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Newsletter
2021



A Note from the Department Head

Although we had learned how to deal with the pandemic during 2021, there were still many functions of the department that were affected.

Having developed content for delivering courses online in 2020, we were better prepared in case of dramatic increases in Covid-19 virus infections locally. Fortunately, following the protocols suggested by the CDC throughout the university, such as masking, social distancing, using hand sanitizers, etc., allowed us to conduct classes in person for the most part during 2021. This is especially critical for our curriculum involving laboratory experience.

The 2021 calendar year was noteworthy for several accomplishments despite the ongoing Covid-19 virus pandemic. Dr. Mike Reed was promoted to Distinguished Professor in 2021. Mike is an internationally recognized researcher with an extensive record in astroseismology and related areas of astrophysics. Dr. Dave Cornelison was awarded the CNAS Faculty Excellence in Service Award. Dave developed and coordinates PhysBiz, which is a touring van featuring physics demonstrations for schoolchildren, and the STEMspots science radio show broadcast on KSMU. Dr. Bradley Mills was awarded the CNAS Student-Nominated Award for Excellence teaching award.

PAMS held a public viewing night at Baker Observatory in November 2021. Attendance was limited to about 300 due to Covid-19 safety protocols and the event was very much enjoyed by the public. The PAMS Advisory Board held its annual meeting in hybrid mode on Dec. 13, 2021. Our undergraduate and graduate students presented on their research during a poster session at the advisory board meeting. Attending scientific meetings by faculty and students was still somewhat limited in 2021 and was held predominantly in virtual format. The department held both virtual and in person seminars during 2021. The virtual seminars worked out so well in 2020 that we decided to hold a number of these in 2021 enabling the department to have speakers from various areas of the country.

We welcome Dr. Daniel Moreno-German to MSU. Daniel teaches mechanical engineering courses in the cooperative MS&T-MSU program as an MSU faculty assigned to our department. He obtained his PhD and MS in Mechanical Engineering at Georgia Tech and his research and professional interests include electrochemistry, renewable energy, thermal-fluid science, thermodynamics and water treatment. We also welcome Adam Beck to the department. Adam is our new Administrative Assistant in the department.

Dr. Robert Mayanovic



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New Grant will Give MSU a Single Crystal X-ray Diffractometer for Research and Teaching

X-ray diffraction is one of the most powerful structural techniques available to scientists. Single crystal x-ray diffraction, specifically, is the utmost technique to completely determine the structure of a material, i.e., to yield the full three-dimensional geometric information about the atomic arrangement in a crystalline material, whether it is inorganic, organic, or biochemical (e.g., proteins). PAMS currently operates two x-ray diffractometers, one for single crystals (SCXRD) and one for powders and thin-films (PXRD), acquired in 2007. The SCXRD has suffered several malfunctions and has had its x-ray tube replaced three times. Besides its frequent down-time, it could not satisfy the diverse research needs of faculty relying on single crystal x-ray diffraction.

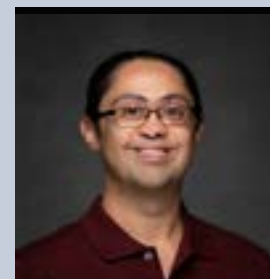
To address this, a team of six faculty members from PAMS, Chemistry, and GGP decided to acquire a new and modern SCXRD that could handle a variety of materials: small inorganic materials of T. Besara (PAMS), incommensurate structures of F. Wang (Chemistry), optically active crystals of N. Gerasimchuk (Chemistry), organic molecules of E. Bosch (Chemistry), proteins of N. DeVore (Chemistry), and minerals of G. Michelfelder (GGP).

The team put together a successful grant titled "MRI: Acquisition of a Single Crystal X-ray Diffractometer for Research and Teaching at Missouri State University", acquiring funding from the National Science Foundation's Major Research Instrumentation program. The team was awarded \$342,000, and purchased an XtaLAB Synergy-S Diffraction System from Rigaku. The features of the new diffractometer will suit not only the diverse research of the faculty involved in the grant but also teaching at PAMS and Chemistry.

The new diffractometer will have a dual x-ray source for very different samples to be measured, a microfocus x-ray source for more focused beam and higher flux, a hybrid photon counting detector for sharp signal and low noise, variable divergence slits to allow for wider range of crystals to be measured (from large protein structures to small inorganic ones) and a cryosystem utilizing dry nitrogen gas for measurements in the temperature range of 80-400 K. The software – free to use! – is a combined data collection and processing software that controls all aspects of the diffractometer.

Overall, the new diffractometer will increase the research productivity and output of the three departments involved, and will enhance the competitiveness of MSU.

Dr. Tiglet Besara



Meet New Faculty Dr. Daniel Moreno – Assistant Professor of Engineering



Daniel Moreno completed his bachelor's of science in mechanical engineering at the Cooper Union for the Advancement of Science and Art. He then went on to receive his master's of science and PhD from the Georgia Institute of Technology. Moreno pursued postdoctoral research at the University of Kentucky. Moreno strives to promote alternative and renewable

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energy sources. He integrates electrochemistry – the interactions between chemical reactions and electricity – with traditional concepts from mechanical engineering like thermal and fluid sciences into his research.

“At MSU, I hope to bring in a multidisciplinary group of researchers from different engineering backgrounds, as well as chemistry and materials science,” Moreno said. “Together, we can work on transitioning from the fundamentals of renewable energy sources to their practical application in the market.”

The many facilities and collaborations across CNAS departments available at MSU attracted Moreno to the university. He also appreciated the opportunities for course and curriculum development within the cooperative engineering program offered at MSU. Moreno considers such potential course development a key motivator of his decision to pursue an academic career following his own student experience, he shares.

“I look forward to serving as a mentor and educator for students, and assisting them in their professional development,” Moreno said. “Everyone brings different backgrounds and experiences to the classroom, which creates the chance to advance diversity and inclusion in the campus environment.”

Intellectual Contributions 2021

Department of Physics, Astronomy, and Materials Science

Besara, Tiglet (Assistant Professor)

Cornelison, David M. (Professor)

Frodermann, Evan (Assistant Professor)

Ghosh, Kartik C. (Distinguished Professor)

Huang, Shyang (Professor)

Mayanovic, Robert A. (Distinguished Professor)

Mitra, Saibal (Professor)

Morrison, Sarah J. (Assistant Professor)

Redd, Emmett (Professor)

Reed, Michael D. (Distinguished Professor)

Sakidja, Ridwan (Professor)

Besara, Tiglet (Assistant Professor)

Journal Article, Academic Journal (Published)

Krishnan, S., Besara, T. (2021). A new topological semimetal candidate: SmMnBi₂. *Acta Crystallographica B / IUCR*, 77, 577-583. <https://doi.org/10.1107/S2052520621005849>

Journal Article, Academic Journal (Published)

LaBarre, P. G., Phelan, D., Xin, Y., Ye, F., Besara, T., Siegrist, T., Syzranov, S. V., Rosenkranz, S., Ramirez, A. P. (2021). Fluctuation-induced Interactions and the Spin-glass Transition in Fe₂TiO₅. *Physical Review B / American Physical Society*, 103(22), L220404. <https://doi.org/10.1103/PhysRevB.103.L220404>

Journal Article, Academic Journal (Published)

Du, Q., Wu, L., Cao, H., Kang, C.-J., Nelson, C., Pascut, G. L., Besara, T., Siegrist, T., Haule, K., Kotliar, G., Zaloznyak, I., Zhu, Y., Petrovic, C. (2021). Defect-induced Colossal Cryo-thermopower in FeSb₂. *npj Quantum Materials / Nature Publishing Group*, 6, 13. <https://doi.org/10.1038/s41535-020-00308-z>

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Ghosh, Kartik (Distinguished Professor)

S. Balijapelly, K. Ghosh, A. V Chernatynskiy, A. Choudhury, Discovery of an olivine-type lithium manganese thiophosphate, LiMnPS_4 , via a building block approach, *Chem Commun.* 57, 13182 (2021).

R K DeLong, R Swanson, M C Niederwerder, P Khanal, S Aryal, R Marasini, M Jaber-Douraki, H Shakeri, R Mazloom, S Schneider, S Ensley, L L Clarke, R A Woode, S Young, S Rayamajhi, T Miesner, M L Higginbotham, Z Lin, T Shrestha, K Ghosh, G Glaspell, E N Mathew, Zn-based physiometacomposite nanoparticles: distribution, tolerance, imaging, and antiviral and anticancer activity, *Nanomedicine* June (2021).

P Sandineni, H Y Asl, W Zhang, P S Halasyamani, K Ghosh, A Choudhury, Interplay between Oxo and Fluoro in Vanadium Oxyfluorides for Centrosymmetric and Non-Centrosymmetric Structure Formation, *Molecules* 26, 603 (2021).

Mayanovic, Robert (Distinguished Professor)

X. Yuan, R.A. Mayanovic, G. Zhang, Phase transitions in CaCO_3 under hydrous and anhydrous conditions: Implications for the structural transformations of CaCO_3 during subduction processes, *Am. Mineral.*, 106, 1780 (2021).

A. Kalintsev, A. Migdisov, C. Alcorn, J. Baker, J. Brugger, R.A. Mayanovic, N. Akram, H. Xu, H. Boukhalfa, F. Caporuscio, H. Vishvanatan, C. Jove-Colon, Y. Wang, E. Matteo, R. Roback, Uranium carbonate complexes demonstrate drastic decrease in stability at elevated temperatures, *Commun. Chem.*, 4, 1 (2021); open access <https://doi.org/10.1038/s42004-021-00558-3>.

A. Al Shafe, M.D. Hossain, R.A. Mayanovic, V. Roddatis, Mourad Benamara, Tuning Exchange Coupling in NiO-Based Bimagnetic Hetero-structured Nanocrystals, *ACS Applied Materials & Interfaces*, 13, 24013 (2021).

Mitra, Saibal (Professor)

Journal Article, Academic Journal (Published)

Barari, M., Kundu, S., Mitra, S. (2021). An Empirical Analysis of COVID-19 Response: Comparison of US with the G7. *International Review of Applied Economics*, 35(6), 886-903. <https://doi.org/10.1080/02692171.2021.1965100>

Redd, Emmett (Professor)

Journal Article, Academic Journal (Published)

Redd, E., Senger, S., Obafemi-Ajayi, T. (2021). Noise Optimizes Super-Turing Computation in Recurrent Neural Networks. *Physical Review Research*, 3(1), 10. <https://link.aps.org/doi/10.1103/PhysRevResearch.3.013120>
PhysRevResearch.3.013120-1.pdf

Conference Proceeding (Published)

Redd, E., Obafemi-Ajayi, T. (2021). In Farkaš I., Masulli P., Otte S., Wermter S. (Ed.), *Noise Quality and Super-Turing Computation in Recurrent Neural Networks* (vol. 12894, pp. 469-478). Heidelberg: Springer. https://doi.org/10.1007/978-3-030-86380-7_38
Paper Poster Video-PowerPoint-Script-1.zip



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Reed, Michael D. (Distinguished Professor)

Journal Article, Professional Journal (Published)

Sanjayan, S., Baran, A., Ostrowski, J., Nemeth, P., Pelisoli, I., Ostensen, R., Kern, J.W., Reed, M. D. (2022). Pulsating subdwarf B stars in the oldest open cluster NGC 6791.

Monthly Notices of the Royal Astronomical Society Volume, 509, 763.
<https://ui.adsabs.harvard.edu/abs/2022MNRAS.509..763S/abstract>

Journal Article, Professional Journal (Published)

Reed, M. D., Slayton, A. (2021). Pulsating subdwarf B stars observed with K2 during Campaign 7 and a mid-term examination of group seismic properties. Monthly Notices of the Royal Astronomical Society, 507(3), 4178-4195.
<https://doi.org/10.1093/mnras/stab2405>

Journal Article, Professional Journal (Published)

Uzunoglu, M., Vuckovic, M., Nemeth, P., Reed, M. D. (2021). Asteroseismic analysis of variable hot subdwarf stars observed with TESS. Astronomy & Astrophysics. 10.1051/0004-6361/202140961

Journal Article, Professional Journal (Published)

Baran, A., Ostensen, R.H., Heber, U., Irrgang, A., Sanjayan, S., Telting, J.H., Reed, M. D., Ostrowski, J. (2021). Space observations of AA Doradus provide consistent mass determinations. New HW-Vir systems observed with TESS. Monthly Notices of the Royal Astronomical Society, 503, 2157.
<https://ui.adsabs.harvard.edu/abs/2021MNRAS.503.2157B/abstract>

Conference Proceeding (Published)

Wolf, S., Reed, M. D. (2021). Transit observations of Hot Jupiter systems. Bulletin of the American Astronomical Society.
<https://ui.adsabs.harvard.edu/abs/2021AAS...23734404W/abstract>

Abstract (Published)

Reed, M. D., Ostensen, R.H., Telting, J.H. (2021). Asteroseismology of extreme horizontal branch (subdwarf B) stars with TESS data. Posters from the TESS Science Conference II (TSC2). <https://ui.adsabs.harvard.edu/abs/2021tsc2.confE..37R/abstract>

Sakidja, Ridwan (Professor)

M Gong, B Timalisina, R Sakidja, J T. Douglas, J Z. Wu, "Ligands Anchoring Stabilizes Metal Halide Perovskite Nanocrystals", Advanced Optical Materials, Advanced Optical Materials 9 (22), 2101012, <https://doi.org/10.1002/adom.202101012>

K Baral, Saro, Rn Sakidja, A Couet, Kr Sridharan, and W-Y Ching, "Temperature-Dependent Properties of Molten Li₂BeF₄ Salt Using Ab Initio Molecular Dynamics", ACS Omega, Vol. 6[30], 19822–19835, (2021).

W. C. Chang, S. Lee, C. -H, Chung, R. Sakidja and J. S. Park, "Ablation Stability of In Situ Al₂O₃ Layer in Aluminized AISI 4130 Steels under High-Temperature Plasma Flame Environments", Journal of Materials Engineering and Performance, Issue 10 (2021) <https://doi.org/10.1007/s11665-021-05899-7>.

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Let's Talk About Grants

When it rains it pours, the saying goes, and it seems like that pertains to both the good and bad things in life. 2021 was certainly a "rainy" season for us as we continued to deal with all the challenges of Covid 19 in our labs and classrooms. However, we also had a very nice shower of grants here in the PAMS Department at MSU, and those are the floods that are always welcome.



Coding Opportunities, Development, and Education in Rural Schools (CODERS): Developing an Early Phase Project for Rural Students and Teachers:

Dr. David Cornelison, Professor of Physics, Astronomy and Materials Science, is a part of an interdisciplinary team that was awarded a \$4 million grant from the Department of Education. The team is led by Dr. Keri Franklin, Associate Provost at MSU and a professor in the English Department. The team consisted of faculty from Physics, Computer Science, Spanish Literature, Education and Music.

The goal was to work with teachers in rural Missouri schools, grades 3-8, to integrate coding, STEM and writing. The team hit the ground running and spent the spring preparing to run the first summer workshop, which happened in early June, when 26 teachers came to campus for a week of work.

Five teams were then created, and visits in the schools commenced in the fall. Dr. Cornelison and two graduate students, Kali Shoaf-Laughlin and Hayden Stricklin, visited schools and worked through science experiments and Scratch computer simulations of these same experiments. The team also built 300 STEM kits, designed by the team, with Hayden and Kali doing most of the work. Team FIIT Bits also worked closely with Dr. Judith Martinez and her team, collaborating on many visits.

The grant is slated for five years and will ultimately reach hundreds of students. The goal is to create a sustainable set of activities available to any school district. More information can be found at www.msucoders.org

As if that weren't crazy enough, a project started with a group of **Planetary Scientists from Washington University in St. Louis Missouri was funded by NASA**, for a term of 3 years. The proposal, "**Experimental Studies of Volatile Fractionation in the Early Solar System**" was based on a set of experiments to mimic conditions found on hot solar-system bodies. Equipment in Dr. Cornelison's lab was modified, and a new system was built to heat rock to 2000 Celsius and quench it to room temperature, with the goal that isotopes would respond as predicted by models of magmatic thermodynamics. The year was spent mostly building but experiment started in earnest in November. Dr. Cornelison is collaborating with Dr. Gary Michelfelder from the GGP department, and three undergraduate students are hard at work.

To wrap up, Dr. Cornelison worked with the Board for the Missouri Center for Advanced Power Systems (MOCAP) to bring the center's lab equipment to MSU, to begin a focused battery research program here. MOCAP is a group of educational institutions, including MSU, and several local battery companies, working to build opportunities for student internships and faculty/industry collaborations.



Pictured Right:
Dr. Dave Cornelison teaches a physics lesson to middle school students.

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Seuss Day 2021

In celebration of Seuss Day, Ozarks Public Television and the Springfield YMCA hosted an STEM based event at the south YMCA for children. The PhysBiz team consisting of Dave Cornelison and several student helpers, including Yashasvi Moon, Hayden Stricklin, Mateo Guerro Toro, and Cory Padgett, showed some really cool physics and astronomy demonstrations to young school children.

The Return of Public Observing Nights at Baker Observatory Fall 2021

The department held it's first public viewing night at Baker Observatory in nearly two years on Nov. 5, 2021. The number of guests was held to a limited amount due the ongoing Covid-19 pandemic and it was estimated that about 400 people attended the event. The Society of Physics Students (SPS) and the Ozark Amateur Astronomy Club (OAAC) hosted a small refreshments fundraiser at the event.



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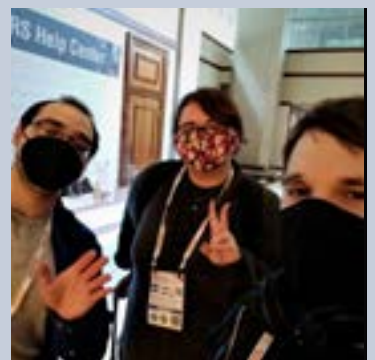


Materials Research Society Fall 2021 Conference in Boston

Dr. Ridwan Sakidja, along with a group of PAMS students, attended the Fall 2021 Materials Research Society conference in Boston.

This is an event where many researchers in the materials science field go to present their research and communicate with investors and companies in the field.

Emily Justus, David Magness, Bikash Timalisina, Judy Wu, Ridwan Sakidja: Applications of a Combined Approach of Kinetic Monte Carlo Simulations and Machine Learning to Model Atomic Layer Deposition (ALD) of Metal Oxides.



Devon Romine, Yuxuan Lu, Judy Wu, Ridwan Sakidja: Modeling Atomic Layer Deposition of Alumina as an Ultra-Thin Tunnel Barrier Using Reactive Molecular Dynamics.

Symposium DS03—Combining Machine Learning with Simulations for Materials Modeling

Tyler McGilvry-James, Bikash Timalisina, Andrew Duff, Nirmal Baishnab, Puja Adhikari, Saro San, Wai-Yim Ching, Ridwan Sakidja: Development of Deep and RF-MEAM Potentials to Model Physical and Thermo-Mechanical Properties of Metal-Rich Carbides.

Emily and Devon's works have been sponsored by NSF and Tyler by Dept. of Energy grants. Emily and Devon work on modeling the synthesis of electronic materials whereas Tyler has been modeling the materials properties of structural materials designed for power plants.



While in Boston the students also visited MIT and got a tour of the Physics, Mathematics, and Engineering building from Yadira Gaibor, an alumni of MSU.



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Graduates 2021

Spring 2021

Summer 2021

Fall 2021

Brugh, Paul BS
 Gaibor, Yadira BS
 Odusanya, Abiodun MS
 Quijano, Kyrie BS
 Rhodes, Taylor BS
 Shoaf-Laughlin Kali BS
 Stricklin, Hayden BS
 Vogel, Meredith BS
 Wolf, Shania BS

Asante Boahen, Kobby MS
 Justus, Emily BS
 Niraula, Alin MS
 Stepien, Christian BS
 Timalcina, Bikash MS

Berry, Jacob BS
 Boyd, Connor BS
 Islam, Sajal MS
 Riggs, Gaige BS
 Zobair, Md Abu MS



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Celebrating Collaborative Research with Dr. Ridwan Sakidja

There are two things Dr. Ridwan Sakidja is passionate about: computational materials science and interdisciplinary research. Sakidja is a professor in the department of physics, astronomy and materials science at Missouri State University, the nation's only such combined department.

Computational materials science uses modeling, simulation, theory and informatics to better understand materials. Sakidja's research is varied, but his ultimate goal is the same.



"Our overall research goal has been to help accelerate the discovery process of and to design new materials. We employ computational materials science to achieve this goal," said Sakidja, an Indonesian native.

He is involved in multiple grant-funded collaborative research projects with level-one research universities (R1), the highest Carnegie classification. The projects have received nearly \$2.9 million total in grant funding from the Department of Energy (DOE) and National Science Foundation (NSF). More than \$1 million was granted to Missouri State.

One example of Sakidja's research is a multi-scale modeling project. In it, he and his collaborators are predicting the performance of a nickel-based superalloy for turbine engines. The goal is to develop new materials for turbine engines to operate at higher temperatures but with less energy and at a reduced cost. The project is supported by the DOE and is a collaboration with UMKC, Missouri University of Science and Technology, and University of South Carolina.

This collaboration is possible because of supercomputer clusters. Sakidja and his graduate assistants perform critical virtual experiments on the supercomputer clusters. The alloy system is very complex, made of 10 elements and contains multiple phases. The modeling is key because it's incredibly expensive to conduct experiments to develop new alloys, he explained. Mechanical failures typically originate from the breakdown at the atomistic or molecular level. So, understanding the dynamics of the mechanical properties at this level is critical.

"Our main contribution to this project is to develop the modeling platforms that can be used for materials development by leveraging our computational research experience," Sakidja said.

Their collaborative work has been peer reviewed and published in SpringerLink, IOPScience and Nature Partner Journals. The first two graduate assistants who worked on the project have already moved on to PhD programs at the University of Pittsburgh and North Carolina State University.

"Dr. Sakidja was a wonderful mentor who helped us find a problem, critically analyze a problem and solve it. This research was beneficial because it gave us real life experience that we would encounter in jobs after graduation. The research greatly helped in PhD admission," said Rabbani Muztoba, who is pursuing a PhD at University of Pittsburgh.

Collaboration is key

For another project funded by the NSF, Sakidja works with UMKC and Ohio State to develop a material used in body armor. The goal is to produce body armor at a lower temperature and reduce the cost of manufacturing. Typically, these materials are manufactured at 1,500 degrees Celsius, consuming an incredible amount of energy.

"The low-temperature process that we helped model offers an alternative route that dramatically reduces the necessary temperature to less than 300 degrees Celsius, a significant saving in energy and thus operating cost. Within this project, we also advanced the use of machine learning to help optimize the low-temperature synthesis process. This was why our project has been funded as part of a special grant from NSF called Designing Materials to Revolutionize and Engineer our Future," he said.



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Their collaborator at Ohio State characterizes the materials via a state-of-the-art scanning transmission electron microscopy. Then teams at UMKC lead the effort to fabricate the new materials and overall design.

Sakidja is also working on a project with the University of Kansas funded by the NSF to develop advanced electronics device called tunnel junctions.

“Our part is helping design the device by modeling the synthesis process at atomistic scale,” he said.

The project supports both undergraduate and graduate students as research assistants and graduate assistants. One of Dr. Sakidja’s students, Devon Romine, contributed to a recent publication in The ACS Applied Materials Science and Engineering Journals. Romine finished his bachelor’s in physics in 2019 and is enrolled in the materials science graduate program as a graduate assistant.

Romane modeled the layer-by-layer deposition/synthesis process at the atomic scale the critical segment of this device, namely the ultra-thin tunnel barrier. Thickness is only about a few nano meters. Think of nano-meter scale in terms of the diameter of a typical human hair being split into 100,000 pieces. Without collaboration, much of this research would be impossible because the equipment costs would be prohibitive, said Sakidja. He also hopes it will help recruit top talent to MSU’s graduate program.

“Computational material science is one of the best return of investments,” Sakidja said. “My hope is students can see this is the best place for them if they are into computational materials science. To be able to hone your skill, to excel and to participate in research at a university that is not as cost-prohibitive as others.”

Story by Juliana Goodwin * Photos by Jesse Scheve



Making an Impact as an Instructor

Graduate student Sajal Islam describes his award-winning teaching assistant efforts in distance learning.

Overcoming the disconnect posed by distance learning starts with quality leadership in the virtual classroom. Graduate student Sajal Islam of the physics, astronomy and materials science department (PAMS) at Missouri State University has proven he has such leadership skills. He recently received

Missouri State’s Certified Distance Educator Award and the department’s Outstanding Teaching Assistant Award for his work as a teaching assistant. Dr. Kartik Ghosh, distinguished professor of physics, is Islam’s advisor.

Islam began his teaching career in his home country of Bangladesh. He worked in several institutions there, including as a GRE faculty at Graduate Resources Enhancing Center (GREC) and as a course instructor at Shyamoli Ideal Polytechnic Institute. Islam found attending MSU offered new opportunities and mentorship. This includes the guidance he has received from Dr. Robert Mayanovic, department head of PAMS.

“Dr. Mayanovic has taught me the value of quick communication and showing students genuine care,” he said.

Islam considers constant communication with students to be key to quality instruction. He stays in touch with his over email and discussion boards. As an additional source of contact, Islam encourages students to schedule one-on-one meetings or to visit him during his office hours, he shares.

“I try to respond to my students’ requests as instantly as possible, even if to schedule a meeting for later,” he

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said. "I want them to get the help they need when they need it."

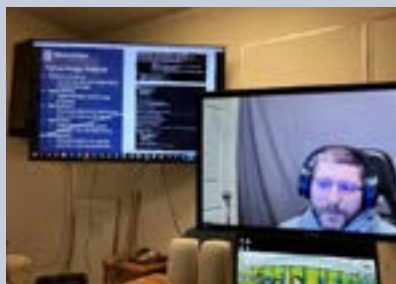
Islam knows connecting with students isn't just about correspondence. It also results from making them aware that they are not alone in the education process.

"One of my goals is always to help students understand that they should never have to hesitate to ask questions," he said. "As a fellow student myself, we all are learning together."

Islam will graduate from MSU this summer. He plans to then pursue a doctoral program in materials science and engineering at the University of Texas at Dallas.

While that time may bring a new school and degree program, Islam knows he will maintain his love of teaching fostered at MSU.

"The teaching experience and recognition are things that I will always cherish," he said. "Having the awards will remind me of the memories made during my time at MSU."



Virtual Meetings and Conferences were still the norm in 2021

Congratulations to the 2021 CNAS Undergraduate Research Symposium Award Winners Physics, Astronomy and Materials Science

1st Place: Daniel Amuedo

Amuedo presented "Free-Standing Liquid Membranes as a Non-Fouling Filter for the Removal of Micro-Plastics from Water."

His faculty advisor is Dr. Tiglet Besara, assistant professor of materials science.

2nd Place: Tyler McGilvry-James

McGilvry-James presented "Artificial Intelligence for Defect Examination (AIDE)."

His faculty advisor is Dr. Ridwan Sakidja, professor of physics.

45th International Conf. on Advanced Ceramics and Composites

Alin Niraula and Bikash Timalina presented their computational works on high-temp diborides; an NSF-funded collaboration on Missouri S&T and MSU.

NASA - MOSGC

PAMS student Tyler McGilvry-James teamed with Justin Freres from MSU's Dept. of Information Technology and Cybersecurity - they presented their AI project to ID microstructural defects at annual meeting sponsored by NASA-MOSGC

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Science Bears find growth in their field and friendship

PAMS seniors Meredith Vogel and Yadira Gaibor share their Missouri State experiences and post-graduation plans.

Seniors of the department of physics, astronomy and materials science (PAMS) have come to know this well during their time at Missouri State. Both graduated from the university in spring 2021. They took a moment to reflect on their shared experiences in the department and their diverging paths for the future.

Vogel came to Missouri State as a transfer student and fashion merchandising major. But her passion for physics led her to PAMS. She met Gaibor when first transferring to the department and joining the Society of Physics Students (SPS). Gaibor was president of the organization at the time.

"From the moment we met, I knew she would become my friend," Vogel said.

Gaibor felt the same about Vogel. Both credit SPS with helping them form a close bond with one another and others in their department. Vogel later served as president of the organization herself.

"Student research involves a lot of individualized learning. But SPS provides a chance to share work with fellow undergrads through symposium events and board meetings," Gaibor said. "It's a great opportunity to really connect and support each other's research growth."

Finding a sense of community can be key to reaching success as students. The strong sense of community fostered by the department made transferring manageable, Vogel shares.

"I owe making the move as a transfer student successfully to the support I found in fellow students and professors," she said.

While Gaibor's love of astronomy led her straight into the program as a student, such support has pushed her to reach greater success, she explains.

"We all know each other, so there's always someone there to offer advice when you need it," Gaibor said. "Making connections along the way has made it possible to go farther in the field as a student than I ever thought possible."

Gaibor and Vogel have gone far together, competing and placing at many of the same conferences. Special value comes from connections with faculty. Dr. Sarah Morrison, assistant professor of astronomy, serves as Vogel and Gaibor's research advisor and mentor. Both have completed research under her guidance.

"Dr. Morrison has given us experience and a perspective of the larger picture surrounding the sciences," Vogel said. "Applying knowledge directly under her guidance has opened the door to all the field can offer."

Gaibor identifies Dr. Michael Reed, professor of astronomy, as a fellow mentor. She has completed research under his guidance since her sophomore year. Dr. David Cornelison, professor of physics, too provided Vogel and Gaibor with mentorship that set them on their career paths.

"Having so much encouragement from faculty leaders is incredibly valuable" Vogel said, "especially as women in STEM."

Vogel and Gaibor's time at a shared university ended, and they started separate doctoral programs in the fall, with Gaibor at Massachusetts Institute of Technology (MIT) and Vogel at the University of Florida (UF). But the bond they formed at MSU will remain strong.

"We will definitely keep in touch as we take this next step," Vogel said. "We've already made plans to visit each other's schools."

Vogel plans to pursue the passion for computational physics, which involves coding, that she discovered at MSU. She would also like to study gravitational waves. The focus would allow her to travel for work in the field and make connections worldwide. Gaibor plans to continue her studies on exoplanets in the solar system and explosions among stars. She would like for her future to include teaching and mentorship, passions she could fulfill in the classroom or research lab.



M o m e n t u M



2021 Events & Photos



Left to Right:
Dr. Sakidja, Tyler McGilvry-James, Bikash Timalisina, Alin Niraula, Kwabena "Kobby" Asante-Boehen, Devon Romine, Marium Mostafiz Mou and Emily Justus.



Left to Right: Dr. Sakidja, Tyler McGilvry-James, Nur Aziz Octoviawan, August Schwoebel, Devon Romine, Marium Mostafiz Mou and Emily Justus.



Left to Right: Sajal Islam, Abiodun Odusanya, Jessica Fink, Dr. Kartik Ghosh, Rifat Shams, Jacob Berry, Bishwajite Karmakar

Left to Right: Dr. Sakidja, Bikash Timalisina- Now PhD Candidate in Mechanical Engineering at University of Virginia. Kwabena "Kobby" Asante-Boehen- Now PhD Candidate in Nanoengineering at North Carolina A&T State University. Alin Niraula- Now PhD Candidate in Physics at Louisiana State University (LSU).



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Faculty and Students Awards 2021

CNAS Faculty Excellence Award - Student Selected & Awarded 2021
Dr. Bradley Mills, Instructor, PAMS Dept.



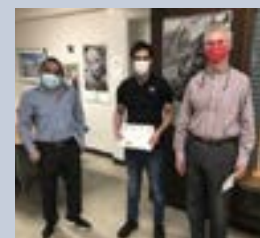
Nontraditional Student Service Award
Dr. Sarah Morrison, Assistant Professor, PAMS Dept.



Outstanding PAMS Undergraduate Student
Yadira Gaibor



PAMS 2021 Outstanding PAMS Graduate Student for Research Bikash Timalina



Outstanding PAMS Teaching Asst. Award
Sajal Islam



2021 Scholarship Winners

Andereck Family Scholarship: Betime Begzati, Anthony Dorhauer, Mateo Guerra Toro, Riley Hochstein, Alex Hubbard, Seungmin Lee, Yashasvi Moon, Cory Padgett, Rajah Shukla, Blake Smith

Banks Family Scholarship: Riley Hochstein, Seungmin Lee, Tyler McGilvry-James

Howard Petefish Award: Cory Padgett

John Northrip Memorial Scholarship: Mateo Guerra Toro, Tyler McGilvry-James

Kenneth Soxman Memorial Scholarship: Quinn Coulter

PAMS Dept. and Friends Scholarship: Alex Hubbard, Emily Justus, Yashasvi Moon

PAMS Dept. Scholarship Fund: Quinn Coulter, Rajan Shukla, Blake Smith, Christian Stepien

Thomas Cave Astronomy Scholarship: Robson DaSilva, Anthony Dorhauer, Caroline Witt

Thurman Family Scholarship: August Schwoebel

Engineering Program Scholarships: Jair Tobias-Zamora

1st Lieutenant Gary Finley Engineering Scholarship: Brenyn Freeman

EOzark Chapter MO Society of Professional Engineers Leo Day Scholarship: Jenna Biser

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Alumni News



Mohammad Tauhidul Islam - awarded Callahan Fellowship PhD candidate, Mohammad Tauhidul Islam was selected for the Callahan Fellowship, a \$5,000 award for “the most promising and academically qualified PhD applicants to the Case School of Engineering.

Ariful Haque - accepted a new position as an Assistant Professor of Electrical Engineering in the Ingram School of Engineering at Texas State University, San Marcos, TX. Ariful obtained his MS in Materials Science from our department in 2015 and a PhD in Materials Science Engineering and in Electrical Engineering from North Carolina State University in 2020.

Mohammad Delower Hossain - obtained his PhD in Materials Science Engineering from Penn State University in Summer of 2021. He is currently working as a postdoc at the Pacific Northwest National Laboratory in Richland, WA.

Alumni

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

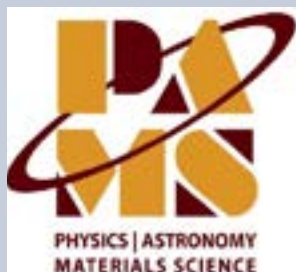
Include your current contact information, graduation year and Missouri State degree.

Let us know where you are working now, job title or other career or personal accomplishments so we may include you in the 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 & Contact Information



Please visit us on Facebook at www.facebook.com/MSUPAMS2/

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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 may include you in the next issue.

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

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

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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.
Springfield, Missouri 65897.

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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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 Marla Fritz at Momentum@MissouriState.edu or Marla123@MissouriState.edu

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