DIMENSIONS

Spring 2020

From the 1918 flu pandemic to the 2019 COVID-19 outbreak...
Mechanical engineering at Iowa State has been through it all

IOWA STATE UNIVERSITY
Department of Mechanical Engineering

Letter From the Chair

Publication Credits

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Designed by Brittany Veto

On the cover

The top photo is a scene from Iowa State's State Gym during the 1918 flu pandemic. The gym was converted into a makeshift hospital to accommodate the flu cases on campus…***read more on page 12***

The bottom photo is in the Caterpillar Lab inside Hoover Hall. Mechanical engineering faculty and staff (from left: Josh DeLarm, Teaching Lab Coordinator; John Howell, Teaching Lab Coordinator; Caroline Hayes, ME Department Chair; and Craig Severson, Teaching Lab Coordinator) assembled face shields that would then be donated to various health facilities across the state. The Caterpillar Lab is actually about 100 yards northeast of the makeshift hospital in the above photo…***read more on page 13***

Dear alumni and friends,

I am pleased to share the stories and achievements of our students, faculty, staff and alumni of the Department of Mechanical Engineering at Iowa State University.

Some highlights in this issue include:

- The introduction of ME's three newest faculty members: associate professor Cody H. Fleming, and assistant professors Todd Kingston and Ethan Secor,
- ME student Grayson Burgess has a company that designs and manufactures movie quality replicas, props and memorabilia for fans of comic books and superheroes;
- Juan Bibiloni-Rivera, a graduating senior in ME, has been selected as a prestigious Truman Scholar for 2020;
- ME student Charlie Wickham is pursuing his dream of designing roller coasters;
- Earlier this year we published a history book which tells the story of our department's first 150 years. Visit ***www me.iastate.edu/history-book*** to order your copy of ME history today;
- ME alum Edgar Stanton helped to guide Iowa State through the 1918 flu pandemic in his capacity as the college's acting president;
- Faculty and staff in the ME department today have been working hard to manufacture PPE which has been donated to hospitals and other facilities across Iowa;
- Faculty in our department are busy with research, some of which is related to COVID-19. We narrowed it down to just four projects for this magazine, but you can read about all of our department's news at ***www.me.iastate.edu/news***;
- Our alums are also doing great things, both related to COVID-19 and other projects. You can read several of those stories here;
- Lastly, the department launched its first remote-controlled lab exercise as part of ME 436: Heat Transfer earlier this semester.

This semester has been a challenge because of COVID-19, but like good engineers, we've persevered through it. I hope you will enjoy reading about some of the efforts of our department and alums, to combat this deadly outbreak. I am extremely proud of our students, faculty and staff as they have transitioned to learning, teaching and working remotely.

Our alumni are vital to the growth and success of mechanical engineering and industry in the U.S. and abroad. I enjoy hearing about your accomplishments and encourage you to reach out and share your story. I can be contacted at mealumni@iastate.edu.

Regards,

Caroline Hayes
Mechanical Engineering Department Chair
Lynn Gleason Professor of Interdisciplinary Engineering

Department Honors

Students

Alvina Aui, Ph.D. Student
MEGSO People's Choice Award at William and Virginia Binger Research Symposium

Courtney Beringer, Fall 2019 B.S. Graduate
GRP Fellowship, Awarded by the National Science Foundation

Steven De Alwis, M.S. Student
Leadership Award, Awarded by ISU's Graduate and Professional Student Senate

Rebekah De Penning, Ph.D. Student
Research Award winner at William and Virginia Binger Research Symposium

Yasaman Esfandiari, Ph.D. Student
Research Award winner at William and Virginia Binger Research Symposium

Cole Jensen, Senior
First place in Existing Business Idea Category at Spring 2020 College of Engineering Pitch Competition

Charlie Kolar, Redshirt Junior
Named Captain of the All-Cyclone Team by the Outstanding Scholar-Athletes Celebrating Achievements and Recognitions Showcase

Nathan Kopp, Freshman
Runner-Up in Existing Business Idea Category at Spring 2020 College of Engineering Pitch Competition

Nikita Kozak, Senior
GRP Fellowship, Awarded by the National Science Foundation; Knight-Hennessy Scholar, Awarded by Stanford University; Wallace E. Barron All-University Senior Award, Awarded by Iowa State University Alumni Association; Spring 2020 Student Marshall, Awarded by Iowa State University, College of Engineering

Xian Yeow Lee, Ph.D. Student
Research Award winner at William and Virginia Binger Research Symposium

Marilyn McNamara, Ph.D. Candidate
Research Excellence Award, Awarded by ISU Graduate College

Hannan Nadeem, M.S. Student
Teaching Excellence Award, Awarded by ISU Graduate College

Andrew Nurse, Senior
Inducted into Cardinal Key Honor Society

Roy Pillers, Ph.D. Student
Teaching Excellence Award, Awarded by ISU Graduate College

Manjil Ray, Ph.D. Candidate
Teaching Excellence Award, Awarded by ISU Graduate College

David Reynolds, Junior
Selected for Stanford ADVANCE Undergraduate Institute

Nick Schiefelbein, Senior
Inducted into Cardinal Key Honor Society

Soheila Shabaniverki, Ph.D. Candidate
Research Excellence Award, Awarded by ISU Graduate College; Research Award winner at William and Virginia Binger Research Symposium

Amit Singh, M.S. Student
Teaching Excellence Award, Awarded by ISU Graduate College

Vignesh Suresh, Ph.D. Candidate
Research Excellence Award, Awarded by ISU Graduate College
Research Award winner at William and Virginia Binger Research Symposium

Bowei Zhang, Fall 2019 Ph.D. Graduate
Zaffarano Prize for Graduate Student Research, Awarded by ISU Graduate College

Yi Zheng, Ph.D. Student
Research Award winner at William and Virginia Binger Research Symposium

Keke Zhu, Ph.D. Student
Academic Finalist for the ANSYS Hall of Fame Award

Faculty

Shan Hu, Associate Professor
Promoted to Associate Professor with tenure

Adarsh Krishnamurthy, Associate Professor
Promoted to Associate Professor with tenure

Beiwen Li, Assistant Professor
2020 DCS Rising Researcher, Awarded by Society of Photo-Optical Instrumentation Engineers

Margaret Mathison, Associate Teaching Professor
ME Professor of the Year, Award by Pi Tau Sigma

Paola Pittoni, Associate Professor of Teaching
Advanced to Associate Professor of Teaching;
Award for Early Achievement in Teaching, Awarded by ISU Provost;
ME Professor of the Year, Awarded by Pi Tau Sigma

Soumik Sarkar, Associate Professor
Award for Early Achievement in Research, Awarded by ISU Provost

Cris Schwartz, Professor
Promoted to Professor

Travis Sippel, Associate Professor
Outstanding Student Organization Advisor of the Year, Awarded by the Engineering Student Council

Gloria Starns, Professor of Teaching
Advanced to Professor of Teaching

Bringing Captain America's shield and other movie memorabilia to a living room near you

At just 23 years old, Grayson Burgess's company has already generated more than a quarter million dollars in sales.

Burgess, senior in mechanical engineering, founded Comic Sandwiches, an Iowa-based company that designs and manufactures movie-quality replicas, props and memorabilia for fans of comic books and superheroes. His customers range from diehard comic book and superhero fans to companies looking for a unique way to brand themselves through art and other products.

Burgess launched the company in 2015 to help pay tuition and other expenses. Initially, he created comic book frames by sandwiching comic books inside two pieces of plexiglass. Hence, Comic Sandwiches.

"I pivoted when people showed more interest in a Captain America shield I had made for fun than in the frames. I further developed that idea of a unique prop that most people are unable to see, let alone buy," said Burgess. "We now produce around 40 products, shipped to 21 countries globally, and have done work for companies like Netflix, Paramount Studios, and The Department of Justice."

Burgess grew up in Cedar Rapids, Iowa, and as a kid had an interest in both superheroes and STEM. He was exposed to engineering through his involvement in FIRST LEGO League in middle school, then in high school became involved with the robotics team at Linn-Mar High School.

"I learned a lot of new skills including CAD as well as machining and manufacturing techniques, which I improved through high school and utilized them for starting my company. Mechanical design fascinates me and I love to see something new created from different mechanisms," he said.

His interest in robotics brought him to Iowa State University, where he is majoring in mechanical engineering. He's applied much of what he's learned in M E 324: Manufacturing Engineering to his business.

"It has helped me refine processes in the manufacturing aspects and make things more efficient," he said, adding that Marketing 340: Principles of Marketing and the Pappajohn Center for Entrepreneurship have also provided him with the skills and support to effectively manage his business.

In summer 2019, Burgess participated in Iowa State's pitch competition at the Iowa State Fair, and during the fall 2019 semester he attended the Collegiate Entrepreneurs' Organization Global Conference in Tampa, Florida. He went to just learn from other students and network, but ended up applying for the pitch competition on a whim. He gave his 90-second pitch three separate times, landing in the top 16 out of 80 contestants, advancing to the top 6 and finally finishing in 3rd place with $2000 in prize money.

Burgess plans to complete his studies in fall 2020 and hopes to get a job with "a company that has optimized manufacturing for adaptability, such as 3M." He will continue to operate Comic Sandwiches but has other interests as well.

"I love working on my car and designing new components for it, as well as creating new art projects that implement engineering and CNC manufacturing," said Burgess. "It might not be the norm, but engineering and learning new skills in the process is a lot of fun for me."

Iowa State student selected as Truman Scholar

An Iowa State University student is one of 62 students nationwide to be named a 2020 Truman Scholar.

Juan Bibiloni-Rivera, senior in mechanical engineering, was selected from 773 applications nationwide. He is Iowa State's first Truman Scholar since 2006. The Truman Scholarship is the premier graduate fellowship in the U.S. for those pursuing careers as public service leaders.

Growing up in San Juan, Puerto Rico, Bibiloni-Rivera discovered a passion for leadership and service through the Boy Scouts and at Colegio San Ignacio de Loyola, a college preparatory school in San Juan.

In 2016, he was selected as a George Washington Carver Scholar to attend Iowa State. Here, he expanded on his leadership and service skills by getting involved in numerous organizations, including ISU Student Government – to which he was elected as student body vice president in 2018.

"While I remain true to my Puerto Rican roots, Iowa is now my home thanks to [the George Washington Carver Scholarship] and countless opportunities over the past three and a half years," he wrote in his application.

His passion for increasing transit accessibility led him to serve on the Ames Transit (CyRide) Board of Trustees. His leadership effected change that improved the lives of Ames and ISU riders on a daily basis, including his role in securing automated annunciators to announce bus stops for people who are visually impaired.

Bibiloni-Rivera plans to pursue a master's degree in public administration after graduating from Iowa State next year, focused on public financial management and social policy, as well as a J.D. focused on public interest law.

He aims to build a career in public service developing public transit and infrastructure policy that improves the quality of life for the United States' most marginalized groups.

"If I solely focused on corporate career goals, I would be denying the aptitude for leadership I cultivated over 12 years as a Boy Scout and later as an Eagle Scout," he wrote in his application. "I would be denying the love for community service that I nurtured at my Jesuit high school and was awarded for at graduation. Lastly, I would be denying myself the joy I experienced through my leadership at Iowa State.

"More than ever, I know that public service is my future."

Each new Truman Scholar receives up to $30,000 for graduate study. Scholars also receive priority admission and supplemental financial aid at some premier graduate institutions, leadership training, career and graduate school counseling and special internship opportunities within the federal government. Recipients must be U.S. citizens, have outstanding leadership potential and communication skills, demonstrate academic excellence and be committed to careers in public service.

Contributed by Chelsea Davis/ISU News Service

Follow the latest ME news

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Innovative mindset takes Iowa State student on the ride of his life

You've probably never seen a business card like this before.

It's 3D-printed and folds into a full-circuit model of a miniature roller coaster, pointing to the passion of its creator: Charlie Wickham, senior in mechanical engineering at Iowa State University.

Wickham grew up in a family of programmers and computer engineers in Eagan, Minnesota. As a child, he played with K'Nex and Legos. When he was 7 years old, his older brother was gifted a K'Nex "Screamin' Serpent" roller coaster model. It caught Wickham's eye and eventually became his, a model that he brought with him to Iowa State to test his designs.

"I use it to build off of because it's one of those common toys that a lot of people had when they were younger and have lying around in their basement," he said. "They don't realize that it was a really well-designed toy that you can do stuff with now. If you have a 3D printer, you can print my models and run them on your K'Nex track."

Family vacations often took the Wickhams to amusement parks. His father and older brother loved roller coasters. His mother loved rides that went fast and made you feel like you're flying.

Wickham … preferred to watch.

"I loved roller coasters as an idea, I loved watching them … but I didn't want to ride them," he said. "I hated that first drop so much, that feeling of your stomach going up, I hated that as a kid. If the only good part of your roller coaster is that first drop, it's a waste of a ride. You've got to do something fun and twisty after that.

"I was like that for a long time until my brother forced me to get on a roller coaster that is still to this day one of my favorites: Maverick out at Cedar Point. That was the switch."

Wickham was 10 years old then. Since then, he's ridden 250 roller coasters around the world.

Turning a pipe dream into reality

While working on a BB-8 replica robot his freshman year at Iowa State, Wickham had another realization. He had spent far more time designing the mechanics of the robot than the electronics – so he switched from electrical to mechanical engineering.

His love for roller coasters never faded, but he wondered if working in the industry was "a pipe dream."

"Let's not focus on getting a job in this industry, let's just focus on being a good engineer and finding a type of engineering that I like doing and maybe someday 30 years from now, maybe there will be an opening in this industry," he says he thought at the time.

But while studying abroad in Switzerland his junior year, Wickham started thinking, "What if?"

What if there is a way into the amusement park industry? What if I don't take a chance now?

He started doing research.

Wickham talked to several engineers who had gotten into the industry recently. He applied for an ambassadorship with the largest amusement industry trade show, the International Association of Amusement Parks and Attractions. He was accepted, and has now served as an IAAPA show ambassador for the past two years.

"I learned an incredible amount about the scope of the industry that I never knew before," he said.

That experience led to a co-op internship at Premier Rides, an

amusement ride manufacturer; and then to an internship at Morey's Piers in New Jersey, where he did ride maintenance and helped with construction of a new ride last summer, the Runaway Tram.

"Being able to be there when we opened it for guests and see the first train of guests going around on that roller coaster was an incredible feeling," he said. "It's so amazingly rewarding that I'm hooked. I don't intend to leave this industry anytime soon."

'Challenge accepted'

Wickham first got to work with 3D printers while studying abroad. He took a master's course on additive manufacturing and rapid prototyping, he worked on multiple 3D printing projects, he fixed broken 3D printers and he and his colleagues wrote an academic paper on design methodology for 3D printing.

"Having that understanding helped a lot, being able to optimize how I'm designing these parts, how I'm printing them, which directions are going to be strongest," he said.

He brought those skills back to Iowa State to work on his own 3D-printed roller coaster designs and expand his network in the 3D Printing and Design Club. Last fall, he even started his own club, the Theme Park Engineering Group. Club members focus on celebration, education and professional development for students who want to work in the amusement park industry.

During an amusement park safety standards meeting last February, Wickham met Dave Crawford, executive ride mechanical engineering lead with Disney Imagineering. Wickham tried to hand a typical paper business card to Crawford, who said he only uses LinkedIn. Wickham then heard Crawford mention offhand that he would take a 3D-printed business card.

"In the back of my head, I thought, 'Challenge accepted,'" Wickham said.

Wickham started designing. The card would have to be thin, the same dimensions as a typical business card, one piece and most importantly, unique.

"Every business card is unique and distinct, but they're all cards," he said. "Maybe you go through them, but you're rarely looking for something specific when you're in there. My goal was to be that something specific."

His 3D-printed roller coaster business card was a hit. At the meeting last October, Wickham approached Crawford with his card. Wickham posted to LinkedIn a photo of the card and it went viral, with Crawford commenting, "The bar has definitely been raised on the traditional business card!"

Wickham was set to serve as an IAAPA show ambassador again the next month. So, he printed nonstop for three weeks, and went to the show with almost 150 of his unique business cards.

"My goal is to enter into the amusement park industry as an engineer and work with these companies to design better rides and new concepts in a way that is still at the highest level of safety that we expect, but brings something new to the industry that we haven't seen," he said.

Contributed by Chelsea Davis/ ISU News Service

Incoming ME faculty member returns to his roots

Some kids grow up wanting to be an astronaut or a doctor or any other number of careers. This wasn't the case for Cody H. Fleming. He admits that growing up he was more interested in sports than his schoolwork. However, because of the persistence and encouragement from some of his teachers and mentors, he developed an interest in engineering that eventually led him to the career path he is on now.

"I was encouraged to develop the aptitude I had for math and science classes and ended up doing a job shadow in high school with a local engineering firm," said Fleming. "STEM topics were something I fell in love with more as I learned more, and I am indebted to many amazing teachers and mentors along the way who nurtured and pushed me."

Fleming grew up in Humboldt, Iowa, and his family eventually moved to the Ames area. He graduated from Gilbert High School and remembers playing basketball in Beyer Hall on the Iowa State University campus as a teenager. His skills on the hardwood afforded him the opportunity to play forward for the varsity basketball team at Hope College, an NCAA Division-III liberal arts college in Holland, Michigan, where he also earned his B.S. in engineering.

A series of knee surgeries prevented Fleming from pursuing basketball outside of the D-III ranks, so he decided to instead hone his career in the STEM field. He went on to a complete his M.Eng. in civil and environmental engineering and Ph.D. in aeronautics and astronautics, both from the Massachusetts Institute of Technology (MIT). Between receiving his master's degree and going back for his Ph.D., he spent six years as an engineer for Northrop Grumman Space Technology in Redondo Beach, California.

Fleming, who has served on the engineering faculty at the University of Virginia since 2015, will now return home to Iowa as he joins the mechanical engineering faculty at Iowa State beginning fall 2020. He said that he was attracted to the position at Iowa State for a couple of reasons.

"First, the mechanical engineering department at Iowa State is doing a fantastic job of fulfilling the traditional mission of that intellectual field of study while also pushing in new directions," said Fleming. "Second, the university is invested in their mission to serve the state, the nation and the world. This is not just 'lip service' as the engineering corridor looks dramatically different than when I grew up here. The level of investment in infrastructure is both a concrete, in some cases, literally concrete, contributor to success and also a symbol of ISU's strategic investment in STEM."

At Iowa State, Fleming will teach courses on dynamics, design and controls. His research focuses on autonomy (driverless cars, or the automated flight management systems on aircraft, etc.), systems integration (how do the various components within a system interact with each other in a highly functional way; how do multiple systems, like driverless cars or pilotless aircraft, interact with each other?) and safety (how do we think about all the things that can go wrong and then assure that the system can handle these? Or does not cause any hazards?).

"There are many interesting questions at the convergence of these areas, including how to fuse physics-based models with the emerging use of so-called AI, or artificial intelligence, and machine learning in autonomous systems. How can we take some of these ideas and apply them to new domains, with new collaborators?" Fleming said, adding that he is eager to work with his ME colleagues at Iowa State, who have similar research foci.

Bringing research expertise in fluids and energy

Returning to Ames and conducting research at Iowa State University will be something of a homecoming for incoming mechanical engineering faculty member.

Todd Kingston grew up in North Bend, Nebraska, about three hours west of Ames. As a child, he said he always had "an innate curiosity for how things worked," which attracted him to STEM classes in school.

"I also worked in a local automotive mechanics shop during high school, and this experience fueled my passion for engineering by providing me with exposure to complex mechanical systems," he said.

This interest in mechanical systems influenced his decision to study mechanical engineering (ME) as an undergraduate at Iowa State. Through his coursework, he developed an interest in thermal sciences: thermodynamics, fluid mechanics and heat transfer. He conducted research with Scott Schlorholtz in the Materials Analysis Research Laboratory, through which he developed an interest in experimental research. After completing his undergraduate studies, Kingston continued as a master's student at Iowa State and studied with ME university professor Ted Heindel, allowing Kingston to combine his interests in thermal science and experimental research. He said this work opened his eyes to the possibility of a career in academia.

"I was drawn to the unique opportunity to address today's societal challenges through cutting-edge research and hopefully help influence the societal challenges of tomorrow by educating the next generation of engineers and scientists," Kingston said. "I made it my goal to become a faculty member at a research university, hoping someday I might even work for the mechanical engineering department at Iowa State."

After completing his master's degree, Kingston attended Purdue University to pursue his Ph.D. He worked in Purdue's Cooling Technologies Research Center and had the opportunity to collaborate with individuals from the Naval Surface Warfare Center Crane Division in Crane, Indiana.

While still a Ph.D. student at Purdue, Kingston interviewed for and was offered a faculty position at Iowa State. He deferred his appointment for one year (meaning he'll arrive on campus in fall 2020), to complete a postdoctoral fellowship at the United States Naval Research Laboratory (NRL) in Washington D.C. There he is working with materials research engineer Corey Love and his research group to study the implications of thermo-electrochemical coupling phenomena on the performance and safety of lithium-ion batteries.

When he arrives in Ames, he will look to establish a research niche focused on multiphase thermal-fluid transport for energy transfer and conversion. Through this research, he seeks to advance the fundamental understanding of thermal-fluid transport and provide state-of-the-art solutions to some of the grand challenges in the energy sector.

"One research thrust in my portfolio is focused on next-generation thermal management of high-heat-flux devices, such as power electronics or directed energy systems, using two-phase cooling strategies like flow boiling in microchannels," said Kingston. "Another is the proliferation of renewable energy technologies through thermal-fluid advancements; my current research at NRL fits within this thrust."

Secor brings family history and expertise in aerosol jet printing to Iowa State

Ethan Secor's family has a long history with Iowa State. This includes his grandfather, Gerald Secor (B.S. '48), along with 15 living ISU alumni, and extends back over a century. Secor will continue this family tradition when he joins the ME faculty as an assistant professor in fall 2020.

Secor grew up in Stillwater, Minnesota, about 25 miles northeast of Minneapolis. He was attracted to the STEM field because of his father, Robert, who works as a chemical engineer for 3M.

"Growing up, I always enjoyed learning how things worked, and finding opportunities to apply science and math to solve problems," Secor said.

Secor majored in chemistry and physics as an undergraduate at Drake University and then completed his Ph.D. in materials science engineering at Northwestern University. With expertise in these areas, he will bring a unique perspective to Iowa State's mechanical engineering department.

"My background in chemistry and physics provides a strong fundamental background for my research, while my graduate school experience in materials science and engineering shifted my focus towards applied engineering problems," he said.

Secor has worked as a Harry S. Truman postdoctoral fellow at Sandia National Laboratories since 2017. There he studies a digital printing technology known as aerosol jet printing. He first used an aerosol jet printer in graduate school, but at Sandia he has learned how to build one. He said this knowledge provides a lot of flexibility in customizing the equipment to explore new concepts and push the boundaries of the technology. He primarily focuses on printing electronic materials and devices, as well as advancing the understanding and control of the printing process itself.

"My work at Sandia has furthered my transition to the field of mechanical engineering," Secor said. "To a large extent, once you get to hands-on research and real problems, the boundaries between disciplines become less meaningful and distinct."

At Iowa State, Secor will teach courses such as ME 324 Manufacturing Engineering, ME 345 Engineering Dynamics and ME 370 Engineering Measurements. He will also establish a research lab, which will focus on advanced manufacturing. Specifically, he wants to expand the functionality and capabilities of aerosol jet printing while pursuing applications in electronics, energy and sensing.

He said he looks forward to working with researchers within the ME department at Iowa State who have expertise in advanced imaging and machine learning. He also wants to collaborate with others on campus who have an interest in the area of printed electronics.

In addition to collaborating with other faculty, he is excited to get back into the classroom and to mentor students in his lab. He said a desire to learn is one of the most important qualities he looks for in his students. When recruiting graduate students to his lab, he looks for someone who is interested in his research, eager to learn, reasonably self-directed and comfortable working across boundaries.

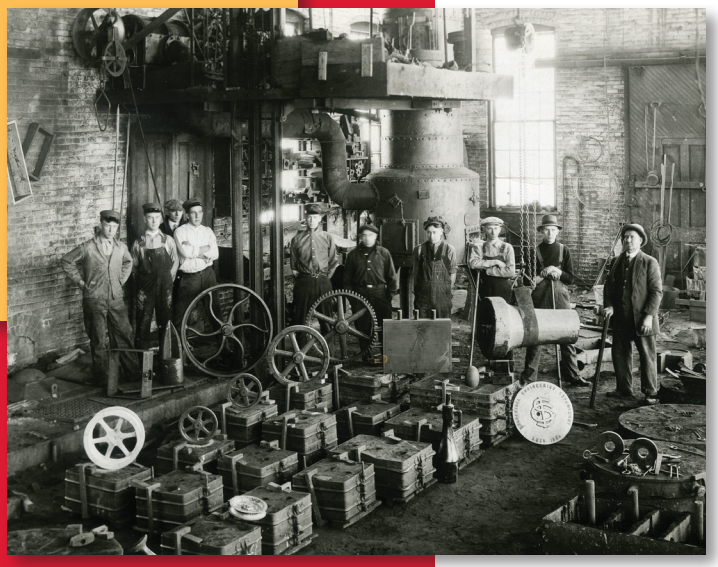
"The mechanical engineering department at Iowa State has an impressive scope, and really pushes beyond traditional mechanical engineering topics to evolve with technology and societal needs. It's a department I can be at home in, while at the same time bringing a unique skill set to capitalize on collaborations and learn a lot in the process."

New book celebrates 150 years of Mechanical Engineering at Iowa State

Twenty-nineteen (2019) marked the 150th anniversary of the first class of students enrolling at Iowa State. In commemoration of this historic event we published a book about 150 years of mechanical engineering history at Iowa State. Mechanic Arts, which included mechanical engineering, was one of the original majors offered to students. The other was agriculture. Today our department has the largest undergraduate enrollment of any department on campus.

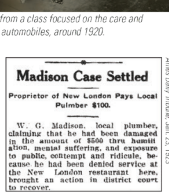
To order your copy, please visit:

www.me.iastate.edu/history-book



A scene from a class focused on the care and repair of automobiles, around 1920.

The Des Moines Register, Sept. 13, 1920



Ames Daily Tribune, Jan. 25, 1923

The Ames Daily Tribune, April 19, 1918

April 1918

The training program begins for military auto mechanics, blacksmiths and machinists as 500 soldiers come to campus. Though completely separate from the college's academic program, the training is led by ME professor Warren Meeker. During World War I "[t]he work of every department was reorganized to render maximum service to the nation. Courses not directly connected with the war effort were dropped." To contribute to the war effort; courses were added in radio communications, signal corps practice, telegraph and buzzer signaling, military reconnaissance, gas engines, machine shop and more. Professor Meeker taught an eight-week course that provided roughly 500 enlisted men with "extensive training" in machine shop, auto mechanics and repair processes. During this time ME alum Edgar Stanton was serving his fourth term as acting president (1917-18), filling in for President Raymond A. Pearson, who took a leave of absence to serve in the U.S. Department of Agriculture as part of the war effort.

Circa 1920

By 1920, Iowa State's engineering school had grown "from one small Department of Mechanic Arts with two instructors, a workshop and less than a score of students, into one of the largest engineering schools west of the Mississippi River, with over one hundred instructors, eleven engineering buildings and over one thousand students of collegiate grade," according to department historical records. Following World War I, ME enrollment hit 430, more than double the enrollment of the previous year.

Sept. 12, 1920

Edgar Stanton, who served his alma mater for nearly half a century, dies. His death was attributed to a combination of the Spanish flu - which he contracted during the 1918 epidemic - and diabetes.

Feb. 1, 1922

ME alum Walter Madison, the department's first African American alumnus, is denied service when he attempts to order lunch at the now-defunct New London restaurant in downtown Ames. Madison, who owned a heating and plumbing business in Ames, filed a lawsuit in Story County District Court against the restaurant's owner for the humiliation and mental anguish he experienced. The case was settled out of court in January 1923, and Madison was awarded $100. State law at the time forbade restaurants, hotels and other establishments open to the public to deny service based on race or color.

ME alum Edgar Stanton helped to lead Iowa State through 1918 flu pandemic

More than a century ago, Iowa State's campus grappled with a pandemic that it had never seen before.

In August 1918, a flu outbreak hit at a time when the world was already engulfed in the final months the First World War. Even Ames, Iowa, saw the economic and cultural impact caused by both the war and the flu outbreak.

By late September 1918 (a little more than a month before the end the war), the flu had spread to Iowa. Iowa State College's State Gym was converted from an athletics facility into a makeshift hospital to accommodate all of the flu cases on campus.

During this time of great volatility, the college's top administrator was Edgar Stanton, who was acting president (his fourth stint in this capacity) while President Raymond A. Pearson was serving in the U.S. Department of Agriculture as part of the war effort. Stanton was the first graduate of Iowa State when he completed his degree in mechanic arts (predecessor to mechanical engineering) in 1872.

On Oct. 1, 1918, the second day of class that quarter (Iowa State was on a quarter system until 1981), Stanton penned a letter in the *Iowa State Daily* welcoming back students. He maintained a mostly positive, encouraging tone in his letter, despite all of the hardship occurring across campus and the nation.

In the coming days, Stanton and other administrators handled the situation with the utmost seriousness and professionalism. Unfortunately, not everyone in Ames took the threat seriously, and crowds poured out onto Main Street in downtown Ames around 1:30 a.m. on October 6 to celebrate rumors that the Germans wanted peace talks with the Allies. This occurred at a time when mass public gatherings were discouraged.

On Oct. 9, 1918, Stanton penned a letter to the Committee on Education and Special Training in Washington, D.C. stating:

"We have some 300 cases of the Influenza, but have ample hospital facilities, physicians and attendants. The number of new cases are decreasing, those discharged from the hospital exceed those admitted, and we feel that we are facing toward normal conditions. We have a strict quarantine separating us from the rest of the world."

Shortly after, he wrote a memo for department heads at Iowa State stating, "At meeting of the Board of Deans on October 8, 1918 it was decided that, for the time being, complete segregation of men from women students be established, including segregation at class periods." There was little mention of the of this female quarantine in the local press at the time, and to this day it is unclear why students were quarantined by gender.

While the campus was on quarantine (which began on October 2), guards monitored the perimeter "24 hours a day, 7 days a week." Those looking to enter or leave campus required special permission and were granted a pass that they needed to present to the guards. Football games and most other social activities were canceled.

Records from the Iowa State's hospital show that 669 flu patients received treatment during the first half of October. In the end, 53 people at Iowa State perished because of the flu outbreak. Two of the deaths were women, while the other 51 were men serving in the Student Army Training Corps (SATC). The names of the SATC men are enshrined in the Gold Star Hall inside the Memorial Union.

Edgar Stanton, or "Stantie" as students affectionately called him, would pass away in 1920 at the age of 69. His death was attributed to a combination of the Spanish Flu (which he contracted in 1918) and diabetes. He served his alma mater for nearly half a century, from the day he graduated and was hired to the faculty in the mathematics department until the day he died when he was serving as the college's vice president. He is buried in Iowa State's cemetery and prior to his death Stanton Avenue in campustown was named in his honor.

MEs fire up 3D printers, round up supplies to make face shields for Iowa hospitals

Caroline Hayes was in her office for more virtual meetings. But the chair of Iowa State University's department of mechanical engineering said she really wanted to be back in the lab.

For the past two weeks, Hayes, department staffers and a few students still in town have been 3D printing and assembling face shields for Mary Greeley Medical Center in Ames and other Iowa healthcare providers.

The challenge hasn't been engineering expertise – there's been plenty of that in the department's Boyd Lab in Hoover Hall and its Additive Manufacturing Lab in the Black Engineering Building. Hayes, who's also the Lynn Gleason Professor in Interdisciplinary Engineering, said the real hurdle to clear for the mechanical engineers has been finding the necessary supplies – rolls of clear plastic for the shields, spools of elastic for the straps, raw materials for every part and piece.

The engineers have two projects going: one involves 3D printing a halo headpiece, designed at Iowa State, then the halos will be delivered for the next stage of assembly elsewhere; the second, which was influenced by a design created by researchers at the University of Wisconsin-Madison, is all about attaching foam headbands and elastic straps directly to plastic shields.

It has been a team effort to keep the printers running, tweak some prototype designs and complete assembly. Lab coordinators Josh Delarm (Boyd Lab) and Taylor Schweizer (3D printing lab) have been managing the teamwork. Iowa State's Center for Industrial Research and Service (CIRAS) has also helped facilitate the partnership between the department and the hospital.

And so far, the efforts have resulted in about 1,000 face shields delivered to Mary Greeley Medical Center, nearly 2,000 more delivered to University of Iowa Hospitals & Clinics in Iowa City, and about 300 more for other facilities.

"We are incredibly grateful for Iowa State's ingenuity and generosity. These face shields will be put to good use and will help keep our healthcare workforce safe," said Brian Dieter, president and CEO of Mary Greeley. "We're aware that Iowa State is working on several other initiatives, some that involve local and statewide industries. They are helping and they are helping others to help. We're humbled by this support and it means a lot to our patients and staff."

Hayes, despite the frustrations of the team's searching campus and the internet for supplies, said this was a good project for her department.

"We're working to keep healthcare workers covered – literally – and healthy," she said. "We've been told the hospital could use 1,000 of these this week and next week. We'll do our best to make that happen."

Contributed by Mike Krapfl/ISU News Service

Update: *As of the time of this magazine being published, the ME department has produced more than* ***8000 face shields*** *which have been sent to* ***Black Hawk, Boone, Greene, Johnson, Marshall, Polk, Story*** *and* ***Tama*** *counties. Credit to* ***Chris Hill*** *and Iowa State's* ***Center for Center for Industrial Research and Service (CIRAS)*** *for assisting the ME department in this effort.*

Engineer uses metal-oxide nanomaterials deposited on cloth to wipe out microbes

In an effort to make highly sensitive sensors to measure sugar and other vital signs of human health, Iowa State University's Sonal Padalkar figured out how to deposit nanomaterials on cloth and paper.

Feedback from a peer-reviewed paper (published by ACS Sustainable Chemistry and Engineering) describing her new fabrication technology mentioned the metal-oxide nanomaterials the assistant professor of mechanical engineering was working with – including zinc oxide, cerium oxide and copper oxide, all at scales down to billionths of a meter – also have antimicrobial properties.

"I might as well see if I can do something else with this technology," Padalkar said. "And that's how I started studying antimicrobial uses."

It turns out nanomaterials are rough on microbes such as bacteria. They actually puncture the cell walls of the single-cell microbes, causing leaks and ultimately death.

Put that on a cloth and you could have an effective, chemical-free disinfecting wipe.

"The implications of our present antimicrobial studies are enormous," Padalkar said. "We can find applications in wide areas, including our everyday life to many very specific applications, like surgical units in hospitals."

But does it work on tiny viruses, too?

More study is needed, Padalkar said. But, the mechanism would be the same – puncturing the protein coats of viruses to damage and kill the microbes.

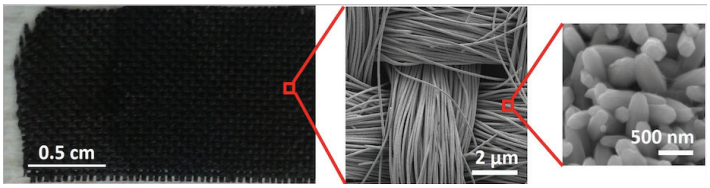
Nanomaterials on a thread

Padalkar said she's been studying metal-oxide nanomaterials as antimicrobial agents for about eight months. Since 2018, she's studied the materials for use in various biosensors.

The key contribution from her lab has been figuring out how to grow nanostructures of metal oxides on cheap, lightweight, flexible cloth and paper. Padalkar's fabrication techniques are based on electrochemical deposition – applying electricity to the cloth or paper while also applying a solution containing precursors to the metal oxides.

Tests show the resulting nanostructures are consistent, stable and robust. She said the technology could be scaled up for larger surfaces and scaled all the way down to a single thread.

She has also worked with Carmen Gomes, an associate professor of mechanical engineering at Iowa State, to study the electrochemical sensing of bacteria using zinc-oxide nanomaterials deposited on glass. So far, she said the preliminary data look very positive. The project will be extended to study antimicrobial activity.



Applications all over

As with most research projects, there are still questions to study and answer.

"What shape, size, density of the nanomaterial will be ideal for this work?" Padalkar said. "What surface charge will be optimal on the nanomaterial so that bacterial interaction is possible? What will be the shelf life of such nanomaterials as antimicrobial agents?"

So far, Padalkar's faculty startup funds are supporting her search for answers. She's now writing a research proposal for external funding for her project.

In these days of hand-washing, social distancing and searching for hand sanitizer, there's certainly a need for all kinds of antimicrobial products. Padalkar said the antimicrobial cloth and paper products made possible by her fabrication technology could be useful in homes, in hospitals and clinics, at workplaces and schools and around farms.

"We do not plan to wrap up this work soon," she said. "The need for antimicrobial products is urgent and understanding the details of the mechanism and material parameters is paramount for the success of these new materials."

Contributed by Mike Krapfl/ ISU News Service

Padalkar

Iowa State University scientists developing portable viral tests for future pandemics

Iowa State University scientists are working with a multi-institutional research group to develop an innovative viral testing platform that could function inexpensively in rural areas. The research has the potential to address the current pandemic and could make a big difference if similar viral outbreaks occur in the years ahead.

Shrotriya

Marit Nilsen-Hamilton, a professor of biochemistry, biophysics and molecular biology, is the principal investigator for the research group, which includes experts in virology and engineering. The team is developing virus testing devices that could be used without the benefit of medical facilities, which would be particularly useful in rural or remote regions. The idea grew out of work Nilsen-Hamilton started through her company, Aptalogic, aimed at developing portable testing devices for the Ebola virus.

The concept depends on aptamers, which are nucleic acids that behave like antibodies in the human immune system. Aptamers can be selected in the laboratory to bind to the spike proteins of coronaviruses, creating a detection method that can be replicated and widely distributed because aptamers are more stable and more easily stored than human antibodies.

"We're moving toward isolating an aptamer that would recognize the viral cause of COVID-19," Nilsen-Hamilton said. "We had planned to do this research well before the pandemic, but now we've decided to put it on the front burner."

Nilsen-Hamilton envisions the production of small portable devices, about the size of a phone, that people can operate without having to go to a hospital or clinic. The devices require a blood or saliva sample, which the devices analyze and report the presence of viruses or viral antibodies. Nilsen-Hamilton said this technology would be inexpensive, portable and adaptable to a wide range of viruses.

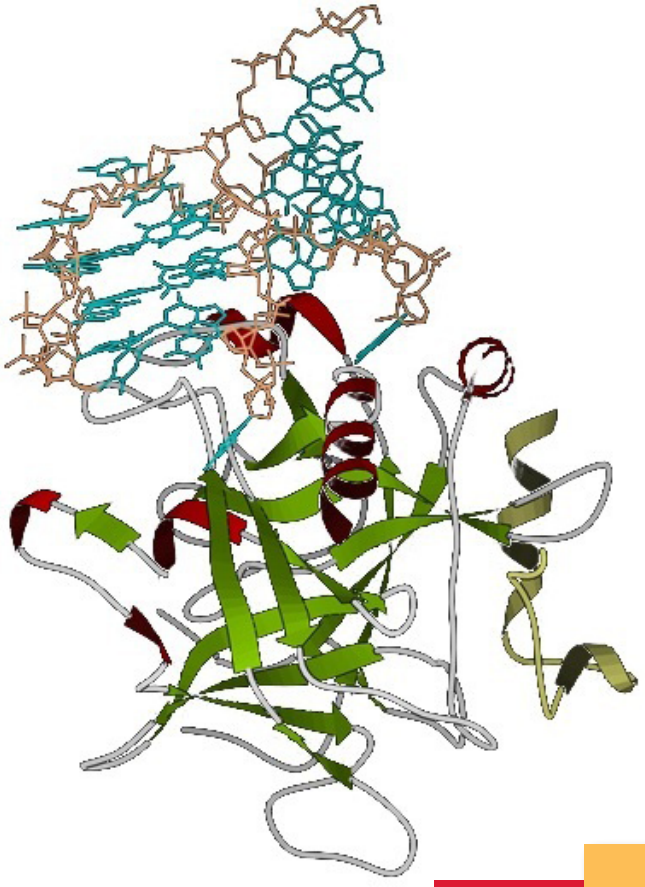
However, the technology will require at least a year before it could be widely available, Nilsen-Hamilton said, so it most likely won't be ready in time to contribute to COVID-19 response efforts this year. But the current pandemic underscores the need for innovative approaches to make testing more widely available, she said. And the technology could be a valuable tool if there's a recurrence of the SARS CoV-2 virus that causes COVID-19, or if outbreaks of different viruses occur in the future.

In addition to detecting the virus, the technology could also detect viral antibodies. Nilsen-Hamilton said this is crucial information because it would allow patients to know if they'd been exposed to a particular virus in the past and are now most likely immune.

"If we had a test that could tell us if we have the virus antibodies, then you know if you've had the virus and are no longer susceptible," she said. "You could then continue to do some of the everyday activities that are shut down right now without worrying about contracting the virus."

In addition to Nilsen-Hamilton, other research collaborators include Wendy Maury, a University of Iowa virologist; and Pranav Shrotriya, a professor of mechanical engineering at Iowa State. Soma Banerjee of Aptalogic leads the effort to select the aptamers.

Contributed by Mike Krapfl/ISU News Service



Using X-rays and high-speed imaging to examine sprays

Iowa State University is part of an inter-university research project examining the intricacies of sprays.

Ted Heindel, Bergles Professor of Thermal Science and university professor in mechanical engineering, is the lead researcher at the Iowa State site. Within Heindel's Experimental Multiphase Flow Lab, the researchers are using X-rays and high-speed imaging to experimentally study the near-field spray region where spray formation occurs.

"As a small subset of this project, we are currently doing a study to use stereographic shadowgraphy imaging to provide data for a control algorithm that will automatically control spray input parameters, like gas swirl imparted on the spray, to maximize the spray angle for a given liquid and gas flow rate," said Heindel, who also serves as director of Iowa State's Center for Multiphase Flow Research and Education.

Findings from the research will have a wide range of applications from liquid fuel combustion and spray cooling to additive manufacturing and painting/coating to liquid fertilizer and herbicide dispersion. The latter of which is especially relevant in an agriculture-focused state such as Iowa, though it is not a direct focus of the research.

"Herbicide drift is a major problem in agriculture as it damages non-herbicide-resistant crops in adjacent fields, and results in higher quantities of herbicide entering the environment," said Tim Morgan, a postdoctoral research associate in the Experimental Multiphase Flow Lab. "By controlling the formation and dispersion of a spray in real-time, applicators will be better able to put herbicide only where it is needed, resulting in less waste and less drift."

The Iowa State site is part of a nationwide Multidisciplinary University Research Initiative (MURI) funded by the Office of Naval Research. The team is currently in their fourth year of a five-year effort to study spray dispersion and control. Other sites include Cornell University (lead), the University of Florida, the University of Washington and the University of Illinois Urbana-Champaign (UIUC).

Palash Sashittal, a Ph.D. candidate at UIUC, has spent some time in Ames to take advantage of Iowa State's facilities and expertise in the noninvasive measurement of multiphase flows, which allows researchers to obtain high-quality experimental data of sprays. Sashittal works in the research group of Daniel J. Bodony, the Blue Waters associate professor of aerospace engineering at UIUC. Bodony, the lead researcher at UIUC, has extensive expertise in the control of complex, non-linear systems.

"By combining our expertise in multiphase flow characterization with their expertise in control of complex systems, we are able to study problems that would be very difficult for a single research group to study," said Morgan. "Moreover, working with another research group also helps improve one's own research. Since we are both working on the same problem, but approaching it from different perspectives, we see different challenges and opportunities in the research."

Work on this project began in June 2016 and funding will continue through June 2021.

Morgan (left) and Sashittal

"By controlling the formation and dispersion of a spray in real-time, applicators will be better able to put herbicide only where it is needed, resulting in less waste and less drift."

Engineering research project studies active shooter situations in schools

Researchers at Iowa State University are using their expertise to create a system that will provide students, teachers, police officers and others with accurate, real-time information in the event of an active shooter situation in a school.

Soumik Sarkar, associate professor of mechanical engineering, is serving as the Primary Investigator (PI) at the Iowa State site for a nearly $650,000 NSF-sponsored research project titled "CPS: Medium: Collaborative Research: Active Shooter Tracking & Evacuation Routing for Survival (ASTERS)." Co-PIs on the project include Stephen Gilbert, associate professor of industrial and manufacturing systems engineering, and Joanne Marshall, associate professor in the School of Education.

The researchers will develop the Active Shooter Tracking and Evacuation Routing for Survival (ASTERS) protocol, which will track a shooter in real time across multiple cameras and microphones, and calculate the optimal evacuation path to safety for each student, teacher and staff member. The program will communicate this information through a mobile app interface that is co-created in partnership with a community of students, parents, educators and administrators as well as school resource officers and school safety officers.

Sarkar will provide expertise to the project in the areas of multi-modal sensing, artificial intelligence (AI) and machine learning.

"ASTERS is about building a decision system that will incorporate multi-modal sensing, AI and machine learning techniques to accurately localize a gunman and weapons while preserving privacy of school community members. It will also use new computer vision and high-performance computing solutions to estimate crowd density and movement of people, and novel optimization and real-time simulation algorithms to predict ideal evacuation routes based on the building layout and predicted movement of the shooter," he said.

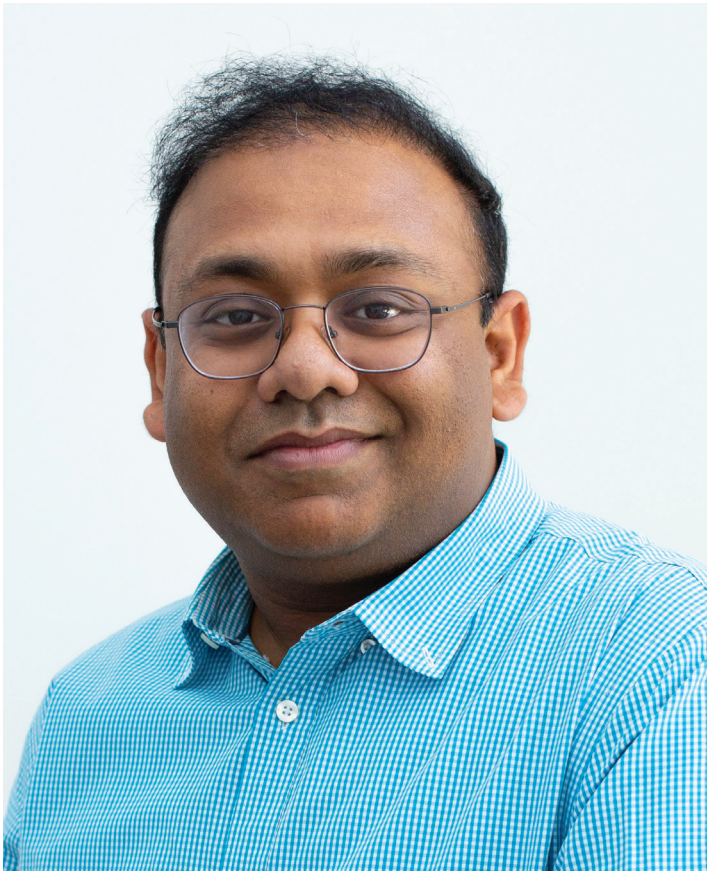
Gilbert will examine the project from a cognitive engineering perspective. Marshall will studies ways in which the ASTERS protocol can be applied the pK12 contexts and will work with a school in Iowa during the third year of this three-year project to test the protocol.

"Building a system such as ASTERS demands a range of expertise from computer science, human-machine interaction, and engineering to social science and education. Therefore, inter-departmental and inter-college collaboration is indispensable in this case," said Sarkar, adding that the project will also rely on expertise from Darin Van Ryswyk, Deputy Chief of Police at Iowa State University, who will help the researchers to understand the mindset of first responders during school shooter crises, what they are trained to do and how ASTERS might help them.

The team will also work with researchers from the University of Tennessee (UT), which is the lead institution for this project. Subhy Chakraborty, associate professor of mechanical, aerospace and biomedical engineering will serve as the PI at the UT site. His previous experience involves calculating optimal evacuation paths under different contexts. Michael Olson, professor of psychology at UT, applies findings from his past research, which has studied how cognition works when an individual is panicked.

One advantage of this inter-university collaboration is that it will allow the researchers to examine a variety of school settings in both urban and rural areas, according to Gilbert. The research team hopes that one day this research can be applied to other active shooter situations at places other than schools.

"ASTERS is important for saving lives under a life and death situation. Plus, figuring out how to communicate most effectively with a crowd that's panicked could be useful in many circumstances outside schools," Gilbert said.



Sarkar

Naval experience paved the way for ME alum

While many college students gain first-hand engineering experience through internships and co-ops, Ryan Williams was gaining this experience before he even stepped foot on campus.

Williams served as an aviation structural mechanic for the U.S. Navy after high school which taught him how hydraulic systems and flight control components work together to put an aircraft in the air. After a four-year stint in the Navy and one year as a machinist for Houston Precision Fasteners, Williams came to Iowa State University.

As a kid growing up in Magnolia, Texas, Williams enjoyed taking things apart to learn how they work. This, coupled with his experience in the Navy and at Houston Precision Fasteners, led him to pursue mechanical engineering (ME) as his major.

"Being able to take what I had learned in the Navy and being able to perform calculations based on design parameters really made my selection to become a ME more definite," he said.

As a student, Williams was active with the Veterans Center which was part of his draw for coming to Iowa State. He also had the opportunity to travel to Nicaragua as part of ME associate teaching professor Gloria Starn's study abroad program. As the only student on the trip with significant welding experience, Williams handled welding duties for the group's service project. Starns said she was impressed with his work ethic and willingness to finish the job on days when temperatures were in the 90s with nearly 100 percent humidity.

Williams took ME 170: Engineering Graphics and Introductory Design with Starns and liked her teaching style so much that he also took ME 325: Mechanical Component Design with her. In class, Starns was impressed again with his work ethic and willingness to work on models "until he had every detail nailed down."

"Having been at Iowa State for many years now, I can say without hesitation that Ryan's work ethic is among the top two or three I have encountered," said Starns. "Ryan is the kind of student that defines the good character and high integrity of Iowa State."

Williams said Starns also left a lasting impact on him and they remain in contact to this day.

"Gloria is by far the most influential professor I have ever had and she guided me to be the person I am today," he said.

Despite being older than many of his classmates, Williams said it was never particularly difficult for him to transition into college life.

"I felt like being of older age really pushed me to finish early as I completed my degree in three and half years," he said.

Since graduating in 2017 with his B.S. in ME in 2017, Williams has worked as a mechanical engineer for SVI Trucks in Fort Collins, Colorado. The company specializes in custom fire apparatuses for vehicles. Williams' duties involve building pumps and chassis-related systems, such as hydraulic systems, high-pressure air systems and generator power systems.

"Iowa State has provided me the training and education necessary to determine fluid flow calculations for pump and hydraulic power systems, and also provided me with the ability to 3D model various components," he said.

In his free time, Williams enjoys hunting, fishing, working on vehicles and just spending time outdoors. Starns said that she is proud of what her former pupil has achieved.

"As a teacher it's just so rewarding to see when your work has such a positive impact on someone both professionally and personally. I think Ryan is a role-model for not only non-traditional students, but for all students."

From Nicaragua to Senegal, ME alum is helping around the world

Helping people has always been a personal mission of Iowa State alum Patrick Ward. It was part of the reason he chose to study mechanical engineering. It was part of the reason he traveled abroad to Nicaragua as a student. And now it is part of the reason he left his full-time engineering job to join the Peace Corps.

Ward grew up in suburban Chicago and developed an interest in engineering through his participation in Project Lead The Way. He looked at various engineering colleges in the Midwest but picked ISU because of "the great value it offered."

As a student, Ward was a George Washington Carver Scholar, served as vice-president of the Iowa State Running Club and was also a member of the TRIclones, ISU's triathlon club. He said his participation in the George Washington Carver Scholar program was especially impactful because it exposed him to courses that opened his eyes to different world perspectives.

"Many of these topics on identity, ethnicity and race are very prevalent in Peace Corps service and these classes have better prepared me for work in the international, multicultural environment," he said.

During the summer of 2016 Ward was part of ME associate teaching professor Gloria Starns' human centered design service learning course which spent four and a half weeks in rural Nicaragua working with locals to design products based on their needs and the resources available. The group worked closely with EOS International, a non-profit company founded by ISU mechanical engineering alum Wes Meier focused on making clean water more accessible in Central America. Ward called the experience a "turning point" in his professional development.

"Not only did this type of work satisfy my passion for engineering and travel, but it was also very fulfilling to positively and directly help a community with problems they have identified," said Ward. "Moreover, this study abroad experience opened my eyes to development work in general."

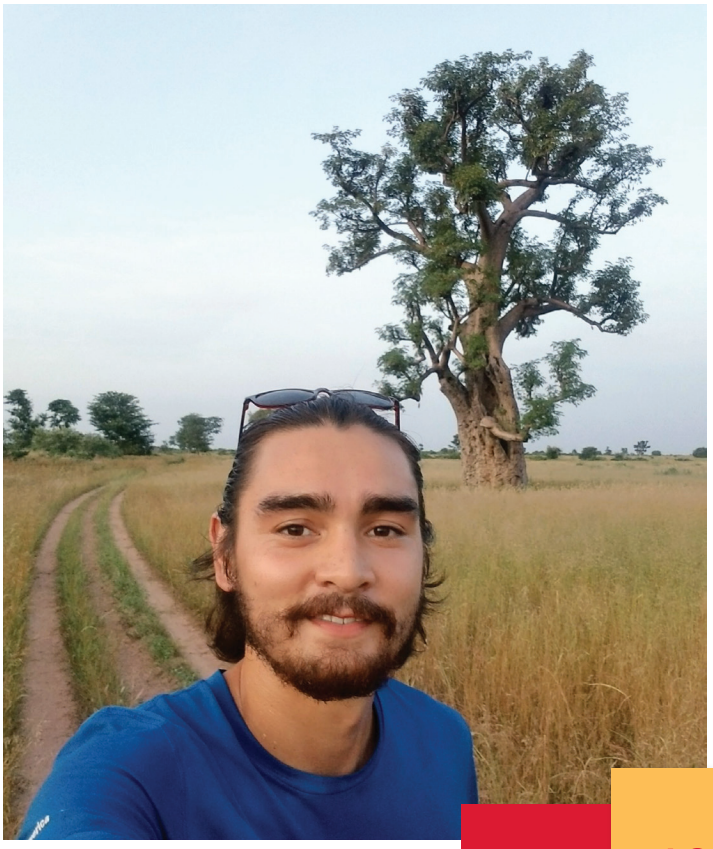
After completing his B.S. in ME, Ward worked as a nuclear engineer for the Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Washington state. His duties involved writing technical work documents for repairs to be done on some of the nuclear systems in aircraft carriers and submarines, specifically focusing on valve systems. After a year and a half as a nuclear engineer, Ward changed career paths and joined the Peace Corps as a health volunteer in Senegal. He often applies the things that he learned in Starns' human centered design course to his current work. For example, when helping locals design mud stoves he is often thinking about how to develop the most efficient product possible.

"I appreciate that my time at Iowa State provided me with both the technical expertise and the professional people skills to get me where I am today."

"I ask myself things like, what is the ideal size of the opening for the best air flow? How much clay mixture is needed for insulating properly, and how much insulation is a waste of resource? How can I increase the life of a mud stove? A lot of these questions still need to be answered but I enjoy the trial and error," he said.

Now that he has been away from Ames for about three years, he often reminisces about the impact that his time at Iowa State has had on him.

"I appreciate that my time at Iowa State provided me with both the technical expertise and the professional people skills to get me where I am today. ISU has given me opportunities I could not have imagined and prepared me for a future I could not have predicted. I simply hope that my experiences and lessons learned will influence others to positively impact those in their life, wherever that may be."



From refining to distilling: ME alums fulfill a vison

Century Farms Distillery in Spencer, Iowa was founded by Amanda and Ryan Bare in 2017. The Bares journey to starting a distillery can be traced back to their time as students in mechanical engineering (ME) at Iowa State.

Originally from Grundy Center, Iowa, Amanda had a thirst for a challenge. After being encouraged to pursue engineering by a high school teacher, she decided to join the ME program at Iowa State.

Amanda became heavily involved in organizations after joining Iowa State. While leading tours for prospective students in the College of Engineering, she was also a member of Tau Beta Pi Engineering Honor Society and the Alpha Omicron Pi Sorority.

For Ryan, who grew up on a farm near Emmetsburg, Iowa, the decision to study mechanical engineering was inspired by his older brother who earned the same degree from Iowa State in 1991. Ryan was involved in the American Society of Mechanical Engineers chapter advised by Bill Bathie, ME professor emeritus.

Ryan also took every class instructed by Alfred Joensen, ME associate professor emeritus who passed away in 2018. Reflecting on his 25 years of working in the energy sector, Ryan says Joensen's power plant design course equipped him with valuable skills for working in the industry.

Engineering Passions Unite

Ryan says he avoided registering for courses before 10am, but that didn't stop him from enrolling in a 7:40am course. Amanda was also in the same class, and the rest was history.

"Ryan and I had one class together: Electrical Engineering 447, but we did not really meet in that class," Amanda said. "One Friday evening we were both at Welch Ave Station – as engineering students tended to do – and happened to sit at the same table with other ME students."

After graduating, Ryan moved to Houston, Texas to work for Hoechst Celanese, a Fortune 500 chemical company now known as the Celanese Corporation. Once Amanda graduated in 1997, she moved to Houston and began working for Lockheed Martin Space Systems at the Johnson Space Center.

Ryan soon transferred to Celanese's plant in Pampa, Texas located in the state's Panhandle. Just thirty minutes west in Borger, Texas, Amanda joined Phillips 66. A few years later, Ryan began working at the same plant. In 2002, Amanda gave birth to their first child. Another move took them to the St. Louis area with ConocoPhillips and their two daughters were born there.

In 2011, the Bares and their three children moved back to Iowa where Ryan began working in the ethanol industry. Here, he learned how to turn corn into alcohol and soon began their entrepreneurial endeavor.

Corn Makes Whiskey, and Vodka

With the Bares careers carrying them to many corners of the United States – and for Ryan, beyond the Lower 48 – the purpose of establishing the distillery was clear.

"I've discovered that most folks have no idea what we do, here, in Iowa," Ryan said. "I wanted to create a tangible consumer product that tied our farms to something city dwellers could appreciate."

With over 19,000 century farms in Iowa, Amanda and Ryan are concentrated on recognizing the long-standing tradition of growing corn in the state. They use a customized distillery process for their whiskey that sources their corn exclusively from individual farmers.

The process for converting ground corn into unaged whiskey takes around seven days. How vodka and whiskey are defined is subject to the standards put forth by the federal government. While vodka is distilled at over 190 proof, whiskey is distilled at under 160 proof.

"The entire distillery is one giant thermodynamic problem, heat and mass transfer problem and engineering economy problem – all rolled into one," Ryan said.

Reflecting on the hours spent studying mechanical engineering as undergraduates, Amanda and Ryan say their decision to study engineering has served to be an invaluable component for entering the distillery business.

"Engineering is a fantastic major for so many things," Ryan said. "The best attribute is the focus on critical thinking and the belief that problems are temporary and can be solved. No technical challenge is insurmountable."

In light of COVID-19, the Bares have temporarily switched their distillery over to producing hand sanitizer.

Looking Ahead

Ryan is now working in a rotational position with BP based in Prudhoe Bay, Alaska. This summer, Ryan will take time off from his BP job to work full time at the distillery. In light of COVID-19, the Bares have temporarily switched their distillery over to producing hand sanitizer.

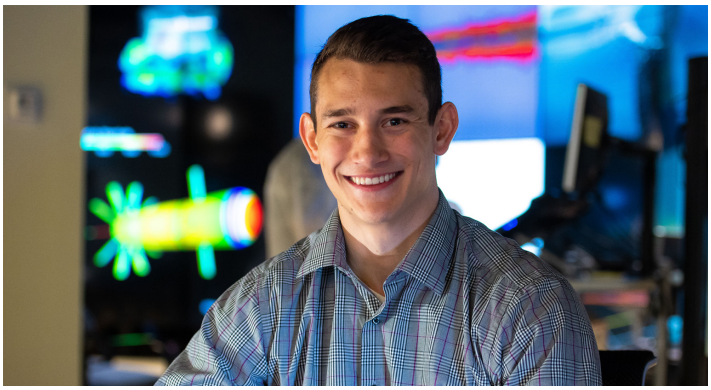
Family has been a major component for Amanda and Ryan as they've worked to establish their business. Ryan's father who has now passed on created the coils used for the distilling process and restored the tractor used for off-loading grain. Today, Ryan's 18-year old son helps him and Amanda keep the business up and running.

Aside from co-operating the distillery, Amanda is involved in the FIRST LEGO League teams through 4-H, the City of Spencer Planning and Zoning Commission, the Spencer Hospital Advisory Board, the Grand Avenue Improvement Corporation and PEO International. Outside of being an active member of the community, she still leaves room for hobbies and brainstorming additions for the distillery.

"I enjoy knitting and someday would love to carve out a place in our tasting room for a yarn store and a place where people can come to knit and have a drink or two," Amanda said.

Contributed by Madeline McGarry / Engineering College Relations

ME student named Stanford Knight-Hennessy Scholar



An Iowa State University graduating senior is the first student from Iowa to be named a Stanford University Knight-Hennessy Scholar.

Nikita Kozak, senior in mechanical engineering from Waukee, was recently wrapping up a long day of schoolwork and cutting down trees in his backyard. After heading inside to shower, eat and talk to his mother, he received a phone call from a California number.

It was John Hennessy, president emeritus of Stanford and the Shriram Family Director of the Knight-Hennessy Scholars program, with the news that Kozak had been selected as a Knight-Hennessy Scholar.

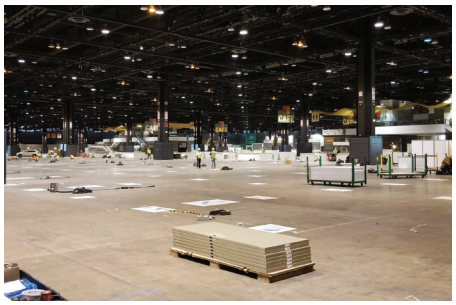
Stanford's Knight-Hennessy Scholars program aims to develop an interdisciplinary community of future global leaders to address the world's complex challenges through collaboration and innovation. Now in its third year, the program's level of prestige and competition rivals that of the world's most renowned awards.

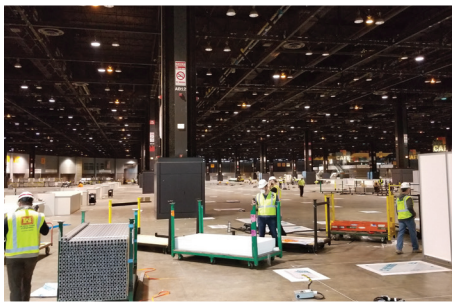
Kozak is one of 76 scholars selected from 6,171 applicants worldwide. He will pursue a Ph.D. in mechanical engineering and a master's degree in computer science at Stanford starting this fall. He aspires to revolutionize vehicles to enable urban air transportation by coupling machine learning and computational engineering.

Kozak has conducted research with the U.S. Army Research Laboratory and both the ISU Computational Fluid-Structure Interaction Laboratory and the Ivy College of Business. He earned first-place honors at five national research symposiums and has two first-author publications.

He is a Goldwater Scholar, a Department of Energy Computational Science Graduate Fellow (the first ever from Iowa State) and a recipient of the National Science Foundation Graduate Research Fellowship. Outside the classroom, Kozak excelled as a goaltender for Iowa State's hockey team, gaining national recognition as a top ten goalie, and all-conference honors.

Contributed by Chelsea Davis/ ISU News Service





ME alum combating COVID-19

ISU College of Engineering Director of Digital Media Content & Strategy Travis Ballstadt recently spoke with 2018 ME graduate Jesse White about Jesse's effort setting up alternative care facilities in Chicago to combat COVID-19 as part of his work with the Army Corps of Engineers. Below is a segment from the podcast.

Portions of this interview have been edited for length and clarity

Travis Ballstadt (TB): What type of projects does the Army Corps of Engineers typically work on?

Jesse White (JW): I work in the military construction aspect of the Corps of Engineers. The thing about the Corps that a lot of people don't know, is that it's actually one of the largest engineering organizations in the world and there are a ton of different tasks that we're associated with. I work specifically out of the Louisville district, which is where our headquarters is, and I work out of a field office in Scott Air Force Base.

TB: Excellent. And when did this current project come onto your radar? I know this one was quite a bit different from past projects. Tell us a little bit about this current project.

JW: I got a call from my boss who said he volunteered us for the emergency response to the COVID-19 situation in Chicago. I was excited to go out there and work on this, just because I know how important this type of thing is. These emergency operations are definitely a whole different ballgame. I've never actually been a part of any, but the Corps has done this sort of work in the past during Hurricane Katrina and down in the Virgin Islands, just to name a few. But this recent effort was a little bit different just because it was closer to home. For the Chicago effort, we were based out of the McCormick Place, which is actually the largest convention center, I believe in North America right now. It's essentially just this huge open space, since there's not any conventions going on, obviously. What we're setting up are basically alternative care facilities inside this space. So essentially, we, the Army Corps of Engineers, worked as the contracting agency and the supervisory agency for the physical construction of all the beds and the cubicles. I think right now we're at around 3000 beds at McCormick. So, it's definitely pretty huge.

TB: How do you feel your time at Iowa State prepared you for this job? And maybe even more specifically for this project? Is there anything you can point to that directly relates to what you're doing on a daily basis?

JW: Yeah, definitely. I think a lot of the project-based classes and the team-building exercises within those project-based classes absolutely helped, just because there are a lot of people we need to coordinate with. And then also just the time constraints from class projects were applicable here. I know a lot of engineering students can attest that sometimes your back is against the wall and you have to get something done and that was definitely the case here. We were prioritizing getting these done as quickly and efficiently as possible. I definitely think that having those experiences at Iowa State helped prepare me, especially mentally, just going into this. Knowing how to keep my composure was key, because there were some times we were putting in 12-hour days, seven days a week. Just having that get-the-job-done type of mindset. That's definitely something I had to do back when I was at Iowa State.

Factor Analysis Podcast

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Factor Analysis

Remote controlled labs deliver "hands-on" experiences from afar

Well before the COVID-19 pandemic vastly altered the everyday lives of people across the globe, a group of mechanical engineering (ME) faculty and staff at Iowa State University were working on ways to bring virtual, hands-on labs into the homes of students via the internet.

In 2012, Jonathan Wickert, then dean of Iowa State's College of Engineering, provided a challenge and funding to the departments in the college through his Dean's Education Initiative. Sriram Sundararajan, then an associate professor in ME, and Jim Dautremont, electronics technician for ME, responded to that challenge by developing ways to deliver thermo-fluids laboratory experiments remotely. In their initial study, the duo developed remote labs for three ME lab exercises: two in the fluids course (ME 335) covering pumps and linear momentum concepts and one exercise in the heat transfer (ME 436) course covering steady state conduction and extended surfaces. The researchers selected experiments that focused on data collection and analysis rather than an inquiry-based laboratory experience.

In each experiment, computer-based remote access was established to view and control the experimental apparatuses, which provided the students with a mechanism to conduct the experiments from a distant, online environment. This emphasis on online course delivery was aimed to address some of the issues the department faced in 2014, which included high enrollment and lack of available teaching laboratory space. It was also aimed at meeting the needs of students who wanted to take classes while away from campus for internships, co-ops and study abroad opportunities.

When developing this new course delivery, the researchers wanted to ensure that students studying remotely would receive the same quality of education as those studying on campus.

"More than 'maintain' quality, we focused on ensuring a comparable experience for labs," said Sundararajan who currently serves as Associate Dean for Academic Affairs in the College of Engineering as well as a professor of ME. "This included remote control of experiments, clear visual aids and live data, same group size and TA [teaching assistant] support for the two cohorts: in lab and out of lab."

In the study, the students were divided into two groups: one group performed the lab as usual, the other group were removed to another room to conduct the experiment. Students in the remote lab reported a similar learning experience compared to their peers in the physical lab.

"These techniques and approaches provide a viable pathway to provide laboratory-based experiences to students in an online or virtual environment. This approach is conducive for labs where acquisition and analysis of real data is the focus rather than open-ended design-build experiences," Sundararajan said.

John Howell, teaching laboratory coordinator for ME, joined the effort in July 2014, taking over responsibilities in the fluids and heat transfer courses and bringing in his expertise in systems engineering.

The team officially launched their first live, fully remote lab exercise as part of the heat exchanger lesson for ME 436: Heat Transfer on April 14, 2020. Earlier in the spring 2020 semester, courses were moved online to combat the spread of COVID-19. So, remoting proved to be the only way to bring an interactive laboratory experience into the homes of the students studying off-campus. The exercise allowed lab groups to remote in. Students used a web browser to run a National Instruments, LabVIEW program as well as WebEx Teams to communicate with one another and their TA. ME senior Sarah Leahy served as a lab technician for ME 436 and was available to answer technical questions about the apparatus.

"It's when they can play with the equipment, make mistakes, make adjustments themselves, and finally have it come out right, that they learn the most," said Caroline Hayes, mechanical engineering department chair and Lynn Gleason Professor of Interdisciplinary Engineering.

Dautremont said that efforts, such as this, advance Iowa State's mission as a land grant university by educating those in remote areas of the state, and beyond.

"We'd like to challenge the university to continue in its land grant mission by offering degrees to those who are unable to come to campus to take courses. The challenge goes beyond providing technical content to supporting these students in their communities as we do for students on campus."

Leahy

An uncharacteristically snowy campus scene (at least for spring!) after a mid-April dusting