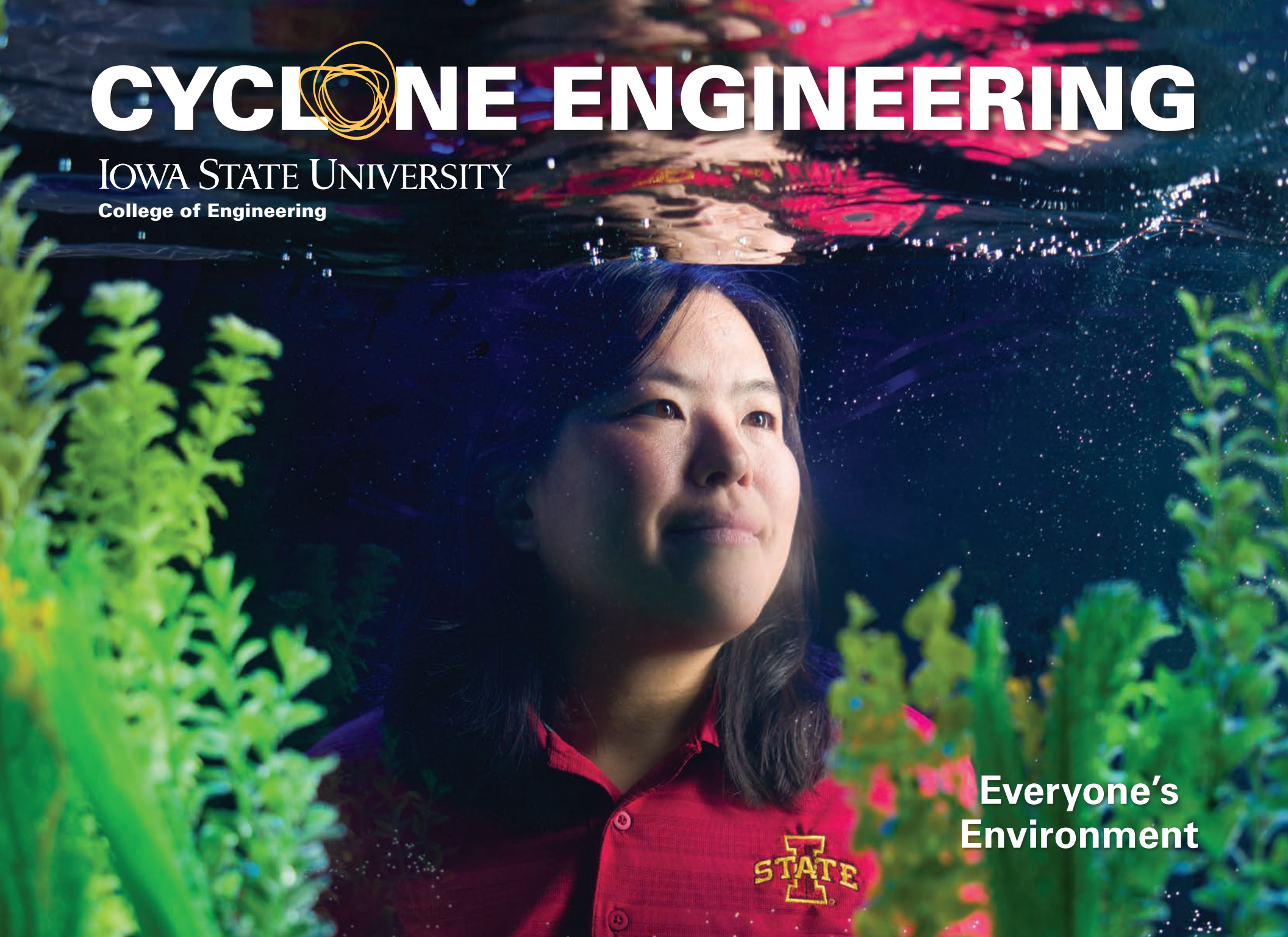
CYCLONE ENGINEERING

IOWA STATE UNIVERSITY
College of Engineering



Everyone's Environment

Environmental engineering for environmental equity

"Cyclone Engineers are focused on using innovation to advance environmental equity. We are developing new technologies and approaches to take on a variety of environmental engineering challenges – with the fair treatment of all people at the heart of our work."

Kaoru Ikuma
Associate professor of civil, construction and environmental engineering

FALL 2022

Major in environmental engineering with a heart for human health

Educating future industrial engineers and advancing manufacturing

Delicious discoveries for safe (and satisfying) food and drink

---

W. Samuel Easterling
James L. and Katherine S. Melsa Dean of Engineering

Arun K. Somani
Senior Associate Dean, Anson Marston Distinguished Professor, Philip and Virginia Sproul Professor

Connie Hargrave
Associate Dean for Equity and Engagement

Sri Sritharan
Assistant Dean for Research, Wilkinson Chair Professor of Interdisciplinary Engineering

Sriram Sundararajan
Associate Dean for Academic Affairs

Editor: **Breehan Gerleman**

Photographer: **Ryan Riley**

Graphic Designer: **William Beach**

Illustrator: **Madeline Willits**

Contact: collegerelations@iastate.edu | www.engineering.iastate.edu

Bridge to Engineering: APEX^{E}

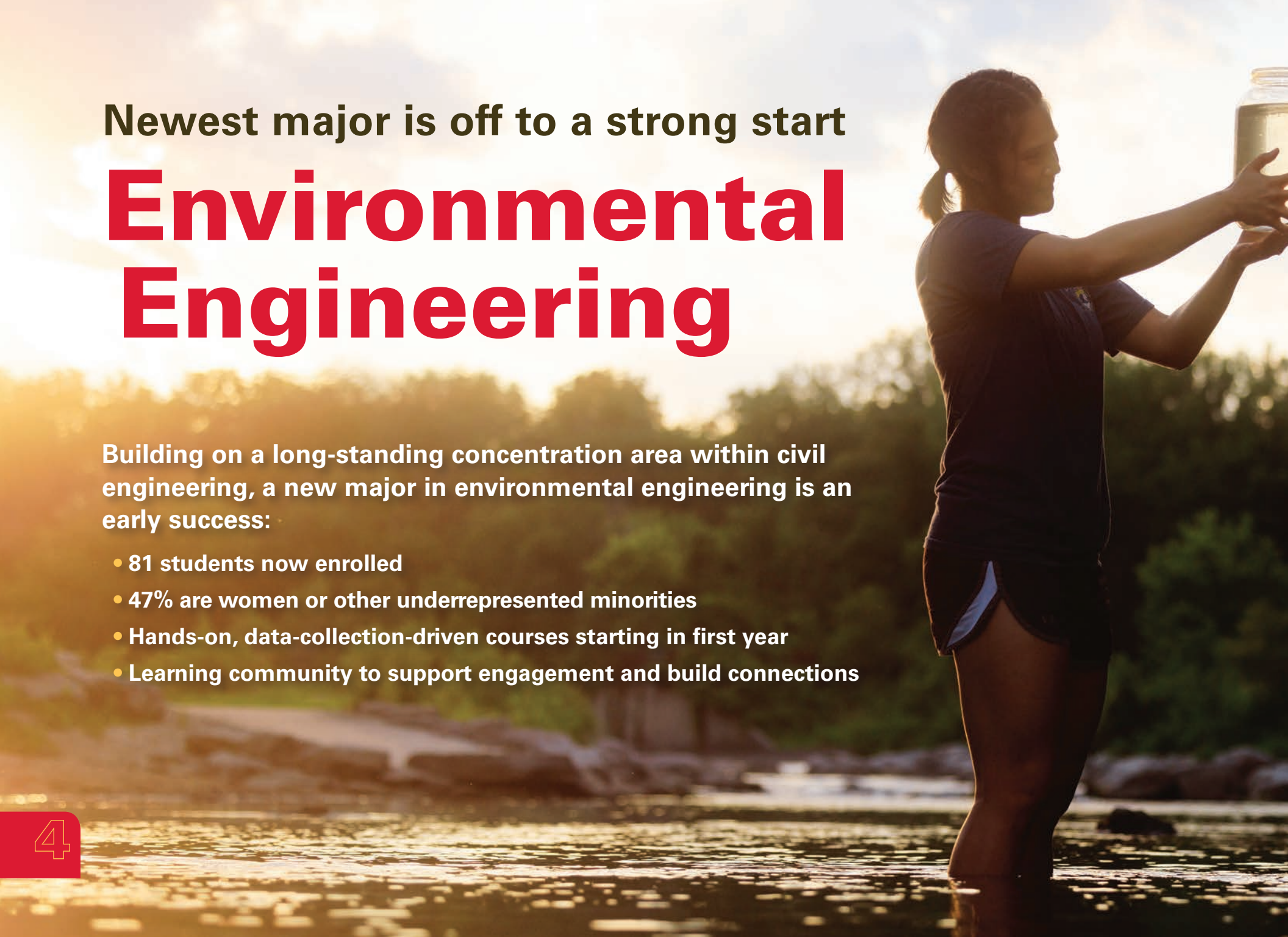
Cyclone Engineering's Academic Program for EXcellence for Engineers (APEX^{E}) is an intensive, eight-week, residential summer bridge program designed to increase the academic, professional and social success of incoming multicultural, first-year engineering students.

APEX^{E} scholars conduct hands-on research with engineering faculty mentors, take foundational engineering courses, and participate in workshops, networking and industry visits to expand their engineering knowledge base and create a sense of connection and belonging.

Manuel Santana, APEX^{E} scholar and electrical engineering major

Newest major is off to a strong start

Environmental Engineering



Building on a long-standing concentration area within civil engineering, a new major in environmental engineering is an early success:

- **81 students now enrolled**
- **47% are women or other underrepresented minorities**
- **Hands-on, data-collection-driven courses starting in first year**
- **Learning community to support engagement and build connections**

"As a student water operator, I put my classroom engineering skills to practice, with responsibility for maintaining the public water supply from start to finish. It is incredibly rewarding to be part of providing a necessity to the Ames community while I'm still a student, especially in a role with a direct connection to quality of life and health outcomes."

Daria Dilparic
Graduate student in environmental engineering
Student operator at the City of Ames Water and Pollution Control Department

Protecting land and water

Advancing Environmental Equity

Iowa State environmental engineers are working on projects with wide-reaching impact, developing new data-driven approaches to ensure all people have access to clean water, resilient infrastructure, and livable environments.

Here are a few areas where Cyclone Engineering faculty are making innovations:

Watershed models

Antonio Arenas uses surface-subsurface hydrologic models to evaluate flood mitigation and agricultural conservation strategies. His team investigates water and nitrogen cycling in farmed prairie potholes, flood and water quality benefits derived from land-use changes, environmental performance of two-stage roadside ditches, and changes to traditional culvert design to achieve flood reduction benefits.

Right-sized climate adaptation strategies

Lu Liu is modeling how climate change will impact rural and urban communities differently – so tailored adaptation strategies can be identified and adopted according to different population-growth rates and climate models.

Common chemical language

Joe Charbonnet is creating a clearer way for scientists and engineers around the world to communicate the characteristics of toxic per- and polyfluoroalkyl substances (PFAS), known as "forever chemicals." A common framework is key to identifying new varieties of PFAS.

Mapping pathogen hotspots

Chris Rehmann leads a team studying where pathogens are most likely to stick around after floodwaters rise and recede. Modeling data about contamination pathways will point to more equitable and resilient approaches to flood mitigation.

Community-led water quality tools

Cristina Poleacovschi leads a project to explore connections between climate change, water quality and health outcomes in Alaska Native communities. The team is partnering with communities on water system monitoring and sampling to create quantitative tools that can be used for infrastructure advocacy.

Reducing risk for older adults

Kaoru Ikuma is working with the Loíza community in Puerto Rico to study how elevated exposure risks to wastewater contaminants after flooding impacts older adults. Her team is modeling contaminant transport, interviewing older residents to learn about their trust in drinking water sources – and combining what they learn into risk-reduction interventions.

Educating future industrial engineering innovators

Construction underway on
New 50,000-square-foot Therkildsen Industrial Engineering building

Degree programs:
BS, MS, MEng, Ph.D. Concurrent BS+MS/MEng and BS+MBA

2021-22 industry-sponsored capstone design projects:
$13.7 million in economic benefit

Sarah Ryan named **C.G. "Turk" and Joyce A. Therkildsen Department Chair of Industrial and Manufacturing Systems Engineering**

“Working as an undergrad research assistant taught me to think differently, and I learned how we can design efficient systems to better conserve our resources – because I believe Cyclone Engineers have the talent and responsibility to create a better world for future generations.”

Landon Getting
Graduate student in
industrial and manufacturing systems engineering
Internships at Boeing, John Deere and Tesla
Three years hands-on undergraduate research experience

Growing companies and communities

The **Center for Industrial Research and Service** connects Iowa's small and medium manufacturers with applied research, education and technical assistance to help them grow and thrive.

CIRAS is the industrial extension arm of Cyclone Engineering and Iowa State University's land-grant mission, connecting companies to expertise in

- **Automation**
- **Materials and large-scale testing**
- **Nondestructive evaluation**
- **Product and process design**
- **Capstone projects**

along with many other services in business and strategy for more than $3 billion in economic impact in the last five years.

CIRAS is one of only 15 NIST Manufacturing Extension Partnership centers led by universities providing U.S. manufacturers with the technology resources they need to succeed.

Industry 4.0 technology lab

CIRAS' Digital Manufacturing Lab powered by Alliant Energy gives Iowa manufacturers a place to try out new Industry 4.0 technologies like wearable sensors, collaborative robotics, advanced vision systems, 3D printers and scanners before buying and implementing them in their businesses – with expert advising by CIRAS tech specialists.

Tomorrow's manufacturing technical advisors

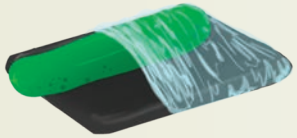
CIRAS is working with Manufacturing Extension Partnership (MEP) centers in Illinois, Kansas and Ohio to increase diversity in manufacturing and engineering talent across the MEP National Network, and in turn, in the field of manufacturing.

The project includes a two-year internship program for undergraduates and graduate students from underrepresented minorities to develop a pipeline for future MEP Center technical specialists.

On the menu:

Engineering for your next meal

Packaging reprocessed



Xianglan Bai, associate professor of mechanical engineering, leads an interdisciplinary team developing new hybrid, plasma-based recycling technologies to convert plastic films from food products into biodegradable polymers.

Seeing steer

Josh Peschel, professor of agricultural and biosystems engineering, is optimizing the placement of cameras in steer feeding operations and using new computer vision algorithms to understand and improve livestock health.

Safer food sensors

Carmen Gomes, associate professor of mechanical engineering, was the first to develop a platinum interdigitated microelectrode biosensor to detect listeria contamination in hydroponic lettuce growing facilities on-site and in real-time.

Every last spud

Using drone technology to fly over fields to check for any sweet potatoes left behind after machine harvest, **Dirk Maier** and **Lie Tang**, professors of agricultural and biosystems engineering, are working to maximize crops collected and consumed – and prevent food waste.

Science of suds

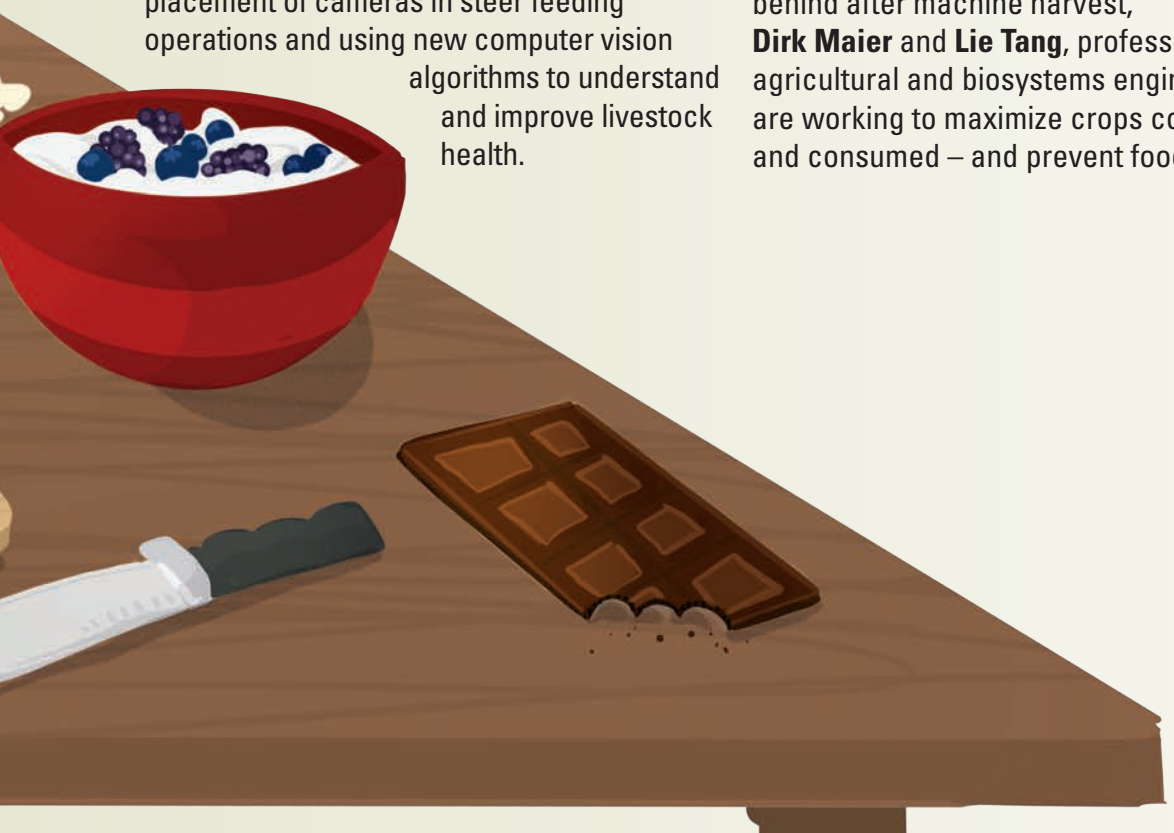
Beer brewer and Distinguished Professor of mechanical engineering **Robert C. Brown** teaches a new Science and Practice of Brewing course about the chemistry, biology, food science and engineering of beer brewing.

A cup of cure

Tom Mansell, associate professor of chemical and biological engineering, is creating new probiotic-prebiotic pairs that can be engineered to make disease-fighting drugs right in the gut, like antimicrobial peptides or anti-inflammatories.

Sweet process

After a 30-year career in chocolate manufacturing, **John Kaiser**, professor of practice in chemical and biological engineering, now teaches students the chocolate process from pods to the finished product.



10:35 Wed Sep 28

IOWA STATE UNIVERSITY
College of Engineering News
news.engineering.iastate.edu

85%

10:35 Wed Sep 28

85%

BioMADE project advances bioreactor fermentation processing

Cyclone Engineers are collaborating with Cargill and Genomatica to scale-up fermentation processes in bioreactors in a new $2.5-million project funded by BioMADE, a manufacturing innovation institute supported by the U.S. Department of Defense. Iowa State is a governing member of BioMADE.

Esther Oreoluwa Jokodola, graduate student in chemical and biological engineering, is on the research team working to close the gap between lab and industry use in bioreactor fermentation.

The team will take on the challenge of predicting how microorganisms, functioning as small chemical factories, will perform as bioreactor size increases. Then Cargill and Genomatica will move the process to large-scale production of a new-generation bio-based intermediate chemical product.

10:35

CAREER award: Powering without batteries

Henry Duwe, assistant professor of electrical and computer engineering, received a 2022 NSF CAREER award to develop intelligent multi-node sensor systems that can be powered solely from energy harvesting without battery storage.

Radio frequency harvesting, vibrational energy harvesting, solar and thermoelectric energy harvesting are all in Duwe's toolbox. While the amount of power harvested would be small, the sensor would be able to run and harvest for decades, opening up the door to less expensive sensors that lessen the impact on the environment.

Hayes reappointed chair of mechanical engineering

Caroline Hayes, chair of the mechanical engineering department, has been reappointed to lead the college's largest department and Iowa State's largest undergraduate program.

Since joining Iowa State in 2012, Hayes has led the ME department to significant growth in faculty hiring and student enrollment, particularly for women undergraduate students. She has also led major building, classroom and laboratory improvement projects.

"Dr. Hayes is a champion for our students, faculty and staff and committed to excellent academic teaching and outcomes. We are excited to see what new ideas and efforts she brings to the department and our college going forward," said **W. Samuel Easterling**, James L. and Katherine S. Melsa Dean of Engineering.

Cybersecurity Faculty Fellows

Iowa State's inaugural class of Cybersecurity Faculty Fellows will integrate cybersecurity course content into non-cybersecurity engineering courses ranging from traffic safety to sustainable engineering to grain processing classes – ensuring Cyclone Engineering students understand the critical role cybersecurity plays across all areas of engineering.

IOWA STATE UNIVERSITY
College of Engineering
4100 Marston Hall
533 Morrill Road
Ames, Iowa 50011-2103

Bridging connections for first-year multicultural engineering students

Advancing manufacturing, educating next-generation industrial engineers

Delivering discoveries from the lab to the dinner table