



Science & Health NEWS

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High-flying fieldwork

UWL researchers use drone technology to help combat invasive wetland plant



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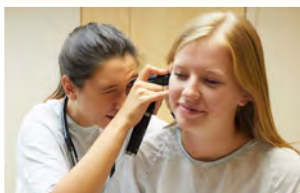
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COVER IMAGE:
Niti Mishra, left, a UWL assistant professor of Geography and Earth Science, has a license to fly a drone up to 400 feet. This one is capable of flying up to 1,600 feet. Mishra is pictured with UWL senior Zachary Woodcock who is learning to fly drones while assisting a local organization with invasive species monitoring with help from Mishra.



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CLASS NOTES POLICY

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High-flying fieldwork

UWL researchers use drone technology to help combat invasive wetland plant

For more than a decade, members of the Brice Prairie Conservation Association (BPCA) have been releasing beetles to control the spread of an invasive flowering plant that is degrading regional wetlands and with them, wildlife habitat.

Above photo: UWL student Zachary Woodcock, right, earned a summer research grant to use drones to conduct aerial surveys of purple loosestrife, an aquatic invasive plant with help from UWL faculty mentor and remote sensing scientist, Niti Mishra. Here Woodcock takes a survey test flight near Bangor.

The BPCA is attempting to stop Purple Loosestrife across selected areas of Brice Prairie and the Lake Onalaska area, in cooperation with the U.S. Fish and Wildlife Service and the Wisconsin Department of Natural Resources.

Unfortunately, tracking whether their efforts are making a measurable impact on the invasive species is difficult without wading across marshland and lakes to physically locate the plant and measure density.

That is, until now.

UWL student researcher, Zach Woodcock, received a summer research grant from the BPCA to use drones to conduct aerial surveys of Purple Loosestrife in collaboration with the organization. The senior has learned how to operate the

drones, as well as how to process the data and create maps for loosestrife identification and more. He has received help from faculty mentor, Niti Mishra, an expert in using drones for remote sensing.

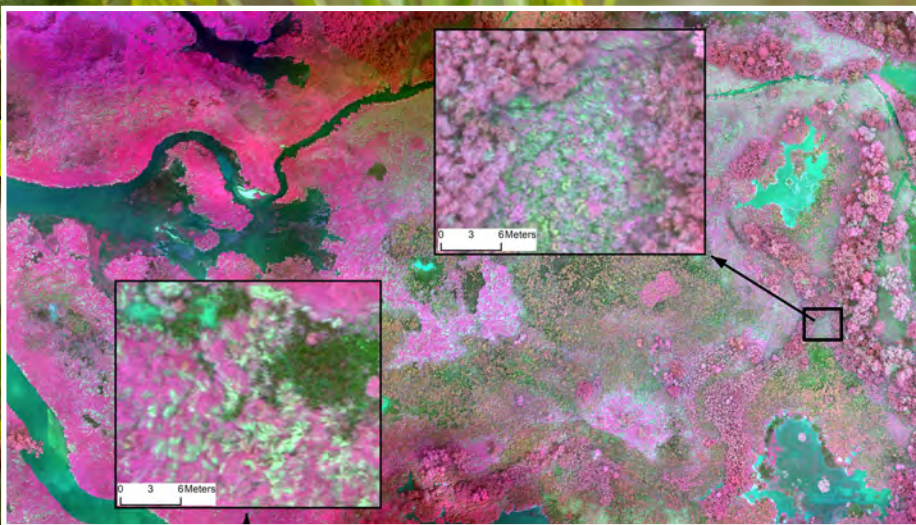
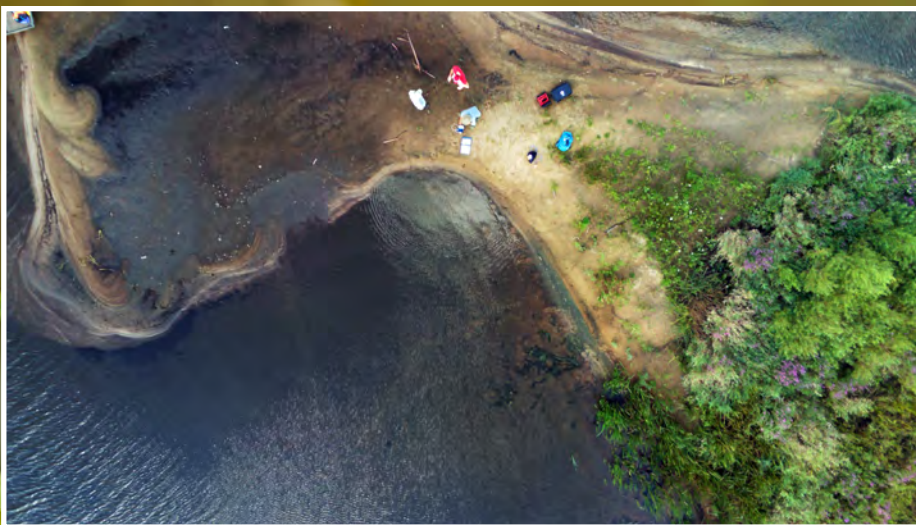
“Since drones are just starting to be used for things like this, there is a lot of opportunity here,” says Woodcock, who envisions a future career involving remote sensing. “This is a great opportunity for me to be getting experience with it.”

Over the last decade, drones — Unmanned Aerial Vehicles (UAV) that originated in the military — have seen immense technological developments and become more affordable, providing a variety of new applications from

Continued on next page.



Purple Loosestrife is an invasive species various organizations are partnering to combat in the La Crosse area.



CLICK TO WATCH



THE DRONE SURVEY OF PURPLE LOOSESTRIFE ON BRICE PRAIRIE



High-flying fieldwork

Continued from page 3.

analyzing crop health to generating climate data. Using them for environmental monitoring and land management is an emerging and exciting field, notes Mishra.

Mishra, a UWL assistant professor of Geography & Earth Science, aims to find more partnerships with the university and in the community to assist with such drone applications while establishing himself and his students in the field.

“If you mix the talent of the community and the talent of the university, you can get a lot of really good stuff done,” says Marc Schultz, a member of the BPCA who is working with Mishra on the loosestrife project. “Mixing those talents embodies the Wisconsin Idea.”

PREPARE FOR TAKEOFF

During a drone test flight at the La Crosse River Delta near Bangor, yellow lights flashed and the drone’s mini propellers began to spin. The device lifted straight up 150 feet into the air hovering above the waters, collecting images of Purple Loosestrife that would be difficult and time consuming to get by foot.

Mishra says that the most important part of the drone is its powerful cameras, including one that captures near-infrared wavelengths that the human eye cannot see. That will allow them to clearly distinguish the invasive plant from other kinds of vegetation. Data collected is analyzed using computer software to map and characterize not only the invasive

species, but also vegetation moisture stress, productivity, height and density.

The amount of data Mishra can collect and its accuracy is immense in comparison to even a few years ago, he notes. When he was in graduate school in 2010, his dissertation was related to detecting bush encroachment in savanna ecosystems of Kalahari in southern Africa. At the time, affordable, high-tech cameras that could be integrated with smaller drones were still under development. So, Mishra used satellite images and ground-data-developed-image analysis methods for semi-automatically detecting invasive plants. Those satellite images, however, could contain cloud cover and lacked the resolution or pixel-sized detail the drone-acquired imagery can provide, he says.

When Woodcock’s summer research project was complete, results of the drone aerial shots were shared with the BPCA. The organization was impressed with the quality and utility of the results, and will continue to partner with Mishra to monitor again in future years and measure changes in the amount of Purple Loosestrife. If the organization finds progress with the beetles, it will be able to share the information with other land management agencies working to combat invasive species, says Schultz.

“There is no comparison to this technology — you see how easy it is to observe just what you are looking for,” say Schultz.

More about Niti Mishra



Assistant Professor Niti Mishra, Geography & Earth Science, second from left, and others test the fixed wings of the unmanned aerial system (UAS) that he flew over a farm to identify areas that may need more fertilization or irrigation. Mishra says using UAS technology in precision farming has helped farmers significantly increase agricultural efficiency and productivity.

As a geographer, Niti Mishra's research focuses on spatial ecological applications such as mapping and monitoring terrestrial vegetation properties, estimating biomass, detecting plant moisture stress, and invasive species infestation levels. The goal of his research is to understand how biophysical determinants (e.g., moisture, temperature, fire frequency/intensity) spatially interact to create observed vegetation distribution patterns.

Most of his research has been based on integrating field measurements of vegetation and land cover properties with ecological matrices derived from satellite and aerial remotely sensed imagery. While satellite sensors provide spatio-temporally consistent data with repetitive coverage over large areas, they lack pixel detail for understanding individual plant species.

Additionally, cloud cover severely degrades quality of satellite images, especially in tropical ecosystems. Imagery acquired using Unmanned Aerial Systems (UAS) addresses these issues by providing unprecedented pixel level detail in centimeters, flexibility and repeatability in image acquisition independent of cloud cover.

Developments in control systems, growth in computing power and computer vision techniques, miniaturization of digital payload, and hardware components have made off-the-shelf commercial UAS and data processing more affordable in recent years. Although the use of UAS for environmental remote sensing and land management applications has grown rapidly, Mishra says the full potential of this technology is yet to be realized.

GEOGRAPHY & EARTH SCIENCE'S DEVICES

The UWL Geography & Earth Science Department owns three multi-rotor and one fixed-wing UAS. The equipment is used intensively for teaching and research, both locally and internationally.

Use of UAS in university teaching requires a remote pilot license. Mishra completed this prerequisite by passing the remote pilot examination conducted by the FAA.

In La Crosse, Mishra is collaborating with local organizations such as Brice Prairie Conservation Association and Mississippi Valley Conservancy (MVC) to develop undergraduate research projects, like Woodcock's project on Purple Loosestrife.

Besides individual student projects, Mishra takes students of his Advanced Remote Sensing class to the New Amsterdam Prairie (NAP) to demonstrate data collection using fixed-wing UAS. Owned by the MVC, NAP is one of last few remaining prairies in its natural state and serves as a migratory bird habitat.

The students analyze the UAS imagery to detect different vegetation structural types and level of photosynthetic activity, as these could serve as a surrogate of bird habitat conditions. The projects and class exercises not only provide hands-on experience of UAS data collection and processing, but also collaborate with local environmental organizations to make ecologically informed decision based on UAS products.

Mishra aims to find more partnerships to assist with drone applications while establishing himself and his students in the field.

In spring, Andrew Anklam, a student of Geography and Archaeology departments will be working with Mishra to acquire multi-spectral UAS imagery of the Termain archaeological site. The objective of his research is to determine how infrared UAS camera can effectively identify known and unknown archaeological features there.

In spring, another student researcher will create a high-resolution map of the UWL campus using UAS derived visible and near infrared images. The high-resolution, near-infrared images will help to map trees on campus.

The UAS imagery will be trained and validated by using tree inventory data collected and maintained by the UWL facilities department. The project will also test the performance of machine-learning algorithms on the UAS derived imagery to map vegetation at genus level.

Continued on next page 9.



Assistant Professor Niti Mishra, center, works to measure geospatial coordinates at a Ground Control Point (GCP) prior to a UAS flight mission at tree-line location in Langtang National Park, Nepal. The tree-line site is a three-day hike from the nearest road-head. Mishra says the data collection mission would not have been possible without help from graduate students and faculty, pictured, from Tribhuvan University in Kathmandu.



Above: A UAS view of Himalaya in Langtang National Park in Nepal. Misha captured the image in the early morning in June 2017 from the tree-line location where he collected plot level data on vegetation structural and functional properties.

Right: Dingboche village in Sagarmatha National Park as viewed from UAS.

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RESEARCH STRETCHES WORLDWIDE

Along with conducting local research projects, Mishra is also involved in projects that include UAS data acquisition and analysis in the Nepal Himalayan region. Mishra's previous research focused on using low-medium resolution satellite imagery to understand phenological changes in the Himalayan region.

Successful application of UAS imaging and vegetation mapping in the Coulee Region motivated Mishra to conduct UAS data acquisition and analysis in the Himalayas. The region is heavily understudied with respect to high-resolution mapping.

With funding from UWL's Faculty Research Grant (FRG), during summer 2017 Mishra conducted UAS data collection in high-elevation, treeline ecotone in the Langthang and Sagarmatha National Parks. Treeline ecotone represents upper-limit of a forest on a mountain.

The Himalayas have one of the highest and most biologically diverse treelines, and due to their high sensitivity to changing climate, treeline vegetation has been noted to migrate upslope with perceptible ecological changes. The treeline field site in Langthang National Park was three days' hike from the nearest road-head.

With logistical support from Tribhuvan University (situated in Kathmandu) and

mountain guides, UAS and other research equipment were carried to the treeline site at 12,000 feet. Over four days, 16 UAS flight missions were flown that produced nearly five thousand multi-spectral images. While UAS images were acquired close to solar noon, simultaneous measurements of vegetation structure and floristic composition were conducted in early morning and late afternoon time.

Unlike Coulee Region where landscape has low relief, UAS flight missions in Nepal were flown in area with greater than 25-degree slope and required manipulating flight parameters to minimize the impact of terrain effects on image quality.

Financial support from the UWL grant not only allowed collection of valuable data, but also helped to develop academic collaboration with Tribhuvan University, the largest research university in Nepal. Upon completion of the field work,

Mishra was invited to give a talk at the university on the application of UAS for ecological research in Himalayas. He also gave a demonstration on UAS data collection to the faculty and graduate students of the botany department at the university.

Mishra plans to continue to collaborate with Tribhuvan University and hopefully take UWL students with him on the next research trip. After returning to La Crosse, Mishra has integrated most of the UAS and field data collected in Nepal as lab exercises in his upper division courses.

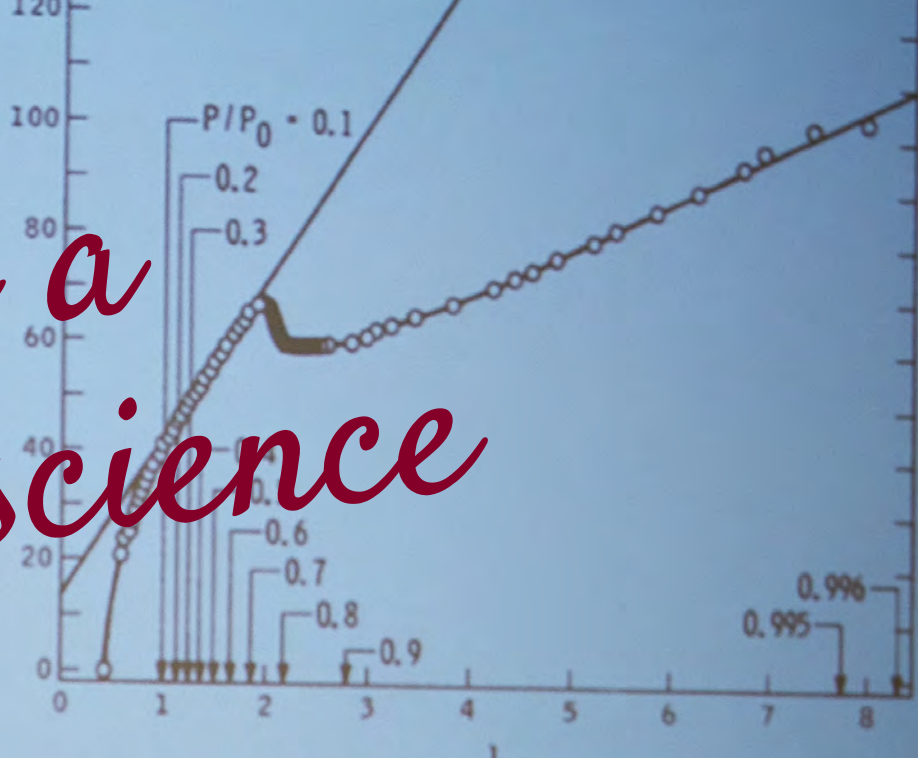


Article by Niti Mishra, assistant professor of Geography and Earth Science



Mishra met these curious children in the Dhading municipal area in the mid hill of Nepal. The UAS data for this area is being utilized to quantitatively map green biomass of Sal forests and access the success of community forestry projects implemented over last two decades.

Sharing a love of science



Physicist, donor launch
Nobel Prize Winner
lecture series nearly
20 years ago



Michael Kosterlitz, the co-winner of the 2016 Nobel Prize in Physics, was the 18th Nobel Laureate to visit UWL in October. Here he speaks with a physics class. The annual lecture series has helped the Physics Department gain its reputation as a recognized leader in physics education.



Every fall young and old come to UWL with their curiosity in tow. They come to learn about discoveries that have shaped how people understand the physical world — from the history of the universe to bizarre particle behavior.

For 18 years, crowds have been able to hear firsthand from the people who made these discoveries — Nobel Prize winners in physics.

Consistently attracting such an esteemed group is not typical. At a recent American Physical Society national conference, UWL Professor of Physics Gubbi Sudhakaran was asked to speak about building a thriving physics program. Afterward, people lined up — some asking how the department at a small, non-doctoral school can invite a Nobel Prize Winner every year when they can pay much less than what other universities do.

The answer? It comes back to physics — particularly work and energy.

A SERIES BEGINS

Sudhakaran recalls the day Al Trapp, former UWL Foundation president, told him about an anonymous donor interested in supporting a Distinguished Lecture Series in Physics. But the annual event would need one important thing — a Nobel Prize Winning speaker. Sudhakaran smiled at the news and agreed.

Trapp came back after talking to the donor, someone with a lifelong interest in physics, who had agreed to support the series. Trapp then asked Sudhakaran, “So, how many Nobel Laureates do you know?”

“None,” he replied. “But I will bring them.”

ENERGY IN MOTION

And he did. For the first lecture, William Phillips, the 1997 Nobel Prize Winner, spoke to a packed lecture hall in Cowley.

Every Nobel Prize Winning lecture since has been equally popular — with crowds flowing into the hallway.

Sudhakaran is typically connecting with three Nobel Laureates at a time to arrange the next visit. When they arrive, the entire department plays a role in their stay. Even Sudhakaran’s wife, Pushpa, plays a role, inviting the Laureate and others into their home for a traditional Indian dinner after the lectures.

The speaker stays two days, giving a seminar, talking to classes, and meeting one-on-one with students, faculty and administrators. Public lectures attract a diverse group of community members and university students, faculty and staff, as well as those from other UW schools and Winona State University. “No other UW institution does this,” says Sudhakaran.

It has brought UWL exposure and helps attract students, says Physics Professor Eric Gansen. “When parents and prospective students ask what our program has to offer, this is one of the first things we bring up,” he says.

When Taviare Hawkins, UWL associate professor of physics, considered teaching at UWL five years ago, she was impressed by the Nobel visits, as well as the department’s national reputation. UWL’s Physics Department graduates more physics majors than any other bachelor’s degree granting institution nationally.

“People here are active in research, but they are also really good teachers,” she notes.

During the visits, students are typically surprised to learn that the laureates are not so super human. “They often

share that they’ve failed and succeeded. It’s nice for students to hear that — especially if they’ve struggled with classes,” says Stephen Harris, an electrical technician in the department.

Community donors, the Physics Department and UWL administration support have made the series possible. “One person cannot do it alone,” says Sudhakaran.

But co-workers and donors note, without Sudhakaran, or “Sudha” as many call him, it wouldn’t be possible. They point to his personality, persistence and national reputation in physics.

Geri Wettstein, a former Kindergarten teacher who collaborates with Sudhakaran to connect K-12 science teachers with a UWL physics workshop every summer, calls Sudhakaran “an amazing gift to the community.” He has become a long-term resource and mentor for area science teachers and former physics students — even Wettstein’s own son, who originally accompanied her to UWL physics laser light shows and Nobel prize winning lectures as a child.

“If you would have asked our son when he was six years old if he would go to school for physics, he would have said, ‘no,’ says Wettstein. “Sudha opened the door for him.”

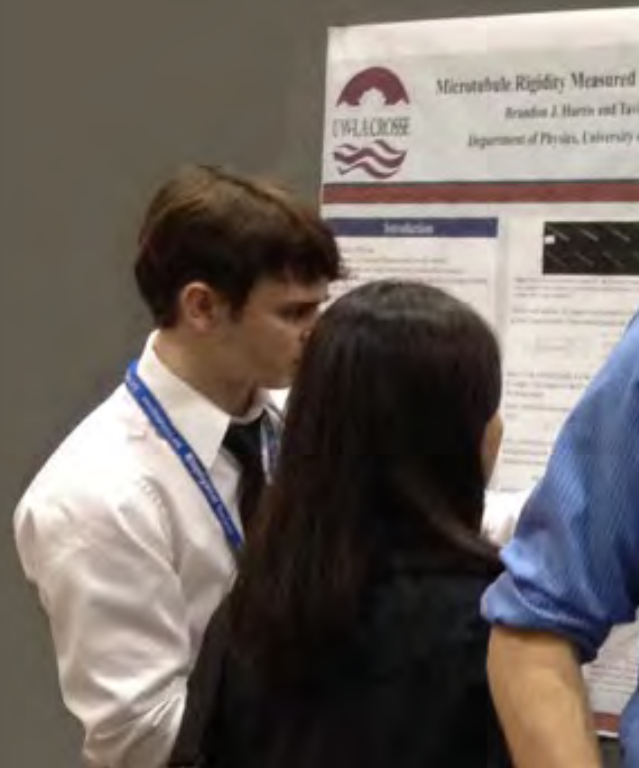
Sudhakaran encouraged her son, Jarrod Wettstein, to enroll in UWL’s dual degree program in physics and engineering, and today he is a successful mechanical engineer. “To this day he can meet with Sudha and call about issues he is having at work,” says Geri. “And I know my son is not alone.”

Sudhakaran has built bridges regionally for students and teachers. That’s why Geri and her husband, Dan, owners of Wettstein’s, agreed to support the lecture series nearly a decade ago.

“He has a life-long commitment to his craft,” she says. “He wants that love of science to be passed on.”

A RESEARCH ODYSSEY

Getting a research-centered education



Scott Erickson, a December 2016 graduate of the Physics and Biochemistry departments, developed a passion for research while attending UWL.

“In a way, undergraduate research was at the center of my education,” Erickson notes. “I could apply what I learned in every class to one project, which helped my studies and turned out to be incredibly rewarding.”

Erickson, originally from Wausau, has been on a research odyssey since his sophomore year when he worked in the biomechanics lab of Professor Robert Ragan (Physics) and Professor Thomas Kernozeck (Health Professions). Later, he tried his hand at experimental biophysics in the lab of Associate Professor Taviare Hawkins (Physics). He worked in Hawkins’ lab for the next two years, gaining research experience in microscopy, biochemistry and programming.

Erickson says doing research made him feel comfortable working in a variety of labs and with people of different scientific backgrounds.

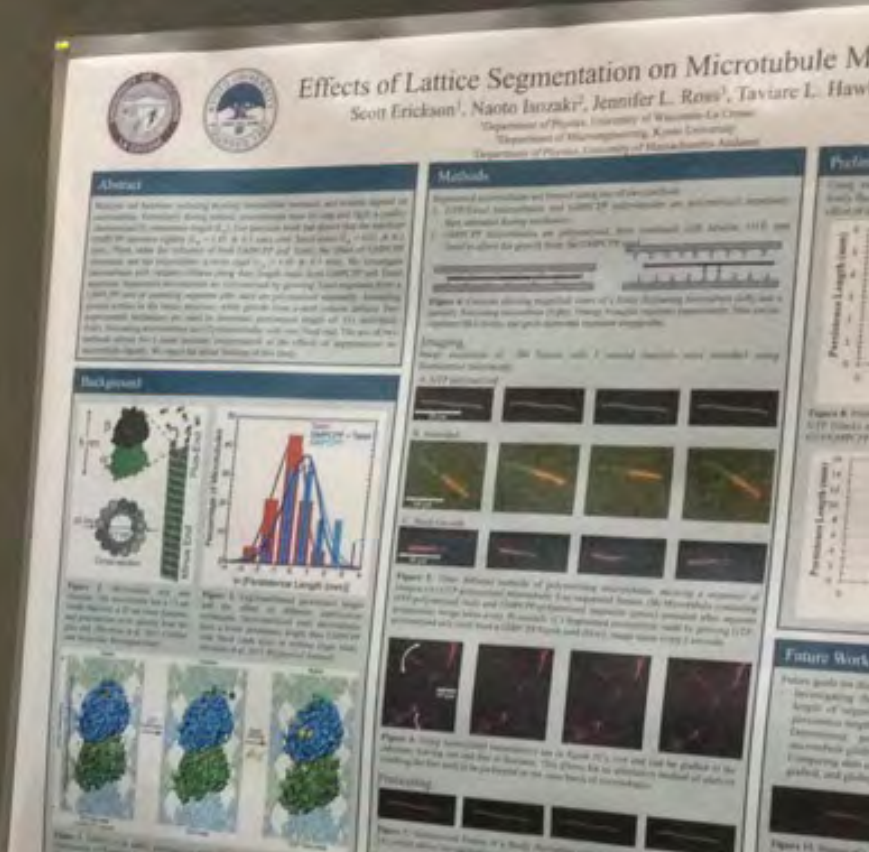
“I appreciate how Dr. Hawkins helped me find what area of research I enjoyed most, then promoted my growth therein,” he explains. “For example, my interest in neuroscience and how Dr. Hawkins supported my summer in Iowa. It was also great



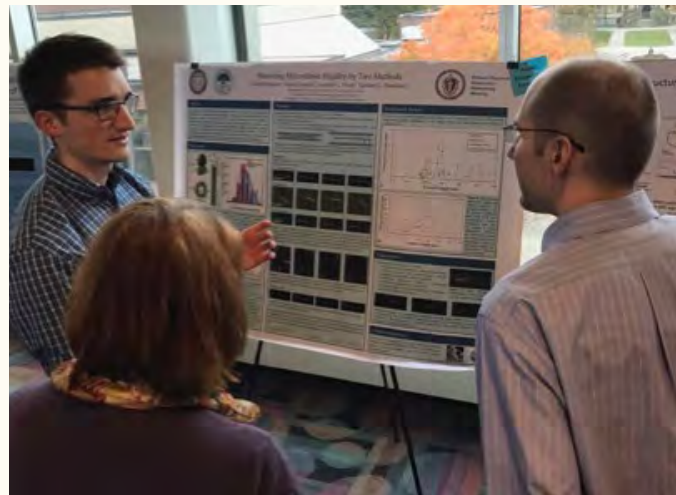
Scott Erickson, '16, as he begins his research in the lab of UWL Physics Associate Professor Taviare Hawkins in 2014. Erickson gained experience in microscopy, biochemistry and programming in the Cowley Hall lab.

being able to present at all of the conferences. That got me a lot more excited about research and our lab’s place in the field.”

In the summers of 2015 and 2016, Erickson participated in two Research Experiences for Undergraduates (REU) at the University of Massachusetts Amherst in Professor Jennifer Ross’ microtubule biophysics lab and the University of Iowa in Professor George Richerson’s electrophysiology lab.



Scott Erickson, far right, with fellow lab members in the labs of Research Engineer Monica Moya at the Lawrence Livermore National Laboratory. Erickson participated as a post-baccalaureate researcher there during the spring and summer of 2017.



Scott Erickson, left, presents at the Midwest Regional Biophysical Society Networking Meeting at Hamline College in 2016.

After graduating in December, Erickson participated as a post-baccalaureate researcher at Lawrence Livermore National Laboratory under the supervision of Chemical Engineer Elizabeth Wheeler and Research Engineer Monica Moya. Currently, he is sponsored by the Japanese government as a MEXT scholar at Kyoto University, where he studies in the micro-engineering laboratory of Ryuji Yokokawa.



Article by Associate Professor Taviare L. Hawkins, Physics

Top-notch teaching

Rec class wins award

Rec management students got to experience an award-winning class during the fall semester.



Associate Professor Laurie Harmon, Recreation Management & Therapeutic Recreation, received The Academy of Leisure Studies' prestigious "Innovation in Teaching Award" for her creative use of technology in the classroom with her "Technology in Natural Resources" course project.

The project is a three-part environmental education program, which highlights using an underwater Remotely Operated Vehicle (ROV) for aquatic exploration and to directly connect with their natural environment. Essentially, students learn what it means to become a "techno-naturalist."

On project day, students visit Goose Island, a county park and U.S. Fish & Wildlife Service partnership site on the Mississippi River south of La Crosse. The students are divided into small groups and rotate through the following mini-programs:

- Connecting with Places
- Whose home is it anyway?
- Dead Poets Society

Associate Professor Laurie Harmon, right, with students at La Crosse County's Goose Island Park. They headed to the Mississippi River backwaters to observe the natural environment via video-camera feed with a Remotely Operated Vehicle.

The overall program integrates course goals, including understanding and articulating environmental ethics, outdoor recreation impacts and natural resources management strategies used in recreation.

The ROV program is highlighted and allows students to use video game-like controls to “fly” the underwater robot in Mississippi backwaters to observe the natural environment via video-camera feed. Each student pilots at some point and teaches their peers best flying techniques as the piloting rotates through.

When reflecting on the experience, students first express the fun factor. They laugh and are surprised by how quickly it moves through the water, and in the words of one participant, “... how cute it is!”

Students test its speed and tend to spend the first minute or two running it on the water’s surface. It’s only after observing others fly the ROV that they ask questions

about its capabilities and how it can be used such as:

- How cost effective is this for finding dropped items near a dock or recovering samples from aquatic environments?
- Can this be used in lieu of diving on a shipwreck and what might be advantages or disadvantages?
- Are there larger units and what do they do that this micro-ROV can’t?
- Would this startle aquatic animals and why?
- Are there other kinds of units not requiring tether attachments?
- Can we program ROVs to record video at certain depths/locations?

Through the program, students learn about relationships between natural resource management strategies and their effects on wildlife. They collaborate and develop cohesive teams. Their

reflections indicate they value their colleagues’ input and the importance of being able to rely on them to successfully navigate the ROV.

While students often ask Harmon, as the “expert” how to operate the ROV at the program outset, within five to 10 minutes they are relying on team members. At the program’s end, over 75 percent of students discuss their relationship with the Mississippi River being expanded due to the opportunity to engage directly with it.

The program design intentionality has a great deal to do with its effectiveness. It relies on combining effective peer learning with interpretation strategies — thus meeting specific course objectives and broader program objectives.

Associate Professor Laurie Harmon, Recreation Management & Therapeutic Recreation, with an underwater Remotely Operated Vehicle. The ROV helps students discover what it means to become a “techno-naturalist.”

Article by Associate Professor Laurie Harmon, Recreation Management & Therapeutic Recreation





ILLUMINATING AUDIENCES

UWL research video featured in award-winning documentary on bioluminescence

UWL Associate Professor of Biology Gretchen Gerrish's underwater research is reaching the general public through an award-winning documentary, which is streaming online through Curiosity Stream and airing throughout most of the world on BBC UK.

Over the last seven years, Gerrish and her UWL student researchers have been studying shrimp-like crustaceans — called marine ostracods — that live in the shallow waters of the Caribbean Sea. These tiny creatures create amazing light displays in the dark water to attract mates. Gerrish and her student researchers film these displays as part of their research on ostracod identification and evolution. Last year

they had the opportunity to travel and film with Ammonite Inc., a United Kingdom company that was working on a documentary on bioluminescence narrated by David Attenborough.

Their ostracod research and images were featured in the documentary “Light on Earth,” which began streaming on Curiosity Stream, a site custom built for streaming documentaries, in spring 2016. It was also featured in the BBC version “Life That Glows.” The film has received numerous awards internationally and just received two Emmy Award nominations, for cinematography and Outstanding Nature Documentary.

Gerrish's research is supported by a National Science Foundation grant and is done in collaboration with four other universities: University of California-Santa Barbara, California State University Los Angeles, Cornell University and University of Kansas.

When a fish consumes an ostracod, the ostracod emits large amounts of luminescence in what is thought to be an anti-predator response. The light in this image is produced by an ostracod as it is being chewed by a fish.

MORE ON GERRISH'S MARINE OSTRACOD RESEARCH

Ostracods emit tiny packets of chemicals that produce bright blue lights. Males produce lights in specific patterns and directions to attract mates, creating a beautiful display and a puzzle for scientists. Gerrish's work specifically aims to test how the intricate light displays used for reproduction influence the evolution for this group. Across just five locations throughout the Caribbean, the research team has discovered more than 25 new species of ostracods. It could be that unique reproductive displays at each location ‘light’ the way for evolutionary change leading to high diversity of these Caribbean reef residents.

CLICK TO WATCH  THE DOCUMENTARY ON CURIOSITY STREAM.

A familiar face

Mark Sandheinrich is next dean of College of Science and Health

Long-time biology professor and researcher Mark Sandheinrich will become the next dean of the College of Science and Health.

Sandheinrich had served as interim dean for nearly two years. Provost and Vice Chancellor for Academic Affairs Betsy Morgan made the announcement Dec. 13, following a nationwide search.

“The key element when hiring a dean is to choose a person who will best serve the college and the university as a whole,” said Morgan in making the appointment. “Mark displays the commitment to collaboration that is key to a complex college such as CSH. He is a quiet leader but one who has already provided innovation in an interim period, and he will lead in a direction indicated by listening to the faculty and staff of the college. In Mark, the campus community and the committee saw integrity and accomplishment.”

Sandheinrich earned a doctorate and master’s in science in fisheries biology from Iowa State University and a bachelor’s in science in ecology, ethology and evolution from the University of Illinois at Urbana-Champaign. He has 30 years of experience and more than 40 publications on aquatic ecology and on the effects of contaminants in aquatic systems. He has worked at UWL since 1988.

Sandheinrich recently served as an invited participant in the Great Lakes Mercury Project – a large, regionally based science synthesis of mercury across the Great Lakes basin funded by the Great Lakes Air Deposition Program. He also was an invited expert panelist on effects of methylmercury on fish, birds and wildlife for the International Conference on Mercury as a Global Pollutant and a guest editor for a special issue of the journal *Ecotoxicology* on the effects of methyl mercury on wildlife. He continues to conduct research with students on mercury contamination.



BUILDING THE FUTURE OF MATH

How a math prof changed a student's career goals, connecting her to faculty mentors to prepare for grad school



Above: UWL senior Kelly Emmrich, a mathematics and statistics major, listens intently to a lecture during an intensive mentoring program for women in mathematics in Princeton, New Jersey, this summer. The program included lectures, seminars, and panel discussions on a wide range of topics of interest to women mathematicians. Emmrich called the experience “empowering.” Photo credit: Andrea Kane/Institute for Advanced Study.

Opposite page: Tushar Das, left, associate professor of Mathematics and Statistics, with UWL student Kelly Emmrich and assistant professor Whitney George. UWL Mathematics and Statistics faculty are eager to support students interested in pursuing a degree in the field.

UWL student Kelly Emmrich remembers the moment she was struck by the beauty of math.

It was a calculus class her freshman year. She was watching Assistant Professor Whitney George draw lines on white board while explaining the meaning behind derivatives.

Emmrich had never had much patience for math. High school calculus was “unsatisfying.” She was plugging and chugging numbers that didn’t appear to have much consequence. But sitting in George’s class that day, Emmrich began to form an entirely new appreciation for the way math explained so much.

“I remember saying to myself, ‘Ahh, yes, that just makes so much sense,’” recalls Emmrich.

Naturally, Emmrich’s new fascination led to many more questions. She took them to George’s office hours where the two would regularly discuss the layers of meaning behind math equations.

“It was the first time I asked a question to someone who was willing to sit here for 30 minutes and tell me about it,” recalls Emmrich. “In high school, there just wasn’t an opportunity like that.”

Answers to her questions led to more. George says they were the type of questions she would rarely get from a student and it was obvious to her Emmrich was thinking about the problems deeply. One day after a fresh round of questions, George stopped Emmrich and inquired what her major was. When the reply wasn’t math, George smiled, “We need to fix that.”

Emmrich says she thought only a “genius” would set out on a path to become a mathematician — certainly not her. But George’s encouragement led her straight to the dean’s office that day to declare mathematics and begin the work

of one day applying to graduate school in the subject.

The senior is well on her way. Emmrich took all of the entry level up to 400 level courses in the Mathematics and Statistics Department in a span of four semesters, giving her time to pursue more experiential learning in preparation for graduate school. She has completed one independent study each semester and two undergraduate research experiences in different parts of the country.

She has also presented research at numerous mathematics conferences. This summer she attended The Institute of Advanced Study Program for Women and Mathematics, a prestigious and intensive mentoring program for women in mathematics at Princeton, New Jersey. Thousands apply to the program. Emmrich was one of only 10 undergraduates selected.

FACULTY CONNECTIONS MAKE THE DIFFERENCE

Emmrich says these opportunities have come to her through UWL faculty connections. George and a team of faculty in the department have rallied around her to make her pursuit of graduate school a

success. The first time a group of seven math faculty all crammed together in George's office to discuss Emmrich's potential graduate school future, she recalls feeling a bit intimidated, but also amazed. She called home to her mother to say, "Mom, you'll never believe what happened today."

But now Emmrich has discovered this level of care is the norm in the Mathematics and Statistics Department. She knows she can walk down the hallway any hour between 8 a.m. and 9 p.m. and an instructor will be there to talk to about whatever she needs.

"As an educator, it doesn't stop with the course content. It goes beyond that," says George. "Mentoring through life situations or career opportunities — Any time I can help a student out, I will do my best to do so."

The department spends a significant amount of time teaching and providing intensive mentoring to math majors — especially those who are graduate school bound, says Tushar Das, associate professor of Mathematics and Statistics.

"Just as excited as Kelly gets about seeing connections in mathematics, we get just as excited when we see students catch that fire," he says.

This support from faculty has led to a rise in the number of students attending graduate school. In the past three years, 15 mathematics majors have been accepted to excellent graduate programs. Das has received follow ups from some of the schools asking if the department can send more.

"We are building the future of math," says Das. "The best part of my job is seeing students succeed. I don't think anything makes me happier than seeing the next generation of mathematicians and knowing I had a part in it."

Emmrich says when faculty talk about her pursuing dreams like graduate school they never say "if." They always say "when." It has challenged her to think about her abilities in a new way. She aims to become a mathematics professor.

"It would be nice to someday make an impact on someone like they made on me," she says.



Rewarding research

As \$338K grant works to prevent heart attacks

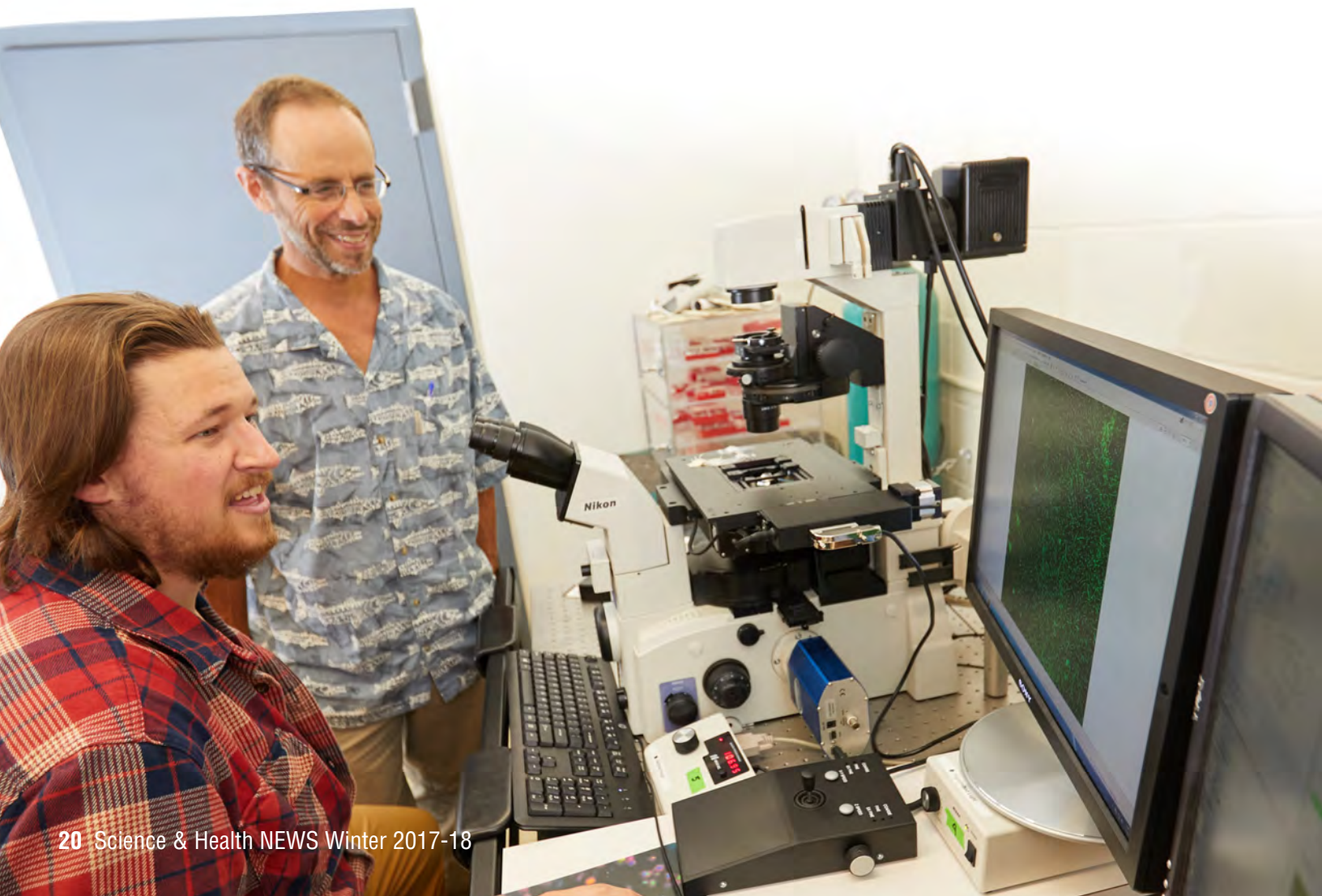
A large National Institutes of Health grant will help a UWL faculty member continue research with major medical implications, while training the next generation of scientists and healthcare professionals.

Biology Professor Scott Cooper received the approximately \$338,000 grant in July, which will support his decade-long study that aims to understand how to prevent blood from clotting. Results could help prevent heart attacks and strokes, the first and third most common cause of death in the U.S.

In addition to health implications, the grant will also help pay for the up to 30 undergraduate students who join Cooper

in his lab is, “yes.” Seniors train newer students. If students contribute to findings, they become co-authors on publications.

“Grants like Dr. Cooper’s provide significant financial support for students to actively participate in the innovation and discovery taking place through faculty’s research,” says Melissa Nielsen, UWL director of Research & Sponsored Programs



and strokes, UWL students get experience

of the experience it gives students, says Mark Sandheinrich, dean of UWL's College of Science and Health. Students learn skills like problem solving, critical thinking, working on a team, writing, presenting results, and more. Some experiences they wouldn't be able to get in a classroom setting, yet they are critical to employers and when applying to graduate schools.

Tanner Tenpas started undergraduate research in Cooper's lab while taking an introductory biology class. A senior, he still remembers how intimidated he felt the first day. He was a non-traditional student attending college as a full-time paramedic. He was surrounded by academics — and a research project he didn't fully understand.

Little by little, he developed an understanding— of the concept behind the research and the lab techniques. And he's been able to apply this



undergraduate research foundation in advanced-level science courses.

Tenpas says the main thing undergraduate research has given him is confidence. In summer he'll be taking the Medical College Admission Test (MCAT), and will eventually apply to medical school to become a doctor.

“When you start out, you see all these professors who are so good at what

they do and are so knowledgeable. It's hard to see where they came from,” he says. “Undergraduate research gave me confidence that anyone can start at the bottom and work their way up — it doesn't take a genius to work in science.”

Research also allows faculty to stay engaged and current in their field, which they apply in classrooms, says Sandheinrich.

“I think of it this way: would you like to take piano lessons from someone who doesn't play?” he asks. “That's why we need to have faculty, even as full professors, engaged in original scholarship.”

Cooper collaborates with Mayo Clinic in Rochester, as well as several universities on the grant, including Harvard University, Colorado School of Mines, and University of Toronto. The collaborators have instruments that UWL does not have access to, so they are able to run experiments on samples for Cooper. When they have results, the institutions will publish together.

“Some think innovation and discovery only happens at larger, research intensive universities, but predominantly undergraduate institutions like UWL are also actively engaged in cutting-edge research,” says Nielsen. That's critical to UWL's mission of student success, she adds.

“Grants like Dr. Cooper's provide significant financial support for students to actively participate in the innovation and discovery taking place through faculty's research,” says Melissa Nielsen, UWL director of Research & Sponsored Programs.

Tanner Tenpas, left, was one of four students working in Scott Cooper's lab last summer with support from a National Institutes of Health grant. Here he practices advanced microscopy techniques using a confocal microscope in the Howard Imaging Center on campus.



CLICK TO WATCH



LEDERHOSEN RACE PLANNING VIDEO

FEST

fun

Class adds Lederhosen Races to Oktoberfest

Like most Recreation Management majors, Ross Ramsey doesn't like to sit in the classroom. He would much rather be working in the community, getting hands-on experience for his future.

That's exactly what he and the rest of his Meetings, Conventions and Event Planning class did during fall semester. Their hard work was showcased at La Crosse's largest festival — Oktoberfest.

"I was so excited," exclaimed Ramsey. "People come to La Crosse just for Oktoberfest."

The class planned a new event — the Lederhosen Races. It's a combination of four smaller events, such as hammerschlagen and grain toss. For many of the students, it's their first time planning an event of this scale. "It's a good way for us to get our feet wet," says Ramsey.

The student's work was showcased at the Southside Fest Grounds two days during the fest.

"Having this experience right now makes it easier for me to know I can keep moving forward," says Aaron Peckham, a junior. "This is why I'm in this major — to see people enjoying things I was a part of."

Librarian's initiative makes health, performance research more readily available

A growing collection of critical research in human health and performance is now more readily available worldwide through a newly networked library system thanks to a UWL librarian.

OregonPDF in Health & Performance, a non-profit foundation affiliated with the University of Oregon, has been collecting and sharing graduate theses and dissertations with subscribers and individual faculty, students and researchers in many fields related to physical activity since 1948. In 2008, the collection went digital. Currently over 60 subscribing libraries in the U.S. and abroad, and over 100 countries each year, gain online access to the more than


11,000 dissertations and theses in the Collection via the OregonPDF website.

Like other independent academic resources collections, OregonPDF has struggled with making their collection broadly visible throughout academia. That changed last summer thanks to William Doering, a systems and metadata librarian at Murphy Library. Doering, whose job includes cataloging and making data records available through library search systems, edited and converted the publisher's information for each item into an easy, usable standard used by all libraries.

Doering successfully lobbied to have the 11,000+ records included in a centralized database used by many academic libraries. Now, the theses and dissertations in the OregonPDFcollection will appear when people search the catalogs of thousands of libraries in the U.S. and worldwide.

Doering is excited about the additional exposure. "We've been subscribing to this great collection for 50 years, and many of our students' theses are in the Collection, so I thought this would be a rewarding and worthwhile project," he explains. "Also, this collection spans everything from biomechanics of exercise, recreation, obesity, sports psychology, and much more, so now I'm hoping more researchers who don't specifically know about the collection will discover more relevant theses as they're doing their research in these many related fields."

Find the theses and dissertations at: www.oregonpdf.org.



MURPHY LIBRARY
RESOURCE CENTER



The UWL-Gundersen-Mayo Physician Assistant Program has helped meet demand for PAs, particularly in the tri-state area. PAs examine, diagnose, treat, assist in surgery, and prescribe medication in hospitals to community health centers across the country.

PA partners

Program is
prescription for
area's healthcare
demand for 20 years

America is home to millions of aging baby boomers and more people with health insurance than ever before. That has helped push one profession in particular into the limelight — the physician assistant.

Physician assistants practice medicine as one of three recognized types of healthcare providers along with nurse practitioners and physicians. The profession is repeatedly named among the highest demand professions in America by major news sources, including USA Today and Forbes.com.

The PA profession has the highest growth and wage prospects out of all high-skill occupations expected to grow at least five percent by 2017, according to the article in USA Today.

20 YEARS OF SUCCESS

As UWL's Physician Assistant program celebrates the 20th anniversary of its first graduating class in 1997, it continues to grow to meet demand in Wisconsin and elsewhere. About 90 percent of program graduates stay within the tri-state area — Wisconsin, Minnesota and Iowa — to practice medicine.

Key to the success of the program, says Sandra Sieck, UWL's PA program director, is the partner healthcare institutions that helped launch the program in 1995: Gundersen Medical Foundation of La Crosse and the Mayo Clinic School of Health Science of Rochester, Minnesota.

“UWL's partnership with two of the nation's premier integrated health systems — Gundersen and Mayo — has attracted high quality students with the academic background, interpersonal skills and maturity necessary to become

outstanding physician assistants,” she says.

Students are exposed to the expertise of dedicated academic and clinical instructors from each partner institution, she adds. Among those instructors is a 1997 alum of the program, Physician Assistant Andrew Horstman who says the PA Program helped him to build a good foundation of knowledge and skills.

Horstman agrees with Sieck that excellence of partner institutions is a major strength of the program. Today he practices at one of those institutions in Interventional Radiology at Gundersen Health System.

“UWL and the clinical partners are all dedicated to the success of the students,” he says. “That partnership and the mission-driven focus of the program is unique and sets this program apart from others.”

Looking back, he is happy he chose this path to becoming a PA, a profession he calls both challenging and rewarding.

“One of the exciting aspects of the PA profession is that as healthcare changes, we continuously evolve to meet the needs of our patients. Sometimes that means creating new opportunities in areas that PAs have not traditionally worked in. Sometimes it might be adding new skills or duties to our current practice,” he says. “Ultimately, I think most PAs tend to be ‘problem solvers’ and get their satisfaction from knowing that they are providing good care to those who need it.”

GROWTH OF THE PA PROGRAM

Over the years, UWL’s program has expanded its academic offerings and its geographical reach. In 2004, the program became a Master of Science in Physician Assistant Studies program. Over the years, regions served by partner institutions has expanded to include central and western Wisconsin, eastern Minnesota and Iowa. And in August 2017, Marshfield Clinic joined the programmatic partnership, providing additional sites for student clinical rotations.

“The expansion is in response to the increasing need of healthcare professionals in the regions served by our clinical partner institutions,” says Sieck. “By educating more PAs, the program hopes to help meet that need.”

The PA program’s inaugural class had 10 students graduating with a bachelor’s degree in PA studies in 1997. Since then, the program has continued to grow with 31 students expected to graduate from the class of 2022.



The PA program mission is to educate competent and compassionate physician assistants. Program graduates have had a 100 percent pass rate on the Physician Assistant National Certifying exam for the past nine years. And all UWL graduates who seek employment after graduation are employed as PAs.



Chopping for a championship

Student earns national lumberjack title

Little did Chas Haas know that growing up cutting wood with his dad would lead to him getting national attention. The senior UWL biology major earned the Stihl Timbersports collegiate national title in August.

The competition featured eight participants who qualified from across the country and pitted them against each other in four events. Haas won two of them, including a record setting performance in the standing block event.

Haas started competing in timber sports three years ago, though he's been fascinated with it since he first saw competitions on TV. "It looked like a real manly, macho sport," he says. "I thought it would be cool to swing an axe."

With his victory, Haas earns a bid to next year's professional-level series.

PRACTICE MAKES PERFECT

Before his competition, Haas honed his skills in front of a crowd.

He'll let out a mighty "yo-ho" as he shows off as a member in the Dells Lumberjack Show — a family-friendly show that mixes competitive lumberjack events with comedic skits and opportunities for young guests to participate.

UWL senior Chas Haas keeps his lumberjack skills up at a show in the Wisconsin Dells. Haas won the U.S. Collegiate Championship in Milwaukee.

[CLICK TO WATCH](#) ► **HIS CHAMPIONSHIP COMPETITION**

"It's the best summer job I've ever had," says Haas, whose parents, Ned, '87, and Carolyn (Nicholas) Haas, '88, are proud UWL alums.

FORESTRY & TIMBER SPORTS CLUB

Haas is working to share his passion on campus. He formed the Forestry and Timber Sports club at UWL.

"It's a great experience to talk about my sport, and being an ambassador is cool," says Haas. "There's a tremendous amount of history in the sport, and La Crosse itself was a huge center for floating logs. It's a vital part of local history to bring knowledge and awareness to the people of La Crosse and Wisconsin."

[CLICK TO WATCH](#) ► **MORE ABOUT THE UWL LUMBERJACKS**



IT'S A MAPATHON

Community helps map to aid natural disaster relief

Three recent natural disasters across the globe, including Hurricane Irma, prompted UWL's Geography and Earth Science Department to organize its first mapathon in September.

The event offered an opportunity for volunteers to create up-to-date maps that facilitate response to crises in vulnerable places in the developing world. Efforts focused on three recent geographic regions where natural disasters unfolded, including Hurricane Irma's toll in the Caribbean and continued damage as it entered Florida, the strongest earthquake to strike Mexico in a century, and extreme flooding in Bangladesh.

The effort was coordinated in conjunction with Humanitarian OpenStreetMap Team (HOT) which aims to make open-source geospatial data available in these regions. Map features were created based on satellite images as required by HOT.

"Within the U.S., we are fortunate to have detailed open-source geospatial data, but in places like Mexico and Bangladesh, there is very limited data available for disaster relief and management," says Gargi Chaudhuri, UWL assistant professor of Geography and Earth Science.

Geography students volunteered at the event. "I believe it's a great opportunity for our students to use their mapping skills and have a global impact right from their classroom," says Chaudhuri.

Learn more about open maps at: www.openstreetmap.org.

UWL's Mapathon offered an opportunity for volunteers to create up-to-date maps that facilitate response to crises in vulnerable places in the developing world.



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SCIENCE LABS BUILDING PROGRESS

Construction on the new \$82 million Science Labs Building continues

The new building will include 35 instructional and research labs for biology, chemistry, geography and earth science, physics, microbiology, river studies and the radiation center, along with shared administrative and building support spaces.

The building addresses space issues and deteriorating infrastructure in Cowley Hall, the existing physical and life sciences facility. When Cowley was built in 1965 and added on to in 1969 and 1970, fewer science programs were offered and fewer students were attending.

The building, which had a groundbreaking in November 2016, is expected to be open for the fall semester 2018.

BUILDING FAST FACTS

- Total Square Footage: 187,600
- Four-story structure with basement
- 11,750 cubic yards of structural concrete
- 822 tons of rebar
- 268 tons of structural steel
- 190,000 bricks

An aerial view from Veterans Memorial Sports Complex of the progress by August 2017.





A view from the west side construction site project in October 2017.

Windows are adorning the north end of the new structure in late November 2017.



GIRLS IN SCIENCE Celebrates 20 years

UWL hosts the 20th anniversary Girls in Science program, along with the Boys Science Exploration Camp June 23-24. Both offer middle school students hands-on activities taught by UWL faculty and staff.

This year, students will pick four workshops from archeology, biology, chemistry, computer science, mathematics and physics. They include exploration of climate change on penguins, investigating and growing crystals, building rollercoasters, and studying the brain and digestive system. The students experience college life with campus meals and a stay in a residence hall.



Jill Welter, an ecosystem scientist at St. Catherine University who promotes women in STEM and Arctic ecology, will keynote this year's 20th annual camp.



Amy Nicodemus, Archaeology, interests Girls in Science campers with "Making Bones Speak."



Christine Schwartz, Biology, teaches a session on "Zombie Brains" during the Boys Science Exploration Camp.

Jill Welter, an ecosystem scientist at St. Catherine University, will deliver a keynote address. She recently worked in Greenland, Svalbard Norway, Kamchatka Russia and Iceland, where she collaborates with an international team of scientists and works to promote women in STEM and Arctic ecology. She will speak on her research which aims to understand how human activities that cause environmental change, including climate warming and nutrient pollution, influence aquatic food webs and nutrient cycling.

KNOW A POTENTIAL CAMPER?

If you know students entering grades 6-8 in fall 2018 who may be interested in the programs, let them know registration starts in late January at www.uwlax.edu/conted/gis and www.uwlax.edu/conted/bse.

INTERESTED IN HELPING THE CAMPS?

As costs have increased, grants, sponsors and donors have been sought to help keep the camps affordable. Bosshard Parke Ltd. in La Crosse has already stepped up as a sponsor. If interested in joining them, contact Susan Kelly, science director for both programs, at skelly@uwlax.edu. Donations lower student costs and provide scholarships for students with needs. Check with employers for matching funds.

SUN SHOW

August 21 eclipse was historic

La Crosse area residents joined those from around the country Monday, Aug. 21, when they headed outside for the first total solar eclipse in the continental U.S. from coast to coast in about 100 years. In La Crosse, people headed out between 11:45 a.m.-2:30 p.m. to view about an 87 percent partial eclipse. On campus, many gathered at Hoeschler Tower around 1:10 for mid-eclipse. The next glimpse of totality across the U.S. will be in 2024.

