



UWRF

A tradition of excellence

Physics

Newsletter



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Summer 2024

Sneak Peak into SciTech Physics Spaces

One of the questions we get most from alumni these days is: “How’s the new SciTech building coming along?” Here, we’ll provide an update on the progress so far, along with pictures from inside the building.

With a warm, nearly snow-free winter, the construction firm was able to make good progress on pouring concrete for the structure, and only a couple more small pours are needed in specific spots. The steel roof above the ‘4th floor’ (which is where all the mechanical equipment for the building is housed) should be in place by mid-July. With the incredibly wet June weather we’ve had, the roof can’t get in place too soon. Recently, work has begun on the exterior brick-work, so we can finally get an idea of how it will look when complete.

On the interior, the ceilings seem to be growing stalactites, with the hangers appearing to support the thousands of pipes needed. On modern, large construction sites like this, those hangers are positioned using GPS, greatly reducing the time it takes to position



A view of the northeast corner of the SciTech building, taken on July 2. The Physics department will occupy the first and second floors of the east side of the building. The windows on the north east corner of the first floor shown here are where the Advanced Lab will be located, and directly above that will be the Astrophysics lab.

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Remembering Kermit Paulson

Following a series of illnesses this past year, emeriti physics professor Kermit Paulson passed away on May 21, 2024.

Paulson was a Wisconsin native - growing up on the shore of Magnor Lake in Clayton - the eldest of 5 children on the family farm. Undoubtedly, that early lake experience was the start of his life-long love of fishing. Life on the farm also probably encouraged his interest in science, which eventually drew him to study math and physics at Augsburg College in Minnesota, where he graduated as valedictorian in 1962.

He next moved to the University of Wisconsin - Madison, where he studied Nuclear Physics, with an emphasis on low-energy interactions, receiving a Master’s degree in 1963 and continuing his research there until he took a Instructor position at the two-year campus that was about to transition

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Kermit Paulson

We Hear That....

Gary Baum (1961) After earning his Ph.D. in Physics at Oklahoma State University and working at both Douglas Aircraft and the Rocky Flats Plant in Colorado, Baum became involved in the paper industry at the Institute for Paper Chemistry at Lawrence University in Appleton, WI. Some of his work there involved using nondestructive ultrasonic testing of the elastic properties of paper. Later, Baum worked for the James River Corporation and was the Vice President for Research and Academic Affairs and Professor of Physics at the Institute of Paper Science and Technology at Georgia Tech. He then founded PaperFuture Technologies LLC before retiring. In 2009 he was awarded the 2009 Gunnar Nicholson Gold Medal from the Technical Association of the Pulp and Paper Industry. Today he can be found @grouchyoldmanmusic.

Emily Luhman (Lombard) (2002) is assistant vice president for Human Resources at the University of New Mexico in Albuquerque, NM.

Michael Majer (2005) is now a Senior Structural Engineer at Dekat Engineering

Mike Tate (2007) has been promoted to being a Principal Telecom Engineer at Great River Energy in Minnesota

Tyler Capek (2013) is a Senior Scientist at Kidde, a manufacturer of fire safety products

Emily Dvorak (2013) is a Signal Processing Engineer with General Dynamics Mission Systems in Minnesota

Bill Ryan (2013) is a Senior Software Engineer with Lockheed Martin Space in Colorado

David Heinisch (2014) passed away in early February, 2024

David Gehring (2018) has taken a position as Associate Software Developer with Data Recognition Corporation

Sara Nafe (Noble) (2019) is now an Associate General Manager with Bosch in Owatonna, Minnesota

Bilal Asif (2020) has taken a position at Coloplast in Minnesota as a Senior Engineer

Andrew Larson (2020) has become a Mechanical Engineer at Opterus Research and Development in Colorado

John Weicherding (2020) now works with atom tomography systems at Cameca in Madison, WI

Tate Rench (2022) is the production technician in the Architecture department at the Pratt Institute in New York City

Zach Bowman (2023) is a Nano Analytical and Testing Lab Technician at Ebatco in Minnesota

Hanna Richards (2023) is a Structural Engineer at the design firm HGA in Minnesota

Ryan Mullin (2023) is working in Nome, Alaska as an Engineer for True North Mining

...SciTech Progress

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them properly. Large monitors are placed in carts to let the crew see 3D renderings showing (with measurements) where each pipe should be located.

The metal stud walls are also starting to appear in some places, making it much easier to picture what the final layout will look like.

The central 'mall' area of campus is currently fenced off and torn up due to the need to lay pipes from the campus heating plant and water chiller all the way over to the new building site. That should all be complete by the time students return in larger numbers for the fall semester.

In summary, the building is progressing well, with the grand opening still planned for January of 2026.



Clockwise from top right: One of the Studio Physics Labs where the introductory physics courses will be taught. Looking through the Physics Commons (student lounge), which will be a bright and inviting location right in the heart of the department. A view down the main corridor of the physics portion of the second floor.

...Paulson

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into becoming UW-Green Bay. He didn't stay there long, however, as an opportunity arose to return to Augsburg as a professor in 1968.

During his time at Augsburg, Paulson began a long-term connection with Oak Ridge Associated Universities (ORAU), affiliated with Oak Ridge National Lab in Tennessee. This included a two-year sabbatical at ORAU as a research associate, which led to his many-year commitment to bring students (over 100 in total) to work at Oak Ridge. A second sabbatical brought him to UW-River Falls in 1984, and that resulted in a permanent move here that lasted until his retirement in 2001.

Paulson's interests propelled him to be an active member of the Health Physics Society (HPS), including serving as president of the North Central Chapter of HPS, and earning the HPS Chapter Service Award.

At UWRF, he taught a wide variety of physics classes, including Nuclear and Particle Physics and guided many students through nuclear and modern physics experiments – always with a smile, support, genuine kindness, and substantial humor. He brought those qualities to the summer courses for high school teachers for well over a decade. Even in the social events for those courses, he tried to bring in an educational moment: Often he would organize a golf 'tournament' – teams of the teachers and one team of UWRF faculty (that somehow always included a couple of 'ringers') would compete to see if the average of the teachers' scores would be better than the faculty's average. It never was, however, because the larger number of teachers would invariably produce a larger average score than that of the very small number of good faculty golfers. As an athlete himself and a devoted fan (particularly of the Green Bay Packers) he also served on the university athletic committee to support college athletes here.

Paulson concluded his career at UWRF as the department chair, leading it at the beginning of a time when there was significant faculty turnover due to retirements. His retirement was focused on being with his family and being an active participant in the lives of their grandchildren.



Paulson preparing for 'graduation' at the end of a summer course.

Impromptu Reunions



Tim Gessert (1982) and Earl Blodgett (1980) ran into each other at an American Institute of Physics meeting this past year, even though both are nominally retired!



Tori Gehling (2024), Anthony Landberg (2005), Dwight Luhman (2001), Lowell McCann (undisclosed), Blodgett, Charlotte Evans (2013), and Angela Coe (2016) posed together at the American Physical Society's March Meeting held in Minneapolis this spring. Also in attendance at the conference, but not present of the picture, were Devin Underwood (2009) and Prof. Jolene Johnson.

‘Food Truck for the Physics Mind’ at UWRF

The week before spring break saw the appearance of a unique science outreach vehicle on the UWRF campus. TeachSpin’s “Food Truck for the Physics Mind” is a 44 foot long trailer filled with advanced undergraduate physics experiments that are set up and ready for students to use. Each year TeachSpin sends the trailer on the road for at least one roughly 2 week tour, visiting universities in a



particular region. The ‘guides’ on the trailer are two TeachSpin scientists (and former physics professors) who are experts on the over 20 different experiments in the trailer.

During this one day stop, UWRF students from multiple classes were able to climb aboard to get a little experience with experiments that are not available to them here, like: pulsed nuclear magnetic resonance, quantum control (examining quantum superposition), diode laser spectroscopy, and magnetic susceptibility. The timing of the visit for the students in Intermediate

Lab was fortuitous - they had just finished a lab involving torque on a magnet in a magnetic field, which was a perfect prelude to learning about the basics of magnetic resonance.

TeachSpin is owned by the non-profit Jonathan F. Reichert Foundation, which supports advanced undergraduate physics lab instruction throughout the U.S. They help fund workshops for faculty and staff to learn new experiments, and offer grants to help pay for new instructional equipment.

Top right: The ‘Food’ Truck sits on campus south of Rodli Hall. Middle left: Aric Isle, Kaitlyn Mclaird, Jon Tabora, and Beau Christensen watch as David Van Baak of TeachSpin prepares a banana to be used in the Earth’s Field NMR apparatus to demonstrate one dimensional magnetic resonance imaging. Right: Tori Gehling and Matt Weiman investigate acoustic band gaps in periodic structures with the ‘Quantum Analogs’ experiment.



Jim Madsen Retires

Long time UWRF Physics Professor Jim Madsen is retiring from the Universities of Wisconsin in August of this year. Madsen earned his Ph.D. in Physics at the Colorado School of Mines and went on to a position at the University of Massachusetts - Amherst before coming to UWRF in 1989. His research interests at the time were Polymer Physics and Condensed Matter Physics.

Madsen was part of a Wisconsin Applied Research Grant that established the Western Wisconsin Polymer Lab at UWRF and allowed the department to purchase a Dynamic Mechanical Analyzer to characterize material properties and phase transitions over a wide range of temperatures.

However, at the turn of the millennium, he spent a sabbatical at the Univ. of Wisconsin - Madison, which got him involved in the AMANDA neutrino experiment at the South Pole. That involvement expanded with the construction of the IceCube neutrino observatory, and brought many opportunities to UWRF students over the years - continuing to



Madsen in the early 1990’s at a Superconductivity workshop held at UWRF

UWRF hosts Modeling/Pivot & Rotational Physics Workshops

On May third, which happened to be the last day of classes at UWRF, the Physics Department hosted 30 local high school science teachers for two concurrent workshops. The first workshop was led by Modeling Instruction evangelist and friend of the department Mark Lattery (UW-Oshkosh). Modeling is a pedagogical approach to science learning that emphasizes having students construct robust, flexible, and testable mental models of physical phenomena. The second workshop focused on how to use Pivot Interactives to increase student engagement in the classroom and increase student access to phenomena. The workshop was led by Pivot Cofounders Peter Bohacek (UWRF MSE Alumnus), and our very own Matt Vonk.

Then in the last week of June, a smaller group of high school teachers came to campus for an intensive week revolving around the topic of Rotational Physics. The class/workshop (teachers could choose whether to take the course for graduate credit or not) covered rotational inertia, inertia tensors, forces in non-inertial rotating reference frames, and a variety of other related topics. The participating teachers all left with a number of new demonstration/lab equipment.



Clockwise from top: Peter Bohacek discusses a concept with the Pivot Interactives workshop group. Modeling Instruction participants work on an optics activity. Shannon Baxter and James Biedrzycki prepare to measure the rotational inertia of a variable inertia disk. Doug Petty pushes Jeff Elmer and Biedrzycki on the Coriolis Force platform - originally built by Matt Haase (2001).

this day with the local leadership of Suruj Seunarine.

In 2007, Madsen was named the UWRF Distinguished Teacher, and a year later was given the Wisconsin Association of Physics Teachers award for excellence in the teaching of physics.

A few years later, he became the Associate Director for Education and Outreach of the IceCube collaboration, which meant that he was splitting his time between UWRF and Madison. As part of that position, he travelled extensively, including presentations at all 26 UW campuses, and giving IceCube talks on every continent.

In 2020, the Wisconsin IceCube Particle Astrophysics

Center (WIPAC) wanted Madsen to expand his role, and he ended up taking a full time position with them, finishing the past two years as its interim Executive Director.

Madsen and his wife Linda have been splitting their time between Minneapolis and Madison the past few years, but will be settling back to western Wisconsin when his retirement begins.



Madsen more recently. Photo from WIPAC.

Student Projects

There seemed to be a natural bifurcation in student projects this year. Some of them explored solutions to gritty real-world problems, while others dove into more abstract and fundamental physics. Here's a recap of the highlights.

Brock Welle created a small-scale version of the same kind of Tuned Mass Damper that might be used to steady a skyscraper during a tectonic shift, or to steady a bridge during strong winds.

In a similar vein, Jordan Cioni investigated the shock absorbing properties of a steel gyroid structure whose voids were filled with polyurethane. The porous backbone of steel provides strength, flexibility, and efficient distribution of forces for the structure while the polyurethane provides energy dissipation. Jordan created simulations of that structure and compared those results to experimental measurements on a 3d printed plastic model that was filled with gelatin to replace the urethane. He also worked to create brass versions of the structure using the lost wax casting method.

Competitive archer Alessia Gillstrom investigated how the fletching (the part of the arrow traditionally made with feathers) affects the velocity of the arrow, which was interesting in its own right, but the audience was also amazed at her precision at shooting arrows.

Completing his Capstone project that was partially performed in Germany, Collin Gartner verified that his prototype equine prosthetic device met the performance criteria it was designed to achieve. The device is meant to help horses recover from superior digital flexor tendon injuries.

But, of all the applied projects, the most concrete topic was explored by Alex Aronson, whose talk, "Imperium Concretum" investigated the self-healing properties of Roman cement.

Moving toward more basic research Matt Weiman investigated a spin coating process to prepare thin films of a superconducting material. He characterized



the films using atomic force microscopy and scanning electron microscopy.

Using an array of scintillator muon detectors, Kevin Ruppert estimated the energy of cosmic rays based on the radius of the cone of the shower of secondary particles produced by the cosmic ray.

Chladni plates are flat thin plates that when vibrated with sand placed on top, allow for the visualization of nodes and anti-nodes of standing wave resonances. Kailan Brown investigated whether he could identify those resonances by also examining the impedance of the circuit driving the vibrations.

Ben Neuffer investigated the mechanics of a dropped ruler - looking into how the orientation of the ruler impacts how high it bounces after landing.

Using data from an array of cosmic ray scintillation detectors at the South Pole, James Bowers performed an analysis to determine if that type of detector could reliably detect increases in the detection rate during solar coronal ejection events.

Chloe Heifner continued her research into simulations of the South Pole neutron monitors. In this work, she examined whether the simulations could be used along with data from the neutron monitors to help forecast the severity of solar storm impacts here on Earth.

Extending a project to create an ultrafast pulsed fiber laser, Tori Gehling started by making a calibration of the output of the laser diode used to excite the Erbium-doped gain material, and then measured to see if splices in the optical fibers or couplers between fibers were sources of energy loss.

Ending up in the realm of fundamental *From Top: Alessia Gillstrom and Jake Lawrence peer into the vacuum chamber they constructed in Advanced Lab to house the radiometer experiment. Alex Aronson and Matt Weiman examine the results of their photolithography pattern test. Kailan Brown prepares for an experiment with the Chladni plate. One of the more remarkable patterns found formed by the sand on the Chladni plate after being left alone overnight. Aric Isle ponders his next step in Electronics Lab.*

2024 Scholarship Recipients

Students who have been awarded Physics scholarships for the 2024-2025 academic year include:

- *Earl Albert Scholarship:*

Haylie Rasmussen

- *Curt and Dee Larson Scholarships:*

Peter Bendel
Jordan Fyksen

- *Henry Tranmal Scholarship:*

Seth Bradway

- *Warren and Anna Campbell Scholarship:*

Michael Langford

- *Dr. Michael J. Wiskerchen Memorial Scholarships:*

Ryan Schneider

- *Physics Alumni Scholarships:*

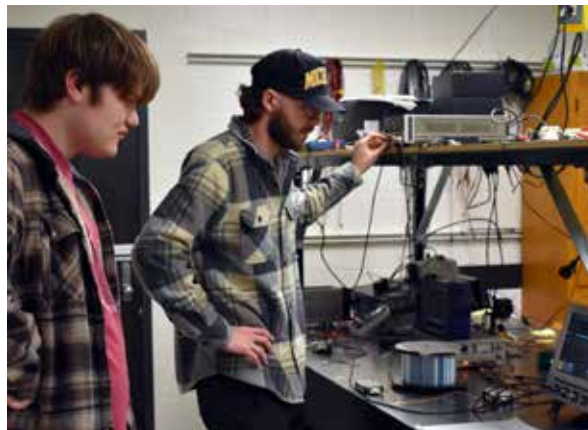
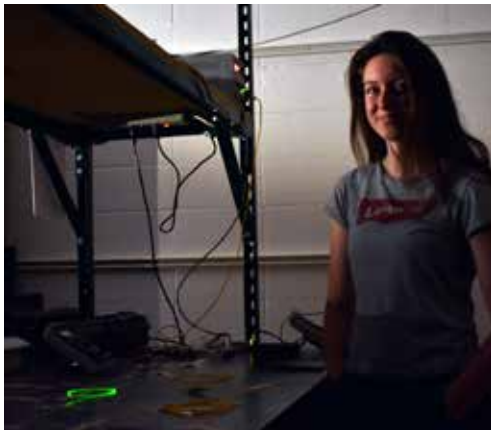
Carter Stuart

In addition, incoming students were offered scholarships that are funded by donations from *Physics alumni:*

Justin Becker, Teagan Gazdzik, Rose Alexander, Aiden Mashos, and Riley Schneider

While UWRF continues to provide an excellent education at a relatively low cost compared to other options, these scholarships are still critical for our students, and we are very grateful to everyone who helps support them.

Anyone interested in making a donation to any of the scholarship funds listed above, or initiating a new scholarship, is encouraged to do so. Simply contact either the UWRF Foundation office or Glenn Spiczak (Glenn.Spiczak@uwrf.edu).



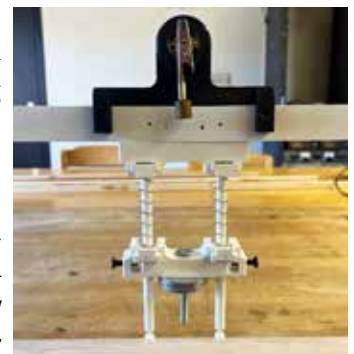
physics, Jacob Lawrence investigated photon momentum using a Crookes' radiometer (those cool little classroom demos with four spinning black and white vanes in a "lightbulb"). As many of you know, the radiometers turn the "wrong" way since they are dominated by thermal effects (the air near the black side heats up more and pushes the vane away) rather than momentum effects (the momentum change of reflected light from the white side will be twice that from the light absorbed by the black side). By constructing a radiometer in a more perfect vacuum, Jake was able to demonstrate momentum transfer from massless photons.

Perhaps the most esoteric project of this batch was Jonathan Parham's determination of Planck's constant by finding a relationship between the threshold voltage of an LED (light emitting diode) and the wavelength of the light produced.

As professors it is always fun and so rewarding to see

students come into their own and produce such interesting work.

Clockwise from top left: Tori Gehling poses next to the pleasing green glow from the Erbium-doped optical fiber in the ultrafast laser cavity. No, it wasn't 'flannel day' in Advanced Lab when this photo of Kevin Ruppert and Brock Welle was taken (isn't every winter day flannel day?), but it does indicate how cool it is to measure the speed of light in a long length of glass fiber. Jordan Cioni pulls a crucible of molten brass out of a kiln just before pouring it into a lost-wax mold of a double gyroid structure. Brock Welle's tuned mass damper - the top black piece holds an unbalanced motor to excite vibrations in the white beam, which are damped by the 'tuned' mass hanging below.



Chloe Heifner: Chancellor's Award Recipient

This spring, senior Chloe Heifner was one of the recipients of the UWRf Chancellor's Award for Students, making her the third Physics major in the past two years to earn the award.

The award honors students who have a positive impact on the university community outside of the classroom. Heifner was cited for her extensive research with the Simpson Neutron Monitor network which led to a paper and presentation at the International Cosmic Ray Conference in Japan, along with a trip to Greenland to work on Neutron Monitors there. She has also been an active member and officer of the Society of Physics Students at UWRf, and has worked as a Learning Assistant in the introductory physics classes.

A double major in Physics and Physics & General Education, Heifner will graduate this year with both a 'normal' Physics degree and a degree that lets her be licensed to teach at the high school level. After she finishes at UWRf, Heifner plans to attend graduate school to obtain a Ph.D. in physics.

This summer, Heifner is continuing her Neutron Monitor research with a two month experience at the University of Delaware, one of the premier institutions for studying cosmic ray physics.



Chloe Heifner

Many thanks for the continued support of alumni and friends who keep the UW-River Falls Physics Department rated nationally in the top 10% of Undergraduate Physics programs, an accomplishment to celebrate.

Great things are happening in the department and there are many opportunities for you to support in the Physics Department.

- Physics Department Fund – supports Physics Department priorities
- Physics Alumni Scholarship – fund supported by Physics alumni to create scholarship support
- Endowed Scholarships - you can help increase the number of students supported by these awards
- SPIE/UWRf Summer Optics Research – an endowed fund supporting student summer optics research
- Science Olympiad Fund – supports hosting high school science students in the region each January

If you are interested in contributing to any of these funds, please click on [GIVING](#) on the UWRf homepage or call the Office of University Advancement at 715-425-3505.

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