

Note from Chair Ravi Pandey

Following the tradition of the High-flying Huskies, **Jonathan Willis,** a senior physics major and AFROTC cadet, is now one step closer to achieving his dream of flying F-22 fighters after graduation. An exemplary student, Jonathan demonstrates excellence in both academics and leadership. Recently, he earned a pilot slot in the United States Air Force, and we are proud of his remarkable success.

Marine stratocumulus clouds are the "global reflectors," exerting a net cooling effect on Earth's climate. Uncertainties in calculating their radiative effects have been attributed to the inaccurate cloud water-droplet-size spectra used in climate models. In a paper published in *Science*, **Nithin Allwayin**, a graduate student working with **University Professor Raymond Shaw**, pointed out that droplet size distributions are heterogeneous and narrow within the cloud, rather than resembling the cloud average. These results are significant because they lead to new modeling representations of the microphysical processes in clouds.

We congratulate Professor Shaw on reaching the milestone of \$1 million in research spending this year. As a leading atmospheric physicist, he is well-supported by the National Science Foundation and the US Department of Energy to study cloud microphysics. His scientific contributions have earned him recognition as a Michigan Tech University Professor and a Fellow of the American Physical Society (APS).

Our department will be hosting the APS Conference for Undergraduate Women and Gender Minorities in Physics in January 2025. We extend our thanks to students **Alyssa Horne** and **Ryan Munter**, as well as **Assistant Professor Tiffany Lewis** and **Professor Jacek Borysow**, for submitting the proposal for hosting the conference to APS. The conference is

expected to bring over 200 students to campus, offering them valuable opportunities to prepare for careers in physics. It will also give these young physicists a taste of Keweenaw winters.

We gratefully acknowledge the generous gift from Ms. Shelly Williams, who has established the **Jim '66 and Shelly Williams Applied Physics Annual Fund.** Jim was passionate about activities that allowed him to explore new ideas and those that challenged him. Whether it was engaging in physical activities or pursuing new learning experiences, he found tremendous satisfaction in expanding his reach in all aspects of his life. This gift has enabled the department to both acquire an instrument for measuring the quantum efficiency of solar cells and support summer undergraduate research on graphene-related materials.

Many of these achievements have been made possible only with your encouragement and support. As you decide on end-of-the-year donations, please consider contributing to the department's endowment (mtu.edu/physics/giving). Your continued support of the physics department's efforts in education and research is deeply appreciated.

Best wishes for a joyous holiday season and a happy and prosperous new year,

Ravi Pandey

Ravi Panelay

Professor and Department Chair pandey@mtu.edu

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On the cover: Rhiannon Turner at the High Altitude Water Cherenkov (HAWC) Observatory, located on the Sierra Negra volcano in México.





At the "Wandering the Immeasurable" statue at CERN. Front row from left: Michael Wendt, Caleb Counts, Michael Martin, Grant Lambert, Lauren Megdanoff, Estyn LaMotte. Back row from left: David Kalajdziovski, Dylan Richards.

| Senior Trip

Michigan Tech Physics Seniors' Swiss Adventure and European Excursion

The Michigan Tech Department of Physics senior trip to Switzerland was an exciting blend of scientific exploration and cultural immersion. Over seven days, students embarked on a journey through Europe, beginning with a tour of CERN, where they delved into cutting-edge particle physics. Their adventure continued in Interlaken, where they embraced various outdoor activities among the Swiss Alps. The trip also included a day excursion to Lyon, France, where they explored the Museum of Fine Arts of Lyon, enriching their experience with a touch of artistic culture. This multifaceted journey deepened their understanding of physics and broadened their horizons through diverse cultural and recreational experiences.

Research Spotlight

Associate Professor Jae Yong Suh joined the department as an assistant professor in fall 2014 and received a promotion to associate professor with tenure in 2020. His research is related to ultrafast pump-probe laser and photon correlation spectroscopy of periodic nanostructures. In the department, he has established a cutting-edge materials physics and laser spectroscopy laboratory, investigating the optical, plasmonic, and quantum properties of materials at nanometer length scales and subnanosecond timescales.



During his sabbatical year (fall 2021 to summer 2022), Suh enhanced international collaborations as a visiting researcher at the Korea Research Institute of Chemical Technology, supported by the National Research Foundation of Korea's Brain Pool Fellowship. This partnership catalyzed

Suh's current research into superfluorescence in quasi-2D perovskites and their light-emitting devices. Superfluorescence is a coherent light-emitting process in solid-state materials with potential applications in highly efficient ultraviolet light generation. Building on his National Science Foundation (NSF) supported work, Suh's research has sparked several follow-up projects. A new collaborative research project with the Army Research Laboratory aims to create orbital angular momentum-embedded, room-temperature polariton condensates with potential applications in interferometric sensing and advanced navigation systems.

To support this expanding research, Suh spearheads significant upgrades to his laboratory's instrumentation. The new setup will feature an integrated femtosecond laser-amplifier system, optical parametric amplifier, pump-probe (transient absorption) spectrometer, and a microscopic Kerrgate photoluminescence spectroscope, enabling more advanced spectroscopic measurements at extremely short timescale. Furthermore, due to his unique expertise in laser spectroscopy, Suh's undergraduate and graduate mentees have secured positions in federal research laboratories (e.g., Naval Surface Warfare Center) and industry (e.g., Intel).

As the sole researcher specializing in ultrafast laser spectroscopy in Michigan's Upper Peninsula, Suh remains at the forefront of this specialized field. Over the coming decades, he will continue to educate and mentor the next generation of STEM scientists. These advancements will further strengthen his group's leadership in materials physics and optical science at Michigan Tech.

| Alumni Spotlight



David Woon '89 (PhD) is a research associate professor in the Department of Chemistry at the University of Illinois Urbana-Champaign. Woon worked initially as a postdoctoral scientist at the University of Texas at Arlington with Professor Dennis S. Marynick, and then at Pacific Northwest Laboratory in Richland, Washington, where he worked with Thom H. Dunning Jr. on extending and benchmarking

correlation consistent basis sets. In 1994, Woon joined the Molecular Research Institute in the California Bay Area as a research scientist. There, he began three decades and more of computational studies of astrochemical reactions in the gas phase and on ice surfaces. Woon moved to UIUC in 2006, where he continued his NASA-funded astrochemistry research and also worked again for several years with Thom Dunning-this time formalizing the concept of recoupled pair bonding as a means of accounting for tetravalence in carbon compounds and hypervalence in sulfur, chlorine, and phosphorus compounds. He was granted his current professorship in 2014. Woon has been married since 2012 to archaeologist Laura Kozuch, PhD, now retired as curator of collections at the Illinois State Archaeological Survey. They are outnumbered by their cats. Woon returns to the Copper Country most summers to spend time at a family cottage on Lake Superior built by his grandfather in the 1930s.



Ramakrishnan (Rama) Bashyam '96 (PhD) is the director, account technologist, at Applied Materials. He was a graduate research fellow receiving a PhD under the supervision of Professor David Keeble. His research work was focused on growing diamond thin films using hot filament chemical vapor deposition and studying the defects using electron paramagnetic resonance and Raman spectroscopy. After

graduating, Rama worked at SUMCO in Salem, Oregon, for eight years in the capacity of process engineer and inspection manager. He then joined MEMC in Sherman, Texas, for five years. In both companies (silicon wafer manufacturers), he focused on silicon epitaxy. He then joined Moser Baer in India as an assistant general manager, working on thin film solar panels for two-plus years. He was instrumental in product development, yield improvement, and cost reduction in both silicon epitaxy and solar.

In 2013, he joined Applied Materials, a leading equipment manufacturer for the semiconductor industry based in Santa Clara, California. His focus is on developing new products and technology and managing lab activities and customers for frontend products, resulting in one US patent and another pending. Rama enjoys spending time with his family, hiking, traveling, and mentoring young people.

Graduate Spotlight



Rhiannon Turner is a PhD candidate working with Distinguished Professor Petra Huentemeyer. She joined Michigan Tech in the fall of 2020. Her research focuses on gamma-ray astroparticle physics and the next generation of gamma-ray particle detector arrays. While at MTU, she has worked on analyzing data from the High Altitude Water Cherenkov (HAWC) Observatory to study the acceleration mechanisms in extreme environments in our

galaxy, such as the sites of supernova remnants and pulsar wind nebulae. This work was published in *Astronomy & Astrophysics* on October 30. Recently, she has been working on hardware and software prototyping for the new Southern Wide-field Gamma-ray Observatory (SWGO). She received the Nicholas Matwiyoff and Carl Hogberg Endowed Graduate Fellowship for fall 2022. She has presented her work at the Quarks to Cosmos APS meeting (2022) and the International Cosmic Ray Conference (2023), with travel costs partially covered by MTU's Graduate Student Government. Rhiannon spent the 2024 spring semester at Los Alamos National Lab after receiving funding from the US Department of Energy's Office of Science Graduate Student Research Program. While there, she used HAWC data to study constraints on the energy threshold for Lorentz invariance violation.



Nithin Allwayin is a PhD candidate working with University Professor Raymond Shaw. He joined Michigan Tech in fall 2019. His research focuses on the physics of clouds at small spatial scales, covering cloud microphysics and turbulence in clouds. At Tech, he helped develop an algorithm to look at spatial similarities of cloud size distributions. He used it to show that cloud droplets exist in similar-looking regions and are narrower in their size distribution

shapes compared to what is used in global climate models. His contributions span multiple high-impact field campaigns, including the Aerosol and Cloud Experiments in the Eastern North Atlantic (ACE-ENA), the Experiment of Sea Breeze Convection, Aerosols, Precipitation, and Environment (ESCAPE), and experiments in the Pi Convection-Cloud Chamber at Michigan Tech. He has visited the Climate and Radiation Laboratory at NASA's Goddard Space Flight Center and the Mesoscale and Microscale Meteorology Laboratory at the NSF National Center for Atmospheric Research (NCAR), where he worked on modeling studies and investigation of cloud size distribution types with relevance to radiation and climate.

His work has been published in prestigious journals, including *Science*, and he has co-authored several papers exploring cloud processes and atmospheric phenomena. He served as the physics department representative for the Graduate Student Government during 2022-23. Recognized for his contributions, Nithin has received numerous awards, such as the Henes Center Fellowship, the Doctoral Finishing Fellowship, and the Graduate Student Service Award. He has presented at multiple conferences, and his research was highlighted at the plenary session of the DOE 2023 Joint Atmospheric Radiation Measurement (ARM) User Facility/Atmospheric System Research (ASR) Principal Investigators (PI) Meeting.

| Senior Spotlight

Jonathan Willis is a senior physics major pursuing minors in mathematical sciences and aerospace studies. He has been active in undergraduate research with Chris Hohnholt of Michigan Tech's Pavlis Honors College, focusing on the effectiveness of alternative educational frameworks in aviation and aerodynamics curricula.



Jonathan is also a cadet in the US Air Force Reserve Officers' Training Corps (AFROTC) and a high-performance, instrument-rated private pilot. His experiences include being chosen to fly

gliders at the US Air Force Academy and recently meeting General Mark Kelly, commander of US Air Force Combat Command, at an AFROTC conference in Washington, DC. "Being able to talk to one of my role models has only made it more clear that being a fighter pilot is exactly what I want to do," Jonathan said. "I am still continuing to follow my dream, and my sights are still set on the F-22."

Jonathan recently earned a pilot slot in the US Air Force and will be sent to pilot training shortly after graduating in 2025. After completing pilot training, he hopes to be selected to fly fighter aircraft. In his free time, he enjoys fishing, flying, and spending time with his family and his fiancée, Mackenzie.

Staff Spotlight

Master Machinist Jesse Nordeng joined the physics department in October 2006, transferring over from the mechanical engineering department, where he was hired in May 1999. Jesse is involved in the fabrication and development of graduate and undergraduate research and classroom projects, as well as assisting department faculty and teaching staff in developing lecture demonstrations. His other responsibilities include serving as the department safety liaison and property manager, along with coordinating with Facilities Management and other contractors whenever there is a need for lab and classroom improvements.

Jesse joined the US Air Force right after graduating from Houghton High School in 1979. The Air Force is where he learned his trade as an aircraft machinist. He moved to Lawrence, Kansas, where he worked in a small fabrication shop before accepting a maintenance machinist position at the University of Kansas. He then went on to take a machinist position for the university's physics department, where he was later promoted to an instrument maker. In the early 1990s, he visited the physics machine shop here at Michigan Tech and hoped that one day he would get the chance to work here—and now here he is. He's an avid fisherman, and likes hiking, vacationing with his wife and adult children, and shooting pool on his time off.

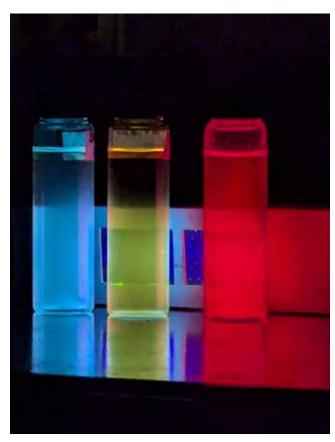


Recent Funding

Professor Will Cantrell is the principal investigator (PI) on a \$1.5 million research and development co-op joint agreement with the United Arab Emirates. The project will span three years and includes **University Professor Raymond Shaw** and **Research Scientist Jesse Anderson** as co-PIs.

University Professor Raymond Shaw is leading a project funded by Brookhaven National Laboratory with a \$35,591 research and development contract.

Assistant Professor Tiffany Lewis received a \$49,776 NASA grant for a three-year project titled "Models & Simulations for Blazar Polarization in Gamma-Rays with COSI." **PhD candidate Krishna Teja Vedula** is a co-Pl on the project.



Quantum Dots synthesized at MTU (Kabel and Yap).

Student Organizations

The Women in Physics (WIP) student organization hosted many successful programs last year that brought free education and insight to MTU students. Last fall, WIP ran an online introductory MATLAB workshop that covered basic operations, practical examples, and useful applications. This course was able to reach roughly 60 people! WIP also brought in Adrienne Minerick, a professor in chemical engineering at Michigan Tech, as a guest speaker to discuss the challenges of maintaining a career path while balancing family life and her role in securing \$1.2 million from the National Science Foundation's ADVANCE program, which aims to increase the representation of women in STEM fields. Additionally, Clio Sleator, an astrophysicist at the US Naval Research Laboratory, was a guest speaker who gave valuable insights during her session about her research and career. WIP also organized tutorial sessions in the spring on Overleaf, Excel, Linux, and MATLAB. We also welcomed MTU PhD alumna Elise Rosky '23, who shared her experiences transitioning from graduate school to postdoctoral work.

The American Physical Society (APS) has also selected WIP at MTU to serve as the local organizing committee for the Conference for Undergraduate Women and Gender Minorities in Physics (CUWiP), which will have a host site at MTU from January 24-26, 2025. We also awarded two scholarship recipients through the Henes Center for Quantum Phenomena to help bring financial aid and support during students' studies. The recipients are Grace Nelson, an undergraduate physics major, and Grace Siliki, a graduate student studying applied statistics. We look forward to working with them throughout this school year! In this upcoming academic year, we will continue to serve our community and create an environment where everyone can access the tools for success!

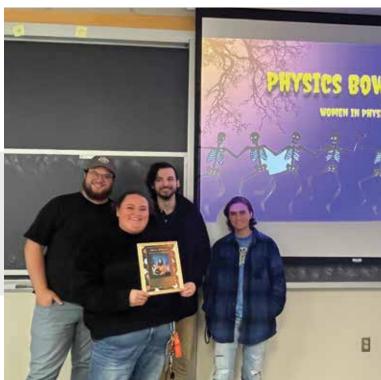
Women in Physics (WIP) Leaders:

President: Swafuva Sulaiman Co-President: Rita Wilson Vice President: Raksha Dubey Co-Vice President: Ryan Munter

Treasurer: Alyssa Horne

Faculty Advisor: Assistant Professor Tiffany Lewis





Awards and Achievements

Teaching Professor Katrina Black was promoted to her current position within the Department of Physics, a recognition of her excellence in teaching and contributions to the academic community.

Administrative Aide Megan Johnson received the Exceptional Staff Member Award from Michigan Tech's Graduate Student Government. She was honored at a banquet in March, where she was presented with the award in recognition of her outstanding service to the department.

The National Society of Black Engineers (NSBE) named **Professor Jacek Borysow** the winner of the 2024 Bayard Rustin Award during the University's 35th annual Martin Luther King Jr. Banquet on Jan. 15. The award recognizes a faculty or staff member at MTU for their behind-the-scenes impact.

Assistant Professor Elena Giusarma was selected by Ravi Pandey, then serving as interim dean of the College of Sciences and Arts, as a Deans' Teaching Showcase member. Giusarma was recognized at a spring 2024 event with other showcase members.

Assistant Professor Tiffany Lewis organized and hosted a weeklong gamma ray workshop on campus in June, drawing 60 faculty, scientists, and students from universities and institutions nationwide.

Professor Will Cantrell, associate provost, dean of the Graduate School, and professor of physics, is leading the Department of Kinesiology and Integrative Physiology (KIP) into Michigan Tech's newly constructed H-STEM Engineering and Health Technologies Complex. This state-of-the-art facility will foster interdisciplinary research and innovation, supporting health-related research and education initiatives.

Research by **Professor Claudio Mazzoleni's** former students, Susan Mathai and Swarup China, was featured on the cover of *Environmental Science & Technology* (November 7, 2023, Volume 57, Issue 44). Their work is also highlighted on the Environmental Molecular Sciences Laboratory (EMSL) facility website at Pacific Northwest National Laboratory (PNNL).

Distinguished Professor Petra Huentemeyer and her team achieved a major milestone by selecting Pampa La Bola, Chile, as the site for the new Southern Wide-field Gammaray Observatory (SWGO), the first of its kind in the Southern Hemisphere. Huentemeyer lauded the collaborative efforts of the 15-country team that enabled the site decision.

Professors Claudio Mazzoleni and Will Cantrell were awarded the 2024 Juan Fernandez de la Mora Prize by the American Association for Aerosol Research for their significant contributions to aerosol science research. Their team received a differential mobility analyzer (DMA) from Yale University for further studies.

Student Awards & Achievements

Nithin Allwayin and **Jester Itliong** were elected to serve as Graduate Student Government (GSG) department representatives.

Outstanding Scholarship Awards were awarded in the 2023 fall semester to **Susan Mathai** and **Elise Rosky. Rishi Babu** was the recipient of the award in the 2024 spring semester. Mathai was advised by Professor Claudio Mazzoleni, Rosky by University Professor Raymond Shaw and Professor Will Cantrell, and Babu by Distinguished Professor Petra Huentemeyer.

In the 2023 fall semester, **Rishi Babu** was awarded the Outstanding Student Teaching Award, and in the spring 2024 semester, **Ryan Munter** was selected for the honor. The Outstanding Service Award was presented to **Nithin Allwayin** in spring 2024. Munter is advised by Associate Professor Jae Yong Suh and Allwayin by University Professor Raymond Shaw.

Ian Norwood and **Tanner Sether** were each awarded a \$5,000 Michigan Space Grant Consortium Graduate Fellowship for the 2024-25 cycle. Norwood is advised by Professor Claudio Mazzoleni and Sether by Assistant Professor Elena Giusarma.

Yi Zhi Chu spent the 2023-24 academic year on co-op at Los Alamos National Laboratory. He is advised by Professor Ravi Pandey.

Rhiannon Turner received the US Department of Energy Office of Science Graduate Student Research (DOE SCGSR) program award; for the spring 2024 semester, she worked on research at Los Alamos National Lab. She is advised by Distinguished Professor Petra Huentemeyer.

Finishing Fellowship awards were made to **Meera Boora** in the 2023 summer semester and to **Susan Mathai** and **Elise Rosky** in the 2023 fall semester. Boora was advised by Associate Professor Jae Yong Suh.

Alan Larson was awarded the King-Chávez-Parks (KCP) Future Faculty Fellowship for the 2023-24 academic year. He is advised by Professor Ranjit Pati.

Meera Boora and **Jeff Kabel** were awarded Henes Fellowships in fall 2023. Kabel is advised by University Professor Yoke Khin Yap.

GSG's 2024 Graduate Research Colloquium was held in March, and **Nithin Allwayin** placed second in the oral presentation.

The department's annual graduate research colloquia were held from January through April, with **Ryan Munter** receiving the peer-voted oral presentation award. In April 2024 research posters were presented, with **Raksha** receiving the poster presentation award. Raksha is advised by University Professor Yoke Khin Yap.

Michigan Tech's Women in Physics (WIP) student organization won the bid to host the 2025 American Physical Society Conference for Undergraduate Women in Physics (CUWiP). The conference will be held on campus at Michigan Tech on January 24-26, 2025. Congratulations to WIP Co-Presidents **Alyssa Horne** and **Swafuva Varappillikudy Sulaiman** and all the members of the organizing committee!

Undergraduate **Austin West** was nominated by physics faculty as the 2024 Department Scholar and a candidate for the Provost's Award for Scholarship. He was honored at Michigan Tech's 30th Annual Student Leadership Awards Ceremony in April.

Michael Martin received the Ian Shepherd Award for outstanding senior undergraduate students. The Elizabeth Henes Award was presented to the most outstanding graduating woman in physics, **Lauren Megdanoff.**

Senior undergraduate colloquia were presented on April 18 by Michael Martin, Grant Lambert, Dylan Richards, Cong Yu, Michael Wendt, Daniel Watson, Lauren Megdanoff, Caleb Counts, and David Kalaidziovski.

Degree Recipients

Student	Destination
Rishi Babu, PhD	Postdoc, Michigan State University
Manpreet Boora, PhD	Intel Corporation, Oregon
Justin Cassell, PhD	Patent Officer, US Government
Sushree Dash, PhD	Postdoc, Chalmers University of Tech.
Dezhi Huang, PhD	Postdoc, University of Maryland
Daniel Kestner, PhD	Seeking Employment
Susan Mathai, PhD	Postdoc, NASA (Langley)
Oindabi Mukherjee, PhD	Postdoc, NASA (Marshall)
Elise Rosky, PhD	Research Fellow, University of Michigan
Cameron Shock, PhD	Seeking Employment
Mohammad Alizadeh, MS	PhD, Saint Louis University
Aleister Kerr, MS	Seeking Employment
Jacob Kuntzleman, MS	PhD, Brown University
Alan Larson, MS	PhD, Michigan Tech
Mahsa Najafi, MS	PhD, Michigan Tech
Kumar Neupane, MS	PhD, Michigan Tech
Khoa Nguyen, MS	PhD, Michigan Tech
Raksha, MS	PhD, Michigan Tech
Join Uddin, MS	PhD, Michigan Tech
Krishna Vedula, MS	PhD, Michigan Tech
Daniel Yeager, MS	Scientist, US Navy
Caleb Counts, BS	Seeking Employment
Grant Lambert, BS	MS, University of Wisconsin-Madison
Michael Martin, BS	PhD, University of Utah
Lauren Megdanoff, BA	Seeking Employment
Tea Momirovska, BA	Envir. Scientist, McDowell & Assoc., MI
Dylan Richards, BS	Seeking Grad School
James Turkovich, BS	Non-Degree, Michigan State University
Daniel Watson, BS	MS, Michigan Tech
Michael Wendt, BS	Seeking Grad School
Max Yu, BS	MS, Michigan Tech





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

Gary P. Agin

Edward Augustyniak '94 & Monika Sujczynska

Ramakrishnan Bashyam '96 & Harini Sampathkumar

Susan & Donald (dec.) Beck

Theodore L. Bedore '72

John '69 & Louise Bretney

Ziyong Cai '88 & Ping Zhou

Susan Causey

Russell '63 & Joan Compton

Paul '73 & Leslie Cupal

Konstantin '95 & Dessy Dinov

Thomas '63 & Judith Essig

Eugenia & John '50 (dec.) Evans

Fidelity Investments
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Thomas '70 & Adele Greenlee

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Heidelberg Institute for Theoretical Studies

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David R. Kalliainen

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James '59 & Carole (dec.) Kauppila

Walter '64 & Margaret Kauppila

James '66 & Kathleen Kortge

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Jack '62 & Kaethe Labo

Jason A. LaCosse '95

Miguel & Anita Levy

Paul '71 & Joanne Michaels

Thomas '76 & Margaret Mohr

Jeffrey '84 & Suzanne Morris

Deborah Morrow & Philip Kaldon '88 (dec.)

David Nitz & Mary Marchaterre

Brenda & Samuel '63 (dec.) Ochodnicky

Donald '84 & Ann '86 Parry

Harold W. Paul '75

Sharon & Thomas '69 (dec.) Plutchak

Manuj Rathor '96 & Shweta Singh

Carly B. Robinson '07

Suresh K. Sampath '98

Xiaolin Shi '88 & Lan Diwu

Thomas & Sharon Silvis

Donald '73 & Carolyn Szenina

T. Rowe Price Program for Charitable Giving

C. John '64 & Kathryn Umbarger

Roger '66 & Linda Urbaniak

SriramaSwaminat Venkataraman '98 & Kalpana Chandrasekharan

Kevin Waters '18

Shelley & James '66 (dec.) Williams

David E. Woon '84

William E. Wuerthele '66

Crystal Zhou '09 & Phillip Huang '07



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Megan Johnson, graduate program assistant and administrative aide, recently departed from the Department of Physics. Faculty, staff, and graduate students gathered to thank her for her service in the department.