

IMSENews

2019-2020

Moving Iowa State's industrial engineering curriculum from the traditional classroom...to the digital sphere



Letter From the Chair

What a crazy school year this has been! We went into the fall with a lot of momentum after an encouraging ABET visit last spring. However, midway through the Spring 2020 semester all of our worlds were turned upside down as the COVID-19 outbreak reached the United States. This forced the university to shut down its campus and transition all classes to be online. Despite these hardships, I am so proud of the way that our students, faculty and staff have adapted to this situation.

Our staff have continued to provide high quality support for our students, faculty and university broadly. Though many of us are currently working from home, our staff have been responsible, productive and responsive, almost as much as when we're working side-by-side. We've even managed to maintain face-to-face interaction with each other, while also maintaining social distancing through Zoom meetings. It's not uncommon for children and pets to make impromptu appearances during these sessions!

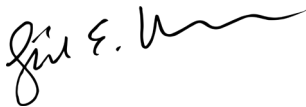
Our faculty have adapted well to the online transition. Some have utilized video and audio recordings to deliver lessons that they've given in-person for years, sometimes decades. Regardless of the delivery method, I'm confident they provided the high quality engineering education Iowa State University is renowned for.

Perhaps most of all, I am encouraged by the way our students have adapted to this situation. They got through this rough semester with integrity and honor. This ability to adapt to their situation will serve them well as they complete their studies and enter the workforce.

Before and even during this pandemic, our faculty and students were very productive from a research standpoint. Read about some of our research highlights on pages 12 and 17 of this magazine. I know that our faculty are eager to get back to normal so they can return to their labs and work side-by-side with their students and other colleagues.

Overall, this has been a challenging year, but we got through it and I'm positive we will be stronger in the future because of it. An ability to adapt to any situation is important not only for engineers, but it's important for all of us as we go about our everyday lives.

May the Cyclone Power be with you, GO CYCLONES!



Gül E Kremer

Professor and C.G. "Turk" and Joyce A. Therkildsen Department Chair



Cover Photo Caption

Top photo: A scene from a Plant Design course taught by longtime IE professor and chair Joseph Walkup in the 1950s. Walkup served as chair of Iowa State's IE department from 1942 to 1973.

Bottom photo: Frank Peters, C. G. "Turk" and Joyce A. Therkildsen Professor and associate professor in industrial and manufacturing systems engineering, points out the threaded metal inserts that were added to this plastic part as part of his plastic injection molding lesson for IE 348: Solidification Processes. The specific topic was the different ways value added features can be added to plastic injection molded parts. While typically taught in person, IE 348 was moved to online delivery to combat the spread of COVID-19 midway through the Spring 2020 semester.

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Liao joins IMSE faculty for 2020-21

Yiliang "Leon" Liao

Ph.D., Industrial Engineering, Purdue University

M.S., Biomedical Engineering, South Dakota School of Mines and Technology

B.S., Materials Science and Engineering, University of Science and Technology of China

Research interests: laser-based advanced manufacturing; additive manufacturing (3D printing); micro/nanoscale manufacturing; and advanced materials processing towards applications in soft robotics, energy storage, biomedical engineering, etc.

"ISU has a worldwide reputation in science and engineering. I am very excited to have the opportunity to join IMSE, and look forward to collaborating with ISU's top researchers and scientists. At IMSE, I hope I will be able to contribute new expertise and perspectives in advanced manufacturing and become a great researcher and educator in the area of manufacturing in the near future."

~Dr. Yiliang "Leon" Liao



Devine joins IMSE faculty for 2020-21

Brendan Devine

M.S., Mechanical Engineering (Emphasis in Combustion & Propulsion), The University of Iowa

B.S., Mechanical Engineering, The University of Iowa

Academic interests: preparing students for employment in aerospace, defense, and green energy industries.

"My academic focus is in large systems integration, dynamic configuration management, and operational testing of new and modified systems, with emphasis in flight and satellite platforms"

~Brendan Devine



Jordyn Koenig wins NSF Graduate Research Fellowship

An IMSE graduate student is among four from the entire College of Engineering to receive a prestigious National Science Foundation (NSF) Graduate Research Fellowship.

Jordyn Koenig, a graduate student in industrial engineering, is the sole recipient from Iowa State's IMSE department to receive this honor. Koenig, who came to Ames via Oronoco, Minnesota, completed her B.S. in IE at Iowa State in Spring 2019.

"I am honored to be named as a NSF Graduate Research Fellow. This award will allow me to continue my research in the Physical Ergonomics and Biomechanics laboratory with Dr. Gary Mirka," said Koenig. "In addition to my work on campus, I am able to develop collaborations with Mayo Clinic to study the physical workload of health care providers."

Koenig is currently enrolled in the dual M.S.-Ph.D. program. She plans to complete her M.S. in Fall 2020 and her Ph.D. in Spring 2023.

NSF's Graduate Research Fellowship Program (GRFP) is awarded yearly to graduating seniors and first or second-year graduate students demonstrating the potential for significant research in STEM fields. Students are selected from an extremely competitive group of around 12,000 applications. The GRFP recognizes and supports those early in the process of pursuing research-based masters and doctoral degrees. The GRFP grant provides three years of support for graduate education at any accredited institution of the individual's choice and international research and professional development opportunities.

Contributed by Martha Haas, Engineering College Relations



IMSE graduates 174 during 2019-20

Iowa State's Department of Industrial and Manufacturing Systems engineering graduated 174 total students during the 2019-20 school year.

During fall 2019, 42 students completed a B.S. in IE, two graduated with a M.Eng. in IE, eight with a M.S. in IE, four with a Ph.D. in IE, and one with a M.Eng. in systems engineering. These students and their families had the opportunity to attend the department's pre-commencement reception on December 21. Gül E. Kremer, professor and C.G. "Turk" & Joyce A. Therkildsen Department Chair of Industrial and Manufacturing Systems Engineering, addressed the students and their families during the ceremony.

"These graduates have worked hard and while their adventure here in IMSE at Iowa State may be complete, they are on the road to new adventures – graduate school, a new job in industry or otherwise, as well as other journeys they wish to explore," said Kremer. "We are glad to have you here to help us honor these wonderful graduates and now alums of IMSE and ISU."

Despite all of the disruptions that COVID-19 has caused to our everyday lives, the students persevered and Iowa State's IMSE department graduated 94 undergraduate students and 23 graduate students received their degrees during spring 2020. Of those graduate students, three completed a M.Eng. in IE, seven with a M.S. in IE, one with a Ph.D. in IE, six with a M.Eng. in engineering management and four with a M.Eng. in systems engineering.

Midway through the spring semester, the university made the decision to shut down the campus in order to prevent the spread of COVID-19. Classes were moved online as was the pre-commencement celebration usually held on the morning of the university-wide commencement ceremony.

During the in-person pre-commencement celebration, students typically go up to the podium to discuss their future plans, give thanks to those who helped them through college, and reminisce about their greatest memories from their time at Iowa State. This year students submitted videos of themselves addressing these topics from their homes. Faculty also submitted video messages of the addresses they typically give at the in-person celebration.

"Cherish those friendships you made while you were here. They will be with you for the rest of your lives," said Kremer. "It's my sincere hope that you will feel a great sense of nostalgia from your time at Iowa State. I also hope you will feel deeply loyal to your alma mater once you leave us. You will forever be a Cyclone alum. This is true."

Watch the Spring 2020 IMSE Commencement Reception
www.imse.iastate.edu/spring-2020-graduation-video/



IAC Junior SubCommittee Being Established

One of the ways IMSE hopes some of our recent graduates remain involved in the department is through a newly established junior subcommittee to the department's Industrial Advisory Council (IAC). Forming this new group will be both beneficial to our recent alums and current students. Former IE student leaders will continue serving in a similar role to mentor current IE students while also gaining perspective as to how our IAC members serve in their roles as valuable resources and advocates of the department. It will be a wonderful opportunity for our newest IE alumni to give back and provide some valuable input as alums while also guiding and providing insight to our future leaders.

*Inaugural members who have agreed to become part of this new adventure include: **Jaclyn Stiller, Hannah Rhoads, Amy Olberding and Zach Woodbeck.***

Honors, Awards and Promotions

Students

Faezeh Akhavizadegan, Javad Ansarifard and Lizhi Wang (Associate Professor)

1st place at Syngenta Crop Challenge in Analytics

Vahid Azizi

Spring 2020 ISU Research Excellence Award,
Awarded by ISU Graduate College

Logan Beguhn

Spring 2020 ISU Teaching Excellence Award,
Awarded by ISU Graduate College

Haley Beving, Jakob Pyburn, Albert Samuel and Robert Quiles-Fernan

Named honorable mention in Simio's Student Simulation contest

Ramin Giahi

Spring 2020 ISU Research Excellence Award,
Awarded by ISU Graduate College

Zhengyang Hu

Fall 2019 Research Excellence Award,
Awarded by ISU Graduate College

Edwin Kurgat

NCAA Cross Country Champion
USTFCCA Cross Country Male Athlete of the Year
Big 12 Indoor Track & Field Men's Performer of the Year
Big 12 Indoor Championships High Point Award
Big 12 Men's Indoor Track and Field Champion (3000-Meter)
Big 12 Men's Indoor Track and Field Champion (5000-Meter)
Big 12 Men's Indoor Track and Field Champion (Mile)
Big 12 Men's Cross Country Runner of the Year
Big 12 Men's Cross Country Individual Champion
Male Athlete of the Year, Awarded by ISU Athletic Department

Anuj Mittal

Fall 2019 ISU Research Excellence Award,
Awarded by ISU Graduate College

Hamid Norasi

Fall 2019 ISU Research Excellence Award,
Awarded by ISU Graduate College

Kaitlyn Ouverson

Winner of ACM XRDS essay contest
on the Future of Everyday Life

Michael Peterson

Fall 2019 Outstanding Senior, Awarded
by ISU College of Engineering

Roshon Roomes

Big 12 Track and Field Champion (600-Yard Run)
Big 12 Track and Field Champion (800-Meter Run)

Zachary Woodbeck

Spring 2020 Outstanding Senior, Awarded
by ISU College of Engineering

Xiao Zhang

George E. Lamp, Jr. Memorial Scholarship,
Awarded by the ISU Foundation
Spring 2020 ISU Teaching Excellence Award,
Awarded by ISU Graduate College

Faculty/Staff

Krista Briley

Omurtag Award for Staff Excellence,
Awarded by ISU IMSE Department

Mike Helwig

Promoted to Associate Teaching Professor

Guiping Hu

Mid-Career Achievement in Research Award,
Awarded by ISU College of Engineering

Gül E. Kremer

ISU Early Achievement in Departmental Leadership, Awarded
by the ISU Office of the Senior Vice President and Provost

Cameron MacKenzie

Best paper award for the Engineering Economy Division,
Awarded at 2019 IISE Annual Conference and Expo
Don Grant Award for Excellence in Teaching,
Awarded by ISU IMSE Department

Gary Mirka

Promoted to University Professor

Leslie Potter

Promoted to Teaching Professor

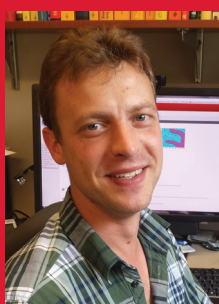
David Sly

Promoted to Teaching Professor

Lizhi Wang

Omurtag Award for Research Excellence,
Awarded by ISU IMSE Department

New faces in IMSE



Kris De Brabanter
*Associate
Professor*



Kate Garretson
*Administrative
Specialist*



Matt Janowicz
*Teaching
Laboratory
Coordinator*



Cynthia Lidtke
*Program Coordinator for
DataFEWSion Graduate
Traineeship*



**Rhaechel
Ohge Fritz**
*Academic
Adviser*

NCAA champ says discipline applies to both sports and school

As a NCAA champion in cross-country, Edwin Kurgat knows about the level of discipline required to reach goals. He also applies this same level of discipline to his study habits as an industrial engineering student.

Growing up in Eldoret, Kenya, Kurgat played field hockey and also enjoyed fiddling with electronics and other machines.

"I knew that one day I wanted to be an engineer," said Kurgat. "I wanted to see how things are built and how they work."

His sister told him about scholarship opportunities available to student-athletes at American universities, so he started an intense training routine for long distance running beginning in March 2016. By August of that year, he was offered a cross-country scholarship at the University of Tennessee at Martin.

He spent three semesters in Tennessee before transferring to Iowa State University. Upon arriving in Ames, he knew he wanted to pursue studies in engineering but wasn't sure which field would best fit his interests.

"I started talking to some people and they told me about industrial engineering and the various subfields. They talked about manufacturing so I chose that as my focus," Kurgat said, adding that manufacturing tied back to his childhood interest in understanding how things are made.

Kurgat cites IE 248: Engineering System Design, Manufacturing Processes and Specifications as one of his favorite courses he's taken so far. He said that being able to take the theory he learns in lecture and apply it to the hands-on activities in the lab has been an effective way for him to learn the course content.

"It's something I had never experienced. I'd never used a machine that can do work like a CNC machine," he said, adding that it's fun

to design something in SolidWorks then see it come to fruition in the fabrication process.

Being both an athlete and an engineering student has taught him everything from learning how to be part of a team where members have an array of different backgrounds and skill sets to managing his time efficiently.

"With both running and studying, it gives you a sense that you have to use your time wisely. You have to manage your time well. You have to discipline yourself. You have to be on top of everything," he said.

All this discipline paid off at the NCAA Men's Cross Country Championship in November 2019. Kurgat completed the 10k (6.2 miles) course in Terre Haute, Indiana, with a time of 30:32.7, which was best in the field.

"When I was just about to cross the finish line, it didn't seem possible, it didn't seem realistic," said Kurgat. "That feeling made me so happy. I was like 'I did it!'"

When the cross-country season concluded, Kurgat shifted his focus to track where he competes in the distance events. Unfortunately, his season was cut short because of COVID-19.

In his free time, he enjoys watching football and basketball, both college and NBA. He's also had the opportunity to attend a handful of Cyclone football and basketball games. Additionally, he enjoys traveling and said that Los Angeles and Boston have been two of his favorite places he's visited in the United States.

Kurgat plans to complete his studies in spring 2021. If possible, he said he would like to continue competing athletically and hopes to one day find a career where he is able to combine his interest in sport with his IE skillset.



Factor Analysis

To listen to the full interview with Edwin, search for "Factor Analysis" wherever you listen to podcasts or visit <https://news.engineering.iastate.edu/factoranalysis/>

Juggling batons, engineering, sorority life and more

Imagine having roughly 120,000 eyes on you as you perform during halftime at a football game. This is almost a weekly occurrence for industrial engineering sophomore Alexis Ashton during the fall.

Ashton is one of the Feature Twirlers for the Iowa State University Cyclone Football 'Varsity' Marching Band, which performs at all Cyclone home football games. She grew up in Solon, Iowa, and first started twirling when she was 6 years old. Growing up she also danced, ran cross country and participated in the Miss Iowa Scholarship Program.

Despite having the University of Iowa practically in her backyard, she always wanted to be an engineer and felt that Iowa State University better offered what she wanted, particularly when she discovered the professional opportunities within the field of industrial engineering (IE).

"What solidified my decision to major in industrial engineering was when [industrial and manufacturing systems engineering teaching professor] Leslie Potter said that industrial engineers improve processes to help people. It was then I decided I wanted to be part of a team that helps a process become more efficient and helpful," Ashton said, adding that Potter has been one of her most influential faculty members during her time at Iowa State.

During a typical game week, Ashton spends roughly 10 hours rehearsing her routine for that week's show. On game days, she arrives at the field five to six hours before kickoff, meaning that she's there between 5 a.m. and 6 a.m. for 11 a.m. games.

She and the marching band start the day off with a practice before welcoming the football players to the stadium during the spirit walk. They then get a short break to eat before performing the step show outside of the Alumni Center. Then, they finally march over to Jack Trice Stadium for the game, where they perform during pre-game and halftime. While the pre-game performance generally remains the same, the halftime show is different each week. In the past, they've performed music from classic artists like Tchaikovsky (Russian, Romantic era composer) and Glenn Miller (Iowa-born big band leader) to contemporary pop acts such as Billie Eilish and Lizzo.

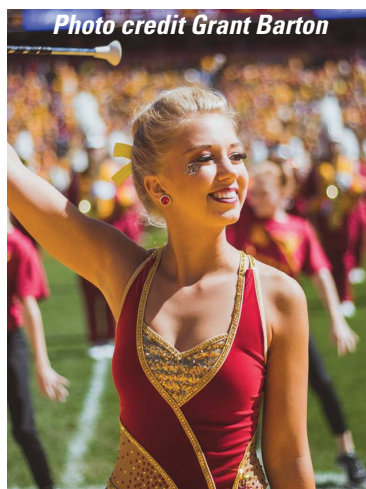
She described the band as a family and said she's become particularly close with the other two Feature Twirlers: Rachel Lasota and Maren McGuire. Despite the stress of performing in front of roughly 60,000 fans, Ashton said she doesn't let her nerves get the best of her.

"I rarely get nervous on game days. Performing at football games is one of my favorite types of performances," she said. "It's one of the best feelings being able to perform for that many people."

In addition to the IE curriculum and her twirling responsibilities, Ashton also participates in Dance Marathon and is a member of Delta Zeta sorority. Part of her work with her sorority includes philanthropic efforts, such as providing aid for the speech and hearing impaired, and also helping to organize events with other sororities and fraternities on campus. She said that the workload is a bit overwhelming at times, but she always manages to persevere.

"Some effective methods I find that work for me is to never procrastinate. I start homework and projects as soon as they are assigned. I also use every minute of my free time to get my work done. I rarely have free time, but when I do I use it wisely."

Ashton plans to complete her studies in spring 2022. She said she hopes to secure a co-op or internship in the near future that might eventually lead to a full-time career.



IE student-athlete wins two Big 12 titles in track

IE student-athlete Roshon Roomes poses with his 2019-20 Big 12 Indoor Track and Field championship medals for his titles in the 600-Yard run and 800-Meter run events. During his track and field career at Iowa State, which was cut short because of the COVID-19 outbreak, he was a four-time All-American, a three-time Big 12 champion, and he set an NCAA record for the 600-yard run in 2019. The Woodbury, Minn. native completed his B.S. in IE in Spring 2020.

Childhood love of video games leads to professional passion for virtual reality

Growing up, Brandon Jorgensen had no idea that his love for video games would one day lead to a professional interest in the field of virtual reality (VR). Today he owns a VR company.

Jorgensen grew up in Pleasant Hill, Iowa, (just east of Des Moines) and graduated from Southeast Polk High School. After high school, Jorgensen enlisted in the U.S. Army and served four years of active duty stationed in Fort Polk, Louisiana.

“The military certainly has had a huge influence on my professional development,” said Jorgensen. “Not only in the traditional aspects such as being on time, dressing well, personal discipline and respect. But also in other ways such as working with others regardless of their background or skills and being able to use those differences to an advantage.”

Jorgensen is the third generation from his family serve in the Army, following in the footsteps of both grandfathers and his father. He said that he learned a lot about leadership through his time in the service.

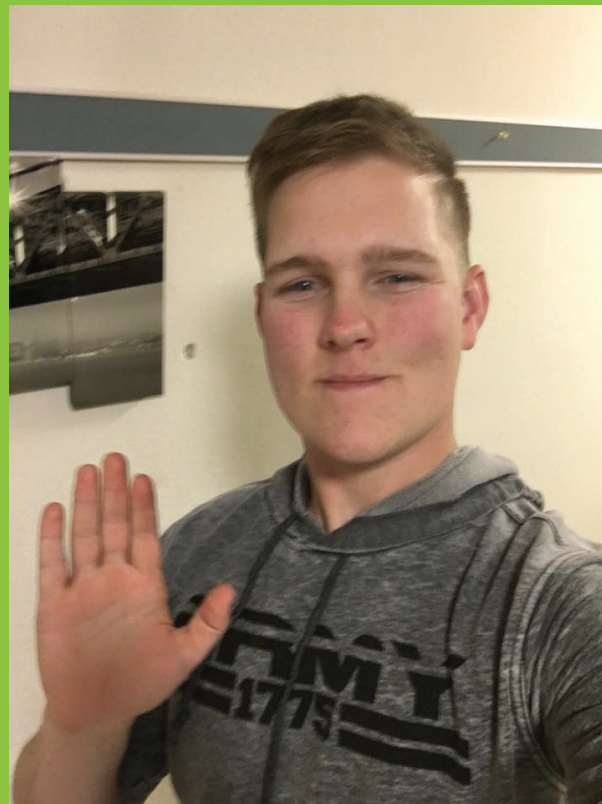
“One of my mentors in the military told me to look at every leader you find yourself under, then to list the bad things and the good things. Eventually you’ll become the leader that you want to see,” he said.

After his service, Jorgensen, who attained the rank of specialist (SPC) and earned an associate’s degree, decided to attend Iowa State University to pursue a bachelor’s degree. He wanted a strong engineering program that was close to his family in central Iowa, so he said Iowa State was a natural fit. After his first year, he was still unsure of what he wanted to study, but it was during his second year that he selected industrial engineering after learning about its applications within the field of VR. In addition to IE, he is also studying business administration.

In May 2019, he launched his own company Iowa VR Labs. Currently the company specializes in mobile VR entertainment for parties, festivals and other community events. Iowa VR Labs also offers team building exercises and other corporate packages. Jorgensen said he sees VR also having practical applications for everyone from military personnel to first responders.

“Being able to construct almost any simulation would vastly enhance training capabilities compared to current systems used for the same purposes and could save lives. Just thinking about it gets my mind racing about all the possibilities,” he said.

Jorgensen plans to complete his studies in spring 2022 and hopes to pursue a career in the field of VR after graduation.



To learn more about Brandon’s company, visit
www.iowavrllabs.com

IE student balances her time between the classroom and the stage

Strong connections link engineering with performing arts, according to one industrial engineering student.

Emily Oldham, a senior pursuing a double degree in industrial engineering and the performing arts, grew up in Rochester, Minnesota, and was involved with the performance side of both dance and theater in elementary and middle school. In high school, she became involved backstage and in other logistical aspects of performing arts. Then it was during her high school AP physics class that she fell in love with the applicable (as opposed to theoretical) side of STEM, so when it came time to go to college she knew she needed to find a place where she could combine both of her interests: engineering and the performing arts.

"I toured a few other colleges before choosing Iowa State," said Oldham. "In the end, I liked how many opportunities I saw in both the performing arts and in engineering, as well as all the trees and the variety of buildings on campus."

She felt that with her skillset and interests she'd be better suited to improve existing systems, as opposed to creating something new from scratch, so she felt industrial engineering was a good fit. It was during her I E 101: Industrial Engineering Profession class with Leslie Potter, teaching professor in industrial and manufacturing systems engineering (IMSE), that she realized she could apply industrial engineering concepts to the stage.

"Especially behind the scenes, theatrical productions are essentially a process that the cast and crew have spent months perfecting, and, as Leslie taught us in I E 101, industrial engineering is all about improving processes to help people. As a stage manager, I make sure all the processes from cast and

crew fit together and create a show that we are all proud to share with audiences," Oldham said.

In summer 2019, Oldham took a break from the stage to work with Stephen Gilbert, associate professor in IMSE, as an undergraduate research assistant at the Virtual Reality Applications Center.

She worked on projects focusing on telecommunications and extended reality research.

In addition to research, Oldham has also been involved in tap dancing classes and theatrical design classes at Iowa State. She also enjoys attending performances as a spectator, citing *Something Rotten* and *Kinky Boots* as two of her favorite performances she has seen at Stephens Auditorium. She said she also looks forward to seeing *Chasing George Washington* and *9 to 5*, as well as other performances.

Oldham plans to complete her studies in May 2022 and after graduation hopes to find a career that allows her to combine her two passions. She said that she encourages other students who have an interest in performing arts to explore some of the opportunities offered at Iowa State.

"Theater is loads more accessible than people seem to think it is, in terms of cost and in terms of understanding the shows themselves," said Oldham. "And if you ever want to be involved in theater, there's plenty of stuff to do. As well as actors and directors, we have people sewing costumes, building and painting sets, ushering, running the lights and sounds, and more."



Stone named IMSE's Director of Inclusion

The IMSE department at ISU is committed to ensuring all its members feel a sense of connection and belonging, regardless of their personal identity. To this end, we are proud to announce the creation of a department-wide diversity and inclusion officer. Rick Stone, associate professor, has agreed to take on the role of Director of Inclusion. In this role, Stone will be a resource for students to ensure that IMSE remains a positive environment that fosters inclusivity, collegiality and learning. As the Director of Inclusion, Stone will work with both individual



students, faculty or staff, as well as with student organizations to better understand the current climate within the department and work on ways to improve. This will include: creating and leading activities related to supporting diversity and inclusion; and serving as a confidential resource to IMSE students on matters relating to diversity and inclusion. Stone will also communicate opportunities and issues related to diversity and inclusion to the Department Chair.

Please contact Stone via email at rstone@iastate.edu or via phone at 515-294-3644 if you have any inclusion-related items you would like to discuss.

Improving food systems in Iowa through industrial engineering

Improving food systems in Iowa requires a lot more than just a knowledge of agriculture.

Anuj Mittal, a recent Ph.D. graduate in industrial engineering (IE) at Iowa State University, has been part of a U.S. Department of Agriculture (USDA) study which will allow food hubs in Iowa to share supply chain best practices among each other and to add new food hub nodes to the already established shared transportation and warehousing network of food hubs in Iowa.

“My role in the project is to develop an inventory tracking system and standard operating procedures for facilitating shared logistics activities between food hubs in Iowa,” said Mittal. “As part of this project, I will also work to develop methods to fairly allocate shared logistics cost among the participating food hubs and farmers and study how adding new nodes will better help meet supply and demand of individual food hubs.”

Work on this project began in 2016 and was initially funded by the North Central Region Sustainable Agriculture Research and Education (SARE). Later in 2017, USDA funded the study through 2020 with a total project funding of more than \$300,000.

Mittal will use concepts and methods that he has learned in his IE studies, such as supply chain management, machine learning, engineering economic analysis, process automation and statistical analysis. Other collaborators on the project include Caroline C. Krejci, Mittal’s co-major professor who currently serves on the industrial engineering faculty at the University of Texas at Arlington; Jason Grimm, Deputy Director at Iowa Valley Resource Conservation & Development (RC&D); Kayla Koether, Food Systems Specialist at ISU Extension and Outreach; and various food hub managers across Iowa.

Mittal graduated with his Ph.D. in industrial engineering in December 2019. Since summer 2019, he has served on the faculty of the industrial engineering technology department at Dunwoody College of Technology in Minneapolis, Minnesota. He also continues to work as a supply chain researcher for Iowa Valley RC&D, where he is currently working on three different USDA-funded projects related to process automation and data-driven tool development in the area of food safety and shared logistics among food hubs in Iowa.

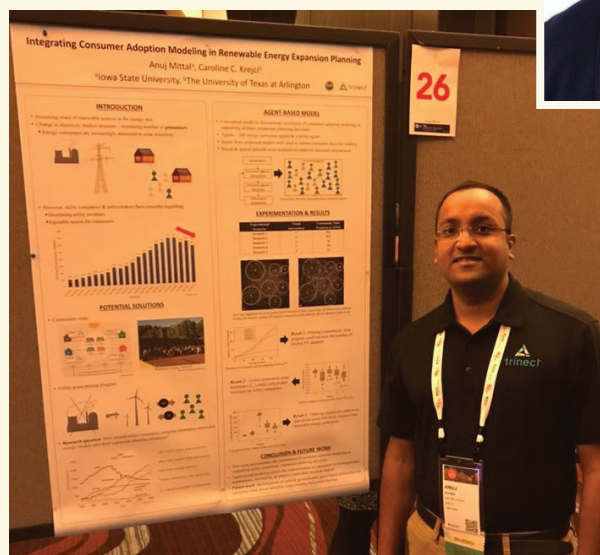
Mittal grew up in Rajasthan, India, and graduated with a bachelor’s in electrical

engineering from Delhi College of Engineering, University of Delhi. He worked for two years as a systems engineer at Doosan Power Systems in Gurgaon, India, before pursuing his graduate studies at Iowa State.

“I was really fascinated by how there is an entire field in engineering focused on improving system efficiencies. Skills and knowledge gained through industrial engineering can be widely applied across different domains and therefore, it can be a really good choice for graduate studies for those who have a wide array of interests. Therefore, I chose to pursue a graduate degree in industrial engineering,” said Mittal, adding that part of the reason he chose Iowa State was because of the wide breadth of research taking place within the IE department as well as smaller class sizes which lead to a closer relationship with faculty.

As a graduate student, Mittal served as an NSF Trinet Fellow and as a Summer Institute of Sustainability and Energy (SISE) 2018 Fellow. Much of his research at Iowa State was focused on developing quantitative methodologies to study sustainable sociotechnical systems with applications in regional food supply chains, renewable energy and food insecurity.

“Through my research in the lab and my work in the classroom, Iowa State’s industrial engineering program has really helped to prepare me to take the next step after graduation,” said Mittal.



Iowa State teams finish 1st, 8th at international data mining competition

Two teams from Iowa State University placed in the top 10 at the 2019 International Data Mining Cup.

A team of Iowa State students from the industrial and manufacturing systems engineering (IMSE) and statistics departments took the top spot at the competition, which just celebrated its 20th year. The team consisted of Qihao Zhang (Statistics), Qinglong Tian

(Statistics), Shaodong Wang (IMSE), Zerui Zhang (IMSE), Xingche Guo (Statistics), Yifan Zhu (Statistics), Haoyan Hu (Statistics), Gang Han (Statistics), Haihan Yu (Statistics), Lijin Zhang (Statistics), Yueying Wang (Statistics) and Wenting Zhao (Statistics).

A second team of IMSE and statistics students took eighth place. That team consisted of Oscar Aguilar (Statistics), Hanisha Vemireddy (IMSE), Samira Karimzadeh (IMSE), Reyhaneh Bijari (IMSE), Kanak Choudhury (Statistics) and Souradeep Chattopadhyay (Statistics).

"This was a great accomplishment for both our students and for our university," said Max Morris, former chair of Iowa State's Department of Statistics who has a courtesy appointment in IMSE.

The winning teams were invited to Berlin, Germany for a celebration ceremony on July 3 and the first place team took



home 2,000 euros in prize money. All of the students on both teams completed Steve Vardeman's STAT 602: Modern Multivariate Statistical Learning course last spring. Vardeman is a university professor with appointments in IMSE and statistics.

Teams at the 2019 competition were tasked with uncovering cases of fraud in mobile self-scanning in

food retailing. The 2019 competition consisted of 149 teams from 114 universities and 28 different countries.

"This was an excellent opportunity for our students and our university to shine on an international stage," said Gül E. Kremer, professor and C.G. "Turk" & Joyce A. Therikildsen Department Chair of Industrial and Manufacturing Systems Engineering.

"This was also a great example of our focus on interdepartmental collaboration. IMSE and statistics have a long history of strong collaboration that is evident in joint faculty appointments. Specifically, Dr. Morris and Dr. Vardeman have been instrumental in sustaining this strong collaboration. As chair of IMSE, I am committed to strengthening this collaboration even further."

Teams of Iowa State students also were among top-10 at this competition in 2013, 2014, 2015 and 2016. In 2014, the Iowa State team won first place, which was the first time that a team from the United States took the top spot.

Morris calls it a career after more than four decades

Longtime Iowa State University faculty member Max Morris has found a permanent home back in the Department of Industrial and Manufacturing Systems Engineering (IMSE). Morris joined the ranks of "professor emeritus" for both IMSE and statistics after announcing his retirement in June 2020.

Morris holds a B.S. in mathematics from Oklahoma State University as well as M.S. and Ph.D. degrees in statistics from Virginia Tech. He served on university faculties in Texas and Mississippi then as a researcher at Oak Ridge National Laboratory in Tennessee prior to joining the Iowa State faculty in 1998. He had regular faculty appointments in both departments until 2014, when his appointment with IMSE became courtesy. From 2014 to 2019, Morris served as chair of Iowa State's statistics department. He also served as interim chair of IMSE in 2011.



During his career, he published nearly 80 academic articles and authored the textbook *Design of Experiments: An Introduction Based on Linear Models*. He has advised nearly 20 graduate students and has taught hundreds more at both the graduate and undergraduate levels. Morris is a fellow of the American Statistical Association and is an elected member of the International Statistical Institute.

"I will certainly miss the regular contact with colleagues and students that was so rewarding throughout my career at Iowa State," said Morris. "But I am definitely looking forward to retirement. I will be spending more time with my grandchildren, with volunteer service work, with my piano and trombone, and with continuing professional projects, so I will have plenty to keep me busy."

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.

“After the intelligent surveillance system can calculate the optimal evacuation routes, we have to communicate those to panicked people. That’s where I will be applying principles from cognitive engineering,” said Gilbert. “Communicating an evacuation route during a panicked time is a cognitive challenge because when people won’t spend much time to think, they’ll just act, so we don’t have a lot of time and we need to get it right.”

Marshall will study ways in which the ASTERS protocol can be applied to 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.

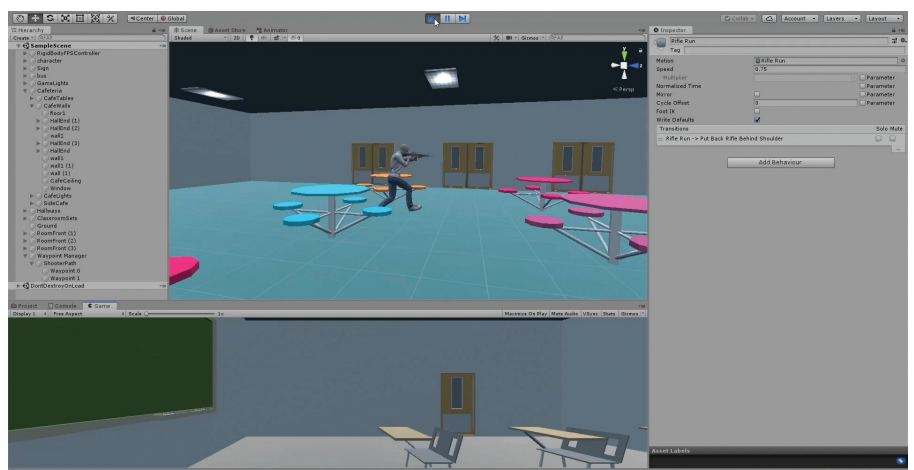
The team will also work with researchers from the University of Tennessee (UT), which is the lead institution for this project. Subhy Chakraborty, associate professor of mechanical, aerospace and biomedical engineering, will serve as the PI at the UT site. His previous experience involves calculating 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.



Gilbert



Screenshot from the simulation software

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A special note from the Chair

It's my birthday today. This year I hit one of the big milestones. At the moment, I think I have accumulated a sufficient number of stories to tell along with the associated nuggets of wisdom from failures. Ask me ten years later though, it is hard to know what the future holds. Yet, I am full of hope for all I would like to do, to support, and to enable. Of course, the COVID-19 pandemic with all its impacts on our campus, in all corners of the nation and the world has been on my mind. All these make a great time for deep reflection. And, reflection, I think, is important as it builds self-awareness, which in turn informs behavior and actions.

Industrial Engineering was my first choice as a major; it was much harder to get into than EE, ME or CE programs. Not joking... its appeal was about the same as Electronics and Computer Engineering. The program I completed had a cohort model of 42 students, of which about 40% were women. Curriculum then added up to about 160 credit hours, with only little time off from a full week of learning activities. General education courses were not a major piece of the curriculum. But then again, I should mention it was a time before pervasive software use. I had to carry a T-square to class for at least two days; technical drawing must have been a 4-credit hour course. My first computer cost me about \$5000. We had Basic and Turbo Pascal as programming languages. Right before I finished my degree early versions of C were becoming popular. I remember taking many Operations Research related exams where I solved 4-6 iteration simplex or dynamic programming problems by hand. Mathematical modeling was indeed a piece of cake, after completing the Hamdy Taha book cover to cover. Machining and manufacturing processes courses were hands-on with ample opportunity to fall, fail but learn, and conquer our fears.

I was not a bad student overall, with only minor mischiefs. I recall being called to the blackboard by our physics professor as he thought I was not paying attention. I was debating about the atomic structure of a tomato with a classmate, who was trying to impress me. Since that day, I have been a great multi-tasker! I look at those years as learning, growing, and testing the limits of my potential. Across all four years, our cohort might have had a total of 3-4 woman TAs; I had no female engineering professor. I believe we had one course from a woman mathematics professor.

We had a huge graduation party; everybody was dressed up, big smiles on all our faces. All professors at the event center celebrating with us. In the picture below, I am with one of my best friends (Seda Kaynak), and our Human Factors/Ergonomics professor, Mr. Cevat Taray. He had degrees both in electrical and mechanical engineering, and many years of experience, rising through the ranks in plant management. He loved talking about the Therbligs, Frederick Taylor and other pioneers of the discipline.

Celebrating our hard work could not have been better. Everybody together, faculty and new graduates, saying goodbyes, with promises to stay in touch, etc. In fact, having experienced such a great graduation event, I could understand the loss our students felt, having to leave without proper goodbyes to us and to their friends. It is not just about the dress you wear; it is the comfort and confidence that hard-earned diploma affords as you bid goodbyes as a fellow engineer. I should point out gold is still the favorite color of mine; of course, the second best is cardinal red... what else?

At this event, one distinct, impactful moment was an interaction with another professor of mine then, Dr. Afyonkale. We took two courses from him, and I completed a junior thesis with him as well. He said, as part of a pleasant conversation, that I was the best engineer in the graduating class. Normally, Dr. Afyonkale was a serious and reserved person, many of our cohort members feared him. "Best Engineer!", he said. Best engineer in the class, as deemed by one of my respected professors! This little sentence gave me wings or a medal of honor although no one could see... I was only the 5th by GPA ranking though. But hearing him name me the Best Engineer made me fly to the moon with happiness.



A special note from the Chair

Fast forward about a year, I was taking courses for my masters degree at the time. With a broken heart (a must in younger ages) as well as time spent on vacation during dead week rather than studying, to which I travelled to with many textbooks in tow, I found myself in the classroom on time to take the final for an advanced operations course. I remember the moment as if it happened yesterday where I stopped my thinking and reminded myself, "I was a great engineer; indeed, best in class!. If I could not solve these problems, no one could." Literally, my brain was activated by the recall of that impactful moment with Professor Afyonkale. I was able to channel all my learning in operations research and advanced mathematics way better than I could just for studying for one course material. Of course, I earned the highest grade, what else would you expect from the best engineer?

One of the reasons I am proud of all IMSE faculty is their deep understanding on the importance of their interactions with our students. Without a doubt, such interactions give wings to our students, build their confidence opening doors to bright futures. With the campus shutdown during the spring break, all teaching and learning had to move to online delivery. I am grateful by that time our faculty got a chance to get to know our students, building these very impactful interactions. Normally, we do offer online courses; for undergraduates they are meant to provide flexibility (e.g., they can take a course while at work for a co-op opportunity), for professionals in the workforce, online learning is a means to getting a degree without making a drastic life change. Our view is that a completely online undergraduate engineering degree cannot produce what is needed for today's engineering/business world; your hands need to be on those machine tools, you need to feel the pressure from peers and professors in solving engineering problems in a timely and effective way!

Let's fast forward to my early years as a faculty member. To seven or eight years from my undergraduate degree completion. Still young at that time, and very relatable to students. This one semester, I was teaching a project-based learning course, where I formed an all-woman student team for their second 5-week long project. The only all-woman team... I must have had about 15% woman students in the class. These students asked to speak to me after class one day... Their names were Danielle, Michelle, Christine; and there was one more whose name I cannot recall. They said, "we feel like we are at a disadvantage... There are no guys in our team..." I must have been perplexed for a few milliseconds... But I responded with confidence: "I know your capabilities, I am confident you will do great." Not only did they do great (best out of class), but also went on to earn one of the top awards in a design competition.

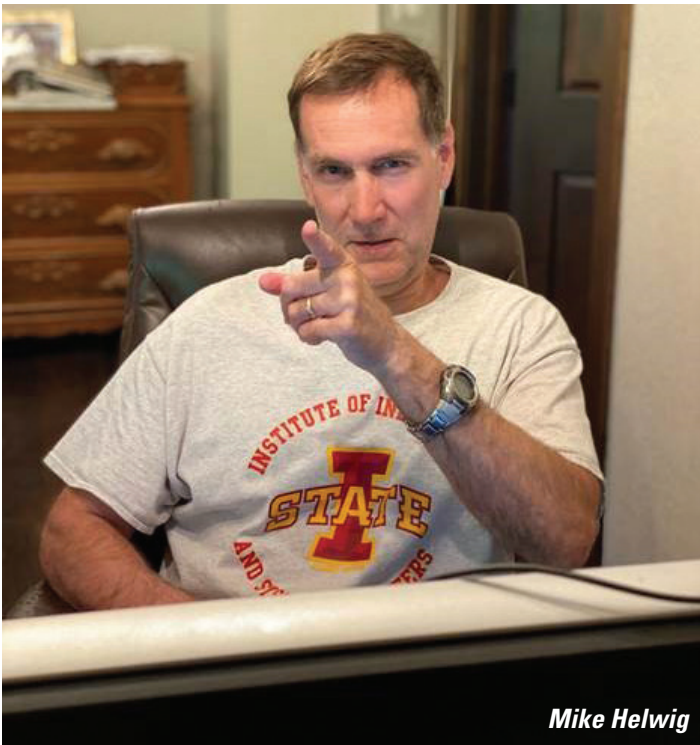
Was I as impactful as Dr. Afyonkale? Will they remember that confidence-building moment? Did it make a difference? A few years later, Danielle and Daniel (one of the other students from the same class) stopped by to let me know that they were engaged, and would join Boeing at the end their semester. I would like to think that my interactions with Danielle and her all-female team had something to do with her success, however small.

As I said, it is an opportune time for reflection... When I look back on my career, and who I wanted to be as a professor, the most cherished moments are those relating to interactions with my students, undergraduate and graduate. Of course, two teaching awards to my name are among my most valued possessions. No, it is not because of the Nittany Lion on them (picture above)... It is because they capture what I stand for as a professor and a leader. And, perhaps this is why I feel at home in IMSE at Iowa State; I know, all faculty and staff feel the same way. We are committed to creating a positive learning environment, a home away from home, for all our students. Not only while they are getting their degrees, but forever...

Last December, I climbed the Bell Rock in Sedona; my visible joy reflects how proud I am with our collective accomplishments. We are #15 in undergraduate rankings... With COVID 19 and its impacts, I find it hard to feel joy nowadays. Yet, dedication of our faculty and resilience of our students give me confidence for fall 2020 and beyond... I will have victory hikes in my future!



Into the virtual classroom...



Example 11.8

- Reconsider the Automated Machining Center project discussed earlier. What will happen to this investment project if
 - the general inflation during the next five years is expected to be 5% annually,
 - sales, operating costs, and working capital requirements are assumed to increase accordingly,
 - the firm's inflation-free interest rate is known to be 15%.
- Determine the PW of the project.

So that means if inclusion is five percent and we were not considering inflation or I'm sorry, give me a minute. My daughter is here say, hello to everybody and this is the child that's interrupting our class.

Lizhi Wang

Engineers contribute to project aimed at improving protective clothing systems for firefighters and first responders

Firefighters and first responders need effective personal protective equipment (PPE) that provides the right combination of functionality, protection and comfort. A project led by a team of Iowa State University researchers aims to develop fundamental knowledge and tools for the next generation of high performance PPE.

Guowen Song, Noma Scott Lloyd Chair in Textiles and Clothing and associate professor of apparel, events and hospitality management, is leading the project titled "Development of hand-specific model and systematic tool (HMST) for next generation gloves used for firefighters and other emergency responders." Funding is provided by the Firefighter Safety Research and Development (R&D) Activity office within the U.S. Department of Homeland Security's Federal Emergency Management Agency. These R&D projects are aimed at improving firefighter safety, health or wellness through research and development that reduces firefighter fatalities and injuries.

Song has assembled a multidisciplinary team of researchers from textile engineering and design, human development and family sciences, industrial and manufacturing systems engineering, kinesiology, mathematics and mechanical engineering.

"This is the nature of multi-science. We really need a team in order to make revolutionary progress," Song said.

Xinwei Wang, professor of mechanical engineering, will bring his expertise in thermal science to the project.

"I'll help to design a new material that provides thermal protection," said Wang. "To do this, I will use some of the techniques that I've developed in my Micro/Nanoscale Thermal Science Laboratory, such as the transient electro-thermal technique for measuring thermophysical properties of micro/nanofibers and the differential laser-heating and infrared imaging, or DLI, a technique for measuring the thermal resistance of coatings and cloth."

Wang first connected with Song when Song arrived on campus in 2014, and they have collaborated on projects in 2015 and 2018. The duo said they hope to expand upon their past research with this current project.

Lizhi Wang (no relation to Xinwei), associate professor of industrial and manufacturing systems engineering (IMSE), will contribute his expertise using mathematical modeling, optimization and machine learning.

"I will help develop a hand-specific thermoregulation model and explore the design of next-generation high-performance gloves for firefighters," Lizhi Wang said.

Wang added that the benefits of interdisciplinary research such as this are "bi-directional."

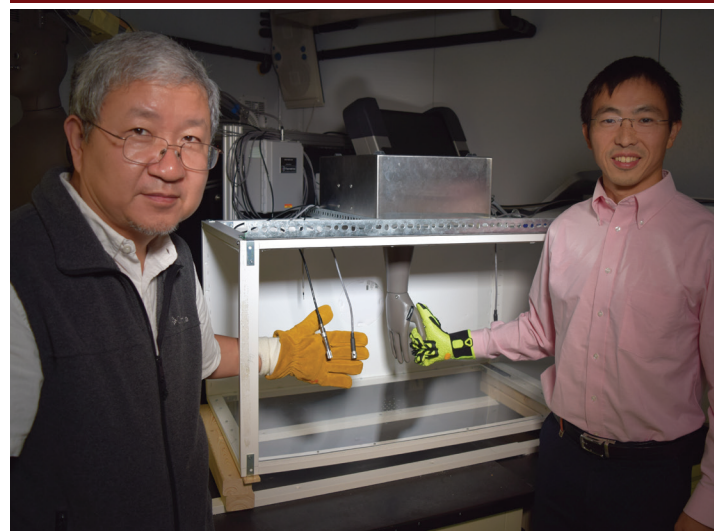
"On the one hand, industrial engineering, or IE, provides advanced modeling and solution techniques to improve the effectiveness and efficiency of decisions. In this case, better design decisions will lead to more protective gloves and fewer injuries for firefighters," said Wang. "On the other hand, challenges from this specific application will also motivate improvements in the IE tools and methods, which will subsequently benefit other application areas."

Song said contributions from engineers helps to advance the research within the field of textiles by bringing in aspects of applied science that he could not do by himself.

"When people think of textiles they don't necessarily think science. They think design or art," said Song. "There's a lot of lab simulation, modeling, materials engineering and more. Incorporating these technologies into the textile side is crucial in making the textile system more responsive to the body and hazardous conditions in the environment."

The researchers hope that one day the technology they develop from this research might be applied to other fields such as foundry work, hazmat responders, healthcare and the military.

The Research Team: Warren Franke, *kinesiology*; James Lang, *kinesiology*; Ellen McKinney, *apparel, events, and hospitality management (AESHM)*; James Rossmanith, *mathematics*; Daniel Russell, *human development and family sciences and psychology*; Chunhui Xiang, *AESHM*; Lizhi Wang, *industrial and manufacturing systems engineering*; and Xinwei Wang, *mechanical engineering*.



Xinwei Wang (left) and Lizhi Wang

From engineering to business to law, Chris Proskey has experience in it all



An undergraduate degree in industrial engineering (IE) can lead to a career in many fields. For one Iowa State University alumnus, that field happens to be patent and intellectual property law.

“IE seemed like the toughest degree to get and I’m always attracted to a challenge,” Chris Proskey thought when he was deciding on his major.

Proskey was born in Long Island, New York and moved to Minneapolis, Minnesota where he attended high school. He decided to attend Iowa State University, knowing he wanted to pursue a degree that would provide him good job prospects, as well as a challenge intellectually.

Though he felt challenged, he said he was always supported by the industrial and manufacturing systems engineering (IMSE) faculty. As a kid, Proskey said he enjoyed building and making things, so he especially enjoyed taking IMSE professor Frank Peters’ IE 248 and IE 348 courses which focus on engineering system design and manufacturing processes.

“I loved learning about how things are made. I also loved going on factory tours. As a patent, trademark and intellectual property attorney, it is critical for me to understand how my clients manufacture their products,” said Proskey. “I literally use the lessons I learned in IE 248 and IE 348 on a daily basis to understand my clients’ products and processes.”

Proskey said he also enjoyed IE 361: Statistical Quality Assurance with IMSE university professor Stephen Vardeman.

“Surprisingly I really enjoyed the central premise of this class – which is understanding what the data really is telling you. Professor Vardeman would often ask in class – ‘How good are your eyeglasses?’ Understanding what the data is telling you is extremely important in engineering as well as in law, not to mention in life in general,” Proskey said.

In addition to his coursework, Proskey was also active with his fraternity, Delta Tau Delta, through which he also learned many life lessons.

“College would not have been the same for me if it were not for my fraternity experience,” said Proskey. “Living with that many people all in one house taught me so much about how to get along with people, how to go with the flow and roll with the punches.”

Proskey had an internship with Seagate Technology in Minneapolis, Minnesota, during the summer between his junior and senior year, and because of this experience, he ended up working full-time with Seagate when he completed his B.S. in IE.

Always seeking a challenge, Proskey began taking night classes at the University of Minnesota Carlson School of Management’s MBA program while also working full-time for Seagate. He said that Iowa State’s IE curriculum provided him skills and knowledge and helped him to succeed in business school.

His work with Seagate involved developing manufacturing systems and processes for hard-drive heads. He even had the opportunity to spend a few weeks in Northern Ireland where he implemented one of his systems at a factory there.

Even with a B.S. and MBA under his belt, Proskey wanted more, so after a few years in Minneapolis, he moved back to Iowa to attend law school at Drake University on a fully-funded scholarship.

“Law school was a big shift for me. It was rigorous and a lot of reading,” said Proskey. “I feel like the analytical skills that I learned at Iowa State helped me evaluate and understand the cases we studied. I very much approached law school as an engineer.”

When he completed his J.D. from Drake, Proskey entered the field of patent law and today he is co-chair of the Intellectual Property Practice Group at the Brown Winick Law Firm in Des Moines. He primarily works with technology companies and helps them protect and enforce their intellectual property rights. Proskey also served as General Counsel of QMotion Advanced Shading Systems, where he helped sell the company to a publicly traded company (Legrand).

“As an intellectual property attorney I find it interesting that most engineers are paid to develop intellectual property for their companies. However very few engineers have a good understanding of intellectual property rights,” said Proskey. “I think every engineer should have a full understanding of patents, trademarks, copyrights, trade secrets and other intellectual property rights and concepts.”

When he’s not practicing law, Proskey might be playing with his three kids or helping his wife’s family on their North Central Iowa farm. He also follows Cyclone athletics and enjoys fishing and hunting. Though actual engineering is now just a relatively small part of what he does, he said having that background has been critical to his professional development.

“To all those students working so hard in their engineering studies, I would encourage you to continue to work hard. It has been my experience that having an engineering degree will serve you well regardless what you choose to do.”

Inspiring young women to pursue STEM careers

After being singled out as the only girl in an electricity class her first year of high school, Erin Mitchell swore she would never pursue a career in the STEM field. Now, a decade later, she works as an industrial engineer for Collins Aerospace in Melbourne, Florida.

Mitchell, an alumna of Iowa State University's industrial engineering (IE) program, remembers being the only girl in her high school electricity class with 18 guys. She said that one day one of her classmates asked why she was taking the class and even said "You're not good at this."

"That turned me off STEM so fast, and even though I was really strong in math and science, I swore off engineering because of that comment," Mitchell said. "Obviously, that didn't work out because I'm an engineer now, but that is why it is so important to connect with and empower women."

In addition to her work with Collins, Mitchell also serves as the chief financial officer of Reinvented, Inc., a national nonprofit organization aimed at encouraging girls and young women to pursue careers in STEM fields. It was that unfortunate exchange with a classmate her freshman year of high school that inspired her to empower young ladies in similar situations to stick with it.

Mitchell was born in Dallas, Texas, and grew up in Minneapolis, Minnesota. Her friend, Kelsey Draus, an alumna of Iowa State's materials engineering program, suggested that Mitchell consider Iowa State for college. After visiting the campus and watching Draus blow glass in the old Gaffer's Guild studio, she was hooked. Then after a second visit, this time for an Experience Iowa State day, she knew Ames was truly the place for her. Once on campus, she felt that IE was a good fit since it allowed her to combine her technical abilities with her people skills.

"I get to work with people every day to make things better," she said.

Two courses from the IE curriculum have been especially applicable to the work she does today: I E 222: Design & Analysis Methods for System Improvements with Leslie Potter and I E 577: Human Factors with Rick Stone.

"Leslie's focus on the operator and knowing why they come to work every day has been the basis of my success. It refocused my role as an IE," said Mitchell. "Then in Dr. Stone's class, I gained an understanding of how to design a system with the operator's comfort and ease-of-usability in mind."

Outside of the coursework, Mitchell was also involved with the Iowa State SAE chapter, the WiSE (Women in Science and Engineering) program, Team Neutrino, FIRST LEGO League and the National Center for Women in Information Technology. As a



student, she also completed internships with Rockwell Collins and UTC Aerospace Systems.

"I remember after SAE cabinet meetings on Tuesdays, a group of us would all go to Perkins for half-priced pie and spend hours there chatting about everything under the sun," she said. "I also fondly remember attending the STEM Princess Ball when I was a student role model for WiSE. It was so fun for all of the elementary students and role models to dress up like princesses and participate in hands-on STEM activities."

Mitchell completed her studies in spring 2018, graduating with a MBA, B.S. in IE, and a minor in French. Her first job after graduation was in the Rockwell Collins Operations Rotation program. As part of the program, she had stops in Cedar Rapids, Iowa; Wilson, North Carolina; and Melbourne, Florida. She currently has a more permanent position with New Product Introduction at Collins.

"I'm working on the transition of programs from the design phase to the manufacturing floor: ensuring the programs are cost-effective, designs are feasible and reliable, and there is a clear execution and support plan in place for the program," she said.

Outside of work, she loves traveling, having recently visited Salt Lake City, Indianapolis and Raleigh, just to name a few. She's also physically active, running and participating in Tough Mudder events. During the summer of 2019, she ran a half-marathon at the Grand Canyon.



Though she now lives nearly 1,500 miles from her alma mater, Mitchell said Iowa State University will always have a special place in her heart.

"Iowa State gave me a home away from home. Iowa State gave me a launchpad for my career and a network of Cyclones I can connect with everywhere!"

Certified green: Company co-founded by industrial engineering alum receives LEED Zero certification

Entrepreneur and engineer Chris Ladner (Class of '88) is typically focused on business growth – big numbers in marketing, sales and customer satisfaction. But recently, Ladner made news by leading his business, Entegrity, to a rare and sought after zero.

Ladner's Entegrity headquarters is the first Leadership in Energy and Environmental Design (LEED) Zero Energy certified building in the nation – and only the second in the world. LEED Zero certification recognizes buildings whose total energy consumed is less than or equal to the total renewable energy generated.

Career exploration leads to success

Ladner's life today as a business founder and entrepreneur was never written in the plans. Ladner first entered Iowa State as a chemical engineering major but soon found his calling in the industrial engineering program.

Ladner says he turned the experiences he had at Iowa State into engineering business success, from technical engineering skills to being comfortable with public speaking.

"The general culture at Iowa State allowed me to become a more well-rounded graduate and went on to help me in my career," Ladner said. "My professors had real world experience that opened my eyes to the variety of opportunities I could pursue."

As founding partner of Entegrity, Ladner works to provide technical engineering support as well as assistance with marketing, sales and his knowledge of LEED Zero certification. He also manages the company's operations, coordinates team projects and oversees finances and business planning.

Sharing a passion for sustainability

Prior to co-founding Entegrity, Ladner obtained a wealth of experience in supporting and implementing sustainable energy systems. He was a former commissioner on the Arkansas Governor's Commission on Global Warming where he contributed to developing energy systems and LEED certification for Bethel Middle School, the first LEED K-12 school in Arkansas.

Ladner also previously served as a consultant for the Clinton Climate Initiative and was involved with the energy systems on the Clinton Presidential Library in Little Rock, Arkansas. Today, his interest in advancing sustainability has intersected with his desire to share solutions with businesses.

"I enjoy working with our staff and finding opportunities for clients to address sustainability, quality and cost efficiency," Ladner said.

Entrepreneurship from Cyclone to founder

Ladner says the biggest challenge he has encountered over the course of his career is running a business and experiencing the growth of a company firsthand. As an undergraduate, he completed an entrepreneurship in engineering course that would later go on to complement his interest in founding Entegrity.

"There are a lucky few people that know the exact path they would like to follow into their career, but I wasn't one of them," Ladner said. "Not knowing what you would like to do can be just as valuable as knowing, and I learned to keep my eyes open and investigate all opportunities."

With Entegrity's headquarters now LEED Zero Energy certified, Ladner and his colleagues are working to expand the certification as a turn key approach through the company's other offices in Arkansas, Tennessee, Oklahoma, Mississippi and Kansas. Ladner aims to provide these sustainable options and opportunities to the company's clientele across the nation.

Contributed by Madeline McGarry, Engineering College Relations



A father's legacy leads one Cyclone Engineering alum to an unexpected career

With generational differences and 34 years separating their graduations, Jim Hooper unintentionally followed his father's footsteps to Iowa State and his career.

Hooper (Class of '70) didn't set out to Iowa State because his father went here, but after visiting the campus, Hooper knew he needed to attend.

"I visited Iowa State and it was the most beautiful campus I'd seen," said Jim.

Three decades before Hooper would step on campus, Louis Kent Hooper, Jim's father, began his journey at Iowa State studying general engineering. In an autobiography, Louis wrote, "Iowa State is one of the most beautiful campuses I've seen. The campus is located about a mile west of Ames and is like a small town with shops and stores on the south side of Lincoln Way... Almost in the center of the campus was a beautiful carillon tower with manually operated bells. We were serenaded morning and night with delightful music."

While attending school, Louis lived in a rooming house at 208 Stanton run by a woman named Ma Taylor. He lived with veterinary medicine students who pranked the mess hall by embalming animal parts to the bottom of dinner plates.

Louis Hooper worked with the Iowa State High Commission while trying to finish his engineering degree.

"It was a hard decision to quit work and finish school and it turned out to be the best decision I ever made," wrote Louis. "I took the bull by the horns and went back to Iowa State for the winter quarter of '35-'36 and graduated in June 1936."

Louis Hooper found himself working for Crane Company as a quality control manager, helping produce and sell products, such as industrial valves, to the US Navy for cooling nuclear reactors. While at the company, Louis met Admiral Hyman G. Rickover, a moment in his life he never forgot.

Jim Hooper admired his father. He was a craftsman, always tinkering with something new. Jim remembers the days he and his brother spent in the basement playing with their train sets. Louis sat in the corner, not far from his boys, connecting with his amateur radio and using call sign K9QJS. A memory so solid that Jim found himself interested in amateur radio operating and picked up the hobby later on.

"When my father passed away in the '90s, his call sign was dropped," said Hooper. "I contacted the FCC (Federal Communications Commission) and requested his old call sign."

K9QJS passed from identifying Louis to Jim's new call sign. Jim has connected with two people who knew his father through amateur operating.

"In 2012 a guy from Florida asked me how I got the call sign and I explained that it was my father's. Turns out he had contact with my dad back in 1961 and sent me a postcard my father had sent him," said Hooper.

A small connection that kept Louis Hooper's memory alive. Louis didn't live to see his son shift career paths to a quality control manager, but Jim finds it funny that they ended up in similar career paths.

"If I had been told at the time that I'd follow my dad's footsteps, I would have said 'No, that's not very likely,'" said Hooper.

While the city of Ames had changed dramatically when Jim attended Iowa State, they shared a similar appreciation of their times on campus. Hooper spent his time in school rotating from Iowa State's campus to his co-op in California every quarter. Working for Lockheed Martin Space Systems in the San Francisco area, Hooper said the hands-on experience allowed him to see what real work activity looked like.

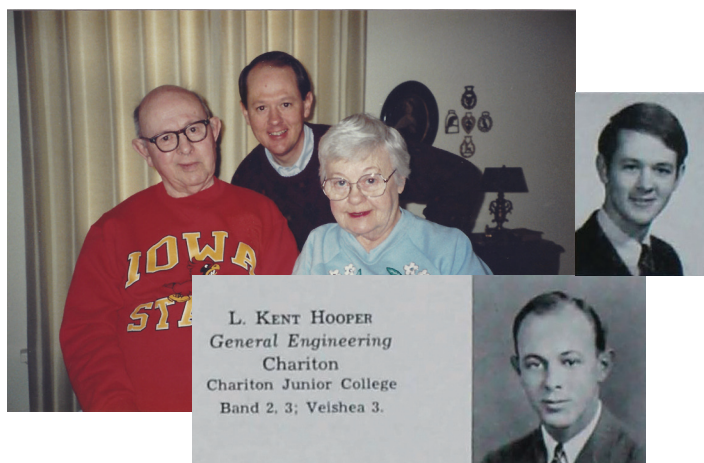
After graduating in 1970, Hooper moved back to California and attended Stanford University for a master's degree, and eventually began working at Hewlett Packard where he stayed for 32 years. During those years, Hooper changed jobs a handful of times, starting in sales office and retiring as a quality manager, the same title as his father.

"My dad was just an ordinary person who worked hard," said Jim. "I know he'd be proud of the life I had."

Now enjoying retirement, Hooper looks back at his life and remembers the counsel of his professors and his father.

"You really haven't experienced life until you fail and learn from it," said Hooper.

Contributed by Liz Jacavino, Engineering College Relations



Adapting to COVID-19

Faculty, staff and students in the Department of Industrial and Manufacturing Systems Engineering (IMSE) have vastly altered their working, teaching and learning routines as the country grapples with defeating this deadly COVID-19 outbreak.

On March 11, 2020, Iowa State University president Wendy Wintersteen made the decision to move all classes to online delivery. Initially this was supposed to be temporary, but was eventually extended to the remainder of the spring 2020 semester and now even through the summer 2020 terms.

For IMSE faculty this meant delivering their course content through Canvas (an online course management tool) as well as producing video recordings of lectures and lab lessons. IMSE staff have also altered their work routines as many are now working from home. Digital Zoom meetings have replaced many face-to-face interactions and it's not uncommon for pets and children to make impromptu appearances during these sessions.

Despite these hardships, Gül E. Kremer, C.G. "Turk" & Joyce A. Therkildsen Department Chair and professor, said she has been impressed with the resolve she has seen out of her department.

"This has been a difficult transition for all of us, but I am incredibly proud of how the students, faculty and staff in this department have been willing to adapt," said Kremer. "But my heart does go out to the graduating seniors who will no longer see many of their classmates in person again. I hope that those students might continue to cultivate the relationships they started here by keeping in touch with friends and faculty via social media. I think our students deserve a lot of credit here for their ability to adapt to this adverse situation, and they did so with honor and integrity."



Q&A with IE grad student Logan Beguhn

Q: Tell me a bit about yourself: Where are you from? What is your undergrad degree in and where did you attend for that? What degree are you currently pursuing? When do you plan to graduate? Career plans for after graduation?

A: I'm from Johnston Iowa. I graduated with my B.S. in IE from Iowa State in 2019 and am currently pursuing a master's in IE. I plan to graduate in summer 2020. After graduation, I plan on working for General Dynamics Mission Systems in Bloomington, Minnesota.

Q: Tell me about some of the things you've been working on lately.

A: Currently I've been working on creating online content for IE 348 labs. Historically the labs have been very hands-on so I've been trying to create videos that capture as much as I can so the students can have the virtual experience of being in the lab.

Q: In what ways has your normal routine changed because of COVID-19?

A: My work has changed a lot in the last few weeks. Specifically, teaching labs have been affected the most. I E 348 labs are very hands-on and are best taught that way. So it has been a challenge to make sure students are getting the information they need to complete the lab reports without actually being in the lab. Being available to students via email or over the phone has become even more important as we try to teach remotely. Being a student, it has changed my learning as well. Currently I have one class that still meets via WebEx and another, I E 547 with Dr. Qin, that has pre-recorded videos, both are small sections with about 10 students. The WebEx meetings are nice because they allow presentations to continue and allow for guaranteed contact with the instructor twice a week, but would be difficult with large classes. For my class that has pre-recorded videos, it allows me to complete my work at times that are convenient for me. I am also grateful that Dr. Qin is very diligent on replying to emails quickly and is proactive with meeting with his students. Because we have a final project for I E 547, Dr. Qin makes it a priority to have Zoom meetings with every project group twice a week to make sure that we are on the right track and have everything that we need.



IE alum joins effort to combat COVID-19

Though Iowa State's industrial engineering curriculum does not specifically cover pandemic situations, like the one the world is currently experiencing, one alum is using the skills and methods he developed at Iowa State to assist with efforts to combat COVID-19.

Shubham Khoje is a manufacturing engineer for the NSK Corporation facility in Clarinda, Iowa. The company was founded in Japan in 1916 and now has facilities all across the globe that manufacture ball bearings, which are used in everything from automobiles to wind turbines.

Khoje has had to adapt from his normal work routine as the company refocuses its efforts to produce components needed for equipment that will assist in the fight against COVID-19. NSK is currently manufacturing ball bearings which it will send to Ford and Puritan Bennett plants that are currently producing ventilators, a crucial piece of equipment to fight the COVID-19 pandemic. NSK is also working with Clorox to produce disinfectant sprayers, which will also be used to reduce the spread of the virus.

"For all these applications, there was an increase in demand for a few specific part numbers," Khoje said. "We had to make some manufacturing changes and increase our production for those part numbers and meet their increased demand with tight deadlines."

Khoje, who is originally from Pune, India, started working for the NSK in early 2018. He completed his M.S. in industrial engineering (IE) at Iowa State in the fall of that year. His thesis adviser was Gül E. Kremer, professor and C.G. "Turk" & Joyce A. Therkildsen Department Chair of Industrial and Manufacturing Systems Engineering.

His work today mostly focuses on process improvement and the development of new products within the realm of medium-sized ball bearings. He uses things he learned in the IE curriculum on a daily basis, including lean manufacturing and statistical analysis as well as software programs like SolidWorks and AutoCAD.

"My job primarily involves working on projects to improve the productivity and reduce costs and, ultimately, saving dollars for the company," he said.

Khoje isn't the only alumnus of Iowa State's College of Engineering working at NSK. Colin Sunderman, a 2018 graduate of electrical engineering, also works at NSK. Khoje remains grateful for the career training he received at Iowa State as well as for other resources the university offered. As an international student, Khoje said he was apprehensive about finding work in the United States after graduation, particularly in regard to visa sponsorship. However, by using the resources available to him, he was able to successfully navigate this process and end up where he is today.

"I am tremendously grateful for all of the opportunities that Iowa State University and the Department of Industrial and Manufacturing Systems Engineering offered to me," Khoje said. "I am proud to call myself a Cyclone Engineer and am also proud to use the skills Iowa State taught me to contribute to something bigger than myself or my company. In this case, that happens to be combating this deadly COVID-19 outbreak."



Learn more about **100 years of Industrial Engineering history at Iowa State University**
www.imse.iastate.edu/history-book



John B. Slater – war veteran, engineer, environmentalist, philanthropist and more

John Billings Slater was born in Chicago, Illinois, on Oct. 10, 1921. He earned his Eagle Scout Award in 1938 and the following year graduated from Lane Tech High School. He then made the more than 300-mile trek west to Ames, Iowa, where he attended Iowa State College (as it was then called).

As a collegian, Slater stayed busy with his general engineering studies (the predecessor to industrial engineering) as well as various other activities. He served as president of the student body, was an active member of Phi Delta Theta fraternity and even competed on the college's varsity swim team.

"Becoming a member of Phi Delta Theta fraternity and the friendships I developed through that is perhaps my fondest memory from my college days," said Slater. "But I also fondly remember working as a courier for a local florist. It was immensely rewarding to see the reactions of the young ladies who were very happy when I would deliver a corsage to them."

Slater was also an ROTC member and was assigned to 242nd Engineer Combat Battalion which was training for amphibious operations and attached to the 77th Infantry Division. During his service, he helped to coordinate beach landings in the Pacific.

"My time in the service taught me the skills for working with people of all levels and backgrounds. I was able to apply some of these skills to my professional career after my service, too," Slater said.

Following his service, he worked for the family business in Chicago, H.R. Slater Company. The company had a reputation for proficient and responsive machining and fabricating. Slater was named the company's lead operator in 1960 and served in that role until his retirement in 1995. He said he was able to apply the skills he developed in the general engineering curriculum at Iowa State throughout his career.

"I absorbed skills in friending, doing, leading and helping at Iowa State. These skills prevail anywhere," Slater said.

Slater met his wife, Mary Helen, on the skating rink and in 1954 the couple wed. They welcomed their son Mark into the world in 1958. In 1960, the family moved to Morton Grove (a Chicago suburb) and lived in a home close to a wooded site where Slater remembered hiking with his Boy Scout troop growing up. Slater's passion for the Cub Scouts and Boy Scouts continued well into his adult life, and he was recently honored by the Blackhawk District of the Boy Scouts of America for his more than 70 years of dedication.

His and Mary Helen's support for Iowa State University has also been strong. They gave their first gift to his alma mater in 1974 in the form of a general achievement fund. They have also supported efforts with Gold Star Hall and Phi Delta Theta fraternity. The Slaters have various places on campus named in their honor including the Slater West Entry Lawn and Gardens, and the Slater Alma Mater Monument Garden and Native Prairie (established in Mary Helen's memory), both of which are at the ISU Alumni Center in Ames, as well as the Slater Laboratories for Advanced Manufacturing inside Black Engineering Building on the main Iowa State campus.

More recently, he made a gift to plant hundreds of trees around campus. For Slater, environmental sustainability is one of his greatest passions.

"If we want to sustain our home, our environment, manufacturing is a factor. And it can be more sustaining if its products are designed for sustainability."



IE alum endows two faculty positions with emphasis on sustainable manufacturing

John B. Slater, a 1943 graduate of Iowa State University's industrial engineering program, has endowed two faculty positions, both of which have an emphasis on sustainable manufacturing.

Matt Frank, professor of industrial and manufacturing systems engineering (IMSE), will hold the John B. Slater Professorship in Sustainable Design & Manufacturing, while Jo Min, associate professor of IMSE, will hold the John B. Slater Fellowship in Sustainable Design & Manufacturing.

"This was great news for our department and a well-deserved honor for Dr. Frank and Dr. Min," said Gül E. Kremer, professor and C.G. "Turk" & Joyce A. Therkildsen Department Chair of IMSE. "Because of the generous support of alumni like John, we'll be able to train the next generation of engineers to have sustainability in mind so that they too might pass that on to help make the world a better place to live."

The medallion ceremony for this event was held November 18 in Marston Hall. Attendees for the ceremony included Slater's son Mark, Kremer, Frank and Min, as well as College of Engineering dean Sam Easterling and others from the ISU community.

As a student at Iowa State, Slater was on the swim team, a member of Phi Delta Theta fraternity and president of the student body. After graduation, he served in the U.S. Army Corps of Engineers during World War II. Following his service, he worked in the field of manufacturing in Chicago for roughly five decades. During his life, he has supported various philanthropic efforts, particularly with the Boy Scouts and his beloved alma mater. He has also supported efforts promoting environmental sustainability.

Frank joined the IMSE faculty at Iowa State in 2003. He holds a Ph.D. in industrial engineering as well as master and bachelor of science degrees in mechanical engineering, all from Penn State University. He said that this new professorship will allow him to advance his research in the field of manufacturing with a greater emphasis on sustainable design.

"Through this professorship and the research I conduct because of it, I hope I can carry on this legacy of sustainable design that John has started," Frank said.

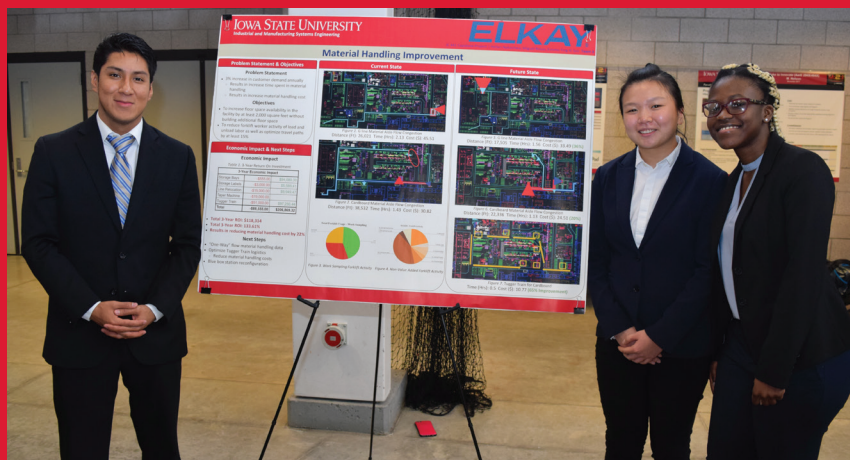
Min joined the IMSE faculty in 1990. He holds a Ph.D. and a master's in industrial engineering and operations research from the University of California, Berkeley as well as a B.S. in math-systems science from UCLA.

"Being named to this new fellowship is a great honor," said Min. "I hope to honor John and all that he has provided for our department through my research and teaching."

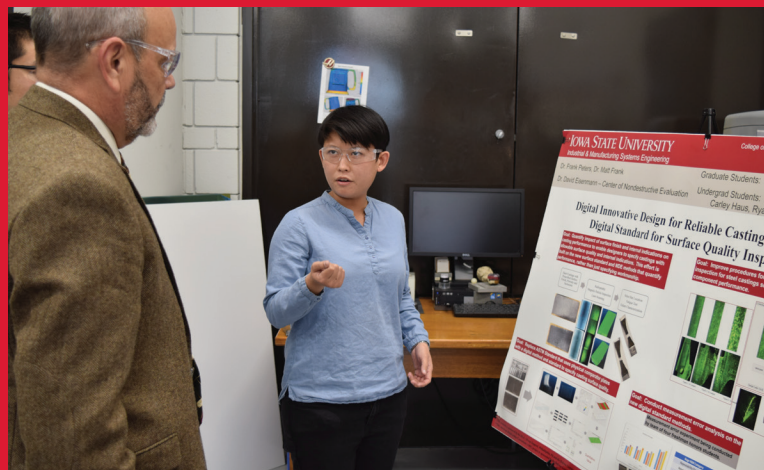




Jeff Chu, a Ph.D. student in IE, poses alongside Aaron Jordan, laboratory supervisor for IMSE. The duo were grilling hamburgers and hot dogs for the department's annual Welcome Back Picnic on Sept. 11, 2019.



The Elkar-sponsored team poses with their capstone poster during the fall 2019 IMSE 441 Poster Session on Dec. 13, 2019.



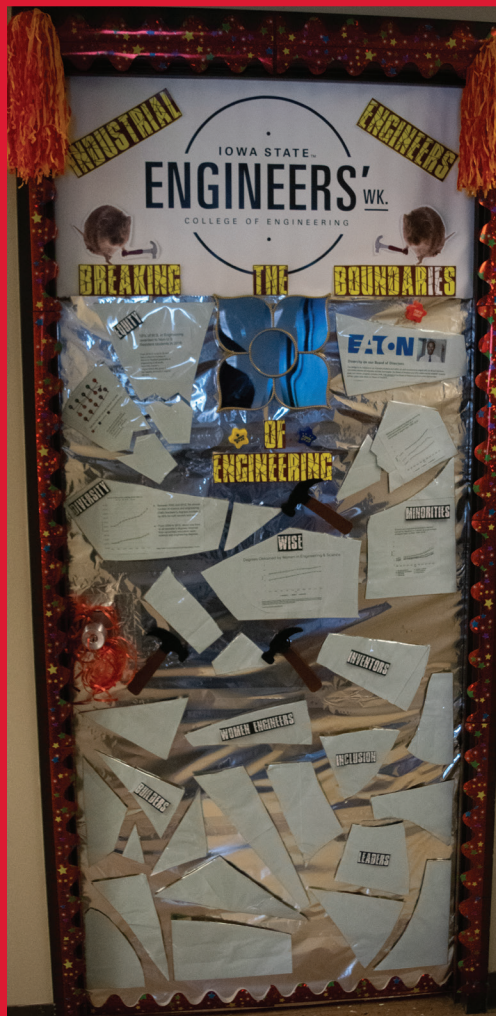
ISU College of Engineering Dean W. Sam Easterling listens to a presentation from Sharon Lau, a Ph.D. student in IE, during the dean's visit to the IMSE department on Oct. 17, 2019.



The IE ambassadors pose at the IMSE table during the College of Engineering's Scholar's Day on Feb. 28, 2020. From left: Meghan Heavener, Abby Zimmerman and Jaclyn Stiller.



Members of the IMSE intramural championship broomball team pose after their final game on Nov. 17, 2019. This marked the second year in a row that the IMSE team won the intramural broomball championship.



The office door of IE student services specialist Devna Popejoy-Sheriff decorated by undergraduate IE students as part of the festivities for Engineer's Week, or E-Week. The IE design ended up winning first place out of the entire College of Engineering.



The Alpha Pi Mu team poses during the 2020 IMSE Volleyball Tournament on March 5, 2020. The Alpha Pi Mu team ended up besting the field and taking first place at the 2020 tournament.



Students line up as IMSE faculty and staff serve pizza (from Pizza Pit!) and soda during the annual spring Welcome Back Lunch on Jan. 29, 2020.



Engineering students who were part of the Torino, Italy study abroad program overseen by IMSE associate teaching professor Mike Helwig. In this shot the group poses while trekking the Hike of the Gods along the Amalfi Coast during a weekend excursion to the Naples/Rome region. IEs in this shot include Logan Weber (far left) and Austin Kollos (far right).



The 2019-20 IDEAL Learning Communities peer mentors pose outside of Black Engineering Building. From left: Luke Safris, Kristen Naber, Hans Mueller, Landon Getting, Ameer Ratrou, Meghan Heavener, Macie Vannurden and Thomas Berquist.



IMSE faculty and staff pose inside of Marston Hall during the 2019 department retreat.



Members of Pi Tau Sigma, the industrial engineering honor society, constructed bee houses as part of their fall 2019 service project. By preserving bee populations, the group hopes it will have a positive impact on agriculture and the greater ecosystem.

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