



Michigan  
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# PHYSICS NEWS

MICHIGAN TECH DEPARTMENT OF PHYSICS NEWSLETTER

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## Note from the Interim Chair

**Professor and Department Chair Ravindra Pandey** is currently serving as the interim dean of the College of Sciences and Arts. In the meantime, I (Jacek Borysow) am writing to you as interim chair.

2023 has been an important year in our Department of Physics history. In October, the department went through an extensive external review process. I am pleased to share the news that we received a favorable evaluation of our Physics, Applied Physics, and Atmospheric Science programs. The review committee was impressed with our achievements. I have taken the liberty to insert a few quotes from the committee's report:

First: "One of the most important aspects of MTU physics is the sincere collegiality of the entire department. The faculty has very respectful and supportive relationships with each other, and they have respect and trust in the department chair. The collegiality permeates the teaching and research efforts and is one of the most valuable attributes of the department. Junior faculty members are confident in consulting with their peers, and it is evident they are dedicated to student well-being. They have intentionally made an effort to create community among students and support them to the extent possible. This includes funding undergraduate research and graduate students to the extent possible."



Next: "A remarkable department achievement is the opportunity for undergraduate research. The department aspires to provide paid opportunities for all undergraduate students to participate in research, and they have a funding mechanism to provide this."

And finally: "The research facilities seem well supported and include state-of-the-art and one-of-a-kind facilities, most notably the Pi Cloud Chamber. The research team is leveraging

this facility to support the design of a next-generation Cloud Chamber, an example of dreaming big enough to be exciting and impactful. The Henes Center for Quantum Phenomena is another department gem, both in terms of the capacity to grow in an essential area of research as well as the capacity to support student research and travel."

The 2023 Michigan Tech Research Award went to **Distinguished Professor Petra Huentemeyer** for her work in multi-messenger experimental astrophysics. Petra is an internationally recognized expert in high-energy gamma-ray astronomy and galactic cosmic rays. She serves as a vice-spokesperson for the multinational Southern Wide-field Gamma-ray Observatory. She is the past spokesperson and co-founder for the High Altitude Water Cherenkov (HAWC) gamma-ray observatory ([hawc-observatory.org](http://hawc-observatory.org)). At MTU, Dr. Huentemeyer is a distinguished professor of physics and the director of Michigan Tech's Earth, Planetary, and Space Sciences Institute ([mtu.edu/research/about/centers-institutes/epssi](http://mtu.edu/research/about/centers-institutes/epssi)). Congratulations, Petra! The Michigan Tech Research Award offers an opportunity for an individual to be recognized for outstanding achievement in research. For the award, the term research is interpreted broadly to mean scholarly endeavors. The award is not only an honor to the recipient, but also symbolizes Michigan Tech's high standard of research achievement. Nearly half of physics faculty members are recipients of MTU's Research Award.

**Distinguished Professor Raymond Shaw** received the 2023 University Professor title. Professor Shaw was instrumental in bringing the Pi Cloud Chamber to Michigan Tech's campus. He is one of the founders of the Atmospheric Sciences program, where he serves as a director of graduate study. During his career, Dr. Shaw has received several multimillion dollar research grants. He has also published over 125 scientific papers, many in prestigious journals like *Physical Review Letters* and *Proceedings of the National Academy of Sciences*. Raymond is an elected Fellow of the American Physical Society (APS).

Three current and four former physics professors have been elected Fellows of APS. Two are Fellows of Optica (formerly the Optical Society of America). In 2023, **Professor Ramy El-Ganainy** became an elected Fellow of Optica: "For seminal contributions in non-Hermitian photonics, parity-time symmetry, and optical supersymmetry." Dr. El-Ganainy is also a Humboldt Fellow.

Not everything was as joyful as we would wish in 2023. **Professor Bryan Suits** passed away after a long and courageous struggle with cancer. Bryan was a valued colleague and dear friend to many. He was a truly brilliant experimentalist, an outstanding teacher, and a meticulous department historian. A longtime MTU physics professor, his experimental skills became invaluable assets for our students. He developed a state-of-the-art electronics lab that accompanied his lectures. Bryan's legacy of teaching lives on through his demos and the two textbooks he wrote for the courses he developed: *Electronics for Scientists* (Springer, 2020) and *Physics Behind Music* (Cambridge, 2023). We will miss him dearly.



Many of our achievements wouldn't be possible without your generosity. Your financial support over the years has enriched the lives of undergraduate students in the physics department. At Michigan Tech, we strive to provide extraordinary learning experiences for our students, and we make this happen with the help of donors. One way we accomplish this is by providing opportunities for undergraduate students to be involved in real-life research projects. The research experience they gain will directly influence their endeavors to create a better tomorrow.

On behalf of the Department of Physics, I wish you joyful holidays and a prosperous New Year. Dr. Pandey will be back next year.

Best wishes,

**Jacek Borysow**

*Professor and Interim Department Chair*  
jborysow@mtu.edu



## Research Spotlight



### Assistant Professor Tiffany Lewis

joined the physics department faculty in fall 2023 and specializes in blazar theory. Blazars are galaxies in which the frenzied feeding of the supermassive black hole launches a jet toward Earth that is wider than the solar system, longer than the galaxy is wide, and more powerful than any other sustained cosmic

source in the universe. Luckily for us, they're also pretty far away—but that distance can make it difficult to see what's going on directly. Dr. Lewis uses advanced math, supported by computational tools, to test hypotheses of blazar jet physics against real multiwavelength and multi-messenger data.

After Dr. Lewis received her PhD in Physics from George Mason University in 2018, she traveled to Israel, where she held a Zuckerman STEM Leaders Fellowship. Most recently, she was a NASA Postdoctoral Program Fellow, working in the Astroparticle Physics Lab at Goddard Space Flight Center in Maryland. Dr. Lewis is a member of several gamma-ray and multi-messenger collaborations associated with NASA missions and mission concepts, especially the Fermi Space Telescope and the Compton Spectrometer Imager. She shares these connections and networks with her students to broaden their ties within the field and further support their careers.

## Michigan Tech University Professor

**Distinguished Professor Raymond Shaw** has been named this year's University Professor. Since being appointed as a Distinguished Professor in 2018, Shaw has continued an outstanding forward trajectory in teaching, research, and service, and some of his achievements are noted here.



From teaching introductory physics courses to 400-plus students to designing upper-level and graduate courses tying into research, his teaching style is appreciated by students. "Your enthusiasm and dialogue in class are great; it's always great to listen to an intelligent person explain something they care about," wrote a student. And, as stated by an external reviewer: "He has a unique ability to deftly articulate essential

aspects of frontline research to very diverse audiences, from undergraduate students to field's leading scientists and program managers from federal and industrial agencies."

Since 2018, Shaw has received several research grants from federal and industrial agencies. The most notable is a \$3 million grant from the National Science Foundation to assemble the MTU Cloud Chamber to be a community laboratory facility for faculty and students at universities both nationally and internationally. In his career, he has published over 125 papers in scientific journals, including the *Journal of Atmospheric Science*, *Physical Review Letters*, and *Proceedings of the National Academy of Sciences*.

Shaw has also grown MTU's Atmospheric Sciences program as its graduate director, and since 2018, he has graduated six MS and PhD students. He has also mentored undergraduate students who have co-authored peer-reviewed publications with him.

In 2020, Shaw was named a Fellow of the American Physical Society.

Another statement from an external reviewer summarizes Shaw's contributions well: "He is a world-renowned scientist in the field of atmospheric physics," they wrote, and added that Shaw and his colleagues have put MTU "on the world map as one of the shining beacons of atmospheric physics."

## Student Organizations

The **Women in Physics group**, or WIP, co-chaired by PhD students **Alyssa Horne** and **Swafuva Sulaiman**, has been actively involved in both the physics department and the broader community. Alyssa works in Physics with Dr. Ranjit Pati, and Swafuva works in Atmospheric Sciences with Dr. Will Cantrell.

In spring 2023, the group had the privilege of hosting NASA scientist Dr. Hashima Hasan, who shared insights into her involvement and research at the Webb Observatory. Another notable guest was Dr. Lynn Mazzoleni, whose insightful talk highlighted her journey as a professional and how she balances her job with personal pursuits.

In fall 2023, the group's first speaker was Dr. Adrienne Minerick, who delved into her research and highlighted her ongoing commitment to the ADVANCE Initiative, which aims to provide support for underrepresented scientists.

Last April, WIP organized an outreach event at Jeffers High School, where graduate students shared their research and experience to spark interest in physics in the new generation of scientists. The high school students witnessed physics in action by engaging in hands-on demonstrations showcasing various physical properties.

WIP wrote a proposal to the American Physical Society (APS) to host the APS Conference for Undergraduate Women in Physics—a three-day regional conference for undergraduate physics majors—in January 2025. According to APS, the conference is meant to help attendees continue in physics by providing “the opportunity to experience a professional conference, information about graduate school and professions in physics, and access to other women in physics of all ages with whom they can share experiences, advice, and ideas.” Congratulations to the WIP executive committee for raising \$65,000 to bring the conference to Houghton.

If you wish to contribute to WIP activities, please contact Alyssa Horne at [alysaaho@mtu.edu](mailto:alysaaho@mtu.edu).



## Awards and Achievements

**University Professor Robert Nemiroff** was elected a 2022 Fellow of the American Physical Society: "For exceptional daily astronomy outreach for over 25 years, primarily through the Astronomy Picture of the Day (APOD) website, which has served billions of space-related images with explanations translated daily into over 20 languages." Furthermore, Nemiroff published a book, *Faster than Light: How Your Shadow Can Do It But You Can't*. As a testament to his significant contributions to the field, the International Astronomical Union renamed asteroid 2002 GB185 as (270558) Nemiroff in his honor.

**Professor Ramy El-Ganainy** was selected as a Fellow of Optica (formerly the Optical Society of America): "For seminal contributions in non-Hermitian photonics, parity-time symmetry, and optical supersymmetry."

**Administrative Aide Megan Johnson** and **Master Machinist Jesse Nordeng** were recognized by MTU's Staff Council with Making a Difference Awards in the Unsung Hero and Legacy Award categories, respectively. They were honored at a January reception.

**Professor Miguel Levy** received a research grant from Photonica to investigate surface reconstruction and nonreciprocal beam-splitting studies for emerging magneto-optic quantum technologies. Photonica has been funding Miguel's group for the past several years.

**Director of First-Year Programs Wil Slough** was selected by Dean David Hemmer of the College of Sciences and Arts for the Deans' Teaching Showcase. Slough was recognized at a spring 2023 event with other showcase members, and was also a candidate for the CTL Instructional Award Series.

### GRADUATE STUDENT AWARDS & ACHIEVEMENTS

**Rhiannon Turner** was awarded the Hogberg Fellowship for fall 2022.

Outstanding Scholarship Awards were granted in the 2022 fall semester to **Jesse Anderson** and **Sambhawana Sharma**. In the 2023 spring semester, **Dharmendra Pant** received the same award.

In fall 2022, **Aaron Wildenborg** received the Outstanding Student Teaching Award. **Siddharth Karkhanis** was selected as the award recipient for spring 2023.

**Yi Zhi Chu** spent the 2022-23 academic year on co-op at Los Alamos National Laboratory.

**Lucas Simonson** and **Daniel Yeager** were selected for the US Department of Defense Science, Mathematics, and Research for Transformation (DoD SMART) Scholarship, starting in fall 2022 for three academic years.

Finishing Fellowship awards were made to **Sushree Dash, Tong Gao, Dharmendra Pant, Sharma Sambhawana,** and **Cameron Shock** in the 2022-23 academic year.

**Elise Rosky** was the recipient of the 2023 Michigan Tech Sustainability and Resilience Campus Leadership award.

**Aaron Wildenborg** was awarded the DoD SMART Scholarship for the 2023 academic year until graduation. Aaron will work with groups at the Naval Information Warfare Center Atlantic in South Carolina. Aaron has also received a summer 2023 internship at the Naval Information Warfare Center Pacific in California through the Naval Research Enterprise Internship Program.

During the Graduate Student Government's 2023 Graduate Research Colloquium in March, **Shreya Joshi** achieved third place in the poster presentation.

Henes Center Fellowship awards were made to **Geeta Sachdeva** and **Tong Gao** in the 2022-23 academic year.

**Aaron Wildenborg** and **Jester Itliong** were recognized for their contributions during the annual graduate research colloquia in 2023, held in person from January through April 2023. Wildenborg received the peer-voted oral presentation award, and Itliong was honored for having the best research poster presentation in April 2023. These awards reflect the achievements of graduate students in presenting and sharing their research findings.

**Aaron Wildenborg** also published a research paper in January 2023 titled "High-Quality Surface Plasmon Polaritons in Large-Area Sodium Nanostructures." This paper resulted from collaborative work between Michigan Tech, Oakland University, and the Argonne National Laboratory. It represents the scholarly efforts of graduate students and their involvement in research partnerships across institutions.

### UNDERGRADUATE STUDENT AWARDS & ACHIEVEMENTS

**Alexander Gonzalez** was honored with the Ian Shepherd Award, recognizing his excellence as a senior undergraduate student. Additionally, the Elizabeth Henes Award was presented to **Tea Momirovska**, who was acknowledged as the most outstanding woman graduating in physics. These awards highlight the achievements of these individuals in their respective academic pursuits.

As our 2023 Departmental Scholar, **Michael Martin** was nominated for the Provost's Award for Scholarship.

# Degree Recipients

Student	Destination
Jesse Anderson, PhD	Cloud Chamber Research Scientist, Michigan Tech
Tong Gao, PhD	Postdoc, Tulane University
Neerav Kaushal, PhD	AI Scientist, Sail Biomedicines, Inc.
Geeta Sachdeva, PhD	Postdoc, University of Tennessee-Knoxville
Sambhawana Sharma, PhD	Assoc. Prof., Independence Community College, KS
Dharmendra Pant, PhD	Postdoc, Clemson
Joshua (J.D.) Brandewie, MS	PhD (Mathematical Sciences), Michigan Tech
Alyssa Horne, MS	PhD (Physics), Michigan Tech
Hitendra Singh, MS	PhD (Physics), Michigan Tech
Riley Dickert, BS	Assoc. Engineer, Analog Devices
Nick Folcik, BS	Lab Assoc., Michigan Tech
Oliver Jensen, BS	_____
Casey Aldrich, BS	MS (Physics), Michigan Tech
Alex Gonzalez, BS	Lab Assistant, Michigan Tech
Dan Koshar, BS	MS (Physics), Michigan Tech
Sidney Ogilvie, BS	Nuclear Weapons Lab, CA
Benj Sloma, BS	National Park Service
Jason Flittie, BS	Grad School, Texas A&M

## | Alumni Spotlight

**Carly Robinson '07 (BS)** is an assistant director at the US Department of Energy (DOE) in the Office of Scientific and Technical Information. After receiving her BS in Applied Physics from Michigan Tech, Robinson attended graduate school at the University of Colorado, Boulder, obtaining an MS (2010) and PhD (2013) in Atmospheric Chemistry. Following graduate school, she was an American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow in both the US Senate and the DOE Office of Science.

While in the Senate, Carly drafted energy-related legislation and climate speeches for Senator Mark Udall. As assistant director for information products and services, she currently leads teams overseeing the management of DOE research search tools and providing persistent identifier services to DOE researchers, while continuing to co-author publications. Her recent work includes co-authoring the DOE 2023 Public Access Plan and chairing interagency groups organized by the White House's Office of Science and Technology Policy and the National Science and Technology Council.

## | Graduate Spotlight

**Aaron Wildenborg** is a PhD candidate working with Associate Professor Jae Yong Suh. He joined Michigan Tech in fall 2020. His research focuses on quantum optics and the interaction of light and matter at the nanoscale. While at MTU, he has worked on measuring surface plasmon resonances of alkali metals to explore their use as cheaper, lower-loss plasmonic materials—leading to two papers in *Nano Letters*. Recently, he has been exploring quantum phenomena of 2D materials such as superfluorescence and photon antibunching.

He has also received multiple department accolades, including first prize for his 2023 graduate student colloquium oral presentation, first prize for his 2022 poster presentation, and the 2022 Outstanding Teaching Award.

This past summer, Aaron received a position with the Naval Research and Enterprise Internship Program—he worked at the Naval Information Warfare Center Pacific in San Diego, California, fabricating and characterizing quantum-engineered nanodevices. He has also received a Department of Defense Science, Mathematics, and Research for Transformation (DoD SMART) Scholarship to join and work at the Naval Information Warfare Center Atlantic in Charleston, South Carolina.

## | Graduate Spotlight

**Susan Mathai** is a PhD candidate working with Professor Claudio Mazzoleni. She joined Michigan Tech in August 2018. Her research focuses on studying the physical, chemical, and optical properties of atmospheric particles (aerosols) emitted from biomass combustion. With Mazzoleni, Susan developed a broadband cavity enhanced extinction spectrometer that can measure the light extinction of laboratory generated aerosols over a broad wavelength range (400 to 550 nm).

During an internship at the Pacific Northwest National Laboratory, Susan worked with Dr. Swarup China '14 (PhD), PNNL senior scientist, for 16 months, leading three projects: measuring the optical properties of tar ball particles abundant in wildfire smoke plumes to improve climate and weather models (*Environmental Science & Technology* has accepted her manuscript); studying the physical and chemical properties of aerosols collected in hazy conditions in an urban polluted environment in the Indo-Gangetic Plains; and estimating the radiative forcing of black carbon containing particles from vertical profiles collected in the US Southern Great Plains using a tethered balloon.

Susan received the 2020 Outstanding Teaching Award and a fall 2023 Finishing Fellowship. She has presented her research at the American Association for Aerosol Research annual meeting (2021, 2022, 2023), the American Geophysical Union annual meeting (2021, 2022), and the International Conference on Carbonaceous Particles (2023), with travel costs partially covered by the Henes Center for Quantum Phenomena.

## | Senior Spotlight

**Tea Momirovska** is a senior physics major, currently in her last semester at Michigan Tech. While completing her physics degree, she's also pursuing minors in sustainability science and law and society. She's been active in undergraduate research with University Professor Yoke Khin Yap, focusing on boron nitride nanotubes and contributing to the synthesis of nanomaterials for research in electronics and biomedicine.

Tea has been involved with the Society of Physics Students and is a member of the Figure Skating Club. In 2022, she received The Elizabeth and Richard Henes Memorial Award, recognizing her as an outstanding woman physicist. In her free time, she enjoys playing *Dungeons & Dragons* and exploring the natural beauty of the Upper Peninsula. After graduation, she hopes to pursue a career in energy policy and climate conservation.

## | Staff Spotlight

**Lab Associate and Learning Center Coordinator Nick Folcik** joined the physics department in August 2023, shortly after graduating from Michigan Tech with a BA in Physics. During his time as a student at Tech, he worked in the Physics Learning Center as a coach and eventually head coach. He also held a number of teaching assistant positions in both lectures and labs, as well as providing demonstration support for lectures.

Before attending Tech, Nick had dropped out of college and enlisted in the US Marine Corps, serving on active duty from 2012 to 2016 as a heavy equipment operator. The experience motivated him to return to school and pursue engineering. Along the way, however, he developed a passion for teaching students in a field he never thought possible for him to pursue—physics! Nick enjoys taking his practical experience from the military (and an assortment of other odd jobs) to create relatable and tangible physics examples for his students.

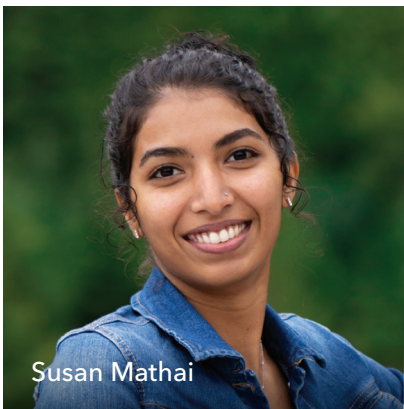




Carly Robinson



Aaron Wildenborg



Susan Mathai



Tea Momirovska



Nick Folcik



Back row from left: James Turkovich, Benj Sloma, Jason Flittie. Front row from left: Tea Momirovska, Rita Wilson, Claire Wiitanen.

## Senior Trip

In May 2023, five undergraduates, accompanied by **Budget Coordinator and Office Manager Claire Wiitanen**, traveled to Geneva, Switzerland. The trip focused on a tour of the European Organization for Nuclear Research (CERN). They also visited Albert Einstein's former residence in Bern, soaked in the beauty of the Swiss Alps, and mastered traveling via train and tram. The Elizabeth and Richard Henes Center for Quantum Phenomena sponsored all travel expenses.

### Newsletter Coordinators:

Mauricio Reyes and Claire Wiitanen

## Recent Funding

**Distinguished Professor Petra Huentemeyer** is the principal investigator (PI) on a project that has received a \$590,584 research and development grant from the National Science Foundation (NSF). The project is titled "WoU-MMA: Understanding the Strongest Accelerators in our Galaxy by Combining Data from the HAWC Observatory and Other Instruments."

**Professor Miguel Levy** has been awarded a \$36,440 grant by Photonica Inc. The grant funds surface reconstruction and nonreciprocal beam-splitting studies for emerging magneto-optic quantum technologies.

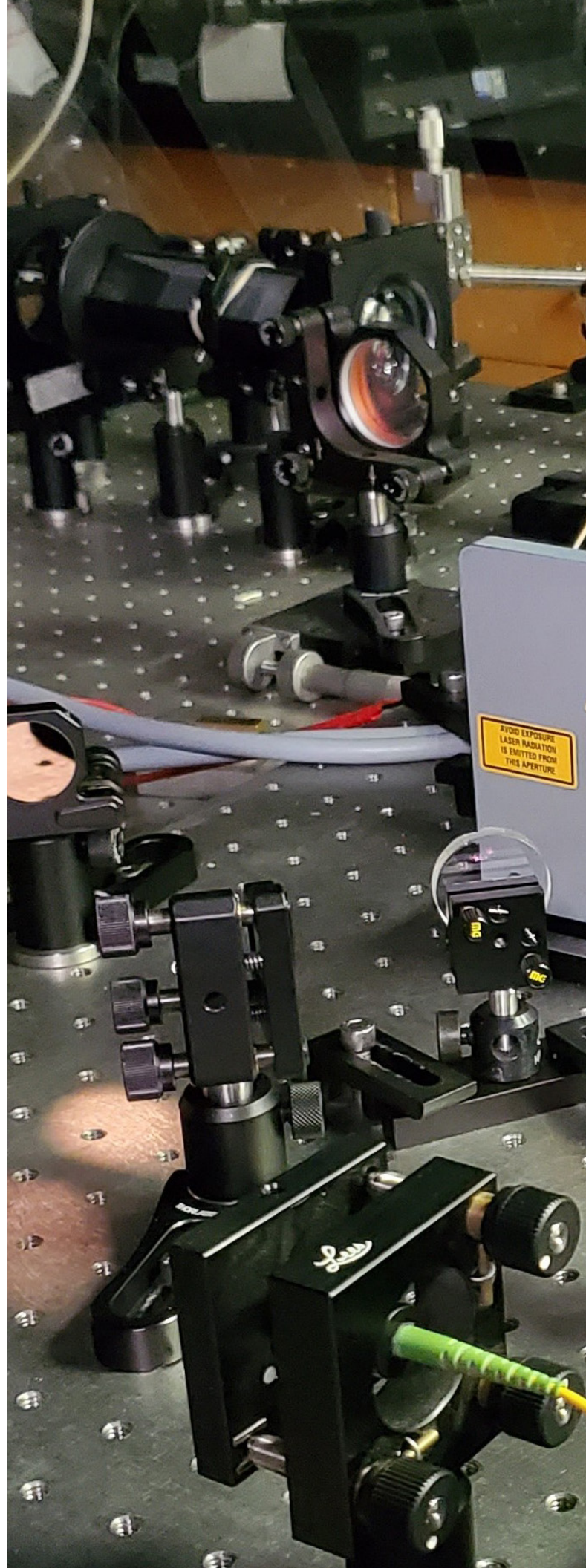
**Professor Alex Kostinski** is the PI on multiple recently funded research projects: "Theoretical Support for Gas-Gun Experiments: Towards Suppression of Shockwave Instabilities and Jetting" has secured a \$99,512 research and development contract from Lawrence Livermore National Laboratory; "EPIC Solar Glint Product: Statistics of Terrestrial Glitter" has received a \$38,097 research and development grant from NASA; and "Texture of Stochastic Process in Physical and Radar Meteorology," a four-year research and development project, has received a \$571,879 grant from the NSF.

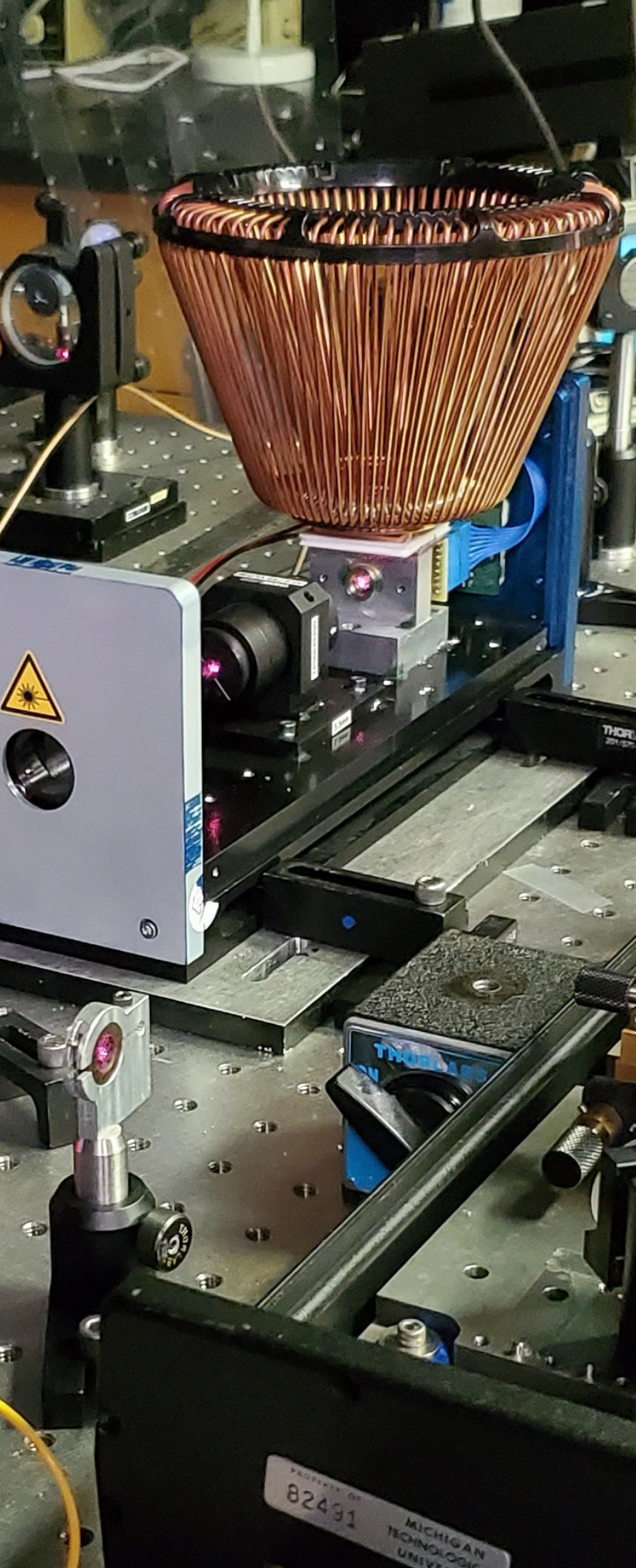
**Associate Professor Issei Nakamura** is a co-PI of an NSF-Major Research Instrumentation (MRI) grant awarded to Michigan Tech. The project is titled "Acquisition of a GPU-accelerated cluster for research, training, and outreach."

**Associate Professor Jae Suh** received an NSF grant to work on "Development of light-emitting devices having intensive quantum-optical properties using a low-dimensional semiconducting material."

**Professor Ranjit Pati** is a co-PI of a \$600,000 NSF award. The project is titled "Computation-Guided Advanced Fabrication of Silicide Nanostructures with Novel Magnetic Properties."

**Professor Ravindra Pandey** is the PI on a project that has received a \$75,000 research and development co-op/joint agreement from the Army Research Laboratory. The project is titled "Study of Structure-Property-Function Relationships of Low-Dimensional Materials for Multiphysics Applications."





## Thank You!

We extend our deepest appreciation to our friends and alumni who have made recent gifts or pledges to Michigan Tech. As always, we appreciate your continued interest in the Department of Physics at Michigan Technological University.

Did we miss your contributions? If so, please contact [physics@mtu.edu](mailto:physics@mtu.edu).

Edward Augustyniak '94 & Monika Sujczynska  
Ramakrishnan Bashyam '96 & Harini Sampathkumar  
Susan & Donald (dec.) Beck  
Theodore L. Bedore '72

Benevity Community Impact Fund  
James '67 & Janet Bohren  
Ziyong Cai '88 & Ping Zhou  
CIGNA Corp.

Russell '63 & Joan Compton  
Konstantin '95 & Dessy Dinov  
John Donohue

Fidelity Investments Charitable Fund  
James '68 & Lynne Gekas  
Thomas '63 & Dona Gould  
Joel H. Graber '87

Heidelberg Institute for Theoretical Studies  
Susan E. Hill '85  
Binita Hona '20

Stanley '70 & Christine Jefferson  
David R. Kalliainen  
Paul '76 & Peggy Kaptur

James '59 & Carole Kauppila  
James '66 & Kathleen Kortge  
Jack '62 & Kaethe Labo  
Jason A. LaCosse '95

Robert '61 & Eugenia '64 Lind  
Paul '71 & Joanne Michaels  
James '65 & Joan Mitchell

Mitchell Intellectual Property Law  
Thomas '76 & Margaret Mohr  
Deborah Morrow & Philip Kaldon '88 (dec.)

David Nitz & Mary Marchaterre  
Brenda & Samuel '63 (dec.) Ochodnický  
Lin Pan '08 & Hong Wei Yu

Photonica Inc.  
Thomas '69 & Sharon Plutchak  
Manuj Rathor '96 & Shweta Singh

Mary J. Repar '75  
Suresh K. Sampath '98  
Mary Ann & Maximilian (dec.) Seel

Abu Sayeed Md Shawon '21  
Thomas & Sharon Silvis  
Gilbert '48 (dec.) & Sonia (dec.) Sloan

Donald '73 & Carolyn Szenina  
Glen J. Tauke '72  
C. John '64 & Kathryn Umbarger

Roger '66 & Linda Urbaniak  
SriramaSwaminat Venkataraman '98  
& Kalpana Chandrasekharan

David E. Woon '84  
William E. Wuerthele '66



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**Participants from MTU's Society of Physics Students attended the 2022 Greater Michigan SPS Conference at Michigan State University.** Pictured from left: Tom Harvey, James Turkovich, Benj Sloma, Jason Flittie, Riley Dickert, Rita Wilson, Tea Momirovska, Dylan Richards, Josh Rolfe, Lauren Megdanoff.