral scholar at the Center for Exoplanets and Habitable Worlds in the Department of Astronomy and Astrophysics of Pennsylvania State University. She received a BA in Astronomy at Cornell University, a MS in Planetary Science at University of Arizona, and a PhD in Planetary Sciences at University of Arizona. Her research interests include planetary system formation and evolution, exo-planets, debris disks, proto planetary disks, orbital dynamics, planet-disk interactions, influence of orbit environment on planetary surfaces, data science, science education, and computational astrophysics.

Dr. Morrison travelled to Geneva, Switzerland to attend the European Planetary Science Congress-Division of Planetary Sciences Joint (Society) Meeting, which was held from Sept. 15 to 20, 2019. During the meeting, she presented a talk titled, “Producing a diversity of super Earths from a diversity of disk conditions.” In addition to presenting a talk, Dr. Morrison participated in scientific societies’ committee activities, as the lead Exoplanet & Origins Program Group Coordinator on the Science Organizing Committee for the conference and as a committee member of the American Astronomical Society’s Division of Dynamical Astronomy (DDA).

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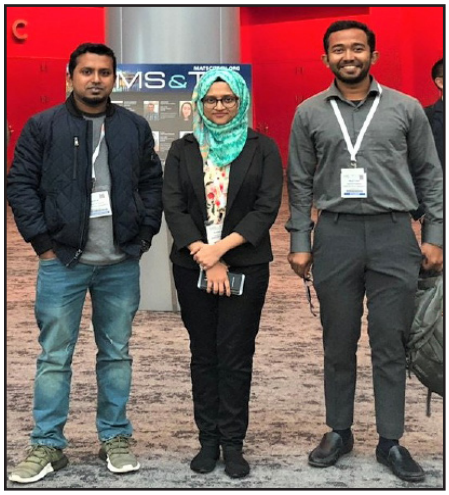
Student Opportunity for Excellence

Many of our students have been given the opportunity to travel to, attend conferences, present research, and to show their excellence. Here are a few examples.

In 2019, PAMS student Yadira Gaibor received a great opportunity in the form of an NSF sponsored internship at Notre Dame, studying the cataclysmic variable called AR Scorpii with Dr. Peter Garnavich and Colin Littlefield, which resulted in a first-author paper in MNRAS. Yadira's favorite part of the program was getting to know other physicists (undergrad, grads, & professors) outside of the academic environment.

Pictured Above and Below: Yadira Gaibor at University of Notre Dame in Indiana.

Pictured Above: Dr. Sakidja, Rajan Khadka, and Kwabena Asante-Boahen gave a presentation to their NSF DMREF research collaboration team at UMKC on their computational project including the work of former student Nirmal Baishnab now at MU.



Pictured Left: Abdullah Shafe, Sabila Kader Pinky, and Muztoba Rabbani presented their research at MS&T19 in Portland, Or.

Pictured Right: (left to right) Dr. Sakidja, Nirmal Baishnab, M. Delower Hossain, and Rajan Khadka in Florida for the ICACC 2019 -International Conference and Expo on Advanced Ceramics and Composites.

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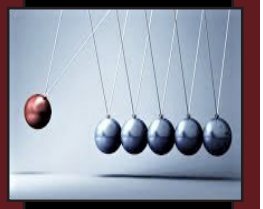

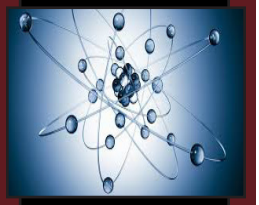

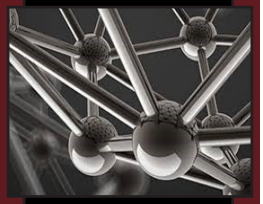

Thomas Callaway
Making Batteries More Sustainable

Thomas Callaway presented his master's thesis research about batteries, with Dr. Saibal Mitra, a PAMS professor, serving as his adviser.

"Many modern devices utilize liquid lithium ion batteries as a source of power," Callaway said. "However, these batteries have a few drawbacks such as runaway thermal reactions, meaning they are easily combustible."

Callaway synthesized a solid lithium-based electrolyte that was more stable. He wants to test these samples to see their uses in batteries and in energy saving electrochromatic windows. Electrochromatic windows are windows that electronically tint without blinds.

PAMS Students Tour NASA's Johnson Space Center

Drs. Dave Cornelison, professor of physics, and Tiglet Besara, assistant professor of physics, took 20 students on a trip of a lifetime. In April, they went to the NASA Johnson Facilities in Houston, Texas, for an insider tour.

Yadira Gaibor, a physics major, says she enjoyed learning more about her chosen field. Gaibor said, "I enjoyed meeting other people in our field... We got a glimpse of the various paths our career may take. These trips give students a perspective of what physics can lead to."

Charlie Armstrong, a Missouri State alumnus, retired from NASA Johnson after 35 years there. He arranged the tour for the current students, who met with the Dr. Anna Fisher, the first mother in space. They also went to mission control, saw moon rocks and went into a mock spacecraft.

Students also visited the Rice Center for Quantum Materials at Rice University. They met scientists and toured labs. "We take these trips to show students the best work in the field," Cornelison said.

In previous years, Cornelison has taken students to:

- Argonne National Lab
- Fermi Lab
- The Joint Institute for Laboratory Astrophysics (JILA)
- National Institute of Standards and Technology (NIST) Bolder Laboratories

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Ms. Becky Baker Retirement

From the desk of Ms. Baker: I have been associated with this department since I was an undergrad uate starting back in 1972. Not only did I do my undergraduate and graduate program here, I have also taught part/full time since 1997. It does feel like home and I will miss teaching, as well as every one in the department. I have seen many changes since the late 70's. A great deal more emphasis is now placed on research in the department than before. I think that has helped the program remain current and increased the experiences our students have in a number of ways. We have a bigger graduate program now with an emphasis on Materials Science, whereas before there was just masters level programs within the college. The faculty, staff and students I have know over the years are very important to me and I will carry their memory with me for the rest of my life. I see the accomplishments of members of the faculty and staff that are no longer with us as I honor their memory. I remember when we were located on the third floor of Temple Hall. Larry Banks had me move my office to Kemper Hall several years before the entire department made the move. I remember that Bob Whitaker and Bill Thomas come over to visit and see my office and were escorted out of the building by the then head of the Industrial Arts Department and told not to return. I always told Larry I was his sacrificial lamb when it came to moving into the middle of the Industrial Arts Depart ment. If I survived then it was okay for everybody else to come over. I survived and came to appreciate their department however it was nice when the rest of my department joined me over here. I carry many memories of my years in the department and am grateful for each and every one.

Ms. Becky Baker, Senior Instructor in the PAMS Dept, retired in Dec. of 2019. During her part-time appointment, her duties were split teaching Chemistry and Physics introductory courses. Becky was instrumental in helping to establish the Physics component of the Secondary Science Education program and curriculum assessment efforts for the department. Becky was involved in several funded educational grant efforts during her tenure at MSU targeted at K-12 education.

Pictured Left: Becky Baker and Dr. Mayanovic.

Pictured Right: Becky Baker and Pat Mills

Pictured Below: Ms. Becky Baker and her class performing her legendary end of the semester tradition, "The Egg Drop".

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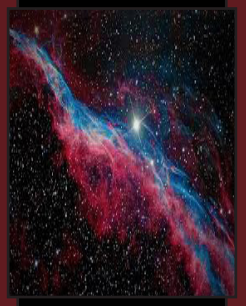
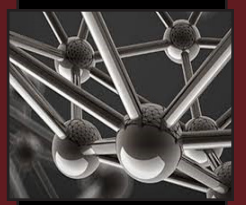
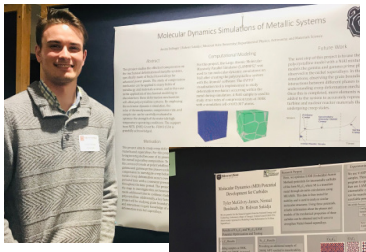
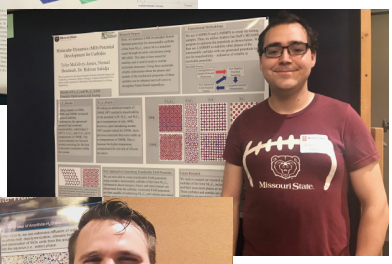
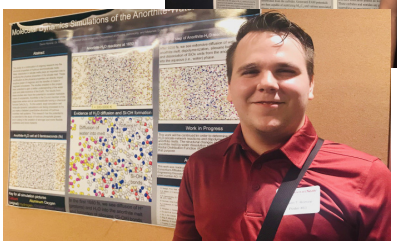



Some Photos from Our 2019 Events

Pictured Left: Dr. Dave Cornelison gives a presentation to the kids at The Phelps Center for the Gifted Education.

Pictured Below: Austin Bollinger, Tyler McGilvrey James, and Devon Romine present their research at the PAMS Advisory Board meeting.

Pictured Left: The 1st PAMS Dept. Student Research Poster Display for our Advisory Board.
Pictured Below:

Pictured Below: Middle school students participating in the CNAS-Discovery Center summer science camp are assisted in working on the Raman spectrometer by Ashif Anwar in Dr. Mayanovic's lab.

Pictured Right: PAMS students and faculty with Charlie Armstrong in the Mission Control Center at NASA's Johnson Space Center.

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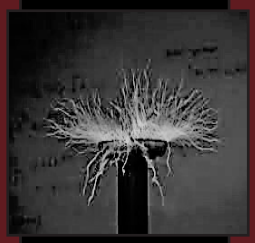

PAMS Graduates 2019

Spring 2019

Alam, Md Nazmul	MS
Brockmeier, William	BS
Dhakal, Diwash	MS
Gooch, Joshua	BS
Hopp, Eldon	BS
Huber, Joseph	BS
Johnson, Spencer	BS
Klenke, Christopher	BS
Luckey, Gregory	BS
Renfrow, Weston	BS
Toplikar, Patrick	BS
Yeager, Matthew	BS

Summer 2019

Baishnab, Nirmal	MS
Callaway, Thomas	MS
Das, Sanchali	MS

Fall 2019

Bollinger, Austin	BS
Khadka, Rajan	MS
Pinky, Sabila Kader	MS
Rabbani, Muztoba	MS
Romine, Devon	BS

Pictured Right:

Dr. Kartik Ghosh
Dr. Robert Mayanovic
Muztoba Rabbani
Rajan Khadka
Sabila Pinky
Dr. Ridwan Sakidja

Here are a few of our PAMS Department Graduates enjoying their moment, on commencement day December 2019.

Pictured Left to Right:

Austin Bollinger,
Devin Romine,
Sabila Pinky,
Rajan Khadka, and
Muztoba Rabbani

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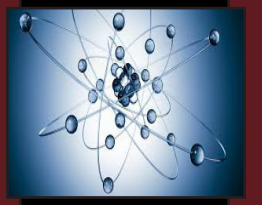

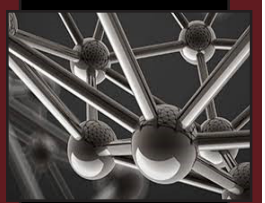

Faculty Excellance Awards

Dr. Ridwan Sakidja

Faculty Excellence in Research Award

Dr. Michael Reed

Faculty Excellence in Teaching Award

Dr. Kartik Ghosh

Atwood Faculty Research & Teaching Award

In Celebration of the 50 Year Anniversary of the Apollo 11 mission and the Moon landing, the MSU Department of Physics, Astronomy and Materials Science offered a free viewing of the award winning Apollo 11 documentary.

This event was held in the Plaster Student Union Theatre on September 13, 2019.

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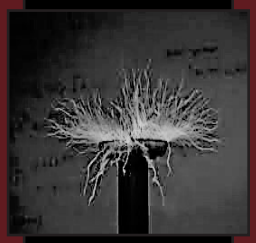

2019 Scholarship Recipients

Andereck Family Scholarship	Alexandria Klingenberg	1,000
Banks Family Scholarship	Riley Hochstein	1,000
Engineering Program Scholarships	Noah Taylor	310
Howard Petefish Award	Tyler McGIlvry-james	450
John W. Northrip Memorial Scholarship	Shania Wolf	500
Kenneth A. Soxman Memorial Scholarship	Cory Padgett	750
Ozark Chapter Missouri Society of Professional Engineers Leo Day Scholarship	Paul P. Brugh (Renewal)	1,500
	Liberty Robinson (New)	1,500
Physics and Astronomy Department and Friends Scholarship	Tyler McGIlvry-james	1,000
Physics, Astronomy, and Materials Science Department Scholarship Fund	Meredith Vogel	1,000
Pre-engineering/Engineering Physics Scholarship	Caroline Witt	400
Ryan and Faith Giedd Scholarship 1)	Cory Padgett	1,000
2)	August Schwoebel	1,000
3)	Kali Shoaf	1,000
4)	Shania Wolf	1,000
Thomas Cave Endowed Astronomy Scholarship	Yadira Gaibor	1,500
Thurman Family Scholarship	Blake Smith	1,250

Down Time

What do PAMS students and faculty do when they are not science-ing? They are participating in community service and extracurricular activites with the rest of the PAMS family.

Pictured right is Dr. Sakidja and many PAMS students volunteering with the Ozarks Food Harvest Weekend Backpack Program

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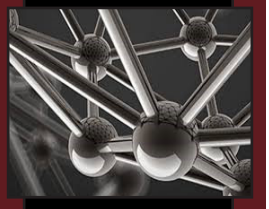

Pictured Above and Left: Dr. Sakidja and his research group enjoying a summer picnic at Phelps Grove Park.

Pictured Above: Dr. Mayanovic and PAMS students Abdullah Shafe, Shahidul Asif, Sinjan Majunder, and Abiodun Odusanya, celebrate Dr. Mayanovic's birthday.

Pictured Left: PAMS student Samiul Hasan with his son.
Pictured Below: Just your typical CNAS Admins grabbing their Boomer phot op! Laura Rios, Marla Fritz, and Linda Allen.

PAMS Alumni & Friends

Pictured Above: Diwash Dhakal is in his PhD study at UW and works at the Inst. for Nano-Engineering Systems.

Media & Contact Information

PHYSICS | ASTRONOMY MATERIALS SCIENCE

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You can reach us by e-mail at **Physics@MissouriState.edu**
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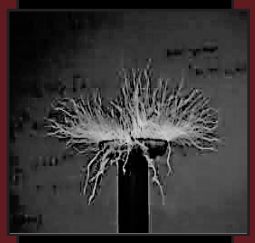

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