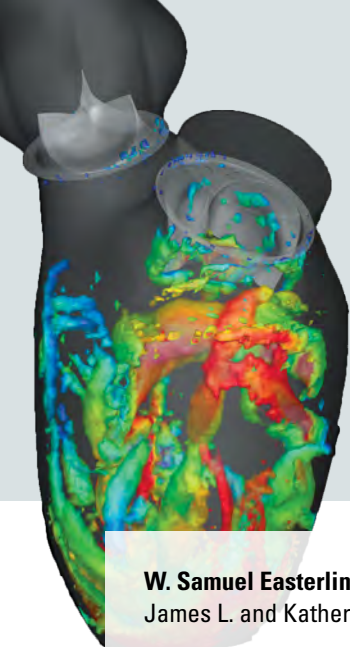


# CYCLONE ENGINEERING



IOWA STATE UNIVERSITY  
College of Engineering





## SPRING 2023

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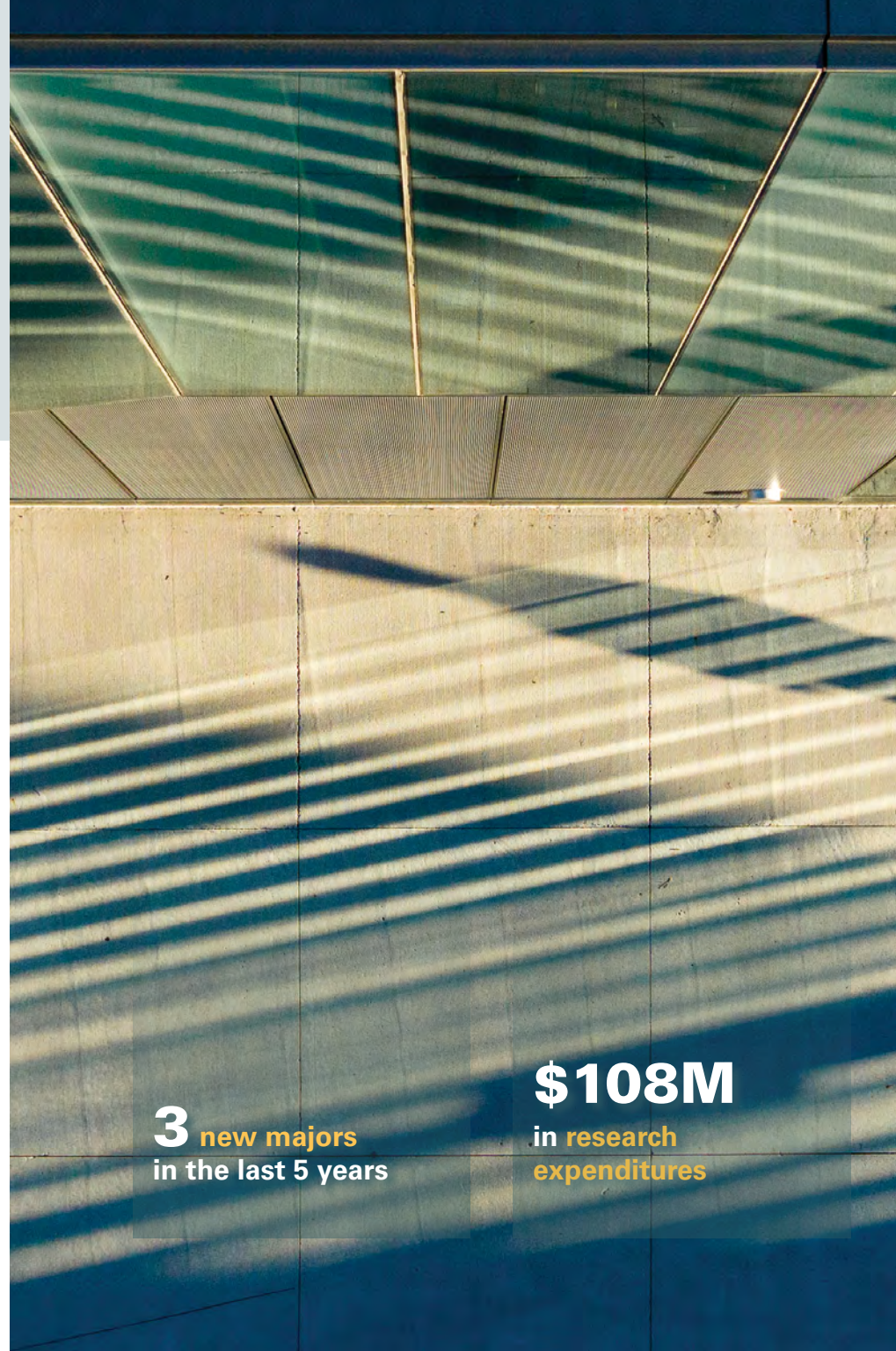
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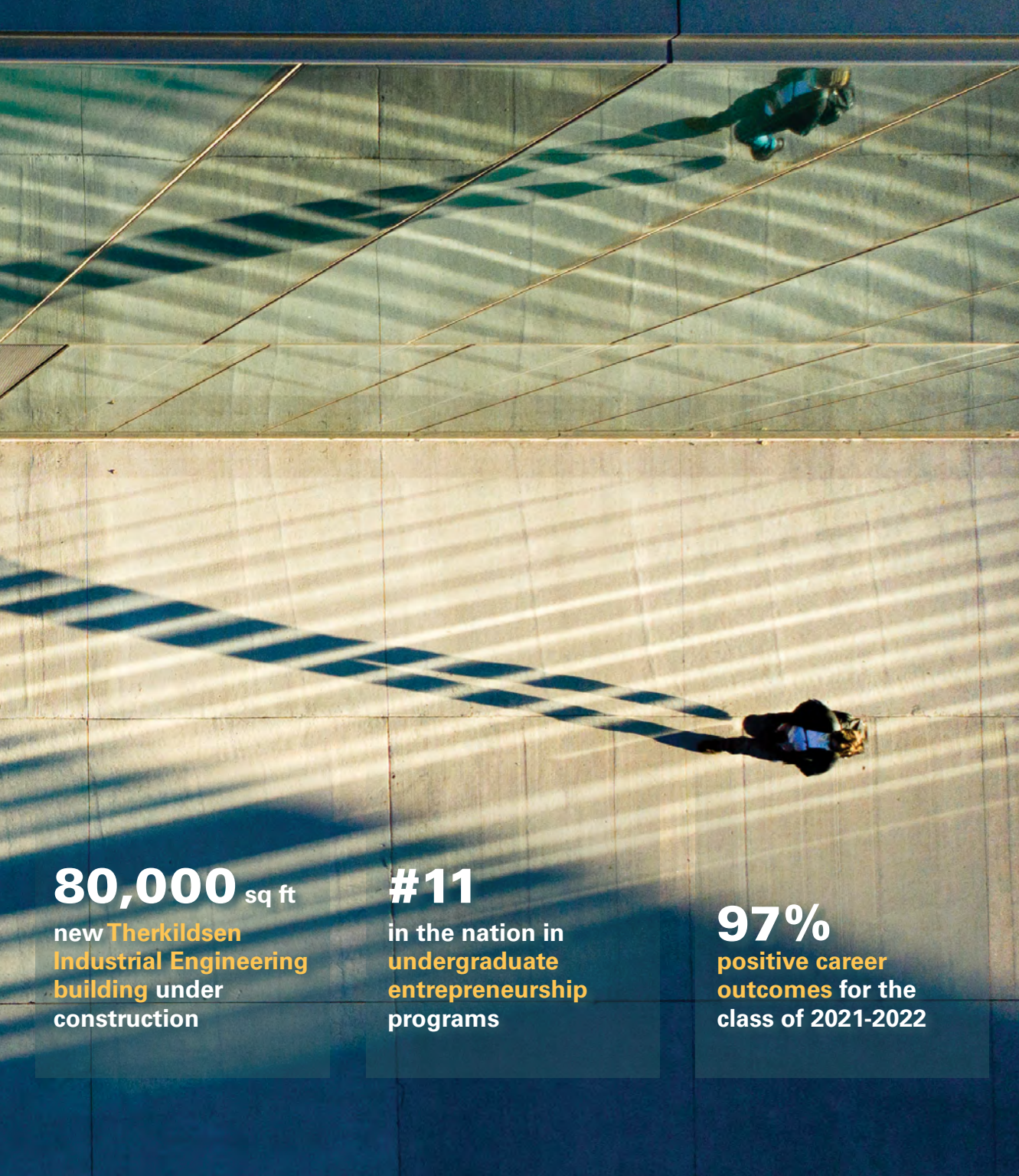
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**3** new majors  
in the last 5 years

**\$108M**  
in research  
expenditures





**80,000** sq ft  
new **Therkildsen**  
**Industrial Engineering**  
building under  
construction

**#11**  
in the nation in  
undergraduate  
entrepreneurship  
programs

**97%**  
positive career  
outcomes for the  
class of 2021-2022

## Easterling elected Distinguished Member of ASCE

**W. Samuel Easterling**,  
James L. and Katherine  
S. Melsa Dean of  
Engineering, has  
been elected a  
Distinguished  
Member of the  
American Society  
of Civil Engineers.



He is being recognized for his transformational contributions to the field of composite and cold-formed steel structures and his outstanding leadership in advancing engineering education. Easterling has been Iowa State's dean of engineering since July 2019 and has led the college in expanding academic offerings, equity and engagement efforts, faculty hiring and new teaching and lab facilities.









# New Biomedical Engineering Degree

## Collaborations for translational health innovations

A new interdisciplinary biomedical engineering major leverages existing Cyclone Engineering expertise in engineered medicine across the college – and Iowa State’s cross-campus expertise in biology, kinesiology and biomedical sciences.

Collaboration with faculty in Iowa State’s College of Human Sciences and the College of Veterinary Medicine offers students unique experience in exploring both human and animal models for translational health innovations.

### Nanovaccine Institute

Iowa State’s Nanovaccine Institute is a national, transdisciplinary research consortium to advance nano-based technologies to treat and prevent disease. More than 80 researchers from 21 institutions are working together on nanovaccines and nanotherapies for respiratory infections, neural disorders, tropical diseases, cancer and veterinary diseases.

### National One Health leadership

Iowa State University is a national leader in One Health, the cross-disciplinary initiative working toward optimal health outcomes by recognizing the interconnection between people, animals, plants and our shared environment.

# Engineering better health

## Stronger protection in a blast

**Sarah Bentil** (pictured right), associate professor of mechanical engineering and a Building a World of Difference Faculty Fellow, is mimicking and measuring how explosive device shock waves cause traumatic brain injuries – providing the experimental data needed to design better protective gear for military members and first responders.

## Longer-lasting synthetic heart valves

**Ming-Chen Hsu**, associate professor of mechanical engineering specializing in fluid-structure interaction, is using sophisticated computational techniques to simulate how artificial replacement heart valves interact with blood flow. Currently, bioprosthetic heart valves have a limited lifespan of about 10 years, so additional surgical intervention is needed once they wear out. Hsu's work will lead to more efficient and durable valve designs, reducing the need for patients to undergo repeat open-heart surgeries.

## Unfolding DNA-origami drug delivery

**Ian Schneider**, associate professor of chemical and biological engineering and professor in charge of the biomedical engineering program, is designing DNA-origami-based nanoscale structures that unfold and deliver drugs locally in response to subtle cellular forces. The cell-controlled release of drugs will advance treatment of fibrotic diseases and cancer.

## Micro-mechanics of bone

**Sid Pathak**, assistant professor of materials science and engineering, is using advanced micro- and nano-mechanical techniques to study bone at the micrometer and sub-micrometer sized domains. Better understanding of linkages between bone structure and its property is a key step in improving diagnosis and treatment of bone fragility.

## Synthetic biology for diagnosis

**Meng Lu**, associate professor of electrical and computer engineering, is developing chip-scale systems for microbial and phage-based sensing technologies. The micro total analysis systems can be used for diagnostic assays for infectious diseases, metabolic disorders and cancers – right at the point of care.

## Biomanufacturing better treatments

**Nigel Reuel**, associate professor of chemical and biological engineering and an Engineering Entrepreneurship Faculty Fellow, is scaling-up manufacturing of therapeutic cells by pairing sensors with artificial intelligence – all to get new treatment options for chronic illness out of clinical trials faster and into widespread use.

## Big treatments in small packages

**Rizia Bardhan**, associate professor of chemical and biological engineering and a Nanovaccine Institute researcher, leads the development of new nanocarriers that can deliver drugs across the difficult-to-cross blood-brain barrier, opening the door to additional treatments for Alzheimer's, Parkinson's, epilepsy and other brain diseases.

## 2-D detection and diagnostics

**Jonathan Claussen** and **Carmen Gomes**, both associate professors of mechanical engineering, are taking advantage of the unique properties of graphene to create printed or laser-treated biosensor electrodes – for everything from detecting COVID to ensuring food safety to a quick analysis of hydration and fatigue.





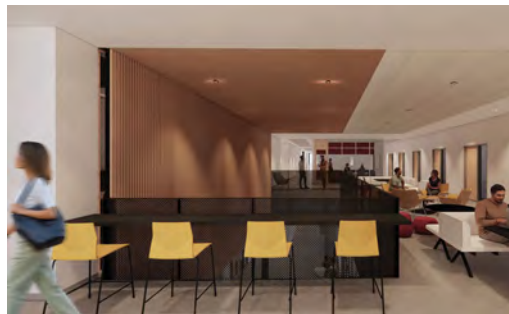


# New building for industrial and manufacturing systems engineering

The Therkildsen Industrial Engineering building will be the new home for Iowa State's Department of Industrial and Manufacturing Systems Engineering, with nearly 80,000 gross square feet of labs and learning spaces.

- Advanced manufacturing laboratories to train Cyclone Engineers for the Industry 4.0 era
- Human factors and ergonomics teaching and research labs for tomorrow's advancements in workplace health and safety
- Engineering analysis and visualization labs to study and teach data-driven decision making and process optimization

The building is named in honor of Iowa State graduates **C.G. "Turk"** and **Joyce A. McEwen Therkildsen**. Their \$42 million lead gift for the facility is the largest gift for an academic building at Iowa State University.



*Artist's renderings of the proposed Therkildsen Industrial Engineering building.*











# SafetyScan: Student startup sees the future of workplace safety

“What could be more important than using engineering skills to keep people safer – especially at their jobs?” said **Sarah Ng**, junior in industrial engineering. “If technology can be used to mitigate risk, that’s what I want to be doing.”

Ng (pictured right) is co-founder of SafetyScan with **Phillip Gorni** (pictured left), junior in aerospace engineering.

SafetyScan is an on-the-job-site tool that integrates cameras, computer vision and machine learning to increase the time workers’ personal protective equipment is worn.

So when a worker on a construction site removes a hard hat or an employee on a manufacturing floor removes safety glasses, SafetyScan senses the missing PPE and after a

few seconds, offers a sound and a flashing light to remind the employee to put the PPE back on.

Ng and Gorni discovered a shared dedication to safety and entrepreneurship when they worked together on a weekend-long Iowa State Pappajohn Center for Entrepreneurship and Start Something Innovation Prize competition. Since that initial competition, SafetyScan has gone on to win other entrepreneurship prizes – and raised investment to hire four software developers.



*start something*

**#3 in the Midwest  
and #11 in the nation  
for undergraduate  
entrepreneurship  
according to The  
Princeton Review**

## Start Something Entrepreneurship Support

- CYstarters summer business accelerator for Iowa State students
- College-by-college business idea pitch off competitions
- 400-level project-based courses in entrepreneurial product engineering
- Undergraduate minor in entrepreneurial studies
- Faculty Engineering Entrepreneurship Fellow in each Cyclone Engineering department



# Ready to Level Up?

How Game2Work is using serious gaming to transform engineering education

Loading...

## UNLOCK ACHIEVEMENTS



### Engineering identity

**If playing a video game lets us try on new identities, can building a video game do the same to encourage more people to see themselves as the "character" of engineer?**

Game2Work researchers are hosting game jams where middle schoolers team-up to experience basic programming concepts and develop video games.

They're studying how game creation can encourage students to think of themselves as people who can build things with technology and solve problems with technology – core components of an engineering identity.



### STEM course competence

**How can gamification in STEM courses help students master class content and persist through degree programs?**

In one study, Game2Work collaborators are using a gamified dashboard for introductory chemical engineering courses to study how the personalized feedback of badges, leaderboards and rewards can increase student agency and enhance student success.

In another, students in an intro geotechnical engineering course are designing video games to develop mastery of threshold learning concepts.



### Collaboration and connection

**How can serious gaming extend from the engineering classroom to the workplace?**

Game2Work brings together 20+ Iowa State researchers from education, human-computer interaction, cybersecurity, psychology, design and more.

Add to that K-12 STEM education outreach specialists and professionals from digital simulation and game design companies in Iowa. The Game2Work network is tying theory to application to translate the benefits of serious gaming to as many engineering fields (and beyond) as possible.



Iowa State's Game2Work is on a quest to use serious gaming to solve a serious challenge: Meet the national need for STEM professionals.

Led by **Michael Dorneich**, professor of industrial and manufacturing systems engineering, and **Michael Brown**, associate professor in the school of education, the interdisciplinary Game2Work research team is leveling up video games beyond entertainment – and studying when, how and why we should put games to work in engineering education.





# Candid Connections

Closing the network gap  
one conversation at a time



“Increasing diversity in engineering is not a pipeline problem. The pipeline of talent is there,” **Abdelwadood Daoud** (’18 mechanical engineering) realized when he was working as a tech company program manager and leading recruitment initiatives focused on Black talent.

“The real problem is the pipes just aren’t connecting fully to diverse populations,” said Daoud. “Up-and-coming engineers have the know-how, but in a world where ‘who you know’ matters more, personal networks become critical.”

So Daoud is creating many new pipeline connection points. He partnered with **Uma Abu** (’20 software engineering), **Kristina Hu** and **Shelby Schrier** to create Candoor, a platform that pairs Black, Latinx, Indigenous and other underserved students in free one-on-one conversations with career advisors who are working in STEM jobs.

“With Candoor, engineering students learn about careers, but they also get valuable feedback from experienced engineers and professionals. The kind of candid feedback that can turn them into the best job candidate they can be. Moreover, through the Candoor platform, STEM employers get to know more about talented future engineers in a way that a resume can’t match,” said Daoud.

When the time came to build out Candoor’s university partner program, Daoud wanted Cyclone Engineering students to be among the first to try it out.

“Iowa State Engineering Career Services is already great at what they do, and Iowa State students have great outcomes – and I like to think Candoor just expands the number of people who feel like they have career champions inside their dream companies, so they can get their own engineering dream job,” said Daoud.

**97%** positive career outcomes within 6 months of graduation for the class of 2021-2022

**75%** of students graduate with internship or co-op experience

**779** employers participated in 2022-2023 in engineering career fairs

**Over 1400** employers recruit Cyclone Engineers each year

“The candid conversations Candoor makes possible are invaluable to boost students’ sense of belonging in STEM careers and grow their networks. We’re proud to offer underrepresented students more opportunities to connect one-on-one with engineering industry professionals.”

**Kellie Olson**

director of engineering career services





# IOWA STATE UNIVERSITY

## College of Engineering

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Ames, Iowa 50011-2103

Powered by **INNOVATE** at Iowa State



**New major for translational health innovations**



**Breaking ground on Therkindsen Industrial Engineering building**



**Putting Games2Work to level-up engineering education**