The Wisconsin Physicist

Volume 30 | 2025

Star light, star bright

UW–Madison physicists played a starring role in the commissioning of the Vera C. Rubin Observatory

Also inside:

Can learning physics make you better at sports?
Attosecond X-ray laser pulses
Welcoming new AMO, AI, high energy and string theory faculty

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On the Cover

This past June, scientists across the world celebrated the release of the first images from the NSF-DOE Vera C. Rubin Observatory. UW–Madison physicists played a key role in the commissioning of the observatory, led by Prof. Keith Bechtol, who served as the project's System Verification and Validation Scientist and is now the Early Operations System Optimization Lead. "It will catalog more stars, galaxies, and Solar System objects during the first year of science operations than all previous telescopes combined," Bechtol says. This cover image is cropped from an original one that combines 678 separate images taken by Rubin Observatory in just over seven hours of observing time. Combining many images in this way clearly reveals otherwise faint or invisible details, such as the clouds of gas and dust that comprise the Trifid nebula (top) and the Lagoon nebula, which are several thousand light-years away from Earth.

For more on the Vera C. Rubin Observatory, see page 10 of this issue or visit RubinObservatory.org

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GREETINGS FROM THE CHAIR

Dear Alumni and Friends,

This year has had both its share of challenges and fortuitous successes. Student interest in physics continues to grow, evidenced by the ever-increasing number of undergraduate majors and applications to our PhD program. Our faculty continue to garner awards and honors. Demand for our educational outreach programs, both by campus visitors and in the community, is near the greatest we have seen. But we are also in a time of budget cuts, funding uncertainty, and challenges to the 80-year partnership between the federal government and research universities. But first, the stories of triumph despite those challenges!

One exciting recent development has been the success of our newest non-majors course, Physics 106: Physics of Sports. In three years, Dr. Jim Reardon has grown enrollment from 36 to 300 students in Fall 2025. Certainly the topic is interesting enough to draw in students who are looking to satisfy their physical sciences breadth requirement, but that is unlikely to be the only reason the course is so popular. Jim treats lecture like a spectacle, drawing students in with active learning and demonstrations that depict the laws of physics and how they apply to sports in a familiar way, before getting to the math and science behind the physics.

This summer, our department also celebrated the culmination of over a decade of work by Prof. Keith Bechtol and his group on the commissioning of the NSF-DOE Vera C. Rubin Observatory. It also marked the transition to the data collection phase. Rubin Observatory will capture the entire southern hemisphere sky every three nights over its anticipated 10-year run, and is leveling the playing field for astronomers around the world by making the data and analysis tools accessible to anyone with an internet connection.

This year, we welcomed four new junior faculty members. String theorist Prof. Jakob Moritz joined back in January, and his research seeks to understand how precisely the particle physics and cosmological history of our universe can arise from string theory. High energy theorist Prof. Joshua Foster joined in August, and his research focus includes searches for dark matter, gravitational waves, and new Physics. AMO experimentalist Prof. Josiah Sinclair also joined in August. He specializes in neutral atom quantum computing, and is looking for ways to build bigger and better processors modularly, by linking multiple smaller systems using single photons traveling through optical fibers. Lastly, Prof. Mariel Pettee joined in August as part of Chancellor Mnookin's RISE (Research, Innovation and Scholarly Excellence) initiative, in this case, RISE-AI, focusing on artificial intelligence and machine learning. A particle physicist by training, her work is broadly interdisciplinary, using AI approaches to address problems in high energy physics, astrophysics, and more.

In January, we celebrated the well-earned retirement of Prof. Mark Rzchowski, a condensed matter experimentalist and longtime associate chair. Mark's work in electronic, spintronic, and structural correlations in complex thin film systems, combined with his impact on education in our department, will be greatly missed. In October, we learned of the passing of Prof. Paul Quin, a key player in the department's nuclear physics program in the 1970s and 80s. He was a postdoc here from 1969-71, then held a faculty position until his retirement in 2001.

Our current faculty continue to earn honors in their respective fields. Prof. Mark Saffman, a pioneer in neutral atom qubits, won the American Physical Society's 2026 Ramsey Award, one of the, if not the, top prizes in AMO physics. He won "for seminal developments of quantum information processing with neutral atoms that allow the investigation of many-body problems that are intractable by classical computing." AMO physicist Prof. Deniz Yavuz was elected an APS Fellow "for outstanding experimental and theoretical contributions to nanoscale localization of atoms with electromagnetically induced transparency and collective radiation effects in atomic ensembles." And the American Astronomical Society's High Energy Astrophysics Division awarded Prof. Dan McCammon their Distinguished Career Award "for his pioneering work on the development of microcalorimeters that has led to breakthroughs in X-ray astronomy and on soft diffuse X-ray background."

The future is looking bright for our junior faculty as well, with four of them earning early career awards. Prof. Matthew Otten won an Air Force Young Investigator Research Program (YIP) award, offered through the Air Force Office of Scientific Research. Prof. Roman Kuzmin won a National Science Foundation CAREER, the Foundation's most prestigious awards in support of early-career faculty. Finally, both Prof. Tiancheng Song and Prof. Vladimir Zhdankin won Department of Energy Early Career awards.

In May, we celebrated spring commencement and our awards banquet, a highlight of our year when we focus on student achievement. We graduated 54 undergraduate students in Spring 2025, a 20% increase from last year. Our major has also grown dramatically in the past five years. We ended the Spring semester with 219 declared majors, a 30% increase from a year ago and a 56% increase from three years ago, so we anticipate graduating many more Badger physicists in the short term. At our awards banquet, we recognized 21 graduate and undergraduate students for their academic, research, and teaching excellence with departmental awards, all made possible through the generosity of our alumni and supporters.

We welcomed another near-record-setting incoming PhD class of 44 students, and given the quality of students we continue to attract, this should be a good trend. However, because of budget uncertainties, central campus has asked all instructional units to take at least a 5% budget cut and L&S imposed a final cut of 7% to our budget. We are also been mandated to reduce our TA budge reduce (despite growth in enrollment). We also must plan other budget saving mechanisms to reach our budget goals; unfortunately, these measures mean not replacing staff and faculty when they leave or retire.

Federal funding at this time remains our primary means of research support, though recently we have seen some grants that we expected to be approved were instead rejected or reduced due to pressures on the federal budget. We all await the successful completion of the federal budget cycle with much anticipation.

Given these uncertainties, we plan to admit our smallest PhD class in recent history to matriculate in Fall 2026. Our department is committed to supporting all of our current 221 PhD students through to their defense. Accordingly, we have designated our Physics Alumni Graduate Fund as our priority fund this year.

We must remain nimble, creative, and resilient even in these difficult times to preserve our primary mission of teaching and research.

On, Wisconsin!

— Kevin Black, Department Chair and Professor of Physics

FACULTY UPDATES

Four faculty members joined the department in 2025, one retired, and one passed away

Welcome, Professor Joshua Foster!

Theoretical astrophysicist looks to data new and old for dark matter and gravitational wave detection

Joshua Foster's long-standing interest in computational tools is, he believes, what led him to research a range of theoretical physics, including dark matter, gravitational waves, and new physics. "What got me interested in studying theoretical physics in particular was the idea that you could study structures or ways of doing calculations that would enable you to make predictions or derive results that just wouldn't have been possible with previous approaches," he says.

Foster, who refers to himself as "extremely Midwestern," grew up in Indianapolis, attended Indiana University as an undergraduate, and the University of Michigan for his PhD. He joined MIT as a Pappalardo Fellow in the Center for Theoretical Physics, then Fermilab as a Schramm Fellow in Theoretical Astrophysics. In August 2025, he joined the UW–Madison physics faculty.

Please give an overview of your research.

I'm generally interested in problems that surround: 1) the optimal design of an astrophysical observation or a laboratory-based experiment, 2) serious phenomenological calculations that give us a good understanding of what a signal of new physics might look like, and 3) the application of statistics and data analysis to determine if new Physics signals were hiding in data that was accessible to us all along.

My primary interest, at least historically, has been in dark matter. At present, all we can really say is that 85 percent of the matter of our universe is yet to be identified, so it seems like a rather urgent problem to understand what that is. It also seems to be one of the few unambiguous hints of new physics. My research is generally focused on what often is referred to as indirect and direct detection. The idea behind indirect detection — meaning that dark matter or other signals of new physics might appear to us in astrophysical datasets — is that although it might be challenging to directly observe dark matter or new physics phenomena, we might be able to observe its downstream effects in astrophysical contexts. For example, dark matter could be made up of particles that annihilate when they encounter one another, and doing so produces gamma-ray signals. Or, dark matter could convert to photons in extreme astrophysical environments, producing radio signals. I've been thinking a lot about how to perform optimal searches in radio data in the search of that data. Another possibility is, we say, okay, these systems are interesting but complicated and intrinsically messy. Then we might alternatively look for dark matter interactions with precision laboratory systems. That's the two-pronged big picture: looking for new physics in astrophysical observables and looking for physics in laboratory-based searches.

Then lately I've been thinking quite a bit about gravitational waves, which I find exciting because they might let us probe the mysterious early universe. We typically look back in time by looking at photons that are coming to us from a very, very long time ago. There's a certain time we can't look past, which is when the universe was too opaque to photons, but gravitational waves should have freely propagated through the universe, providing us with a way of looking even further back in time. It might be our best chance at understanding the physics of the very highest scales that would have been active in the early universe.

What are the first one or two projects your new group will work on here?

A major focus of my research going forward will be on detection strategies for gravitational waves. One exciting possibility that I've been studying recently is that the roughly 60 years of lunar laser ranging data — high precision

Prof. Joshua Foster

measurements of the Earth-Moon distance — could be used to detect gravitational wave backgrounds at frequencies that have been challenging to access by other technologies. In tandem, it's nice to understand what the new physics theories are that can generate gravitational wave signals, either at the frequencies that we can access with lunar laser ranging or at the frequencies that are being accessed currently by, for example, pulsar timing arrays, but might also be accessed in the future by the upcoming LISA observatory. And so really understanding how to make optimal use of the data that these observatories are collecting and how to connect them with new ideas for how models of new physics can generate gravitational wave observations is something that I plan to focus on.

In conjunction, I am looking for radio signals of axions, which convert to photons in the strong magnetic fields which surround neutron stars. The facilities and technologies through which we can perform radio observations are constantly being improved and eventually are going to culminate in two upcoming observatories: DSA-2000 and the Square Kilometer Array. As we prepare for these upcoming facilities, there are both prototypes and pathfinder observatories that are collecting data right now. So I'm interested in using those existing datasets, first off, to perform searches that are already going to have reach unparalleled by any others, and to set the stage for future data collections and analysis efforts with these upgraded facilities.

What attracted you to Madison and the university?

Well, having begun this conversation by saying I'm very Midwest — I wanted to come back to the Midwest. And the department here has people with a broad set of expertise in many different technical fields that are all of interest to me. For example, in these contexts where I'm thinking about axion-photon interactions around neutron stars, the great challenge is understanding this complicated astrophysical environment. Here, there are experts in plasma physics, and there's WIPAC, which is this incredible particle astrophysics center. The connections across campus in terms of the emerging data science focus also made me feel like this was a place where I would have colleagues with strong overlapping interests.

What is your favorite element and/or elementary particle?

I like helium. We can use helium-3 and helium-4 to make things very, very cold, and many of the experiments that I like to think about require extraordinarily cold systems to minimize thermal noise. They are only possible thanks to dilution refrigerators that pump helium in a manner that allows it to reach temperatures as low as 10 millikelvin. And helium-3 has a number of other, to my mind at least, magic quantum properties. The number of interesting things that you can do with helium-3 seems to be limited only by your imagination.

My favorite particle is the axion. It's my favorite dark matter candidate. And it might not exist in nature, but it is my favorite hypothetical particle. I hope it exists and that we find it.

What hobbies and interests do you have?

Cooking is my primary hobby. I like to eat—that's part of it. But one of the joys of cooking is that you get to spend time on a craft. You can develop a skill and expertise, and you can measure your progress over time, and at the end of it, you eat the thing that you made, and then move forward with your life unburdened by your act of creation. So it's also very low stakes. Other than cooking, I like to hike and I like to read.

Welcome, Professor Jakob Moritz!

String theorist looks for equations and solutions that better match the Universe we observe

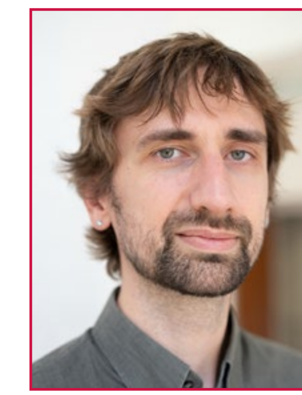
String theorist Jakob Moritz joined the faculty as an assistant professor of physics in January. He joins us from CERN where he had been a postdoc for just over a year. Previously, he was a postdoc for four years at Cornell University, and before that, he earned his PhD from the University of Hamburg and DESY.

Please give an overview of your research.

I work on string theory, a theoretical framework for quantum gravity. It is the only known approach that consistently combines quantum mechanics and Einstein's theory of gravity. Physicists have struggled for decades to reconcile these two fundamental theories, and string theory achieves this unification. Sometimes called "the theory of everything," string theory addresses physical phenomena at arbitrarily high energies. While the nickname may sound a bit grandiose, it highlights the theory's incredible scope.

However, while the field equations of string theory have solutions that are relatively easy to study, these don't resemble our universe. My research focuses on going beyond these "easy" solutions to find ones that better match the universe we observe. By doing so, I aim to uncover insights into the origins of the peculiar laws of physics governing our universe.

Something that I find particularly interesting is dimensionless constants of nature. These constants are significant because they are independent of a choice of units. For example, the ratio of the electron's mass to the top quark's mass is a dimensionless number — about 0.000003, which is remarkably small! There are many such constants whose values are determined experi-



Prof. Jakob Moritz

mentally, yet we lack a theoretical explanation for them.

In the early 20th century, particle physicists didn't focus much on questions like, "Why are the constants of nature what they are, and not something else?" But with string theory, we can begin to address this. My work seeks to identify solutions of string theory in which these numbers align with experimental values. Another well-known example is the energy density of the vacuum, or dark energy. Despite being the dominant energy source in the universe today, dark energy is extraordinarily small in natural units — just 10^{-120} when compared to the natural energy scale of quantum gravity. This discrepancy, known as the cosmological constant problem, is something I find deeply intriguing. How can such a small value arise? Why isn't it zero? Similarly, why is the Higgs mass so small? These are the kinds of profound questions I aim to explore through string theory.

What are one or two main projects your group will work on first?

One major project will involve finding the Standard Model of particle physics within string theory. This is something I am already working on, but having more hands on deck would be invaluable. The goal is to "engineer" realistic laws of particle physics — either the Standard Model or something close to it — as solutions of string theory. This work is crucial for addressing the electroweak hierarchy problem: why is the Higgs mass so unnaturally small? Currently, no one has a clear explanation for this.

Technically, this involves a lot of geometry. String theory predicts the existence of extra dimensions, which are both a blessing and a curse. They must be small enough to have remained unobservable, yet they also determine the physical laws we experience at larger scales. Much of our work will focus on understanding these geometries — particularly how certain objects, called branes, wrap around features like circles in these spaces — and calculating the resulting physical laws.

What attracted you to Madison and the university?

I really appreciate the breadth of the theory department here. String theory is a vast field, encompassing topics that range from almost pure mathematics to particle phenomenology. Because my work leans toward the phenomenological side, it intersects with many other areas of theoretical physics, including cosmology, particle physics, and applied mathematics. Being at a large place like Madison, with its diverse and talented faculty, is incredibly exciting.

Additionally, I know that Madison attracts outstanding students who are eager to work on string theory and particle physics. That's something I'm looking forward to as well!

What is your favorite element and or elementary particle?

Neutrinos are cool because they're almost massless. For a long time, they were thought to have zero mass, as predicted by the Standard Model of particle physics. But experiment has revealed otherwise! This discovery hints strongly at new physics at high energies.

What hobbies and interests do you have?

I love music. I play piano and guitar, and music is a big part of my life, especially since my partner is also a musician. I also enjoy sailing. While at Cornell, I spent summers sailing and participated in weekly competitive races, which were incredibly fun. I know that sailing is also a thing here — I look forward to getting back on the water!

Welcome, Professor Mariel Pettee!

Interdisciplinary physicist applies machine learning to high energy physics, astrophysics, and more

Interdisciplinary physicist Mariel Pettee uses techniques grounded in machine learning to study a range of topics that span high energy physics and astrophysics, with an ultimate goal of developing a better understanding of the fundamental physical building blocks of our Universe.

Originally from Dallas, TX, Pettee was a physics and mathematics undergraduate at Harvard University, a master's student in physics at the University of Cambridge, and a PhD student in physics at Yale University. While pursuing a postdoc at Lawrence Berkeley National Lab, she also joined the Flatiron Institute in New York City as a guest researcher. She then joined the UW–Madison physics faculty in August.

Please give an overview of your research.

My background is in high energy physics, and that training has fundamentally shaped the way I approach my work. But over the past several years, I have become more of what you might call a "data physicist" — someone with physics expertise who works at the intersection of physics and data science. In particular, I'm interested in how machine learning can help us do interdisciplinary physics research and make discoveries using massive experimental datasets that would otherwise be out of our reach.

On a broad scale, my research touches on high energy particle physics and astrophysics through the lens of machine learning. Some of my work applies recent machine learning techniques to domain-specific problems such as anomaly detection, object re-

Prof. Mariel Pettee

construction, and unfolding. Another part of my work explores core questions in machine learning in areas such as self-supervised learning and likelihood-free inference in a physics-driven way. I'm also interested in developing large-scale foundation models for broader scientific use.

What are one or two main projects you'll have your group focus on first?

The field of scientific foundation models has been rapidly taking shape over the last couple of years, but there are still a lot of open questions to explore. By researching what might make training foundation models on fundamental physics data distinct from training on more common industry-standard data, I think there is significant potential to understand our data more deeply.

I'm interested in simultaneously incorporating information from multiple heterogeneous layers of a detector, e.g. time series, images, and point clouds, as well as across detectors. Early projects in this direction will develop a variety of self-supervised learning strategies on multimodal HEP and astrophysics data to understand how models can simultaneously incorporate many different types of measurements of the same physics objects.

I'm also interested in studying stellar streams, which are remnants of ancient galaxies or globular clusters being absorbed into the Milky Way and serve as interesting tracers of local dark matter. The first step is to simply detect more of them using unsupervised or weakly supervised anomaly detection: trying to learn with no labels or with imperfect or missing labels. We can use machine learning models to automatically detect resonant anomalies in data, and stellar streams emerge as resonant anomalies in velocity space due to their constituents' shared origin.

I'm optimistic that we will also eventually be able to use aggregate stream information to better map local dark matter substructure. Beyond their immediate physics use cases, streams can also serve as a nice testbed for understanding the limits of domain transfer for foundation models due to their resonant properties: perhaps particle physics data, with its 3D point cloud structure and "bump"-like anomalies, has more shared information with streams from the perspective of a foundation model than one might initially expect.

What attracted you to Madison and the university?

I felt a strong fit with Madison and the university from my first visit. I think that's a combination of the general spirit of the department, how warm and open it felt, and how much I admired the researchers that I met when I was here. Also, the nature of the position that I was offered gave me the kind of flexibility that I dreamed of — to work and move between these spaces of high energy physics, astrophysics, and machine learning with a lot of freedom.

What is your favorite element and/or elementary particle?

Well, I have to pick a particle! I got into physics because of the Higgs boson. I started my physics career as an undergraduate at CERN on July 1st, 2012, and then the discovery of the Higgs boson was announced three days later. So I think I have the Higgs to thank for really getting me energized about this field. Waking up so early that morning, witnessing those presentations, seeing hundreds of people buzzing with excitement, scribbling on chalkboards, popping champagne corks — it made me feel like I was in the center of the universe.

What hobbies and interests do you have?

I love the performing arts of all kinds—contemporary dance, theater, music. I'm a dancer, choreographer, and occasional actor and director. I'm also an amateur birdwatcher.

Welcome, Professor Josiah Sinclair!

AMO physicist looks to build a better quantum computer modularly, by linking smaller systems via photons and optical fibers

When he was young, UW–Madison assistant professor Josiah Sinclair wanted to be a scientist-inventor when he grew up. In high school, he would ask questions in biology and chemistry classes that his teachers said were really physics questions. So, when he began his undergrad at Calvin University, he majored in physics, believing that experimental physics would be at the intersection of his interests. In the end, it was quantum physics that really fascinated him, motivating him to complete a PhD in experimental quantum optics and atomic physics at the University of Toronto. He says, "The ethos of my PhD group was this idea that with modern technology, maybe we can invent an apparatus that can reproduce the essential elements of this or that classic thought experiment and learn something new." After completing a postdoc at MIT, Sinclair joined the UW–Madison physics department as an assistant professor in August, where he will tinker in the lab as an experimental quantum physicist, and just maybe invent a new kind of neutral atom quantum computer.

Please give an overview of your research.

There's a global race underway to build a quantum computer—a machine that operates according to the laws of quantum mechanics and uses an entirely different, more powerful kind of logic to solve certain problems exponentially faster than any classical computer can. Quantum computers won't solve all problems, but there's

Prof. Josiah Sinclair

strong confidence they'll solve some very important ones. Moreover, as we build them, we're likely to discover new applications we can't yet imagine.

The approach my group focuses on uses arrays of single neutral atoms as qubits. Right now, the central challenge in practical quantum computing is how to scale up quantum processors without compromising their quality. Today's atom-array quantum computers are remarkable, hand-built systems that have reached hundreds or even thousands of qubits in recent years—a truly impressive feat and possible in part due to pioneering work done right here in Madison. However, as these systems grow larger, we're hitting fundamental size limits that call for new strategies.

My lab is working to develop modular interconnects for neutral-atom quantum computers. Instead of trying to build a single massive machine, we aim to link multiple smaller systems together using single photons traveling through optical fibers. The challenge is that single photons are easily misplaced, so to make this work, we need to develop the most efficient atom–photon interfaces ever built—pushing the limits of our ability to control the interaction between one atom and one photon.

Once we get these quantum links working, we'll have realized the essential building block for a truly scalable quantum computer and maybe someday the quantum internet. Beyond computing, these technologies could also enable new kinds of distributed quantum sensors, where multiple quantum systems work together to detect extremely faint signals spread across a large area, like photons arriving from distant planets.

What are the one or two main projects your new group will work on?

Our main focus will be to build two neutral atom quantum processors in adjacent rooms and link them together with an optical fiber. This project will teach us how to integrate highly efficient photonic interfaces—such as optical cavities—with atom arrays, and how to precisely control the interactions between atoms and photons. Step by step, we aim to demonstrate atom-photon entanglement and eventually send quantum information back and forth through the fiber.

We're collaborating with a new company called CavilinQ, a Harvard spin-out supported by Argonne National Lab, to integrate a new cavity design with the geometry we want to explore for atom-photon coupling. Because we intend to iterate rapidly on the cavity design, our setup will be built on a precision translation stage, allowing us to easily slide the system in and out and swap out cavity components.

Another project in the lab will focus on developing a new kind of cold-atom quantum sensor. Most current sensors rely on magneto-optical traps, which require bulky electromagnets and impose constraints that limit performance. We plan to explore magnetic-field-free trapping techniques that could lead to simpler, more compact, and ultimately higher-performance quantum sensors.

What attracted you to Madison and the university?

Well, for me professionally, Madison's a powerhouse in atomic physics and quantum computing. There are groups here that have been highly influential since the beginning in developing neutral atoms as a platform for quantum information science. So there's a strong atomic physics community here that has incredible overlap with my research interests, and a thriving broader quantum information community as well. Some people work best in isolation, but that is not who I am, so the prospects of joining this vibrant collaborative environment were very appealing to me.

I also really enjoyed all my interactions with the members of the search committee and other faculty here both during my interview and subsequent visits. On the personal side, my wife's family is all in the Chicago area, so the prospects of being so close to one side of the family were very appealing. We have a 18-month-old daughter, and when we visited, we just had such a positive impression of Madison as a place to have a family and to grow up.

What is your favorite element and/or elementary particle?

It's rubidium. I worked with it in my PhD, I worked with it in my postdoc, and I will work with it again. It's simple. It has one electron in the outer valence shell, which makes it easy to work with. It was one of the first atoms to be laser cooled and one of the first to be Bose condensed, but I think it still has some tricks for us up its sleeve. I believe the first quantum computers are going to be built out of rubidium atoms. Some people (and companies) think we will need a more complicated atom, like strontium or ytterbium, but I think we already have the atom we need—we just need to figure out how to make it work.

What hobbies and interests do you have?

In the last year: spending time with my eighteen-month-old daughter. It's been a special time. I also enjoy photography. I do some photography of research labs, but mostly I do adventure photography. I don't think of myself as a particularly talented photographer, my specialty is more being willing to lug a heavy camera up a mountain. I also really enjoy cycling, rock climbing, reading, and traveling.

Congrats, Professor Mark Rzchowski!

Condensed matter experimentalist and long-time associate chair retired in early 2025

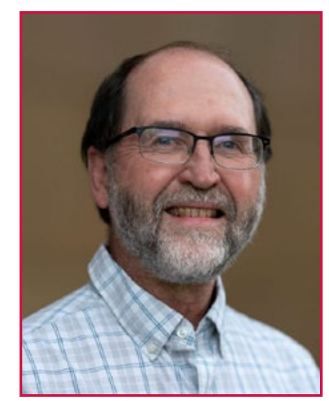
Prof. Mark Rzchowski retired January 17. He is a condensed matter experimentalist who joined the department as an assistant professor in 1992 and has been a full professor since 2004. He served as Associate Chair for Undergraduate Program and Academic Affairs from 2008-10 and again from 2011-24.

When Rzchowski arrived to UW–Madison, high-temperature superconductivity had recently been discovered, and his early research largely centered on that topic, focusing on novel measurements of their fundamental physical properties. He then began collaborating with materials science and engineering professor Chang-Beom Eom, pairing forefront growth and manipulation of crystalline thin films with state-of-the art measurement approaches. Their collaboration resulted in over 70 co-authored papers largely focused on quantum correlations and topologies in complex oxide thin-film materials.

In spintronics, a technology that takes advantage of the intrinsic quantum spin state of an electron to substitute spin currents for the charge currents in "elec"tronics, they developed an all-thin-film membrane-based system that demonstrated an intrinsic coupling between voltage and spin. This helped to address a persistent problem in spintronics, namely better controlling magnetism at the nanoscale: the extreme thinness of the material allows low operating voltages to control the spin properties. In another spintronics study in 2023, Rzchowski and Eom demonstrated uniquely oriented thin films of oxide crystals that controls the natural symmetry of the crystals, allowing them to produce vastly more useful spin currents — a critical step forward in advancing next-gen computer memory devices.

In 2022, Rzchowski was elected a Fellow of the American Physical Society for "pioneering discoveries and understanding of physical principles governing correlated complex materials and interfaces, including superconductors, correlated oxide systems and multiferroic systems, and spin currents in noncollinear antiferromagnets."

Rzchowski provided decades of service to the department, largely in his role as associate chair. He led the redevelopment of several of the large introductory courses, for example hiring course coordinators to provide consistency. He also was largely involved in the overhaul of algebra-based Physics



Prof. Mark Rzchowski

103 and 104, supported by the provost's REACH initiative. REACH is designed to give students as many chances as possible to actively engage with physics principles and ideas, and to collaborate in group settings.

In March 2020, Rzchowski successfully led the transition of every departmental course to all-online instruction when the Covid-19 pandemic abruptly sent everyone off campus, then to hybrid online/in-person instruction as students slowly returned. More recently, he helped leverage what was learned from those semesters into offering the summer session of Physics 103, and, now this year, Physics 104, as fully online courses. These online offerings have more than tripled summer enrollments — both UW–Madison students as well as visiting students.

Rzchowski was also chair of the department's space committee in the early 2000s and oversaw the design of new laboratory and office space in Chamberlin Hall, and the transition from Sterling Hall to Chamberlin.

Adam Malecek and Jason Daley of the College of Engineering contributed to this story

Remembering Professor Paul Quin

Nuclear physicist and innovative instructor passed away in October

Emerit professor of physics Paul Quin passed away on October 9, 2025. He was 84.

Born in Brooklyn, NY in 1941, Quin received his doctorate in physics from the University of Notre Dame, where his thesis work centered on the spectroscopy of the SD-shell nuclei. He joined the nuclear physics group at UW–Madison as a postdoc in 1969, playing a central role in the construction and installation of the new Lamb-Shift polarized ion source. He was also one of three survivors of the 1970 Sterling Hall bombing.

Quin joined the faculty in 1971 and went on to supervise nine students who received doctorates under his guidance. His research focused on the use of polarized beams as a tool for nuclear spectroscopy and his group made numerous important contributions in this field. In addition, Quin was an important player in the many instrumentation development projects that took place in the nuclear physics lab during the 1970s and the early 80s.

Around 1980, Quin began expanding his research focus, moving into the field of weak interactions. In the years that followed, he carried out a variety of interesting and important experiments on β decay of polarized nuclei. These experiments typically involved tests of the conserved-vector-current hypothesis or searches for right-handed currents. In 1986, he and T. Girard published an important paper which described a new and potentially very sensitive technique for detecting right-handed currents in β decay. This new concept, which involves measuring the polarized-nucleus beta

Prof. Paul Quin

asymmetry correlation, became the basis for a number of experiments performed over the subsequent decade in both the U.S. and Europe, with Quin playing a central role in many cases.

Later in his career, Quin continued to work in the area of weak interactions, helping to define the role of various nuclear physics experiments that place constraints on extensions of the standard model.

Quin made many contributions to the teaching mission of the department. In the '80s, he developed new experiments for the Physics 321 lab (electric circuits and electronics) and upgraded existing ones. Towards the end of his teaching career, he taught large intro courses, contributing to the implementation of computer-based labs. Quin was also a staunch supporter of the department's then-new Peer Mentor Tutor Program.

In retirement, Paul was an active participant in many feeding projects for those in need. He was instrumental in securing volunteers and food for the Men's Shelter, The Adopt-a-School program and the Allied Community. In addition he was a long time volunteer for Meals on Wheels. After moving to Maryland to be nearer to his daughter and her family, he was a proud grandparent who enjoyed being with his two grandchildren.

This story was compiled largely from department archives

RESEARCH HIGHLIGHTS

A look back at some key research findings from the past year

Vera C. Rubin Observatory celebrates first images, start of 10-year survey

By Sarah Perdue, Department of Physics

The first images of the greatest cosmic movie ever made were released by the Vera C. Rubin Observatory this past summer, and one of the “directors” was UW–Madison physics professor Keith Bechtol.

It’s a story a decade in the making for Bechtol, who served in a leadership role as the observatory’s System Verification and Validation Scientist and has been part of the international collaboration since 2016. He and his UW–Madison research group have been key players on a team of thousands of people that brought the observatory to the main stage. In 2025, its state-of-the-art telescope started taking the first images of the night sky.

“Rubin Observatory is a confluence of technology that allows us to map the universe faster than we’ve ever been able to before,” Bechtol says. “It will catalog more stars, galaxies, and Solar System objects during the first year of science operations than all previous telescopes combined. We will chronicle how the universe changes over time.”

Space-based telescopes like Hubble and James Webb typically focus on one spot for a prolonged time. In contrast, the ground-based Rubin Observatory, positioned on a mountaintop in Chile, is quickly scanning the sky, taking an image with its 3.2-billion-pixel camera every 40 seconds and collecting 20 terabytes of data each night. The observatory is running the “Legacy Survey of Space and Time,” capturing the entire southern hemisphere sky every three nights over its anticipated 10-year run.

In his role, Bechtol was one of five technical group leaders who organized the observatory’s commissioning effort — the building, implementation, and testing that happens on the way to a fully operating observatory.

Rubin Observatory scientists, including Keith Bechtol (in black t-shirt) react as they view some of the first images produced by the observatory’s camera — the largest digital camera in the world.

Bechtol oversaw the science deliverables of the project. “I gather the evidence to show that all components of Rubin Observatory are working together to produce the most detailed time-lapse view of the cosmos ever made,” he says. “I’ve been responsible for anticipating things that could go wrong and helping to address those challenges, designing observation plans, rehearsing observatory operations, and implementing tests of increasing sophistication as we built the observatory. It’s been many years of preparation to get to this point.”

In April, Rubin Observatory achieved “first photon.” In June, people across the globe celebrated the release of the first images, including a viewing party in Chamberlin Hall.

Bechtol and his group will use the data to probe fundamental questions related to dark matter, dark energy, and the early universe.

“We’re using the whole universe as a laboratory to ask big, open questions about the nature of matter, energy, space, and time. What is the universe made of? How did the universe begin? How will it end?” Bechtol says. “We use measurements of strong and weak gravitational lensing and the clustering of galaxies to study dark energy, as well as so-called ultrafaint galaxies to learn about dark matter.”

Generating attosecond hard X-ray pulses

By Sarah Perdue, Department of Physics

Once only a part of science fiction, lasers are now everyday objects used in research, healthcare and even just for fun. Previously available only in low-energy light, lasers now come in wavelengths from microwaves through X-rays, opening up a range of different downstream applications.

In a study in *Nature*, a team led by UW–Madison scientists generated the shortest hard X-ray pulses to date through the first demonstration of strong lasing phenomena. The resulting pulses can lead to several potential applications, from quantum X-ray optics to visualizing electron motion inside molecules.

“We have observed strong lasing phenomena in inner-shell X-ray lasing and been able to simulate and calculate how it evolves,” says Uwe Bergmann, physics professor at UW–Madison, and senior author on the study.

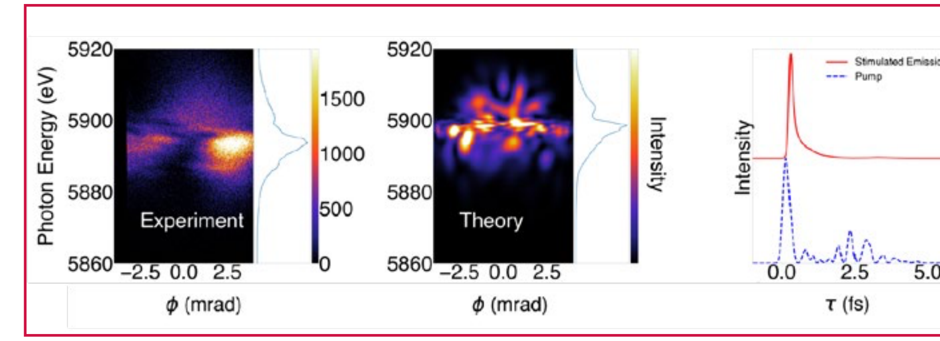
The inner-shell X-ray lasing process is similar as it is in optical lasing, just at much shorter wavelengths. Because inner-shell electrons are tightly held, powerful X-ray pulses, like those from X-ray free-electron lasers (XFEL), are required to excite enough of them simultaneously to result in lasing. In turn, the photons they emit in this process are also at X-ray wavelengths. But XFEL pulses are generally “dirty,” with each pulse really being made of several short, intense spikes in time, and a range of spikes with different wavelengths, limiting some of their applications.

“They’re just not clean, beautiful pulses (like visible lasers),” says Thomas Linker, joint postdoctoral researcher at UW–Madison and the Stanford PULSE Institute at SLAC and lead author of the study. “But it’s the only thing we have.”

Here, the researchers tightly focused XFEL pulses onto a sample made of copper or manganese. The input pulse is still dirty, but very short and incredibly powerful: the equivalent of focusing all the sunlight that hits the Earth into one square millimeter. The emitted X-ray photons hit instrumentation that disperses them by wavelength, much like a prism disperses visible light into a rainbow, reflects it based on its angle, then is read by a detector.

Their results show that emitted light contained all of the expected wavelengths, but spatially, it showed a few hotspots instead of the expected smooth signal. Applying a 3D simulation, Linker calculated that the emitted X-rays underwent filamentation, a strong lasing phenomenon.

When they further increased the intensity of the input pulse, they saw another unexpected result: instead of seeing hotspots of one wavelength, they observed spectral broadening and sometimes multiple spectral lines. They ran the simulation on this new data and realized that this result can only be explained by another lasing phenomenon called Rabi cycling, where the pulse is so strong that the sample will cyclically absorb photons and emit them by stimulated emission. They used their simulation to plot the emitted pulse intensity over time and found that their dirty input pulses resulted in extremely short stimulated emission pulses — the shortest hard X-ray pulses observed by anyone to date.



The experimental data (left) are used in simulation (center) to plot the emitted pulse intensity over time (right). The dirty input pulse (blue line) resulted in extremely short emission pulses (red line) that were as short as 60-100 attoseconds in length.

“We have generated hard X-ray pulses, 60 to 100 attoseconds in duration, with these strong lasing phenomena,” Linker says.

An attosecond is one quintillionth of a second, and this extremely short pulse duration is what could drive new, advanced LASER applications.

“If you want to see electron dynamics, how they move inside their orbitals, that’s the attosecond timescale,” Linker says.

Adds Bergmann: “There are so many nonlinear technologies and phenomena that the laser community uses now, but very few of those have dared to have been tried with hard X-rays. This work is a step towards pushing the exciting field of real laser science into this powerful hard X-ray regime.”

Simple, cost-effective trapped ion qubit technology developed

By Jason Daley, College of Engineering

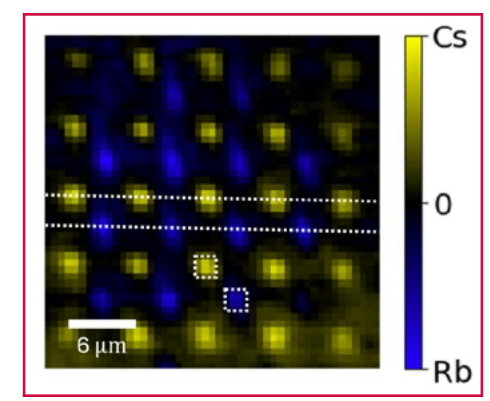
Physics professor Mark Saffman, affiliate professor Mikhail Kats and their groups have developed a simplified but ingenious method for trapping atoms of different species to make quantum bits or qubits, they published in *Science Advances*.

Capturing two types of neutral atoms next to each other, the method creates interleaved grids of cesium and rubidium atoms that can be used as qubits in quantum computing and quantum sensing. The setup is much simpler and cost-effective than previous efforts and is already being used in early-stage quantum devices.

“Other groups have trapped two types of neutral atoms, but their setups are pretty sophisticated, use multiple lasers, and are expensive,” Kats says. “We have demonstrated that you can do this kind of trapping with a single laser and single micro-fabricated mask.”

As quantum computing emerges, there is no clear consensus on which material should be used to make the qubits which are the building blocks of quantum computers. Researchers are looking into qubits made of superconductors, diamond, trapped ions, and other specialized materials. But one relatively scalable qubit candidate is neutral atoms — those, like rubidium and cesium, that have a net zero electrical charge — that can be isolated, or “trapped,” using lasers.

All qubits are sensitive to their environment and need to stay as isolated from the outside world as possible so they maintain their quantum state: external influences can cause them to “decohere” and lose information. However, when the time is right, otherwise well-isolated qubits need to be able to interact with each other and with external inputs.



Filtered laser light leads to interleaved grids of cesium and rubidium atoms.

Trapping two types of neutral atoms next to each other is a promising approach to these seemingly contradictory requirements for components of quantum computers and quantum sensors. To isolate two types of atoms in the same space, the team fabricated a specialized optical mask using ultrathin layers of gold and the semiconductor germanium.

Sending a specific frequency range of laser light through this semitransparent mask divides it into a pattern of bright, dark, and intermediate areas, which interact to form the traps. The researchers filter and demagnify the light pattern before it enters a vacuum cell filled with cesium and rubidium atoms. Rubidium is attracted to the areas with high electromagnetic field, called bright traps. Conversely, the cesium migrates into the dark traps. The result is two sets of neutral atoms in distinct patterns in close proximity to each other.

These interleaved patterns of atoms can then be used for computing; one set of undisturbed atoms is for computation while the other set communicates commands and information with users. The atoms can also be used for sensing, with one set of atoms interacting with and collecting data from the environment while the other set records and processes the signals.

FACULTY AWARDS & HONORS

Professor Mark Saffman won the American Physical Society's 2026 Norman F. Ramsey Prize in Atomic, Molecular, and Optical Physics, and in Precision Tests of Fundamental Laws and Symmetries, for "seminal developments of quantum information processing with neutral atoms that allow the investigation of many-body problems that are intractable by classical computing."

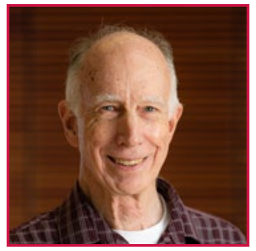
Mark Saffman

This career-spanning award recognizes his demonstration of the first neutral atom CNOT logic gate and the first quantum algorithm run on a neutral atom quantum computer.

Professor Deniz Yavuz was elected a Fellow of the American Physical Society. He was nominated by the Division of Atomic, Molecular & Optical Physics (DAMOP) and elected "for outstanding experimental and theoretical contributions to nanoscale localization of atoms with electromagnetically induced transparency and collective radiation effects in atomic ensembles."

Deniz Yavuz

Professor Dan McCammon won the Distinguished Career Award from the American Astronomical Society's (AAS) High Energy Astrophysics Division (HEAD) for his pioneering work on the development of microcalorimeters that has led to breakthroughs in X-ray astronomy and on soft diffuse X-ray background.



Dan McCammon

Four junior faculty earned early career awards: Profs. Matt Otten, Roman Kuzmin, Tiancheng Song, and Vladimir Zhdankin.

Otten earned an Air Force Young Investigator Research Program (YIP) award, offered through the Air Force Office of Scientific Research. The program intends to support early-career scientists and engineers who show exceptional ability and promise for conducting basic research. The three-year award will fund a postdoctoral fellow in Otten's group, who will work on quantum characterization, verification, and validation (QCVV) of quantum computers in an effort to engineer better systems.

Matt Otten

Kuzmin was selected for an NSF CAREER award. The five-year award will support his group's research on understanding fluxonium qubits and how their properties can be used to simulate the collective behavior of quantum materials. The Faculty Early Career Development (CAREER) Program is an NSF-wide activity that offers the Foundation's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education.

Roman Kuzmin

Song and Zhdankin earned Department of Energy Early Career awards. For Song, the five-year award will fund his research on improving superconductors made from two-dimensional (2D) materials for next-generation quantum devices. Zhdankin will use the five-year award to fund his research on energy and entropy in collisionless, turbulent plasmas.

Tiancheng Song

Finally, congratulations to the four faculty who earned tenure and/or promotion this year: Prof. Ke Fang was promoted to associate professor with tenure; **Prof. Justin Vandenbroucke** was promoted to full professor; and **Profs. Dan Hooper and Britton Plourde**, who joined the department as full professors, were both awarded tenure.

Vladimir Zhdankin

A team of 13,508 scientists, including over 100 from our department, won the 2025 Breakthrough Prize in Fundamental Physics. The Prize recognized work conducted at CERN's Large Hadron Collider (LHC) between 2015 and 2024. The Breakthrough Prize was created to celebrate the wonders of our scientific age. The $3 million prize will be donated to the CERN & Society Foundation, which offers financial support to doctoral students to conduct research at CERN. Four LHC projects were awarded, including ATLAS and CMS, both of which UW–Madison scientists work on.

The Physics of Sports

By Francesca Smith

Students who signed up for a course about the physics of sports probably did not expect to take a field trip to the Kohler Art Library at the beginning of the semester. But the unexpected is the norm with Jim Reardon, the instructor for Physics 106: Physics of Sports. While many science courses on campus consist largely of memorizing equations and staying ahead of the class curve, Reardon takes a multifaceted, participatory approach to teaching his students.

"You're trying to put on a show that grabs their attention and effortlessly keeps it because you're presenting a spectacle, like a movie," Reardon says. "You don't have to force yourself to pay attention to something that's inherently interesting, it just sort of naturally goes there."

At the library, Reardon has students flip through a first-edition copy of Eadweard Muybridge's Animal Locomotion from 1887, which shows phases of movement through photo sequences. Motion — so fundamental a concept to physics that Isaac Newton developed a set of laws around it — is commonly taught using a quantitative approach. Reardon uses Muybridge's images to illustrate the concept of motion in a more intuitive way.

Reardon first developed Physics 106 with the help of fellow UW–Madison physics professor Cary Forest. The two were inspired by a similar course taught by one of Forest's colleagues at UC Irvine, which was a favorite among students there. Physics of Sports was first taught at UW–Madison in Spring 2023, and initially resulted in 36 student enrollments. Now, three years later, course registration numbers have skyrocketed to approximately 300 undergraduates.

Everyone is an expert in torque even if they don't know it yet, says Jim Reardon. Reardon (right, with teaching specialist Mitch McNanna PhD'23), uses familiar concepts — like a seesaw that most students played on at some point in their childhood — to illustrate physics topics such as torque.

While the course's theme attracts sports fans, Reardon's unique methods of teaching also resonate with students, especially those intimidated by the idea of taking a college-level physics course. He follows a hands-on approach to teaching, where students are encouraged to, for example, run and jump in front of the classroom to demonstrate momentum. Field trips such as the aforementioned visit to the Kohler Art Library are also common in the course. Reardon used to work with The Wonders of Physics — the physics department's educational outreach program — and noticed how audiences responded better to participation compared to lectures alone.

'The Horse in Motion,' from Eadweard Muybridge's series on 'Animal Locomotion,' shows a visual way to calculate the physics of motion, including velocity and acceleration.

The course model also emphasizes lots of extra credit opportunities, which offer students a chance to improve their grades through additional work. If a student performs poorly on an exam, for instance, they then have the option to redeem their grade on the exam by demonstrating mastery of concepts they missed. In that sense, Reardon also uses Physics 106 to broaden the traditional standards of technical education. He points out that it's as if students, when they were young, were divided into black-and-white categories of "good" and "bad" at math, which affects the confidence and success of students later on.

"And then we, at the college level, have to deal with that," Reardon says. "Many of them I think would be quite successful, if they only didn't have these mental blocks left from earlier."

By utilizing a topic — sports such as baseball, basketball, football and more — that students find engaging, he can use this initial interest to help teach them about fundamental physics concepts such as impulse and energy. In that sense, Reardon seems to be his own kind of coach for the students in Physics 106: Physics of Sports. He considers an individual student's success a team win, through a joint effort on their end and his.

A fire tornado shows the link between oxygen consumption and energy burned as exercise intensity increases.

"If I'm engaged to teach these students physics, then they're going to get taught physics," Reardon says. "So it takes a lot of extra work for me, but I do feel that there are a lot of gains to be made, too."

Francesca Smith is a communications intern with the Department of Physics

BOARD OF VISITORS UPDATES

Driving the Future: The Vital Role of the Physics Board of Visitors

By Bill Nichols, BoV Chair

If you've considered supporting the Department of Physics, then the Physics Board of Visitors (BoV) wants you! This invitation highlights the crucial and engaging opportunities available to friends and alumni of the department. The BoV, an independent council of dedicated supporters, meets biannually to advise on matters of importance. It serves as a critical bridge between the department's academic mission and the broader community, helping to steer its future and to enhance its impact.

A Comprehensive Mission

The BoV operates under a formal charge to champion the Department of Physics from every angle. Its core responsibilities are comprehensive: serving as ambassadors to increase public awareness of the department's achievements, assisting in fundraising efforts, and advocating for its interests.

Beyond advocacy, the board provides high-level strategic advice. This includes advising on optimizing the impact of the department's research activities and helping to assess the societal impact of new research directions. The BoV is also directly committed to the student body, providing mentoring, networking opportunities, and career assistance to undergraduates, graduate students, and post-doctoral associates.

BoV members actively explore cutting-edge physics research.

Current Initiatives: Enhancing Prestige and Building Pipelines

The BoV's current broad emphasis is on enhancing the department's long-term prestige. A key component of this strategy is supporting the growth of the faculty which, thanks to the support of Letters & Science Dean Eric Wilcots, is approaching historic highs. This growth translates directly into more impactful research, prestigious awards, and successful graduates, building on the department's long history of producing top-tier PhDs for academia, national labs, and industry.

A major recent focus, prompted by Dean Wilcots, is to strengthen the pipeline for undergraduate physics majors seeking employment immediately after their bachelor's degree. While a physics degree and successful programs like AMEP have always provided a strong foundation, the BoV advised on recent changes to the Physics curriculum to make students even more competitive. This new curriculum increases flexibility, allowing students to acquire in-demand skills like computing and large data set analysis. Concurrently, the BoV is identifying and securing summer internships, which are considered vital by many employers.

Our newest initiative is to mitigate today's budget challenges by leveraging the department's key technology thrusts including quantum information systems, fusion research, artificial intelligence, and others, to forge partnerships with industry and government programs. This initiative has just been launched, and we are actively soliciting new members to help bring it to fruition.

The Adventures of the Board

Service on the BoV is not just hard work; it is also an intellectual adventure. Members satisfy their own curiosity at every meeting with research presentations from students and faculty, offering a front-row seat to the department's cutting-edge work.

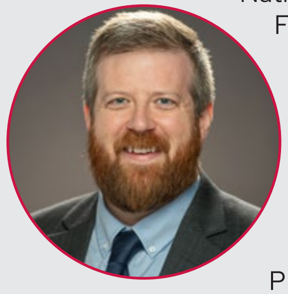
The Physics and Astronomy Boards of Visitors took a tour of Fermilab in October.

The role also includes field trips to some of the world's most advanced research facilities. This fall, we joined the Astronomy BoV for a daylong tour of Fermilab. In the recent past, BoV members have visited CERN in Geneva, Switzerland; Lawrence Berkley National Laboratory in California; and the Physical Science Laboratory in Stoughton, Wisconsin—home of the WHAM plasma fusion device and where IceCube's Digital Optical Modules are made.

Please consider joining the BoV not only to assist the Department of Physics in defining and achieving its goals, but also to have privileged access to leading-edge research, intellectual stimulation, and tours of some of the most famous and awe-inspiring physics laboratories in the world.

Welcome, new BoV members!

William Cottrell earned his PhD in theoretical physics at UW–Madison in 2017 with research touching upon various topics in gauge-gravity duality. Following postdocs at the University of Amsterdam and Stanford, he went on to a career in finance as a quantitative researcher at Jump Trading where he applies machine-learning techniques to construct mid-frequency portfolios. He also teaches a course on crypto currencies at the University of Chicago.



Jeremiah Holzbauer graduated from UW–Madison with an AMEP degree before attending Michigan State for his PhD. At MSU, he discovered particle accelerators and has been working on them ever since. His postdoc at Argonne National Laboratory and 10+ years at Fermi National Accelerator Laboratory have been layering on experience in this deeply applied field, including cryogenic engineering, high power engineering, and precision RF engineering. He is currently a Senior Scientist and Project Manager for about a quarter of the PIP-II Project at FNAL, responsible for delivering ~10 different systems for this major upgrade to the accelerator complex. He is also the lab's lead expert on delicate equipment transport, hazardous material transport, and is lead for the ASPIRE internship. He is a regular instructor at the US Particle Accelerator School.

Jiajun Xu earned his PhD in Theoretical Physics from Cornell University and went on to complete a postdoctoral fellowship at the University of Wisconsin–Madison. Trained in analytical modeling, mathematics, and computer science, he later transitioned into the world of finance, where he applies his interdisciplinary expertise to the complexities of global markets.

Get Involved!

If you are interested in joining our BoV, the best path is to contact your most familiar faculty member in the department (e.g. your former advisor or a colleague). The faculty ultimately approves nominees to the BoV. If you are not yet convinced and require more information, feel free to contact Bill Nichols, BoV Chair, at wjnichols2@wisc.edu.

Distinguished Alumni Awards

Given in recognition of successful careers and the limitless possibilities a physics degree offers, these awards were celebrated at our Awards Banquet in May

Randall Smith, PhD'96

By Prof. Emerit Chun Lin

Randall Smith graduated from Carnegie Mellon University, then came to UW–Madison for his PhD to work with Don Cox. After he graduated, he was a postdoc at the NASA Goddard Space Flight Center before moving to the Harvard Smithsonian Astrophysical Observatory (SAO), where he is currently the Associate Director of High Energy Astrophysics. At SAO, he works on various aspects of X-ray astronomy, and he is particularly famous for his data set in atomic process cross section that proved to be indispensable for analyzing any orbiting observations.

Tao Han, PhD'90

By Prof. Lisa Everett

Tao Han was a graduate student working with Vernon Barger. After graduating, he was a Fermilab Fellow from 1990-93 and then moved to UC-Davis as an assistant professor of physics. He eventually came back to UW–Madison as a tenured faculty member and was our colleague from 1998-2011. In 2011, he moved to the University of Pittsburgh, where he was named the Director of the Pittsburgh Center for Particle Physics, Astrophysics and Cosmology (PITT-PACC), and in 2014, he was named a Distinguished Professor of High Energy Physics. Tao is one of the world-leading physicists in the area where elementary particle physics meets experiment. He is one of the most prominent high energy theorists regarding the physics potential of new collider experiments. Tao is well known for his incredible amount of service to our community: he has been the chair of the Americal Physical Society (APS) Division of Particles and Fields (in 2021), he has been a leader of the Snowmass process for high energy physics planning, and he has led and grown the Phenomenology conferences which of course started in Madison and now continue in Pittsburgh. Tao is an APS Fellow and was elected as a Fellow of the American Association for the Advancement of Science (AAAS) in 2019.

Welcome, Incoming Graduate Students!

PhD students

Angela Abongwa, Ramin Allahverdiyev, Zach Allamon, Sona Baghiyan, Casey Burdett, Roy F. Cruz Candelaria, Nicholas Cutsail, Brandon Friend

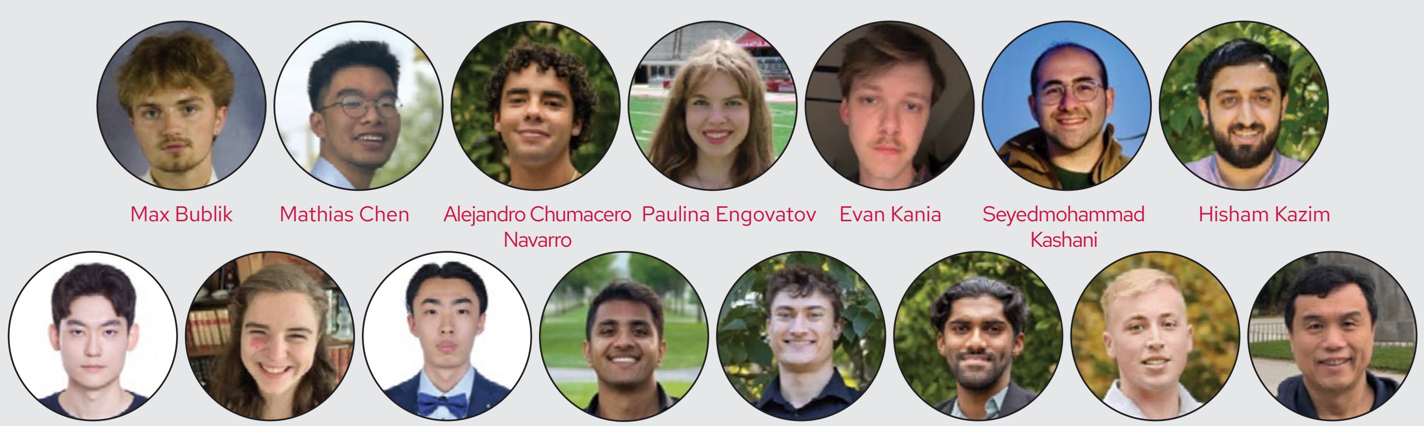
Triet (Tony) Ha, Benjamin Herfray, Aneek Jana, Maggie Ju, Carissa Kiehl, Yuxuan Li, Yi-Jia (Jimmy) Liu

Hongke Lu, Aarav Mande, Amii Matamoros Delgado, Elias Mettner, Julia Nordstrom, Lars Pedersen, Jenna Roderick, Austin Rosypal

Oris Salviano Neto, Evan Sheldon, Connor Sponsler, Sumit Tripathi, Albert Tsai, Jiakai Wang, Rox Wang

Collin Welke, Ben Wellnitz, Nate Woodward, Jianhao Wu, Jiatong Yan, Shi Yan, Songtai You, Junqi Zhang

MSPQC students



Max Bublik, Mathias Chen, Alejandro Chumacero Navarro, Paulina Engovatov, Evan Kania, Seyedmohammad Kashani, Hisham Kazim

Min Kim, Anne Kuckertz, Sheng Liu, Adi Ravi, Jake Strobel, Anish Vallabhaneni, Tyler Walters, Nianqing Wang

No photo available: PhD students Siddhanth Bhowmick, Sean Cameron, Ellen Gates, Aiden Gustafson, Hanse Kim, Zhengwei Zhang; MSPQC students Carlos Alvarez Balladares, Ethan Barry, MJ Diaz Delgado, Salman Iqbal, Haoxuan Mu, Sol Shen, Jacob Thompson

Wonders of Physics Outreach Fellows

Since 2023, The Wonders of Physics Outreach Fellows program has been training graduate students who are interested in and committed to conducting physics outreach. Fellows receive mentoring from the department's public engagement staff and participate in one or more outreach events over the course of the year, from presenting demos at local school STEM nights to starring in The Wonders of Physics Annual Shows. At the end of their Fellowship year, students must document their activities in some way. For example, we now have a repository of detailed activity instructions and best practices for dozens of physics demos available on our website. Some Fellows make sharable videos of their demos; others, like Natalie Hilliard, write about what being an Outreach Fellow means to them.

By Natalie Hilliard, Physics PhD student and Wonders of Physics Outreach Fellow

Natalie with Wisconsin Heights School District students at Summer Science Camp

As we celebrate the 100th birthday of quantum mechanics with the "International Year of Quantum" this year, 2025, we also turn the page to a new chapter of physics as companies and countries race to build the first useful quantum computer. In joining the Otten Group for theoretical quantum information science at the start of this year, I have likewise joined this new chapter of the field. Even with all the excitement, however, as the focus of my study has increasingly narrowed towards my specific niche in quantum computing, I have realized how quickly tunnel vision can set in and obscure the motivation and broader picture for my work. But with the opportunities provided through the Wonders of Physics Outreach Fellowship — and the endless curiosity of the children I worked with — I have reconnected with my own curiosity that first motivated me to pursue quantum physics.

Fellows, including Natalie, left, present demos at science expos like the Wisconsin Science Festival

The opportunities of this fellowship afforded me participation in events of all scales: the physics department's single-day, in-house Physics Fair, the multi-day, campus-wide UW–Madison Science Expeditions expo, and the week-long, single-classroom Summer Science Camp in the nearby Wisconsin Heights school district. Together with the Hybrid Quantum Architectures and Networks (HQAN–an NSF research institute) outreach manager Sarah Parker at these events, I brought quantum physics demos and experiments to the public and into the middle school classroom. In particular, I want to focus on my experiences with the summer camp at Wisconsin Heights. There, Sarah and I co-developed and co-taught the five-day quantum physics unit for middle school students.

At times, matching the level of the material with the students' background proved difficult, but we managed to bridge their understanding with liberal use of analogies and by focusing the content on something familiar — light. By deconstructing the everyday experience of light with diffraction grating spectra and other demonstrations, we introduced quantum concepts like superposition and photons. This new experience of a familiar topic successfully activated that pool of curiosity and thus the subsequent recurrent phrase: "But why?" Channeling the students' questions and refining them into something testable led to my two groups' experiments investigating the following: light mixing with their handmade optical elements, and refraction changes with different liquids and with different source light wavelengths. With our assistance, the students collated their results into a poster presentation for other students and parents.

Reflecting on my role in fostering the students' curiosity with these projects, I realized that I likewise have a responsibility to deliberately cultivate and nurture that same curiosity in myself during my own research. I have since felt reinvigorated when chasing down my own "But why's," and I hope that the momentum I gain from outreach will carry through my early research career. Through the larger outreach events, I have also felt gratitude and a reconnection to the public that supports our scientific endeavors in quantum computing. I hope that I can return the favor with work that will bring us closer to realizing tangible, positive impacts in daily life. Finally, as we turn the page and enter this next 100 years of the field, I look to the future with optimism that our outreach efforts will usher in a broader generation of students who feel welcome to pursue physics and for the transformative advances their own curiosity will bring.

2024-25 Fellows

Alisha Roberts, Benjamin Beyer, Christopher Woolford, Gage Erwin, Isaac Barnhill, Kayleigh Excell, Kyla Martinez, Megan Dalldorf, Natalie Hilliard, Taylor Sussmane

Senior (returning) Fellows

Alicia Mand, Braden Buck, Gavin Chase, Owen Eskandari, Raheem Hashmani, Mason Kennedy, Sam Kramer, Joyce Lin, Mitanshu Thakore

PHYSICS DEGREES AWARDED

Undergraduate Degrees

Fall 2024
Emily Devine
John Marek
Karanvir Singh
Benjamin White
Jiacheng Yan
Jianfeng Ye

Spring 2025
Kalin Ahmad
Andrew Barnes
Zachariah Bath
Ben Biorn
Dylan Bowers
Mikaela Brown
Ella Chevalier
Ian Crawshaw
Joseph De Boom
Haiyue Duan
Carson Ellenwood
Paulina Engovatov
William Griffin
Aiden Gustafson
Tianyang Huang
Charles Jungwirth
Jack Kresich
Joshua Kruger
Luke Lowther
Erica Magee
Nicholas Marston
Quinn Meece
Elias Mettner
Jackson Millin
Jakob Mills
Leah Napiwocki
Coleman Nelson
Dakota Photinos
Corbin Polka
William Pryor
Jaden Radcliff
Jenna Roderick
Isaac Ruder
Tyler Schey
Jake Strobel
Britta Thompson
Tyler Voigts
Patrick Walsh
Nina Weichmann
Collin Welke
Alexander Williamson Junk
Mengtian Yang
Junqi Zhang

Summer 2025
Erik Giese
Joshua Hall
Ruishu Huang
Madison Ludwig
Haoxuan Mu

MA/MS Physics Degrees
Arjav Sharma

MS Physics – Quantum Computing Degrees

Fall 2024
Shoufil Abdul Kareem Subaida
James Fitzwater
Paul Franco
Simeon Ignace
Salizhan Kylychbekov
Scott Lynch
Lucas Rogers
Tyler Schmaltz
Georgia Stricklen
Anosh Ben Asher Wasker
Songtai You

Spring 2025
Nikola Dimitrov
Naga Sai Krishna Vinayswami Kapakayala
Yujiang Pu
Yasif Rahman

Summer 2025
Lucas Anderson
Ben Cramer
Megan Dalldorf
David Pagel
George Simonovich
Jiakai Wang

Doctoral Degrees

Fall 2024
Benjamin Harpt
Advisor: Eriksson

Merritt Losert
Advisor: Friesen

John Podczerwinski
Advisor: Timbie

Avirup Roy
Advisor: McCammon

Victor Shang
Advisor: Bose

Spring 2025
CV Ambarish
Advisor: McCammon

Vedant Basu
Advisor: Karle

Shu-Tian Eu
Advisor: Everett

Zach Huemann
Advisor: McMillan/Dasu

Preston Huft
Advisor: Saffman

Bradley Kumm
Advisor: Egedal/Stechmann

Cody Poole
Advisor: Saffman

Abigail Shearrow
Advisor: McDermott

Summer 2025
Ryan Albosta
Advisor: Brar

Margaret Fortman
Advisor: Brar

Jimena Gonzalez-Lozano
Advisor: Bechtol

David Guevel
Advisor: Fang

Zach Krebs
Advisor: Brar

Abhishikth Mallampalli
Advisor: Dasu

Hruday Deepak Malloubhotla
Advisor: Joynt

Rachel Myers
Advisor: Sarff

Jacob Scott
Advisor: Saffman

Emily Shelton
Advisor: Campagnola/Yavuz

Jessie Thwaites
Advisor: Vandenbroucke

2025 AWARDS & SCHOLARSHIPS

GRADUATE AWARDS

Gerald W. & Tui G. Hedstrom Award: Alicia Mand

This award supports graduate students in the Department of Physics. Alicia is currently a third-year PhD student working on the IceCube project. She is preparing to present analysis of her initial project, searching for neutrinos from Supernova 2013ixf, the nearest and brightest supernova in nearly a decade. More generally, Alicia's work involves searching for the sources of neutrinos, which are weakly interacting particles that are difficult to detect.

Robertson Leach Award: Anirudh Yadav

This award assists first year graduate students in the physics department. Anirudh is a graduate of our MS-Quantum Computing program and is now a PhD student working with Deniz Yavuz. Anirudh works on photonic interactions with atomic ensembles. Presently, is working on theoretical investigations of photons in a closed single mode optical cavity interacting with an extended atomic sample. Anirudh has also been investigating the problem of collective atomic oscillations in an open optical cavity and its implications like super-radiance and spatial coherence of the output fluorescence.

Carl & Brynn Anderson Award: Omar Mohamed

This award is made possible through the generosity of physics alum Carl Anderson and his wife, Brynn. It recognizes achievement in scholarship for a physics graduate student. Omar is now a fourth-year PhD student working as a theorist in atomic-based quantum technologies at the interface between experiment and theory. He is also interested in developing theoretical tools for simulating quantum systems. One of Omar's research goals is engineering physical mechanisms to realize protocols useful for quantum computing, sensing, and networking.

Elizabeth Hirschfelder Award: Lekshmi Thulasidharan

This award honors Elizabeth Hirschfelder, who received a PhD in Math in 1930 from UW–Madison. It supports graduate students in physics. Lekshmi's research aims to uncover the Milky Way's mass assembly history by decoding observable imprints of major mergers and interactions with satellite dwarf galaxies. By integrating data from astrometric surveys and spectroscopic catalogs, her work aims to provide new insights into the dynamics and evolution of our galaxy. Lekshmi's thesis research tackles pressing questions about the Milky Way's structure, including the vertical oscillations of the stellar disk, its merging history, and the warp of its stellar and gaseous components.

James Nelson Humphrey Award: Jaglul Hasan

James Nelson Humphrey received his Master's degree in Physics from UW–Madison. He went on to work at the United States Naval Ordnance Laboratory and the University of Maryland, College Park. Jaglul completed his PhD this past summer. His research portfolio includes work on quantum criticality in correlated materials, topology in superconducting devices, and non-reciprocity in quantum transport. Jaglul's doctoral research was in theoretical condensed matter physics, mostly in superconductivity.

TEACHING ASSISTANT AWARDS

Joseph R. Dillinger Award for Teaching Excellence
Ricardo Ximenes

Best TA Spring 2024
Sam Kramer

Best TA Fall 2024
Mason Kennedy

Rookie of the Year
Benjamin Beyer

Outstanding Undergraduate Assistant
Val Díaz Moreno

UNDERGRADUATE AWARDS

Maritza Stapanian Crabtree Scholarship: Maire Lucero

This award honors the late Maritza Stapanian Crabtree, a graduate of UW–Madison, to offer talented young people a chance to follow their dreams. Maire is now a second-year physics major and honors student interested in spectroscopy, optics, and acoustics. She has been involved in STEM outreach as part of the Wonders of Physics Scholars Program. Maire has also engaged with Geneva Lakes Astrophysics and STEAM, where she designed low-vision accessible educational tools to help teach students about the electromagnetic spectrum.

Bernice Durand Research Scholarship: Ruben Aguiló Schuurs

This award was established by late Professor Bernice Durand to promote meaningful undergraduate research and to support undergraduate majors in the Departments of Physics and Astronomy. Ruben is a third year physics and computer science major. He joined Mark Saffman's lab where he has been exploring the experimental and engineering complexities of neutral-atom quantum computing. Ruben has recently authored a proposal to implement feedforward optical phase noise cancellation for the lab's 1-photon 632 nm laser as an addition to traditional feedback error correction mechanisms.

Hagengruber Scholarship: Nathan Wagner

The Hagengruber Scholarship was established by Madison alum Roger Hagengruber in gratitude to the Department of Physics for providing opportunities to fund his education while in school. Nathan is a third year student majoring in Physics and Mathematics interested in Atomic, Molecular and Optical physics (AMO). Nathan has done research in both high energy physics and computationally-based applied physics. Nathan was previously awarded the prestigious Goldwater Scholarship for his academic and research accomplishments.

Liebenberg Family Scholarship: Elias Mettner

This scholarship opportunity was initiated by Maude Sachtjen Liebenberg who was a 1928 graduate of UW–Madison. Her husband, Rex, was also a Wisconsin graduate. As a UW–Madison physics undergrad, Elias spent most of his time here as a member of the CMS group, conducting research around the Cool Copper Collider. He contributed toward developing the next particle collider, helping conduct early background studies on a possible design that would begin development after 2030. He continued in the department this fall as a PhD student and continues his work on CMS and aiding in the design and planning of future colliders.

Jean M. and Gene M. Bernstein Scholarship: Christopher Fan

This award honors the donors' parents, Jean and Gene Bernstein, and honors undergraduate students in the physics department. Christopher is a physics major and honors student. He is interested in quantum computation, where he works on building a quantum analog device to perform quantum state tomography. He also works with plasma and astrophysics, where he studies the instability of magnetized fluids. Christopher aims to pursue a Physics PhD someday and become a professor and research lead for his own group.

Thaxton Fellows: Zijun He, Alyssa Jankowski, William Jarvis, and Jeana Kim-Bolt

The Hubert Mack Thaxton Fellowship, named after Dr. Thaxton, MA '36, PhD '38, seeks to provide more equitable access to physics research experiences for undergraduates and high school students in related fields. Thaxton Fellows collaborate with a faculty mentor in the department on a research project aligned with the students' interests.

INGERSOLL AWARDS

Ingersoll Prizes are awarded to students who have done the best work in undergraduate courses

Physics 247
Spring 2024
Peter Sellwood

Physics 247
Fall 2024
Rui Wang

Physics 248
Spring 2024
Nico Chou

Physics 248
Fall 2024
Chris Pate

Physics 249
Spring 2024
M Clark

Physics 249
Fall 2024
Lindsey Hmielewski

OTHER STUDENT AWARDS & HONORS

PhD student **Gage Erwin** was named a U.S. Department of Energy Computational Science Graduate Fellow. The 2025-2026 incoming fellows will learn to apply high-performance computing (HPC) to research in disciplines including machine learning, quantum computing, chemistry, astrophysics, computational biology, energy, engineering and applied mathematics.

PhD students **Sam Kramer**, **Michelle Marrero Garcia**, and **Isaac Barnhill** were named to this year's L&S Teaching Mentors program. These mentors are the heart of L&S's Teaching Assistant (TA) Trainings. They are exceptionally passionate and knowledgeable teachers with proven track records for teaching excellence who work closely with the L&S TA Training and Support Team to facilitate various trainings and mentor L&S TAs. Kramer and Marrero Garcia earned Lead Teaching Mentor designation, meaning that they have served as Teaching Mentors more than once and are taking on an additional leadership role within the program.

The Astronaut Scholarship Foundation named undergraduate physics and math major **Nathan Wagner** to its 2025 class of Astronaut Scholars. ASF's Astronaut Scholarship is offered to junior and senior-year college students pursuing degrees in STEM. This year, a total of 74 undergraduate students from 51 universities and colleges across the United States were selected.

Physics, astronomy-physics, mathematics and French major **Caleb Youngwerth** won the Meeting Award for Undergraduate Student Posters at the Fall 2024 meeting of the Eastern Great Lakes Section of APS. His poster presented work conducted in the chemical and biological engineering group of Prof. Rose Cersonsky.

PhD student **Omar Nagib** won first place at the Wisconsin Quantum Institute's Best Student Paper competition.

Four physics majors have earned 2025 Hilldale Fellowships. They are: **Ruben Aguiló Schuurs**, computer sciences and physics major, working with Prof. Mark Saffman (Physics); **Zijian Hao**, astronomy-physics and physics major, working with Prof. Paul Terry (Physics); **Nathaniel Tanglin**, astronomy-physics and physics major, working with Prof. Elena D'Onghia (Astronomy); and **Michael Zhao**, AMEP and physics major, working with Prof. Saverio Spagnolie (Mathematics). Additionally, Qing Huang, a data science, information science, and statistics major working with Prof. Gary Shiu (Physics) also earned an award. The Hilldale Undergraduate/Faculty Research Fellowship provides research training and support to undergraduates. Students have the opportunity to undertake their own independent research project under the mentorship of UW–Madison faculty or research/instructional academic staff.

PhD students **Mason Austin, Isaac Barnhill, Mason Kennedy, Puxin Liu, and R. Sassella** were awarded Graduate Assistance in Areas of National Need (GAANN) fellowships. These department-administered U.S. Department of Education fellowships support students who are committed to contributing to physics research in critical national priority areas while developing skills that will make them effective teachers and educators.

Staff Awards

Bill Foster, an instrument maker in the department's machine shop, was honored with a 2025 University Staff Recognition Award.

John Wallace, an instrumentation engineer with the plasma group, was awarded the department's annual George Ott Staff Award.

Alumni Updates

Michael Procario, PhD'86, is retiring after 25 years at the Department of Energy with the Office of High Energy Physics, where he has been overseeing the construction of major high energy physics projects for the last 15 years. He has contrubted to LBNF/DUNE, PIP II, the U.S. contributions to the LHC accelerator and the ATLAS and CMS detectors, LSST camera for Rubin Observatory, the Dark Energy Spectroscopic Instrument, the Mu2e and muon g-2 experiments, the NOvA and Daya Bay experiments, as well LZ and SuperCDMS dark matter experiments. Before becoming the Director of the Scientific Facilities and Projects Division, he handled university grants for several years and was the HEP program manager for Fermi National Accelerator Laboratory.

David Rainwater, PhD'99, is currently an engineer with Boeing, leading an interdisciplinary product team developing, testing and integrating next-generation navigation technologies.

Samuel Hurley '08, PhD has joined the faculty of the UW–Madison Department of Radiology.

Jason Breitweg, PhD'01 is currently a Senior Technical Account Manager with Red Hat in Hamburg, Germany.

Quinn Fetterly '21, JD is currently an attorney with the DeKalb County Public Defender in Atlanta, GA. He writes, "I'm still using coding experience from Wisconsin to build tools to help public defenders: cell tower mapping, automated phone services, and A/V evidence transcription programs."

Dhanvi Bharadwaj '24 joined NVIDIA as a Software Intern in their CUDA Math Libraries team after graduating from UW–Madison as a physics major with a data science minor. He writes, "It was a fantastic experience to use my knowledge from Quantum Mechanics and Linear Algebra from my physics and math coursework combined with my software skills from my CS/DS classes. It was also an excellent time to be at NVIDIA as we became the largest company by market cap." He is now a computer science and engineering PhD student at the University of Michigan, where his research interests revolve around quantum computing architecture, HPC and their integration for effecient simulation systems. He was awarded the MICDE 2024 Fellowship to support his research in HPC.

The Power of Planned Giving

Leave a Lasting Impact

By utilizing a variety of gift planning options, you can leave a lasting impact on the Department of Physics and the University of Wisconsin–Madison. From an estate gift to a gift of real estate or a gift from an IRA, you can choose to establish your legacy at Wisconsin through your long-term financial plans and maximize benefits for yourself and the Department.

To learn more about incorporating your future gift into your overall financial, tax, and estate plans, please contact:

Mae Saul, Senior Development Director
(608) 216-6274 or mae.saul@supportuw.org

"If it weren't for my experiences at UW, especially under the mentorship of Albert Erwin, I would not be who I am and where I am today. Those undergraduate and graduate years at UW were some of the best years of my life. Because of that, I want to give back for those who will be tomorrow's trailblazers. The purpose of my planned gift is to fund in perpetuity the Erwin-Durandet Award Fund, a fund I established in memory of Albert Ewrin to support the department's graduate students."

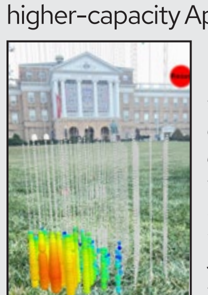
Casey Durandet '89, MS'91, PhD'95

Planned Giving in Practice: The Ray MacDonald Fund for Excellence in Physics

This fund was established as a planned gift by Ray MacDonald MS'75 to promote excellence in all areas of the Department of Physics: research, teaching, and outreach. An annual competition is open only to departmental faculty and staff, making the award rate greater than almost any other funding opportunities. The MacDonald Fund is fully flexible and provides seed funding for research that goes on to secure larger extramural grants and for outreach and teaching activities that are otherwise competing for very limited funds in those areas. Examples include:

Outreach

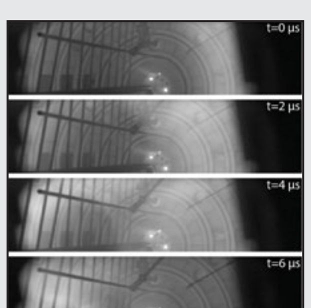
Augmented Reality (AR) lets users immerse themselves into 4D space – perfect for visualizing a high energy neutrino event as if you were in the depths of the IceCube detector or for interacting with the quantum properties of an atom. Prof. Lu Lu has already developed IceCuBEAR, an AR phone app that also works with Microsoft HoloLens goggles. She is using her MacDonald grant to support the current outreach with HoloLens, while also developing it for the higher-capacity Apple Vision Pro platform.



The IceCubeAR app shows visual representations of the patterns of a high-energy neutrino event at the Observatory. Users can receive neutrino alerts in real time, visualize the neutrino interaction in the detector, and see the estimated source direction projected onto a sky map

Research

Plasmas travel fast – up to 100 km/hr – requiring very fast diagnostics to investigate the underlying physics. Prof. Jan Egedal's MacDonald grant provided the balance of funds needed to purchase an ultrafast camera to help diagnose the plasma systems in the lab. The Phantom T3610 allows the plasma physics team to capture movies of visible light emission from the plasma at rates down to nearly 1μs per frame and can visualize much of the large-scale structure better than probes alone.



A magnetic reconnection layer implosion on BRB captured by the ultrafast camera. Brighter areas correspond to emission from the plasma

Student Support

Exploring the theory behind the properties of new superconducting devices such as Josephson diodes, interferometers, and anomalous junctions might only require a computer, pencil, and paper, but the research still requires excellent students. Prof. Alex Levchenko's MacDonald grant supported grad student Jaglul Hasan on an RA appointment as he finished his thesis. With the added flexibility, Hasan was able to explore ideas that weren't initially part of the project, leading to fruitful results that were included in Levchenko's successful NSF grant renewal.

Hasan (left) and Levchenko at the annual department awards banquet

GIFT GIVING GUIDE

PRIORITY FUND: Physics Alumni Graduate Award Fund

Due to uncertainties in funding support, we have an unprecedented demand for a limited number of Teaching Assistant appointments. Your donation will help support doctoral students who need less than one year of funding to complete their degrees, both freeing up assistantships for other students and allowing them to complete their dissertations without the additional demands of TAing.

*Please visit **go.wisc.edu/PhysGradFund** or scan the QR code to give online, or mail in the form on page 24*

OTHER DEPARTMENT FUNDS

UNDERGRADUATE

Fay Ajzenberg-Selove Scholarship Fund

Dr. Maritza Irene Stapanian Crabtree Undergraduate Scholarship Fund

Bernice Durand Undergraduate Research Scholarship Fund

Henry & Eleanor Firminhac Physics Scholarship Fund

Liebenberg Family Scholarship in Physics Fund

Hagengruber Fund

Physics Board of Visitors Undergraduate Research Fund

GRADUATE

Allan M. and Arline B. Paul Physics Fund

Carl and Brynn Anderson Graduate Physics Fund

Cornelius P. and Cynthia C. Browne Endowed Fellowship Fund

Joseph R. Dillinger Teaching Award

Albert R. Erwin, Jr. — Casey M. Durandet Graduate Student Fund

Elizabeth S. Hirschfelder Endowment for Graduate Women in Physics

Karl Guthe Jansky & Alice Knapp Jansky Fellowship Fund

Van Vleck Fellowship

Physics Alumni Graduate Award Fund

Phyllis Jane Fleming Graduate Student Support Fund

Gerald W. and Tui G. Hedstrom Physics Fund for Graduate Support

Robertson Leach Graduate Student Fund

Graduate Student Recruiting Fund

Special Physics Graduate Support Fund (Anderson-Huber Fellowship)

Robert M. St. John Graduate Support Fund

Jeff and Lily Chen Wisconsin Distinguished Graduate Fellowship

Raymond G. and Anne W. Herb Wisconsin Distinguished Graduate Fellowship

GENERAL

The Newton Fund

Barschall Enterprise Fund

Ray MacDonald Fund for Excellence in Physics

Friends of the L.R. Ingersoll Museum Fund

Willy Haeberli Fund for the L.R. Ingersoll Physics Museum

The Wonders of Physics Outreach Fund

George E. Ott Award for Staff in the Department of Physics

David Grainger Physics Library Energy Sources College Fund

Physics Community Building Fund

Jane and Clarence Clay Fund for Chaos and Complex Systems

Physics Research Fund for Quantum Science

Raymond G. and Anne W. Herb Endowment Fund in Physics

L.R. Ingersoll Physics Fund

Dalton D. Schnack Memorial Fund

Atomic Collision Research Fund

Elementary Particle Physics Institute Fund

Quantum Computing Research Center Fund

Thomas G. Rosenmeyer Cosmology Fund

John H. Van Vleck Physics Endowment Fund

ENDOWED FACULTY FUNDS

Bernice Durand Faculty Fellowship in Physics Fund

Martin L. Perl Chair Fund

Dunson K. Cheng Chair in Physics Fund

Carl J. and Brynn B. Anderson Professorship in Physics Fund

Please visit physics.wisc.edu/giving/funds for fund descriptions or to make a secure gift via credit card, Venmo, or PayPal. A mail-in donation form may be found on page 24 of this newsletter.

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☐ Other fund (please write in fund name): ____________________________________

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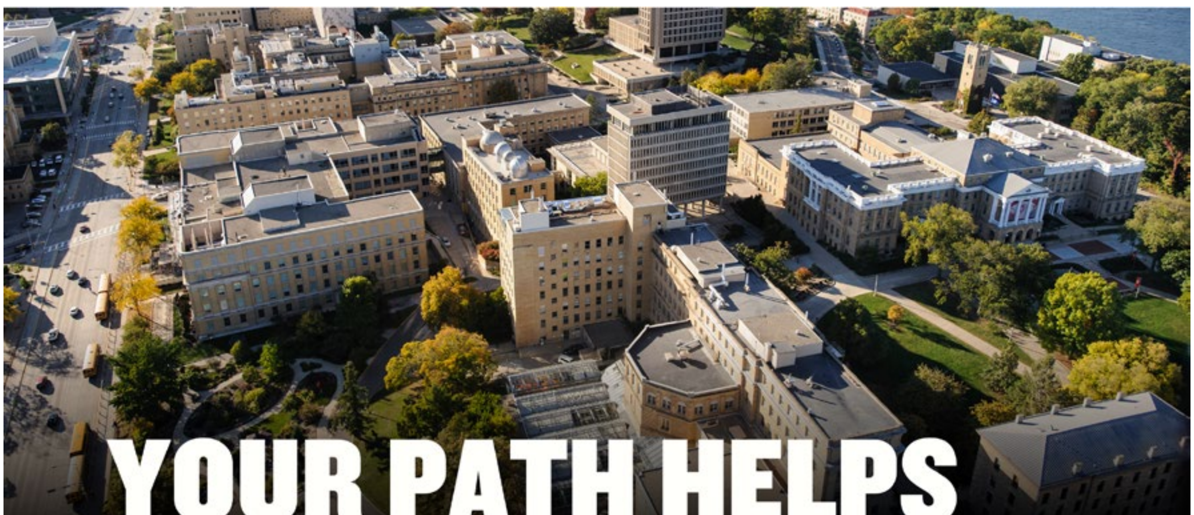

YOUR PATH HELPS PHYSICS STUDENTS FIND THEIRS

UW-Madison Physics alumni are already supporting students through virtual and in-person career mentorship & networking programs like Astronomy & Physics at Work.

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