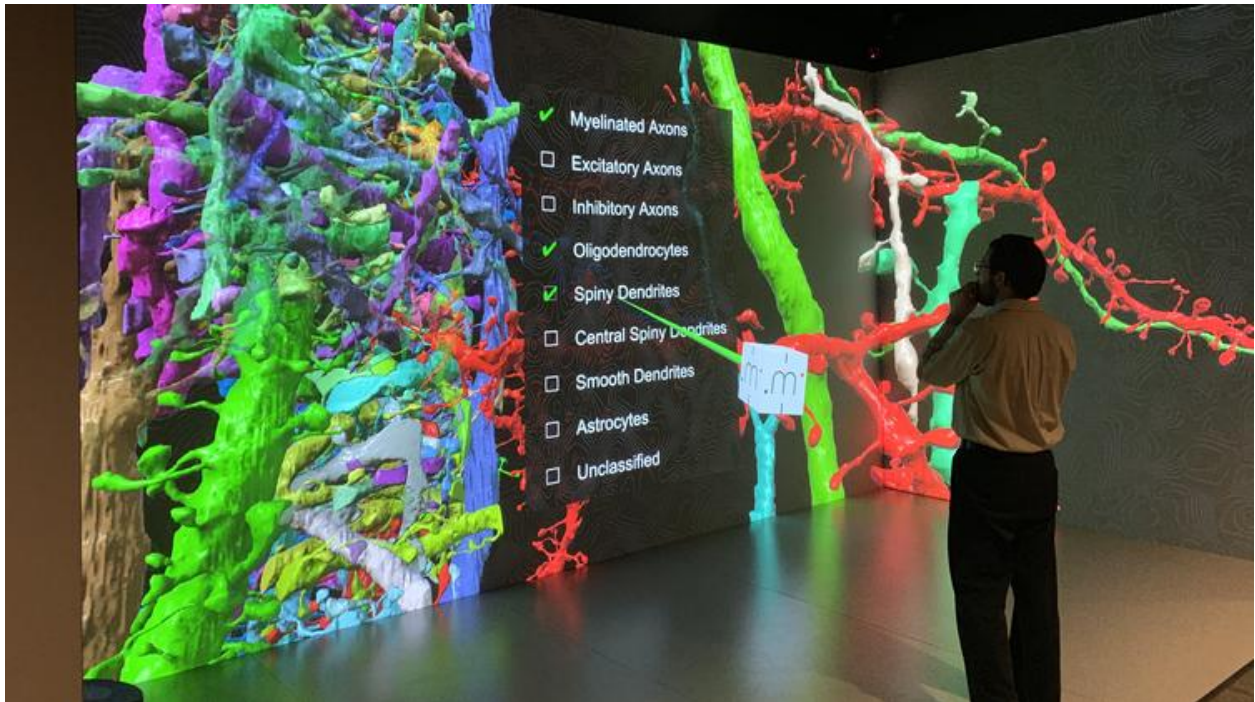


# What's cookin' in college labs: Wisconsin universities push tech limits

Campuses across state add facilities, research that shape industries



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An instructor uses the three-dimensional visualization lab at Marquette University.

By [Nick Williams](#) – Reporter, Milwaukee Business Journal  
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*All tech hubs are centered around a university.*

*So says [Dwight Diercks](#), a Milwaukee School of Engineering alum and senior vice president of software engineering at billion-dollar California tech company NVIDIA, who with his wife Dian, donated \$34 million for a new computer science building at MSOE in downtown Milwaukee that will open this fall.*

*At campuses across Wisconsin, students and faculty within the University of Wisconsin System, private colleges and universities, and the Wisconsin Technical College System are discovering, researching and applying new technologies and ideas that are shaping several industries.*

*In this second of a four-part series focusing on innovation along the Interstate 94 corridor, we highlight the interesting programs taking shape inside college labs in Wisconsin.*

## **Creations inside AI, digital and virtual labs**

In addition to MSOE's new building, which Diercks said has the potential to make Milwaukee a hub for artificial intelligence (AI) research, a handful of college buildings and academic programs will launch in Milwaukee in 2019 year that have the potential to drastically alter Milwaukee's tech scene.

There's the Northwestern Mutual Data Science Institute, a \$40 million partnership between Northwestern Mutual, Marquette University and the University of Wisconsin-Milwaukee and the Connected Systems Institute at UW-Milwaukee, a partnership with Rockwell Automation, Microsoft Corp. and the Wisconsin Economic Development Corp. to develop a learning and research hub focused on the industrial internet of things, which are connected systems in assembly plants and manufacturing facilities.

Beyond those three new buildings, there are existing labs, programs and courses already adding value to Wisconsin's tech ecosystem.

Five years ago, Marquette University invested \$1.5 million to build the Marquette Visualization Lab, an 18-foot-wide, 10-foot-tall and 10-foot-deep three-dimensional, virtual environment space known commonly as caves, inside its engineering hall. The largest of its kind on any Wisconsin campus, MARVL uses 10 projectors that simultaneously blend images in high-definition and cameras that track movement of people standing in the cave.

The technology allows students, faculty, companies and other partners to visualize, simulate, re-create and re-enact images and video in 3-D for learning, research and industry purposes.

Students use the lab for research and presentations, but other uses of the lab, which can fit up to 30 people, have included a training simulation for nursing students, where technicians created a virtual replica of a foreign country to

minimize culture shock of nurses traveling there to deliver health services, and creating theatrical scenery for a student-run rendition of "Macbeth."

The lab has been a useful recruiting tool and is beneficial to graduating students looking for entry-level jobs at companies that apply virtual reality, said John LaDisa, an associate professor of biomedical engineering and director of MARVL.

In 2017, Waukesha County Technical College became the first higher ed facility in Wisconsin to be designated a National Center of Academic Excellence in information assurance and cyber defense by the National Security Agency and Department of Homeland Security after starting its network security specialist associate degree program. It is one of five associate degrees available in information technology and the fastest growing for the department, said [Cyndi Lambach](#), associate dean of information technology at WCTC.

In the first year of availability, 56 students enrolled. By the fall semester of 2018, 119 were enrolled. Between the spring and fall semesters of 2019, the degree program will surpass 200, Lambach said.

"I have so many companies asking for graduates," Lambach said, adding that a recent graduate secured an entry-level job with a salary exceeding \$80,000. "I get many calls every week of companies wanting to know if we have graduates available and if they can do their internship with their company."

### **Advances in food and beverage analysis**

According to the Brewers Association, business and employment generated by more than 130 independent craft breweries had a \$2 billion economic impact on Wisconsin in 2016, and a college professor and students at UW-Eau Claire along I-94 in northwestern Wisconsin are using chemical technologies to further that industry in the state and perhaps, nationwide.

About a year ago, professor [Scott Bailey-Hartsel](#) launched a research project that would not only stir interest among students, but help beer startups in the area. Using a team of undergraduate researchers through the university's chemistry department, Bailey-Hartsel began developing methods for rapid beer flavor analysis.

The one-day analysis, used from beer samples taken by student researchers, help micro-breweries understand how beer profiles can change based on

fermentation and when flavorful components reach their peak. The group has not yet used its system to analyze wine, but is equipped to do so, Bailey-Hartsel said.

The sample tests at UW-Eau Claire are less than \$10 per sample, a fraction of the \$200 or so charged at most large, commercial labs, Bailey-Hartsel said. The flavor-analysis methods could also help micro-brewers characterize test batches and build formulas for larger production, determine the shelf life of beverages and how it performs at different temperatures.

The students and Bailey-Hartsel launched the analysis with an Eau Claire-area micro-brewer and has added a second brewer. The group is applying for a \$50,000 research grant that would pay for student salaries, supplies and equipment. There is potential for students at Eau Claire to create their own craft breweries based on their research, and Bailey-Hartsel is looking to expand into micro- and macro-breweries throughout the region.

“A lot of brewers I know are really wanting to put more science into their brewing to develop new flavors,” said Bailey-Hartsel. “This kind of work is at the forefront of modern craft brewers that think more scientifically than brewers 30 or 40 years ago.”

In a similar vein, possibilities exist for food-related research and startups.

There are more than 500 meat plants in Wisconsin. Only Pennsylvania has more. Slated to open this year at UW-Madison is the \$50 million Meat Science and Animal Biologic Discovery building that will build on the school’s reputation as a hub for meat production research.

Of the many facets of meat production to be analyzed by the new lab are biologic research on molecules and tissues from slaughtered parts of livestock and poultry that can be used for animal and human health, like antibiotics and burn and diabetic wound healing, and lab-grown meat from cultured cells, said Dan Shaefer, executive director of the new building and professor in the department of animal sciences at UW-Madison.

In addition to having equipment and machinery to slaughter and package livestock on site, the building also will be used to investigate pathogens in meat supply, like E. coli and salmonella, for companies looking to validate their manufacturing process, and analyzing ways to grow value to non-meat parts of animals that could be used for protein, cooking materials or tallow, which is found in paint and cosmetic products.

Some of the private donors for the new building include Johnsonville Sausage, Klement Sausage Co., Jones Dairy Farm, GNP Co. and American Foods Group. The building will also provide outreach and research for smaller firms that don't have the capacity to do their own research.

"We will be the best facility in the nation," Schaefer said.

### **Chemical compounds to eliminate opioid addiction**

Professors and students at UW-Milwaukee are working on a neuro-inflammatory medication that could drastically impact the nation's opioid crisis if commercialized. Newly discovered compounds being researched at the university are believed to target the spinal cord and reduce inflammation, which would treat nerve pain associated with cancer, diabetes and neuropsychiatric conditions. When taken, the medication can give users relief without negative effects like sedation, tolerance and addiction, which had led to opioid overdoses.



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UW-Milwaukee faculty professor James Cook and students began research on this compound more than 20 years ago, but in 2015, a new, unique approach identified compounds that reduced the activity of microglia, immune cells of

the central nervous system. This approach would make the compound more stable in the body and making it more difficult for the liver to break down, allowing it to stay in the body for longer periods of time.

So far, UW-Milwaukee research secured \$3 million in grants from the National Institutes of Health for its research on the subtype and \$50,000 from the university.

Human trials for the compound could happen within five years, said UWM professor Alexander Arnold, whose laboratories are characterizing these compounds in the school's department of chemistry and biochemistry. The university has filed several patents to protect its intellectual property of the compound and is seeking industry partners to accelerate research.

UW-Milwaukee graduate student Daniel Knutson has been working on the compound with Arnold and Cook. His first wife became addicted to opioids and other drugs to treat headaches and migraines. She later died from an overdose, he said.

"That motivated me to get to work on this," said Knutson, now 44. "I can help someone else to never go through that."

### **Connected vehicles, driverless shuttles in Madison**

A team of researchers and students at the Traffic Operations and Safety Laboratory at UW-Madison's College of Engineering has been working with the city of Madison's traffic engineers the past three years on connected and autonomous vehicles.

Previously designated as a testing ground for automated vehicles by the U.S. Department of Transportation, the UW-Madison team has established a 6.2-mile testing corridor that links Park Street to Madison's Beltline Highway. Last year, the team installed radio signals at intersections along the route and fixated software to communicate with other hardware at the intersections.

The radar technology is being used for a red light warning system, in which signals are sent to vehicles on the route when another vehicle is approaching a red light at the intersection at dangerous speeds.

Last summer, the team briefly tested connected vehicle technology on the route. Currently, only four radio units are installed, but the plan is to install 26 along the corridor.

Additionally, with the help of some private partners, the research team is preparing this spring to buy an autonomous electric shuttle, said [Jon Riehl](#), a transportation systems engineer at UW-Madison. The plan, Riehl said, is to have the shuttle, priced at \$300,000, loop on a 1.5-mile route from the Capitol Square to the Capitol East District.

"Automated tech is coming whether we want it to or not," Riehl said. "If we let it happen, it will happen in whatever way makes most economic sense, which may not be best for everyone. We need to figure out how to serve not just people who can afford those expensive vehicles, but figure out how they can serve people who don't have access to affordable modes of transportation."