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Imagine engines that conserve fuel by automatically dialing down internal friction, water pipes that seal their own cracks and iPhones that protect themselves when dropped. Metallurgist Pradeep Rohatgi has — and he invented the futuristic materials necessary to build these smart products.

For 40 years, Rohatgi has been steadily creating metal matrix composites, which combine standard metal alloys with completely different classes of material — ceramics, nanoparticles and even recycled waste — to give them “smart” qualities.

For all their potential, most of Rohatgi’s creations sat on the shelf for decades. But a flourishing entrepreneurial culture at UW-Milwaukee, the right partners and a national push for conservation and energy independence convinced him to make the leap into the commercial sphere with a product line made using a self-lubricating composite that he believes will cut friction in internal combustion engines significantly, saving gas while reducing emissions.

“The federal mandates to reduce carbon emissions and increase fuel efficiency could be the incentives that finally help these composites into the marketplace,” said engineering alumnus Chris Jordan, who worked in Rohatgi’s lab as an undergraduate. Jordan and lab mate Simon Beno have joined Rohatgi and two of his collaborators in a startup company, Intelligent Composites, which aims to get car parts made with the composite into commercial use.

If successful, the startup’s product line could reinvigorate Wisconsin foundries that have lost business to cheap labor overseas.
A career in composites

Rohatgi pioneered the development of metal matrix composites in the 1970s while working for the International Nickel Company’s U.S. lab. An official at General Motors suggested the lab develop a lightweight alternative to cast iron that would reduce the weight of vehicles and reduce the cost of shipping vehicles to showrooms.

But metal matrix composites were high-tech materials too complicated to mass-produce, and automakers balked at the cost, Rohatgi recalled. At the time, gas was cheap, so there was little motivation for them to pursue the research.

Rohatgi, however, persevered, believing the materials could improve lives and provide jobs. “These composites can give old-line manufacturing the means to produce new, high-tech products that industries can’t find anywhere else,” he said.

Rohatgi and longtime collaborator David Weiss spent years testing composites with various smart qualities at Manitowoc’s Eck Industries, where Weiss is vice president of engineering. They resolved compatibility issues and devised a method to mass produce composites in foundries, bringing down the cost.

Metal matrix composites have been the exclusive property of labs that custom make them for use in projects like the Hubble spacecraft. Now, Eck will prove that same technology can be used to produce the engine part Intelligent Composites wants to sell.

“For years, Pradeep used to come to Eck, and we were trying to understand how we could scale up some of his inventions with the goal always of bringing them to the commercial market,” said Weiss, who is also acting CEO for Intelligent Composites. “What was missing was a business that could take the materials into production and sell them.”

Proven potential

Jordan was already a successful Internet entrepreneur when he returned to college to finish his bachelor’s degree. He took a part-time job in Rohatgi’s lab in 2012, just as the professor decided to enter the self-lubricating composite in the Governor’s Business Plan competition.

“He said it was only an academic exercise when he asked me to get involved,” Jordan said. But within a week, Jordan was envisioning a profitable startup. He sought help from James Hunter, a Lubar School of Business entrepreneur-in-residence who signed on as the startup’s chief financial officer.

Promising early test results helped Intelligent Composites attract more than $350,000 in grant funding during its first 15 months.

According to the team’s market research, engine and vehicle manufacturers facing stricter federal emissions regulations would sit up and take notice if presented with a cost-competitive method of reducing fuel consumption and emissions by 1 or 2 percent.

Prototype of a rotary engine with a part made from self-lubricating composite have produced far better results. Independent testing reported a 35 percent reduction in fuel consumption compared to rotary engines made of traditional materials.

Jordan and Beno hope to see similar benefits when the composite reduces friction between pistons and cylinders in internal combustion engines. Piston engines are used in almost all cars and trucks, so the impact could be dramatic.

“If every car and truck in the country used Intelligent Composites cylinder liners, the United States could become energy independent,” Beno said.

His claim is supported by years of testing Rohatgi and Weiss did with manufacturing giants Ford, Briggs & Stratton and Oshkosh Corp. before Intelligent Composites formed.

Robert Hathaway, a UW-Milwaukee alumnus and vice president of Global Technology – Materials and Process Engineering at Oshkosh Corp., has collaborated on research projects with Rohatgi for two decades.

“We believe these materials have commercial merit,” Hathaway wrote in a letter supporting the startup’s application for a Small Business Technology Transfer grant. “Should Intelligent Composites achieve the goals outlined in the federal grant application, Oshkosh Corporation would be interested in giving this technology a closer look.”

A dual sales approach

While much more testing is ahead, the team also is executing a two-pronged game plan to break into the market.

Weiss is introducing the composite parts to original equipment manufacturers, or OEMs. These companies, like the major automakers, outsource production of parts used in their final product and can influence others.

“These are disruptive materials that call for the suppliers to change manufacturing processes,” Weiss said. “And manufacturers are not as accepting of change as some of the high-tech companies are.”

Growth potential may help nudge them, Rohatgi said. There are at least 25 other vehicle parts that could become more energy-efficient if made with the composite.

Jordan and Beno are focusing on a second front. They plan to make and sell engine cylinder liners for power sport vehicles – ATVs, snowmobiles and watercraft.

“We first want to approach a group that could be early adopters,” Weiss said. “Racers are willing to do anything quickly that will give them a competitive advantage.

Winning over power sport vehicle users would help validate the technology and show other OEMs that customers want to see Intelligent Composites components in their vehicles. Weiss said.

Grateful for the university’s support, the Intelligent Composites team granted 1 percent equity in the startup to the UW-Milwaukee Research Foundation.

“I feel like the university environment allowed this work to grow,” Rohatgi said. “Our partnership holds an important tech-transfer lesson on the critical role of testing great academic ideas in the industry environment. Each one helps propel and hone the other.”

These composites can give old-line manufacturing the means to produce new, high-tech products that industries can’t find anywhere else.”

Continued from page 5
Thirteen-year-old Madeline Yunker fell hard during a soccer match three years ago, striking her head on the turf with enough force to cause a concussion.

But Madeline seemed fine at the time and quickly returned to the field, falling a second time later that game. Her mother, Kristin Yunker, has since learned that when it comes to undiagnosed head injuries, "It's not the first hit that can kill you. It's the second."

Madeline is one of more than 120,000 youth athletes who experience a sports-related head injury each year. With one of the Midwest’s largest concentrations of youth soccer players in metro Milwaukee, the University of Wisconsin-Milwaukee App Brewery and the Medical College of Wisconsin’s Brain Injury Research Program are working to get injured athletes out of the game and into treatment as quickly as possible. In early 2016, the partners launched the Symptom Tracking App for Concussions (S.T.A.C.), a free smartphone app that helps athletes, parents and coaches deal with head injuries.

The app was conceived by Medical College brain injury researcher Adam Pfaller, who called the need for such a tool "obvious."

Concussions can be hard to diagnose – symptoms may first appear hours or days later – and follow a sometimes unpredictable recovery pattern. "There were no good apps on the market that track symptoms for an athlete who gets a concussion," Pfaller said. "A card is easy to misplace, but we all have our cellphones in hand," said Jennifer Hill, who manages the Brain Injury Research Program.

Coaches with the Milwaukee Kickers, one of the state’s largest soccer clubs, are trained to recognize concussion symptoms, said Jock Mutschler, a coach for the organization. But coaches are not experts, nor are the parents who receive the printed handout about head injuries. Few clubs or schools have a professional trainer on hand at every game.

"This app would be ideal for the Kickers," Mutschler said. "The vast majority of the coaches are parents, and while these parent-coaches have been exposed to basic concussion protocol, they haven’t necessarily gone through the extensive training that a paid coach might have."

Four years after her daughter’s complete but lengthy recovery from post-concussion syndrome, Kristin Yunker agreed. "If you have a cast on your arm, the coach or parent isn’t going to say, ‘Come on, you’ve got to get back in the game.’ But I’ve seen it with head injuries."

Along with convenience, S.T.A.C. offers multiple advantages over a paper handout: It can store an individual player’s baseline or pre-injury status, giving parents and coaches a benchmark they can use to evaluate a player’s neurological health in the "gray area" moments after a head injury occurs. Here’s how it works: A sports club or affiliated medical group performs individual baseline tests in the preseason. For example, if a player’s baseline headache or nausea level is normally a self-reported "1" but it spikes to "6" after colliding with another athlete during the homecoming football game, a coach can take action.

"He can pull the player immediately and get him to a hospital to begin the concussion protocol," explains Dustin Hahn, a girls softball coach and project manager at the App Brewery. Players and parents also can track their post-injury symptoms in the app, an aid in making accurate reports to health care providers during the recovery process. That’s a big improvement over the typical response of an injured teenage athlete several days post-injury, which Pfaller generalized as something like: "Uh, um, uh, I didn’t feel very good."

Hahn has young, baseline-tested athletes at home, a daughter who plays softball and a son who plays soccer. He’s convinced S.T.A.C. was the right project for UW-Milwaukee’s App Brewery, where all projects assigned to student developers must fit the Wisconsin Idea — the University of Wisconsin System philosophy that research should solve problems and improve health, quality of life, the environment and agriculture for all citizens of the state.

"The first questions we asked were whether the project aligned with UW-Milwaukee’s mission and whether our students could handle it," Hahn said. "The answer was clearly ‘yes’ on both counts."
STARTUP CULTURE GETS NEW HOME AT UWM

What is the major source of new jobs in a down economy?
The statistics point to new and young companies.

To Milwaukee super-entrepreneur Sheldon Lubar, however, the optimal environment for job growth is one where anyone can think like a business owner. And he sees UW-Milwaukee as the place where students in every discipline are taught that skill.

“The ideal employee in big companies is also someone who thinks in terms of new things, weighing moves that involve risks but also involve building your company,” he said. “Motivating younger people to think like that could be and should be a game changer for the entire state. We wouldn’t be lagging in job creation if we had that kind of energy across Wisconsin.”

To support that vision, Lubar and his wife, Marianne, have given $10 million, matched by a University of Wisconsin System grant, to build the Lubar Center for Entrepreneurship at UW-Milwaukee, a campus facility where all students can practice business skills, find mentors and learn innovative thinking.

The gift builds on UW-Milwaukee’s growing national reputation as a cultivator of idea generators, and student, faculty and alumni entrepreneurs.

The Lubar School of Business has led the way with interdisciplinary programs offered by the Bostrom Center for Business Competitiveness, Innovation and Entrepreneurship, which focus on internships and graduate research. An explosion of “Ideas Challenge” courses serve as incubators of ingenuity as students develop mobile apps, write business plans or create prototypes of commissioned devices while earning academic credit. Contests such as the Student Startup Challenge and the La Macchia New Ventures Business Plan Competition as well as student organizations and networking events are all aspects of the entrepreneurial ecosystem at UW-Milwaukee.

Such programs bring together students who can feed off each other’s ideas, said Lubar, and the center will be ground zero for them to percolate.

From its central location on the corner of East Kenwood Boulevard and Maryland Avenue, the center also will serve as a gateway to UW-Milwaukee, the first stop for prospective students and other visitors.

“We are excited that the first place prospective students visit will include the Lubar Center for Entrepreneurship,” Chancellor Mark Mone said. “The spirit of innovation will infuse and inspire their education here. For some, the goal will be bringing to market products and services. For others, it will be transforming lives in our region with social entrepreneurship.”

With the launch of two national innovation programs on campus, UW-Milwaukee’s startup culture continues to spread.

The University Innovation Fellows program began at Stanford University to train students to be “change agents” who spread entrepreneurship at their institutions. The I-Corps program, supported by the National Science Foundation and administered in Milwaukee by UW-Milwaukee, guides faculty and graduate students at area universities through the process of deciding whether an idea born through academic research could yield a profitable startup.

Read more about these high-profile programs – and some promising student and faculty startup ideas – in the pages ahead.

Philanthropist and businessman Sheldon Lubar believes a college degree and entrepreneurial training go hand in hand. He and wife Marianne have donated $10 million to establish the Lubar Center for Entrepreneurship at UW-Milwaukee. He is pictured with student and alumni entrepreneurs (from left) Rob Salamon, David Gallegos, Marcia Silva, Cordella Jones, Alex Francis and Adam Wickersham.

For some, the goal will be bringing to market products and services.

For others, it will be transforming lives in our region...”
If Amin Mojtahedi could meet the one person on Earth whose passion exactly matched his own, it would be Frederik Pferdt at Google, the search engine titan known for its promotion of creativity through work environment.

Like Pferdt, Mojtahedi is fascinated by the way the physical aspects of a room or space encourage social interaction and productivity.

So Mojtahedi couldn’t believe his luck when he had the opportunity to visit Google’s headquarters and talk to Pferdt, co-founder of Google’s collaboration hub, The Garage. Their discussion happened thanks to a national program that teaches student entrepreneurs to cultivate innovation at their campuses.

Along with eight other UW-Milwaukee students, Mojtahedi has trained as a University Innovation (UI) Fellow in a program funded by the National Science Foundation’s National Center for Engineering Pathways to Innovation. Trained by Stanford University and VentureWell, a national student inventor’s organization, UI Fellows host activities on their own campuses to foster an alliance of student innovators.

Mojtahedi and his wife, fellow doctoral student Tahereh Hosseini, are developing software that helps designers get the most creativity from their spaces.

“Pferdt said he had been experimenting a lot with [Google’s] space, moving the location of food and furniture around, but if someone could quantify those aspects, it would remove the guesswork and take it to the next level,” said Mojtahedi. “When he told me that, I was so golden.”

With a prototype currently under construction, he and Hosseini are now turning their attention to spreading the innovation gospel as UI Fellows.

“The UI Fellows are building a network of campus makers and doers – a community of practice that applies their education to projects important to them,” said Engineering Associate Professor Ilya Avdeev, who has been a leading advocate of entrepreneurship at UW-Milwaukee.

If you get a swath of different people working together, it will likely turn your project in directions you didn’t expect.”

Three UW-Milwaukee students were among the first to go through the 4-year-old program, which has turned out more than 500 fellows nationwide. UW-Milwaukee fellows have hosted activities such as student startup pitches to an online audience of investors and business executives and fast-paced, design-brainstorming workshops so popular at UW-Milwaukee that the fellows were invited to stage one at UW-Madison’s School of Human Ecology.

“In the past, we saw many fellows developing entrepreneurship-related events at their institutions,” said Humera Fasihuddin, co-leader of the national UI Fellows program. “Now we’re seeing them also hosting design-thinking events and also creating spaces that encourage students to prototype and test ideas.”

UI Fellow Nicole Green is one student who discovered her calling after joining the UW-Milwaukee startup community in 2013. As a senior in graphic design, she conceived a mobile app to help families coordinate elder care.

The class project earned her a spot in the university’s Student Startup Challenge, and she also won the annual elevator pitch competition through UW-Milwaukee’s Collegiate Entrepreneurs’ Organization. A high point was attending the club’s national conference, where she talked with a casting director from the television show “Shark Tank.”

“These experiences gave me new ideas of how I could use a graphic design degree,” said Green, now a master’s student in the Lubar School of Business. “Ultimately, I found that the best part for me was bringing people together.”

Entrepreneurship and innovation aren’t just for engineers and business majors, she said.

“If you get a swath of different people working together, it will likely turn your project in directions you didn’t expect. As a fellow, I see myself as a connector in that process.”
UWM TO GROW STARTUPS

Starting a business and doing academic research both involve experimentation and gathering data. So why don’t more university researchers participate in startup companies?

They need to make a different kind of discovery by probing the minds of potential customers and businesspeople.

Making these vital conversations happen is the goal of the I-Corps program launched by the National Science Foundation. UW-Milwaukee joined 35 other I-Corps sites across the country in 2014 to recruit and train academic teams regionally.

I-Corps attracts faculty members, graduate students and business mentors associated with five area universities to unite behind a research-inspired idea and learn to speak “business.” Marquette, Concordia, the Medical College of Wisconsin and Milwaukee School of Engineering participate in the UW-Milwaukee-based I-Corps program.

The goal is to coach 90 entrepreneurial teams in southeastern Wisconsin by fall 2017.

The deep customer-discovery process is the hallmark of I-Corps at UW-Milwaukee.

On the next two pages, two faculty members describe their experiences as you thought.

“Start up.”

“Engineers or IT people or scientists will write these proposals,” said Clark, an associate dean of humanities in the College of Letters and Science. “They’ll do the best they can. But then there’s another person who has to go in and copy edit or rewrite the whole thing.”

Clark, who works as a writing consultant for a dozen Wisconsin companies, believes there’s a better way. With former doctoral student Tatiana Batova and help from UW-Milwaukee entrepreneurial programs, he founded Responsive Writing Solutions LLC. The company is developing customizable software to guide workers through the writing process.

They’ll be able to use templates to organize their writing, standardize documents for global use and manage content they’ve already created.

“Our goal is to say, ‘If you get better at this, through software and training, then you can save a lot of money,’” Clark said. “You won’t have your CEO sitting up nights copy editing documents.”

He’s in the process of bringing Responsive Writing Solutions through UW Ideadvance, a program that fosters entrepreneurs within the UW System by providing grants and business mentoring. In addition, Clark and his team were recently chosen for the National I-Corps program, quite a feat because the program almost overwhelmingly focuses on products in the science, technology, engineering and math fields. The award comes with a $30,000 grant and additional business training in Atlanta.

“I-Corps demands that businesses conduct 100 interviews with potential clients to determine the needs of the current market,” Clark said. “You try to figure out what the problem is in a quantifiable and objective fashion. Having done that, you are better prepared to build a product.”

Along with providing solutions for Wisconsin businesses, Clark expects Responsive Writing Solutions to help train UW-Milwaukee graduate students in technical writing and offer writing-intensive internships to undergraduates.

Ultimately, he said, the company will be able to take a comprehensive look at any organization and its writing needs and recommend the right solutions – be it software, help from a professional writer or both.

“This will be something that we can scale,” he said. “I can go into an organization and say, ‘OK, tell me about the templates you write. I’ll develop a solution that is specific to them and that will allow their unexpected writers to benefit from the same kinds of tools professional writers use.’”

ENGLISH PROF HELPS ‘UNEXPECTED WRITERS’

Dave Clark calls them “unexpected writers” – technicians, engineers and other employees who, with little or no training, must produce documents and reports.

Their poor writing costs companies money.

In I-Corps’ first six months at UW-Milwaukee, 19 teams had completed the training, and most decided to continue their quest to commercialize.

“The increased activity that comes from I-Corps will help southeastern Wisconsin gain a reputation for commercializing innovation,” said Brian Thompson, president of the UWM Research Foundation, which is coordinating the effort.

More than 1,000 teams nationwide have received training through I-Corps, and many went on to earn additional federal seed funding through the NSF Small Business Innovation Research or Small Business Technology Transfer programs.

Most budding entrepreneurs don’t talk to enough people who may use the product before writing a business plan.

“It’s been like that for decades, said James Hunter, Bostrom Entrepreneur-in-Residence at the Lubar School of Business and a serial entrepreneur since the 1970s.

“The whole idea with the lean startup methodology of I-Corps is you find out what the customer wants before you spend a lot of money on developing the idea further,” Hunter said.

“You may find your initial idea wasn’t as good as you thought.”

On the next two pages, two faculty members describe their experiences in I-Corps at UW-Milwaukee.
I-CORPS MOVES RESEARCH FROM LAB TO MARKET

It’s not unusual for patients with spinal cord injuries to develop pressure ulcers from sitting long periods in wheelchairs. Because the patients cannot feel them, the sores become severe by the time they are noticed.

Chronic wounds, which include diabetic ulcers, resist healing, and many end up having to be closed surgically.

Janis Eells has found an innovative treatment that speeds the healing process significantly without drugs or pain light.

In studies with patients who have spinal cord injuries at the Clement J. Zablocki VA Medical Center, Eells and her research partners have shown that a certain treatment regimen using far-red light healed wounds two and a half times more rapidly than the standard therapy, which amounts to keeping the ulcers clean and dry.

“This is remarkable improvement,” said Eells, a professor of biomedical sciences in the College of Health Sciences. “It’s far better than anything else available.”

The light treatment currently is approved by the FDA to treat only bruises and sprains. But Eells is so confident that the therapy works, the professor of biomedical sciences used it on her own mother to heal a small pressure ulcer developed during hospice care.

“Her sore was only about the size of a dime,” Eells said. “But the wounds we’ve treated at the VA hospital were frighteningly large, and we saw similarly successful results.”

With promising results on real patients, Eells and Elizabeth Liedhegner, a research associate in the College of Health Sciences, enrolled in UW-Milwaukee’s I-Corps program to learn how to bring the therapy to market, where it ultimately would be available to patients.

The strategic interview techniques Eells and Liedhegner learned in the program helped them hone in on the right customer base. In fact, after deciding to focus on wound healing at nursing homes and in clinics, the pair realized they were approaching the wrong people.

“We had been contacting doctors, when wound clinics, which are all over the city, are primarily managed by nurses and nurse practitioners,” Eells said.

The skills taught in I-Corps, she said, will help her as she pursues other opportunities, such as landing a TEDMED speaker’s slot, a goal she has been working on for years. Eells, who has worked on grants with private companies before, also has become intrigued with medical startups.

“I’m a bench scientist. If I’m selling myself as a scientific advisory board member to a company, I’d like to be able to understand how these entrepreneurs think,” she said. “I wanted to figure out what questions they would ask and why they ask them.”

UW-Milwaukee physical therapy students developed a training plan for Noah Stone (left), who wanted to run without pain.

By most measures, Noah Stone is a typical high school senior. He loves writing short stories and playing video games with friends and spent last fall working on college applications.

You might not guess that at 3 1/2, Noah was diagnosed with Nonverbal Learning Disability (NLD), a condition similar to the autism spectrum disorder once known as Asperger’s syndrome. Children with NLD must be taught to read nonverbal social cues, like gestures and facial expressions. They also can have delays in physical development, poor muscle tone and coordination problems.

When Noah was a toddler, he received state-funded therapies. As he entered school, his age and academic success disqualified him from school-based therapies. His parents, both educators, paid for therapeutic horseback riding and other activities to address physical symptoms related to NLD. But they found fewer options as he approached his teens, though he still struggled physically, said his mother, Mary Stone. When he ran cross-country as a freshman, for example, he ended the season with crippling shin splints linked to weak muscles.

Stone reached out to Vickie Moerchen, an associate professor of kinesiology and physical therapy in UW-Milwaukee’s College of Health Sciences. Frustrated, Stone described the lack of services for adolescents with autism spectrum and related disorders. But what Moerchen saw was an opportunity.

“I realized that there was a way that we could offer community service, teaching and research, all wrapped up in one project,” Moerchen said. In 2011, she and instructor Maggie Dietrich launched UW-Milwaukee’s Coordination Clinic for Adolescents with Autism.

Innovative teaching and learning

The monthlong clinic takes place each April, near the end of a pediatrics course required for students working on a doctorate in physical therapy. The students split into two to four groups, with each group working with one client and his or her family. All services are free of charge.

Each week, the students devote one class session to discussing their client with their instructors and

Continued on page 18
planning and a second session to working with their client. The students take a systematic approach to getting to know their client, including that person’s interests, strengths and challenges, Moerchen said.

In the first week, students might notice that a client has tight hamstrings and want to jump in and offer stretches to address that.

“They want to move very rapidly into treating,” Moerchen said. “We work very hard to hold them back and force them to ask a series of questions, including, ‘What do we know?’ ‘What do we need to know?’ The richness of this is that over time, they keep adding to what they know and refining what they don’t know.”

She and Dietrich refer to this as “peeling back the layers of the onion.” Students move beyond preconceived ideas and, after getting to know the client, can make carefully crafted recommendations.

At the end of the month, each client receives a detailed plan to address his or her needs. To help one boy who needed music to feel comfortable moving, the students choreographed and videotaped a dance routine for him to follow.

For Jarod Quigley, a horn player in competitive marching band, the students assembled a series of exercises to strengthen his upper back and ease the pain and fatigue he felt during the marching season. For Jarod’s brother Trevor, a dog lover, the students found a recipe for homemade dog biscuits that he could make for the family pooch, developing fine motor skills in the process.

“This clinic is the epitome of a program tailored to your child,” said their mother, Julie Quigley.

Noah wanted to run without pain. Students working with him noted that he needed orthotics designed for running, and they developed a core-strengthening routine and a summerlong training program to help him increase his distance gradually without reinjuring his shins. One student became his weekly running buddy, and they completed the 5K UWM Panther Prowl in October.

“The students and their teacher were very caring and communicative,” Noah said. “You can tell they really care about what they’re doing and give it their all. They were kind of a mini-family there, which I liked.”

Moerchen and Dietrich have made multiple conference presentations about the class-clinic combination and are now working on journal articles.

A key experience for future physical therapists

In the clinic’s early days, Moerchen was surprised by the complexity of some of the teens’ physical challenges. She believes that difficulty with social skills, combined with coordination difficulties, can lead to a child experiencing less variability of movement and often less physical activity from early ages.

“This leads to musculoskeletal changes by adolescence and adulthood,” Moerchen explained. “And we have seen this impact life goals and opportunities for social interaction, health and wellness, and even employment for the individuals this clinic serves.”

Physical therapy students benefit from the chance to observe these types of physical challenges. But Emily Levine, executive director of the Autism Society of Southeastern Wisconsin (ASSEW), believes they also benefit by interacting with young people on the autism spectrum.

“They’re going to run into individuals on the spectrum when they graduate and are in practice,” she said. “To have this exposure in a supported environment, and get parent input and Vickie’s observations and support, all of that is going to make them better practitioners.”

Levine has an adult son with autism who completed the clinic, and she often refers families from ASSEW to Moerchen.

Parents say the program is an oasis in a desert of options for their teens. “We need to create more programs like this that are really innovative,” Stone said. “Vickie was thinking outside the box with this amazing opportunity that not only benefits the individuals with special needs, but also benefits students at the graduate level.”

Noah continues to run and do the weight-training exercises he learned in the clinic.

“What Vickie and her students gave him was something that he will have with him for the rest of his life,” Stone said. “How cool is that?”
Firefighters can go from a resting heart rate to a racing heart rate in minutes. They lug ladders, hoses, tanks and other gear that can weigh 100 to 200 pounds. They twist and squat, crawl and duck in fast-moving situations.

Nationally, two-thirds of firefighters’ injuries are from strains and sprains, similar to competitive athletes.

“We’re finally getting it out there that firefighting is a strenuous job,” said firefighter Andrew Wilke, a 22-year veteran. “We’re ordinary people doing a job that has some unique demands.”

UW-Milwaukee associate professor and licensed athletic trainer Kyle Ebersole calls these first responders “occupational athletes.” After studying the unique physical demands of their profession for nearly a decade, he used his expertise and close relationships with the Milwaukee Fire Department to redesign departmental fitness and performance evaluations. His approach helps new recruits train better for the job and accelerates the recovery process for injured firefighters. Better health and fewer injuries also produce major savings for fire departments and the taxpayers who fund them – $4 million in Milwaukee since 2010.

Ebersole became interested in firefighter fitness in 2005 at the University of Illinois, where a faculty mentor was involved with the school’s Fire Institute. For Ebersole, the work raised more questions.

“There was very little known about performance,” he explained. “How do you help firefighters become better firefighters? How do you improve firefighter performance and injury outcomes?”

By 2008, Ebersole had returned to UW-Milwaukee, where he’d been a professor and director of the athletic training program nearly a decade earlier. Networking through friends and colleagues, Ebersole connected with Luis Rivera, a physical therapist who introduced him to Jason Mims, health and safety officer for Milwaukee Fire Department.

“Mims said he needed help reducing firefighters’ injury rate and the costs involved,” Ebersole recalled. “Luis told him, ‘I know someone who may be able to help.’ That’s where the three of us gelled this idea.”

Ebersole and his partners designed a plan to prepare Milwaukee firefighters for the physical rigors of the job. The department launched a Peer Fitness Training Program, which has certified 30 firefighters as personal fitness trainers since 2010. Others firefighters who want to establish personal fitness programs can now go to their colleagues for training.

Ebersole does 10 continuing education trainings a year for the Milwaukee Fire Department’s personal fitness trainers. He and UW-Milwaukee students working with him also can be found regularly at cadet trainings, testing new recruits. A ball throw measures power. A step test measures aerobic capacity. A plank exercise tests core endurance.

Ebersole’s contribution is just one part of a broad focus on firefighter wellness in the department. But he’s credited with being a major reason the overall effort has succeeded, saving millions of dollars with fewer medical claims, less time lost at work and lower costs for replacements.

“It could not have been done without Kyle understanding the vision and saying, ‘How do we get there through training, through research, through some of the programs we’re working on right now?’” Mims said.

“The programs are so much easier to push through because the union buys in because firefighters trust Dr. Ebersole. It’s a partnership you can’t even dream up,” Ebersole, Mims and Rivera now hope to scale up their success nationally. Their startup company, Tactical Athlete Health and Performance Institute, won a $25,000 entrepreneurship idea grant from UW-Extension and already has studied firefighter fitness programs at more than 50 departments. The trio presented their program at the Metropolitan Fire Chiefs Conference in Las Vegas last year and are looking to land additional consulting contracts.

Ebersole continues to teach in the Athletic Training and Physical Therapy programs in the Integrative Health Care and Performance unit and has four students – two at the graduate level and two undergrads – working with him on his research.

“This work has created a palpable buzz throughout the active-duty firefighter population,” said David Cornell, a doctoral candidate in kinesiology who’s doing his dissertation using data from an intervention study done with firefighters in the field. “This buzz has led to others becoming interested, as well. Hopefully, the end products of this study can create an even bigger snowball effect across these departments and the community.”
The young scientists bent carefully over their work – soldering connections from a resistor to a battery to an LED as they made an electrical circuit.

Not bad for third-graders, who are normally discouraged from playing with electricity.

Along the way, these Milwaukee students improved their knowledge and understanding of science, technology, engineering, the arts and mathematics (the STEAM subjects).

Chris Lawson, an assistant professor in the School of Education’s Department of Educational Psychology, helped design and evaluate a study of the “maker experience” exhibit in partnership with Milwaukee’s Betty Brinn Children’s Museum with a grant from the Hertzfeld Foundation.

For the study, 278 students in 11 third-grade classrooms and one third/fourth-grade classroom spent five weeks learning about electrical circuits. The students worked in their classrooms and at the museum’s Be a Maker space.

“Third-grade students don’t get to do the stuff in their classrooms and their schools that they get to do in the museum,” Lawson said. “It is cool stuff. They’re making circuits; they’re learning that it’s fun and exciting to play with electricity.”

The students also learned how to use electricity to create sounds, combining and looping them to make music.

“(I liked) that we got to do cool experiments and make noise,” one student said. “That was the first time I ever made noises with random things... and played with the noises!”

Hands-on experimentation = instant gratification

“As academics, we spend a lot of time writing papers that do not get published for years. We have very delayed gratification. This was more immediate; you could see what was happening,” Lawson said.

Students worked with their teachers and with the museum’s education and exhibit leadership team, who helped when needed but let the students make their own discoveries. The maker area was messier than a typical classroom but gave students the opportunity to explore and experiment.

“From a theoretical standpoint, that’s how learning happens,” Lawson said. “We need to let learners go off and discover stuff on their own, make their own mistakes.”

“Our Be a Maker space was designed to help children use materials and technologies to explore STEAM concepts, build new skills and practice working independently and with others on a shared outcome,” explained Fern Shupeck, executive director of the museum.

“They were doing things people might otherwise tell them not to do, but circuits are an important concept in science,” Lawson said. “It was especially fun to work on because these are the kinds of things that are more and more being taken out of schools.”

Excited to learn

One of the goals of the project was to get students excited about learning, especially about science and technology. Studies indicate that Americans are lagging behind in these subjects, so there’s a real need for ways to get students interested and engaged in science, Lawson said.

Approximately 85 percent of students involved in the project are children of color, which is significant because there’s a huge ethnic and gender disparity in the science and technology fields.

Lawson and colleague Erica Halverson, an associate professor at the University of Wisconsin-Madison, are still completing research work and preparing for publication, but preliminary results showed the students improved their knowledge of the scientific concepts taught, and the teachers and students surveyed enjoyed the experience.

“Ninety-seven percent of [the students] said they wanted to learn more in the future, and 85 percent said they’d come back to the museum’s Maker space on their own.”

Study results also indicated that the programs inspired educators to use maker experiences to enhance the classroom experience they provide for their students, Shupeck said.

“We are very pleased that the preliminary results of the study indicate the museum’s hands-on maker experiences improved the students’ understanding of and interest in STEAM,” said Shupeck, adding that this education is critical not only to academic success, but also to community economic and workforce development.

“We need to let learners go off and discover stuff on their own, make their own mistakes.”

Third-graders in the project got plenty of hands-on experience building and using circuits.
Living organisms operate like factories, producing continuous chemical reactions, with proteins serving as the laborers. Every process that sustains life depends on these complex molecules.

Discovering how proteins do their jobs holds incredible potential for improving lives. But unraveling their functions depends on seeing how the atoms are arranged and how they change during reactions. Until recently, only a fraction of the world’s proteins could be observed with current technology.

Now, two UW-Milwaukee scientists have helped usher in a new age of unmasking proteins, using a tool that images extremely small objects with unprecedented speed and clarity. In a groundbreaking experiment, UW-Milwaukee physicists Marius Schmidt and his doctoral student, Jason Tenboer, became the first to witness a protein changing in real time with the Free Electron Laser, or XFEL. The feat has opened the door to resolving what Schmidt calls “some of the grand challenges of biology – understanding the molecular structure at a single point in time – a still snapshot. The pattern provides a fingerprint for that protein. The millions of data points can be mathematically reconstructed to form a 3-D image of the protein’s molecular structure at a single point in time – a still snapshot. But this method works with fewer than 20 percent of proteins – only those that crystalize in a small enough size – and it can’t capture them in action. For that, scientists need a laser with split-second X-ray pulses.

They found the tool they needed at the Stanford Accelerator Center in Menlo Park, California. The team induced a chemical reaction in a protein from nine institutions to put the XFEL to the test. The group included four additional UW-Milwaukee scientists: Abbas Ourmazd, Peter Schwander, Chris Kupitz and Jennifer Scales. The team found the tool they needed at the Stanford Linear Accelerator Center in Menlo Park, California. The team used a light source that’s a billion times brighter than any other equipment, the XFEL transforms X-ray crystallography into a kind of high-definition video, providing ultra-slow motion of extremely rapid events.

For the past 60 years, the only way to examine proteins in 3-D was with X-ray crystallography. The process shoots X-rays at crystallized proteins, which diffract light and create patterns of dots the way shaking a paintbrush sprays drops on a wall. “The pattern provides a fingerprint for that protein. The millions of data points can be mathematically reconstructed to form a 3-D image of the protein’s molecular structure at a single point in time – a still snapshot. But this method works with fewer than 20 percent of proteins – only those that crystalize in a small enough size – and it can’t capture them in action. For that, scientists need a laser with split-second X-ray pulses. They found the tool they needed at the Stanford Linear Accelerator Center in Menlo Park, California. With a light source that’s a billion times brighter than any other equipment, the XFEL transforms X-ray crystallography into a kind of high-definition video, providing ultra-slow motion of extremely rapid events.

Schmidt and Tenboer spent about six months growing protein crystals at UW-Milwaukee before heading west. Deciding it was too risky to fly the delicate cargo, they carefully packed the specimens into a climate-controlled van for the long drive to California. “Biology happens at inconceivably short time spans,” Tenboer said. “So the XFEL allows us to do time-resolved studies of proteins in action down to the femtosecond time scale – that’s 10⁻¹⁵ of a second.”

Since their first experiment, Schmidt and Tenboer have conducted a second experiment, making them the first to observe a chemical reaction unfold among multiple proteins working together. “This study shows that the molecular details of life’s chemistry can be followed using X-ray laser nano-crystallography,” Schmidt said, “which puts some of biology’s most sought-after goals within reach.” Schmidt and Tenboer’s paper was published last year in the journal Science. The UW-Milwaukee physicists named here are members of a prestigious $25 million BioXFEL Science and Technology Center funded by the National Science Foundation. The only way to examine proteins in 3-D was with X-ray crystallography. The process shoots X-rays at crystallized proteins, which diffract light and create patterns of dots the way shaking a paintbrush sprays drops on a wall. “The pattern provides a fingerprint for that protein. The millions of data points can be mathematically reconstructed to form a 3-D image of the protein’s molecular structure at a single point in time – a still snapshot. But this method works with fewer than 20 percent of proteins – only those that crystalize in a small enough size – and it can’t capture them in action. For that, scientists need a laser with split-second X-ray pulses. They found the tool they needed at the Stanford Linear Accelerator Center in Menlo Park, California. With a light source that’s a billion times brighter than any other equipment, the XFEL transforms X-ray crystallography into a kind of high-definition video, providing ultra-slow motion of extremely rapid events.

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A WRENCH FENDS OFF INJURY, FEEDS THE ECONOMY

Nearly one third of injuries to gas utility workers come from changing meters using a traditional pipe wrench. Some of them, like torn rotator cuffs and quadriceps, require surgical treatment, costing thousands in medical bills and lost wages. Nearly one third of injuries to gas utility workers come from changing meters using a traditional pipe wrench. Some of them, like torn rotator cuffs and quadriceps, require surgical treatment, costing thousands in medical bills and lost wages.

Campbell-Kyureghyan has spent the past decade studying the problem of wrenching injuries. Campbell-Kyureghyan’s students collected data on injuries that occur in the field, including thrown backs, torn arm muscles and overexertion, looking for the root causes in order to find solutions.

“Biomechanics is a very important part of tool design because you can’t see how the body is responding from the outside,” Campbell-Kyureghyan explained. “You need quantitative data on what’s going on inside.”

Students researching the problem also identified solutions that weren’t working. Some gas technicians, for example, were lugging bags full of custom wrenches to and from job sites in an attempt to avoid injuries from slips. The additional tools raised the weight of the bags to between 50 and 80 pounds — enough to cause other kinds of strain.

The research also indicated that on-the-job injuries that occur repetitively constitute a substantial amount of the total health care costs for companies, Campbell-Kyureghyan said.

Continued on page 28
A tool that unites a community

The new “ergo” wrench is just as rugged as a pipe wrench but lighter with a longer handle and a head that fits securely to the nut, dramatically diminishing muscle activity in shoulders. The shape of the handle provides a more comfortable grip and reduces pressure points on the hands by 20 percent. A quick-release mechanism allows for speedy swapping of four interchangeable heads, meaning technicians don’t have to carry multiple tools.

Lobo said collaboration with UW-Milwaukee researchers on the gas-meter wrench has laid a strong foundation for future partnerships. Along with academic researchers and private-sector engineers, about a dozen students worked on the project in the past three years.

Continued from page 27

How ‘Liking’ Leads to Buying

Social media offers marketers a once-only-dreamed-of opportunity for free consumer-to-consumer advertising. But success depends on consumers being willing to share messages with their friends and followers, and often, they only share messages they like.

So, how do you get someone to “like” your ad?

The key, according to marketing expert Purush Papatla, is to post content that taps into already established consumer behaviors.

A professor in the Lubars School of Business, Papatla is studying how brands can harness the “liking” in social media to enhance sales. In another study, he and colleague Associate Professor Amit Bhatnagar have probed how the “like” culture affects traditional advertising. They hope to tease apart which aspects of human psychology apply in both and which don’t.

“In social media, the microphone is no longer in the marketers’ hands like it is in traditional mediums,” Papatla said. “So marketers are scrambling to try to get some of that [message] control back.”

In the case of Twitter, he said, the decision to retweet or not hinges on whether the benefits outweigh the time invested by the social-media user. In a recent study, he found Twitter users were most likely to share content that they believed would make them look good to their followers, offered something followers could use or could start a conversation.

So how do lessons about consumer “liking” behavior inform more traditional advertising? Papatla and Bhatnagar collaborated to examine that question and uncovered a strategy that could save advertisers money.

Using customer survey data from a major automaker, the researchers determined how to boost products’ likability in various traditional ad formats.

The researchers discovered that when consumers like one kind of ad for a particular product, that feeling spills over into other ad formats for that same product—especially if each medium focuses on a different product trait. Their findings raised questions about the conventional approach to integrated media campaigns, which calls on all formats to deliver a consistent message.

But the results didn’t surprise Bhatnagar. Each channel has distinct advantages in appealing to consumers’ emotions, he said: “TV is best at conveying energy, ingenuity is online’s strength and print ads trump the other forms on warmth.”

Using them together means brands can produce more sales with less advertising.

Next, Papatla is investigating how marketers can more effectively harness “likes” on Instagram, where 55 million images are posted every day, to boost sales.
CRASH STUDY AIDS TO MAKE ROADS SAFER

It was an early August evening in rural Wisconsin. An SUV traveling north along a two-lane road veered over the center line. Before landing in a ditch, the car hit a light pole, speed-limit sign and a 13-year-old pedestrian who died at the scene.

The police report, like about 500 others over the past three years, landed on Bob Schneider’s desk at UW-Milwaukee’s School of Architecture and Urban Planning. Schneider studies severe or fatal bicycle and pedestrian crashes, collecting data that he uses to guide and encourage city planners, developers and policymakers to make roads safer. A professor of urban planning, he also chairs the Transportation Research Board’s Committee on Pedestrians, a sub-group of The National Academies of Sciences, Engineering and Medicine.

The need for this type of work, Schneider said, has never been greater. “Statewide traffic fatalities were up in 2015 for everyone,” he said, “drivers, motorcyclists, bicyclists and pedestrians. This isn’t acceptable.”

Then what is? After 15 years of study, Schneider has an answer: “The only acceptable number of traffic fatalities is zero. I’m driven to keep researching, researching, researching.”

His multiyear analysis of severe bike and pedestrian crashes has shown that multilane roads into Wisconsin’s major urban areas are hotspots for fatalities. Four-lane roads pose more danger than two-lane roads. Injury severity increases with higher speed limits. Intoxication and failing to yield to pedestrians in crosswalks also contribute to crashes.

His research points to solutions that can increase bicyclist and pedestrian safety:

- Providing separated lanes and wide shoulders for bicyclists; constructing curb extensions to reduce crossing distance and make pedestrians more visible to drivers; enforcing speed limits and drivers yielding to pedestrians in crosswalks; and improving lighting and pedestrian and bicyclist visibility at night.
- Partners like the Wisconsin Department of Transportation (WisDOT) and the Bicycle Federation of Wisconsin translate Schneider’s findings into action. WisDOT commissioned Schneider to perform the crash analysis as part of the state’s campaign to stop traffic fatalities.
- “Bob has a great passion for biking, and he can find the data,” said Larry Corsi, a grant specialist in WisDOT’s Bureau of Transportation Safety. “Analyzing fatalities and severe injuries, we’ve been able to pick out some things we can educate people on – keep an eye out for bicyclists and pedestrians, slow down, remind bicyclists they have to follow the same traffic rules as cars. These behaviors can keep people safer.”

Statistics and engineers dominate the transportation safety field. An urban planner, Schneider has complemented their work by creating the Location Movement Classification Method (LMCM). The approach looks at the location where the crash occurred relative to the intersection and motorist and pedestrian or bicyclist movement patterns when the crash occurs.

The LMCM yielded 57 combinations of motorist and bicyclist/pedestrian behavior, like “N_LRD_X.” Schneider applied that designation to the August crash, in which a child was killed by a motorist along a non-intersection stretch of road after the motorist crossed the centerline. This crash, like more than three-quarters of all pedestrian fatalities in Wisconsin, involved a motorist traveling straight rather than turning, which is important information for urban planners and others tasked with improving safety. One possible solution is adding more sidewalks and wide, paved shoulders along main roads in suburban and rural Wisconsin.

“The reason I call these ‘crashes’ and not accidents is because accidents are not preventable,” Schneider said. “Crashes are preventable – there are actions we can take.”

He acknowledges that some factors are outside the domain of urban planners. The driver who struck the girl had an academic partnership that’s been as specific or in-depth as what Bob has provided.”

Bob’s research is applicable and useful to citizens statewide,” said Jessica Binder, program director for the Bicycle Federation of Wisconsin. “We’ve never had an academic partnership that’s been as specific or in-depth as what Bob has provided.”

Keeping walkers and bicyclists alive is his foremost priority, but Schneider also believes safe transportation is critical to building dynamic, desirable communities. “A great place is one where there is lots of human activity – people walking around or on bikes, sitting outside at cafés,” he said. “The movement to make it safer to walk and bike also makes better communities to live in. In fact, there is a positive feedback loop – more walking and bicycling overall improves safety for each individual pedestrian and bicyclist.”

Schneider’s work earned him a 2015 Advocate of the Year award from the Bicycle Federation of Wisconsin, which has incorporated his safety-first research into media campaigns and efforts to make Milwaukee more bikeable and walkable. “Bob’s research is applicable and useful to citizens statewide,” said Jessica Binder, program director for the Bicycle Federation of Wisconsin. “We’ve never had an academic partnership that’s been as specific or in-depth as what Bob has provided.”

The only acceptable number of traffic fatalities is zero.”
LEAVAGE POLLUTANTS LINKED TO LIFELONG HEALTH ISSUES

As an Eagle Scout in the 1980s, Michael Laiosa took canoe trips down the Hudson River, once paddling from his hometown of Albany, New York, to the outskirts of New York City. He saw both spectacular scenery and signs of toxic environmental degradation. Riverfront signs warned against eating river fish or swimming in the water due to pollutants known as polychlorinated biphenyls (PCBs).

Millions of pounds of PCBs flowed into the river over decades, prompting a fishing ban before the industrial chemicals were ultimately outlawed in 1979.

The trips helped shape Laiosa’s career. Today, as an associate professor of environmental health sciences in the Joseph J. Zilber School of Public Health, he studies the effects of a related class of pollutants, dioxin, on fetuses. He found that the pollutants could cause immune-system changes in fetal mammals exposed to them and lead to weakened immunity for a lifetime.

Those immune deficiencies, in turn, could trigger “anything from increased allergy and asthma as a toddler to increased susceptibility to cancer later in life,” Laiosa said. His research could affect parents’ decisions during pregnancy and how we manage sources of pollution.

Dioxin is a “legacy pollutant,” meaning that the chemical lingers in the environment long after it is produced. One of the most famous sources of dioxin came from Agent Orange, used extensively during the Vietnam War.

Although the Environmental Protection Agency and other bodies now regulate dioxin production closely, it’s still released in an unregulated manner when plastics are burned, Laiosa said. For example, discarded electronics are often shipped from the United States to developing countries for recycling. There, the usable metals are removed and resold, and the remaining plastics are burned, releasing dioxin that can harm local residents and migrate around the globe.

It happens here, too.

A long-lasting pollutant

Dioxin is released if the trash contains plastics, and virtually all of the chemical remains in the environment. Highly mobile, it travels from the atmosphere to the ground in rain and snow. There, it is ingested by animals such as cows and pigs. Humans absorb dioxin by eating dairy, beef and pork. Almost all Americans are exposed to dioxin, usually at really tiny levels. But the chemical accumulates in our fat cells, where it can stay for years.

What dioxin does

In his lab in the Kenwood Interdisciplinary Research Complex, Laiosa studies how exposing pregnant mice to dioxin affects their babies’ development.

His research – originally funded by a five-year grant from the National Institute of Environmental Health Sciences – shows that dioxin alters the hematopoietic stem cells, or blood-forming cells, in fetal mice. When blood-forming stem cells divide in two, one cell serves as a copy of the original stem cell, and the other cell matures into red or white blood cells and immune cells. This dual process of stem-cell renewal and maturation continues throughout one’s entire life but is also highly sensitive to environmental factors that can lead to imbalances in the production of mature blood cells compared to replacement stem cells.

In an article published in the journal Environmental Health Perspectives, Laiosa reported that exposing fetuses to dioxin in the womb increases cell stress, fundamentally altering this balance of blood-forming cells.

“That yields cells that are less able to renew themselves, potentially reducing the number of mature blood cells produced,” he explained.

Laiosa also found that dioxin in fetal tissue binds to a protein known as an aryl hydrocarbon receptor (AHR), which regulates blood formation. When dioxin and AHR interact, blood-forming cells lose their ability to copy themselves over time. Previous studies by other scientists showed that dioxin and AHR interact similarly in adult mice, but “in the fetus, we observed some of these changes at a much lower dose of dioxin than in adult mice,” Laiosa said.

When he transplanted a mix of healthy stem cells and dioxin-exposed stem cells into mice, the healthy cells renewed themselves much faster than the dioxin-exposed cells, at a pace of roughly three to one. “If blood-forming stem cells start out diminished, they don’t recover,” Laiosa said. “They stay the same or get even worse over time.”

“Highly mobile, it travels from the atmosphere to the ground in rain and snow. There, it is ingested by animals such as cows and pigs. Humans absorb dioxin by eating dairy, beef, and pork. Almost all Americans are exposed to dioxin, usually at really tiny levels."
Raped as a child, Gwen cycled in and out of jail and sex work for more than 30 years, abusing drugs and battling anorexia.

Today, she’s two years clean. What changed? When Gwen made it out of prison or attempted rehab in the past, she faced daunting odds with no money, an unstable home and limited job prospects. Among the few constants in her life were neighbors, pimps and dealers who supplied her with crack cocaine and clients. But her last time in rehab, a nonprofit group helped her get a new address. For the first time in decades, she felt safe.

More women like Gwen could be helped if Wisconsin joined 14 other states in creating prostitution courts that provide services to address the underlying causes and offer alternative settings free from negative influences, said Joan Blakey, an assistant professor in social work who has studied prostitution and sex trafficking for almost five years. The courts recognize that women engaged in prostitution are often victims who have limited choices. In lieu of jail or prison, prostitution courts offer services that address early childhood trauma, addiction and job readiness. In most cases, the first steps are providing women with substance abuse treatment and safe housing.

Joan Blakey says a dedicated court system could help women with a history of prostitution address the mental health, substance abuse and education needs that often are barriers to a successful exit from prostitution.

“Despite a number of programs, resources in Milwaukee County fall short in meeting housing, treatment and mental health needs for this specialized population,” said Jeffrey Altenburg, a deputy district attorney. “The Milwaukee County Early Intervention Program attempts to identify resources that can provide some of these services in lieu of incarceration for this population.”

The court system has an early intervention program, but it does not offer safe housing for women who want to leave prostitution. That gap looms large in Blakey’s mind.

“There are pieces here in Milwaukee that we can use to start building up the right infrastructure for these women,” she said. “But unless a woman has safe housing, integrated treatment services that address substance abuse treatment and trauma, as well as a way to support herself financially, it’s almost impossible for a woman to successfully exit a life of prostitution.”

“Traditional systems focus on punishment, not rehabilitation...”

The investment is offset by savings on incarceration, which costs $37,994 per year for each prisoner in Wisconsin.

“The traditional system focuses on punishment, not rehabilitation,” Blakey said. “These women don’t need punishment. Trust me, their lives have been punishment enough.”

In Milwaukee, experts agree, the main obstacle to rehabilitation is the county’s weak social service system.

“Child protective services wasn’t dealing with the parents’ trauma,” Blakey continued. “Substance abuse treatment centers believe women must be abstinent before they can start dealing with trauma. But it’s hard to focus on the substance abuse and not deal with the trauma, just like it’s hard to focus on recovering from trauma when you don’t have a place to live.”

Blakey studied the prostitution court in Tarrant County, Texas. The three-year program includes supportive housing, substance abuse and mental health treatment, and vocational and educational services. The program’s length reflects the fact that women with a history of prostitution typically need two to three years to turn their lives around.

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McLellan said improvements include rain gardens that capture stormwater from city streets and roofs before it hits the lake. “The more we can hold stormwater back, the more we can control pollutants in our lake.”

But McLellan said the lake won’t ever be completely out of danger as long as major cities sit on its shores. “It’s not easy to keep urban water clean. A major metropolitan area puts so much pressure on lakes and rivers. After a major storm, you can see that urban rivers get extra dirty from the runoff. Rain pulls things like blacktop sealant and dog waste off the street and into the water. Leaking sewers can release sewage to our waterways.”

Other stressors include open garbage cans along the lakeshore that attract gulls. Dog and bird waste accumulate, further degrading water quality. Beach sand traps bacteria and drags it into the lake. Milwaukee is home to more than 10,000 miles of pipes that can leak or break as they transport wastewater. Major storms can cause pipes to overflow. Nutrients and bacteria get into the water, disrupting the natural microorganisms that underpin the lake’s ecosystem. Pathogens in human waste create a health risk for waterborne disease.

Working with fellow microbiologists and city engineers, McLellan has sampled and sequenced Lake Michigan water to ID major bacterial pollution sources and trace the flow of contaminated water to leaking or broken pipes. Sometimes the pipes are simply hooked up wrong, sending sewage directly into rivers.

“We map those breaks and misconnections so they can be prioritized and repaired,” McLellan explained. “I know just enough about the system from working with it so much over the years. Even better, I know the engineers.”

Lake Michigan remains McLellan’s first love as a scientist and Milwaukee native, but federally funded research and speaking engagements keep her active on the national water scene. In 2015, she and colleague Ryan Newton sampled water in 71 American cities for an NIH study that tracked human DNA in sewage samples to see what water samples could reveal about the health of a city’s human population. When compared to existing Centers for Disease Control and Prevention data, human microorganisms in water samples predicted with about 90 percent accuracy a city’s obesity rate. The study received much national attention because it could change the way public-health researchers look at the health of a city’s population.

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Close to home, she is involved in renovation of South Shore Beach with support from MillerCoors. Nearby parking lots will be repaved to handle and clear stormwater, keeping more pollutants out of the lake. Naturalization plans will make the beach more welcoming to people but less attractive to birds and ducks. Longer term, one solution may be to boost access to areas 100 yards south of the beach, as more than 10 years of maintaining show it’s less affected by runoff and other sources of bacteria.

There’s one other way beach life has changed for McLellan. She now has a second son, who is 7. Together they go to Bradford Beach, one of her favorite Milwaukee spots.

“Ten years ago, there was no one at the beach,” she said, smiling. “Now, I have trouble finding a place to put my towel.”

Lake Michigan was one of the things that drew Sandra McLellan back to her hometown in 1998, and she made a point of taking her son to the beach. Often.

But the beach had changed since her childhood. Beautiful Bradford Beach on Milwaukee’s east side was contaminated by E. coli. At South Shore Beach, runoff from large concrete parking lots polluted the water, and the area was closed to swimmers more than 60 percent of the time.

McLellan had a doctorate in environmental health, so she understood that Lake Michigan’s unhealthy and stressed beaches were symptomatic of a bigger problem. The lake’s abundant fresh water supply was under threat from the daily pressures of urban life — pollutants, invasive species, human activity and even dog waste.

Since then, the professor at UW-Milwaukee’s School of Freshwater Sciences has been working from her lab on Milwaukee’s inner harbor to address the problem. Her research informs a network of engineers, urban planners, biologists and environmentalists. Across southeastern Wisconsin, she has worked with university and city partners to rehabilitate the urban shoreline, find and repair leaky sewage pipes and unlock the secrets of the delicate microbiome that keeps Lake Michigan one of the world’s top five sources of healthy drinking water.

Funded by UW Sea Grant, the National Institutes of Health and MillerCoors, McLellan’s work is reshaping the city’s relationship with water and making Milwaukee beaches popular again.

“When we see the near-shore areas improve … we see more swimming and healthier fish populations,” McLellan said. Improvements include rain gardens that capture stormwater from city streets and roofs before it hits the lake. “The more we can hold stormwater back, the more we can control pollutants in our lake.”

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ANTHROPOLOGISTS UNCOVER WISCONSIN’S PAST

In the 1860s, a man, likely a German immigrant, died in Milwaukee. He was buried in Gruenhagen Cemetery in the city’s Second Ward. Time passed, and the cemetery was closed, built over and lost to history. Then in August 2015, the Guest House, a local homeless shelter, broke ground to expand into the empty lot next door. The man’s grave – and 82 more – were rediscovered. Construction was halted, and the shelter called the UW-M Cultural Resource Management program (UWM-CRM) for help with the unexpected exhumations.

Public and private agencies hire UWM-CRM to comply with state and federal laws regarding the preservation of historical sites. UWM-CRM, a contractual arm of the anthropology department, conducts historical surveys in advance of planned construction to help its clients avoid disturbing archaeological sites by redesigning the project. If a redesign isn’t possible, UWM-CRM may excavate the site or provide detailed historical analysis of buildings, artifacts or bodies found.

These discoveries help scientists and historians gain a broader understanding of the people who used to live and work in Wisconsin from its prehistoric days to the early 20th century.

Since 1974, UWM-CRM has been busy locating, documenting, excavating and analyzing sites across the state, and even in Illinois, Michigan and Indiana. In years past, the program has excavated forgotten paupers’ graves near the grounds of the Froedtert and the Medical College of Wisconsin complex, conducted research at the 11th-century Aztalan site in Jefferson County and more.

“I think a lot of people don’t realize how much cultural past still exists,” said Patricia Richards, the program’s associate director. “We sort of become the cemetery people, for both prehistoric and historic cemeteries.”

The program hires scientists and archaeologists in addition to UW-Milwaukee graduate and undergraduate students to work the sites and conduct research. Many of those students go on to earn graduate degrees at UW-Milwaukee or work for other cultural resource management organizations.

“I’ve been working for CRM-UWM more or less consistently for the last two or three years,” said doctoral student Marcus Schulenburg, a field tech for the program. “I was very excited for a chance to be a part of it, to work on site and get experience.”

Schulenburg was among the crew excavating Gruenhagen Cemetery, and he and his colleagues found a wealth of information hidden in the bones. Remember the German immigrant? He was probably middle-aged and malnourished. His spine was compressed, which hints at a life of hard labor and back pain.

Bone analysis typically determines the approximate age of an individual, gender and any obvious pathologies that might give hints as to his or her lifestyle. Such information from any burial site provides insight into the lives of the state’s early settlers.

“We learn a lot about lifeways, patterns of disease, the effects of poverty on particular populations, those kinds of things,” Richards said. After analysis, the Wisconsin Historical Society determines whether the bones will be reinterred. If not, they are laid to rest in boxes that line the sliding shelves in the basement of Sabin Hall, where UWM-CRM’s “archive” is housed.

Upstairs, UWM-CRM’s storage rooms are lined with bottles from a 19th-century Irish homestead in Waupaca County and artifacts from other sites. In a laboratory, a scientist analyzes the chemical compounds in a clay pot. Tables are blanketed with bottles from a 19th-century Irish homestead in Waupaca County and artifacts from other sites.

“We charge cost and materials. That’s all it is for us,” she said. “(We) feel very strongly that folks that were recovered from these cemeteries that were forgotten had their own story. It’s our responsibility to tell that story.”

Top: The UWM-CRM lab is full of artifacts found at dig sites, including this bottle, dating to around 1850, taken from the homestead of the first Irish settlers in Waupaca County.

Bottom: Anthropology graduate student Jessica Skinner examines a human bone so she can make a 3-D model for further study of bone stress and wear.
Some people call Chris Guse the Theater Wizard. He prefers to think of himself as a storyteller.

“I use sound and technology to tell a story,” said Guse, who teaches in the Peck School of the Arts. “You go to a rock ‘n’ roll concert to hear the music you love performed live. But there’s more to it – lighting, maybe a video presentation behind the band, pre-recorded audio tracks. Designers and engineers who create that stuff are helping the band tell their stories. I do the same with plays.”

As the theater wizard, Guse has provided award-winning technical expertise for diverse arts groups, including Milwaukee Chamber Theater, Atlanta Historical Museum in Atlanta, Texas, and the Zoological Society of Milwaukee’s Kohl’s Wild Theater. His work stands out, in part, because he has been able to bring high-tech effects even to smaller companies on a shoestring budget.

Dave McLellan, theater coordinator for the zoo program, hired Guse to help develop “The Congo Code,” an original interactive play promoting conservation and STEM-based learning (science, technology, engineering and math) among area middle schoolers.

“Normally, the first thing you’d do with a project like this is hire someone to write the play,” McLellan said. “Given what we wanted to do, we decided to hire a playwright and a tech designer.”

McLellan said Guse was as important as the playwright in telling the story. “That’s not typical in the theater world. When I hired him, I wasn’t sure what he’d do, but he figured it out.”

The 45-minute play took a year to develop. Guse provided video animation, original music and other technology integral to a plot designed to capture the hearts and minds of middle schoolers and teachers: Cameron, the protagonist, was trapped in a video game and relied on the audience and their STEM skills to escape.

The play won the Milwaukee Business Journal’s 2015 Eureka Award for creativity, innovation and ingenuity in education, and Guse was invited to collaborate on another project.

Last fall, Kohl’s Wild Theater debuted “Trash or Tunes,” a collaboration between Guse and Alvaro Saar Rios, an assistant professor of playwriting in the Peck School.

“The theatrical style is more traditional, but we had to build musical instruments out of trash,” McLellan said.

Building the instruments was Guse’s task, and the wizard had many ideas. In the end, he focused on three: a pipe instrument known as a plosive aerophone that makes an unearthly sound; an electric guitar fashioned from a handheld vacuum cleaner; and a drum kit made of buckets, springs, cans and a bike wheel.

Guse’s cost-conscious creativity has humble origins: his Sheboygan, Wisconsin, basement. His high-school rock band, Captain Crunch and the Funky Bunch, practiced there. A guitarist, Guse would pick up his bandmates’ instruments between practices – experimenting with musical arrangements and DIY technology.

“I kludged together a few cassette decks I had collected to create my own multitrack recording system,” said Guse, whose band broke up in the late ‘80s. “It’s an early example of finding a low-cost solution to a high-end technical problem. I found out a couple years later that the joy I got from solving these kinds of problems was actually a skill coveted by the entertainment industry and particularly theater.”

Audiences can see his wizardry at work this spring, when the Peck School presents “Corktown.” The student production will feature animation, video and sound engineered by the theater wizard and his students.
Gene therapies could one day offer life-saving treatments for diabetes, cancer, sickle cell disease and other illnesses that disproportionately affect ethnic minorities, yet many black Americans have profound reason to be skeptical of genetic research.

“The memory of Tuskegee is ingrained in us,” said Patricia McManus, president and CEO of the Black Health Coalition of Wisconsin. “The goal of our study was to get a better sense of their thoughts and experiences in the hope that in the future, more individuals from the black community would at least consider engaging in the research process,” Underwood said.

McManus and Fessahaye Mebrahtu, executive director of the Pan African Community Association, partnered with the professors, in part to ensure that their communities aren’t left out of potential cures for deadly diseases that disproportionately affect ethnic minorities. “This is a new frontier for medicine, and if we do not understand it, our community may not benefit from it,” Mebrahtu said.

The UW-Milwaukee findings may shape how genetic researchers engage minority communities to address health disparities. Boosting awareness of ethical genetic research practices could also lead to strategies that encourage minority populations to participate in future studies — including DNA donation.

A Community Approach

Mebrahtu and McManus — who earned two nursing degrees and a doctorate in Urban Studies from UW-Milwaukee — said they agreed to take part in the genetics attitudes project because of their long-standing relationships with Buseh and Underwood. Both researchers have spent years studying health disparities in Milwaukee. In a recent project, Mebrahtu focused on improving access to breast cancer information and screening among African-American women. Buseh has studied the experiences and challenges faced by African-American men living with HIV and AIDS. Each uses a community-based participatory research approach.

This makes community collaboration central to their studies. They hold focus groups to ask community members what research questions are most important to them and share findings with the community once the research is complete. “We do not use a helicopter approach and fly in and fly back out,” Buseh said.

This type of collaboration takes extra time and effort. “I tell my students: ‘Doing community-based participatory work is not an easy thing,’” Buseh said. But he believes the effort is worth the trust it builds with study participants. McManus agreed. “The way they do it means a lot, and it goes far within our community.”

The genetics attitudes project included focus groups with community leaders and community members, in-depth interviews and a pencil-and-paper survey administered to volunteers. The researchers designed the study with two separate arms: one for African immigrants and another for African-Americans, with 212 people in each arm. Professor emerita of nursing Patricia Stevens joined the team to analyze the data.

Their Findings

The study revealed deep concern about genetic testing among African-Americans and African immigrants. To Buseh’s surprise, those doubts were voiced even by those with advanced degrees. “The issue of trust reverberated through the transcripts,” Buseh said.

Focus group participants wondered what might happen to their genetic samples once they were collected and how genetic information might block their access to insurance. Some expressed doubts that minority communities would benefit from the research after scientists collected the data. African immigrants noted that in their culture, there’s a risk that if a person’s genetic defects become public, his or her entire family might be shunned.

“Almost every aspect of ‘what if’ was raised,” Mebrahtu said.

Some of the conversations touched on the story of Henrietta Lacks, subject of a 2010 bestseller. Lacks, an African-American tobacco farmer, was dying of cervical cancer in 1951 when doctors took a sample of her cells without her consent. After her death, her husband and five children, including a 1-year-old who was pregnant, were cut out of her will.

Continued on page 44
old son, lived in poverty. Two companies were founded to sell copies of her cells, which led to the development of the polio vaccine among other key medical advances – and tens of millions of dollars in profit. Focus group participants expressed anger that researchers might have profited at her family's expense.

In another focus group, McManus shared the more recent example of a 1990 Centers for Disease Control study of measles vaccines in infants in Los Angeles, Senegal and Haiti. Researchers failed to tell parents that their babies received an experimental vaccine and then halted the study when they noticed an increased death rate among female infants in Senegal who received a stronger dose of the vaccine.

Buseh said that any conversations about gene therapies must cover their potential limits. “We can't overpromise that once we get your DNA, we can analyze it and figure out what's happening to you now and will happen to you in the future and you will be fine,” he said.

Buseh hopes to host a genetics summer camp for ethnic minority teens, teaching them about the process of taking a detailed family health history. He wrote an opinion piece in The Scientist, calling for researchers to venture into diverse communities and hold “genetics cafés,” in which they sit down with ethnic minorities to describe their work and answer questions.

Finally, he and Underwood are working with Mabrahut and McManus to expand the study, with the hopes of getting more medical researchers to examine wider health care disparities affecting black Americans and African immigrants.

“We want to create opportunities for bench scientists and community members to meet in the community,” Buseh said. “Building trust starts when the affected people can say that the scientists came to them instead of scientists asking people to leave their community and step into a lab or clinical setting.”

Continued from page 43

Students in the school’s nonprofit program have helped eight Milwaukee organizations expand their Web presence with new sites that enhance visitor engagement – from tracking pollution to taking donations and selling tickets – and also offered simplified maintenance for nonprofits with sparse IT budgets.

“We were looking for ways to help students get the experiences that would help them succeed after they graduate,” said Adam Hudson, the instructor who co-founded the program. “At the same time, we saw an opportunity to make a contribution to the community.”

Making schoolwork work
Senior Sienna Bast agreed.

For her first nonprofit assignment, Bast was on a team that rebuilt the website of Milwaukee Riverkeeper. Last fall, she moved up to project lead at nonprofit, working closely with a community youth organization, Running Rebels, that does everything from coordinating basketball leagues to providing anger management courses and math tutors.

“Many were very interested but had never been asked,” Underwood said.

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UWM OPENS WORLD-CLASS RESEARCH COMPLEX

The first new building to open on UW-Milwaukee’s East Side campus in 20 years, the $80 million Kenwood Interdisciplinary Research Complex provides world-class facilities and state-of-the-art equipment for research in physics, public health and other fields. Here’s a look inside the 132,000-square-foot building destined to be a guiding force in scientific discovery and innovation.

1ST FLOOR
The High Performance Computing Data Center, known as Mortimer, houses processors that work together to allow scientists to perform groundbreaking research in science, math, engineering, digital humanities and bioinformatics, a growing interdisciplinary field focused on analyzing and interpreting biological data.

BASEMENT
The basement is home to the university’s High Resolution Transmission Electron Microscopy (HREM) shared facility, which can examine samples down to the atomic level. Here, physicists and UW-Milwaukee collaborators from engineering, chemistry and biology study the properties of condensed matter surface samples with an eye toward the development of new nanomaterials.

2ND FLOOR
The Department of Chemistry and Biochemistry’s Shimadzu Laboratory for Advanced Applied and Analytical Chemistry houses six new mass spectrometers and a controlled tissue culture suite. Researchers across disciplines use the facility to study issues related to water, soil, agriculture, food and beverage, materials science and health care. One primary user is the Milwaukee Institute for Drug Discovery, which conducts early-stage research and proof-of-concept studies with funding from the National Institutes of Health. The Small Business Collaboratory funded by the National Science Foundation’s (NSF) Partnerships for Innovation program includes a multiphoton microscope, which stimulates electrons in a sample with two pulses of light to produce 3-D images. Imagery of proteins and antibodies could lead to breakthroughs in health care.

3RD FLOOR
Physicists working under the umbrella of the NSF-funded Science and Technology Center use powerful visible and X-ray lasers, as well as synchrotron light and forced-base microscopes, to study the structure of proteins and viruses and how they work within the human body. Meanwhile, physicists with support from the Departments of Energy and Defense, along with the NSF, grow unique multifunctional crystals that could revolutionize the production of batteries, data storage devices and superconductors.

4TH FLOOR
Researchers in the Leonard E. Parker Center for Gravitation, Cosmology and Astrophysics are rewriting our understanding of the universe after the February 2016 announcement that they helped detect the elusive gravitational waves Albert Einstein first predicted 100 years ago. Center scientists provided the computing power and analytical tools that allowed an international group of astrophysicists to determine that a wave detected in September came from the collision of two black holes more than a billion years ago. More discoveries are likely as physicists worldwide comb through the data collected by the Laser Interferometer Gravitational-Wave Observatory, or LIGO.

5TH FLOOR
Faculty members and graduate students in Environmental Health Sciences, a division of the Joseph J. Zilber School of Public Health, work to identify environmental causes of disease with a special focus on how contaminants in water and air can affect health during pregnancy and childhood.

UW-Milwaukee RESEARCH REPORT 2016
Liam Callanan is in the poetry business.
The English professor and novelist founded Eat Local::Read Local, a literary initiative that supports the humanities and local businesses by distributing original, printed poems to restaurants. Servers dish out the poems to diners throughout April, which is National Poetry month.
The social entrepreneurship effort highlights local poets and local restaurants during public readings every April in Milwaukee and Madison.

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UW-Milwaukee

RESEARCH REPORT 2016

Man-made nanoparticles produce beneficial characteristics in products ranging from sunscreen to smart electronics. But are they safe if they get into the environment? Surprisingly, scientists don’t know. To find out, they must first determine how nanoparticles interact with living cells.

Rebecca Klaper, a professor of freshwater sciences, is part of a research team that received a nearly $20 million grant from the National Science Foundation to investigate that question.

If scientists can determine which particles are harmful and why, they may be able to alter their chemistry to render them less toxic, Klaper said. “Our mission is to make them ‘benign by design,’” meaning from the beginning, the particle will have no impact on the environment before it goes into a product.”

PRIZE-WINNING FILM EXPLORES HO-CHUNK HERITAGE

A stark white bridge flashes by as a voice intones a Ho-Chunk song for a safe journey.

In “Jáaji Approx.,” Sky Hopinka takes an abstract journey through places, time and a life.

The seven-minute experimental film that screened at Sundance in early 2016, and has already won a number of awards, combines breathtaking scenery, Ho-Chunk stories and music and an exploration of the bond between Sky and his father, a powwow singer.

Hopinka, a graduate student of film in UW-Milwaukee’s Peck School of the Arts, plans to expand the film into a broader documentary exploring contemporary Ho-Chunk life.

“There’s a lot being done already to preserve the language and the culture. I just want to contribute to that to the best of my abilities and the best way I know how.”

A QUEST TO MAKE NANOPARTICLES SAFE

BLOOD FLOW MAY REVEAL HOW WE THINK

A UW-Milwaukee engineer is building a device that could help answer a particularly puzzling biological question – how blood is directed to the brain to power thinking.

Charting the complex brain networks involved in information processing is the first step in preventing diseases like Alzheimer’s or strokes.

Brain cells called neurons need oxygen and glucose to process information. Blood delivers these metabolic products. But there is another kind of brain cell, an astrocyte, that sits between the neurons and the muscle cells that control blood flow.

Ramin Pashaie, an associate professor of electrical engineering, has received a prestigious CAREER grant from the National Science Foundation to develop equipment with high-resolution imaging that will reveal and quantify the role played by each type of brain cell and how the types work together.

YOUR POEM IS READY

UWM LEADS NEW HUNT TO FIND SECRETS OF THE UNIVERSE

With the recent discovery of gravitational waves, the scientific community will be turning from the quest to confirm Albert Einstein’s prediction to the future of a new branch of astronomy.

As with traditional astronomy, which includes optical, radio and X-ray observations, gravitational wave astronomy can be conducted in a variety of wavelengths to observe different cosmic phenomena.

Opening another observational “window,” UW-Milwaukee physicist Xavier Siemens is leading a consortium of 11 U.S. research institutions that formed the NANOGrav Physics Frontier Center, backed by $14.5 million from the National Science Foundation.

The center will monitor millisecond pulsars – rapidly spinning, superdense remains of supernovas that emit beams of light on either side, like lighthouses. Scientists expect the regularly timed beams to be disrupted by gravitational waves, revealing their presence.

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UW-Milwaukee: An Urban Public Research University

As an urban public research university, UW-Milwaukee plays a unique, vital role within the University of Wisconsin System. In addition to our broad research portfolio and curriculum spanning liberal arts, professional programs and the sciences, we extend our reach as a university via thriving community partnerships. Our world-class faculty shape the state and the world with original ideas, brilliant research and uniquely trained individuals - stories that come to life in this report. And, they apply entrepreneurial and educational innovations here in southeastern Wisconsin for a stronger Milwaukee.

Our faculty are leaders in national and international collaborations, contributing to large multidisciplinary teams. The recent inclusion of UW-Milwaukee in the Carnegie Classification of Institutions of Higher Education and in the Times Higher Education World University Rankings reflects the increasing visibility and impact of our research programs. This includes a major protein-imaging breakthrough that has lifted the curtain on the behavior of molecules essential to human life and healing. Read about this cross-country, interdisciplinary work on pages 24-25.

Within southeastern Wisconsin, research done by our innovative faculty and students in partnership with community organizations improves community health and welfare. On pages 20-21, you’ll meet physical therapist professor and entrepreneur Kyle Eisenole. His data was collected through a years-long partnership with the Milwaukee Fire Department. Today, the protocol he tested and perfected through his own startup company has reduced the city’s firefighter injury rates significantly, saving more than $4 million in taxpayer dollars and counting.

Our creative, world-class researchers and educators also thrive in partnership with international corporations and cutting-edge entrepreneurs. More than $60 million in research is conducted each year in our 13 schools and colleges and more than 150 labs and institutes. Graduate and undergraduate students play key roles in much of this work. On pages 26-28, you’ll meet Naira Campbell-Kyureghyan, who developed a lightweight, industrial-strength wrench that reduces workplace injuries among gas technicians and was licensed by a major tool manufacturer. Much of the testing and research that informed the tool’s design happened in her laboratory at UW-Milwaukee.

The UWM Research Foundation supports commercialization and the development of corporate partnerships. In the past 10 years, this has resulted in 40 patents and more than 50 licenses and option agreements based on UW-Milwaukee research. The foundation also is a strong and early supporter of the startup culture that took root at UW-Milwaukee a decade ago and is spurring economic development in the region and the state. These efforts will take a major leap forward with the Lubar Center for Entrepreneurship that opens in 2017.

As educators, researchers and entrepreneurs, we remain committed to the success of UW-Milwaukee’s research programs, which are central to the institution’s identity and mission and vital to the sustained prosperity of our community. We look forward to new partnerships that allow our research to grow in scope and in impact in metro Milwaukee and beyond. Interested in joining us? We’d love to hear from you.
MADE IN MILWAUKEE
SHAPING THE WORLD

Partner to support research and innovation in Milwaukee and beyond.

uwm.edu/madeinmke/takepart