Stepping up in times of change
HINDSIGHT IS 2020: What a year it was!

2020 has been a year like no other. While the toll of COVID-19 and social justice issues have been troubling for so many of us, our students, faculty, staff, and alumni have truly stepped up to meet the challenge while continuing to deliver outstanding education and groundbreaking research.

CSE faculty and staff have been leaders within the University in identifying innovative ways to deliver experiential and laboratory learning at a distance, and they consult readily with colleagues across the University. In just one impressive example, the Department of Chemistry assembled and delivered more than 2,500 at-home lab kits, enabling students to remotely participate in critical hands-on components of general chemistry courses.

CSE researchers rapidly mobilized to address the pandemic. Their work has been marked by collaboration across disciplines and centered on key themes, including personal protective equipment, emergency treatments, diagnostics, biomolecular research, and disease modeling. In our story “For Minnesota and the World,” we highlight just a few examples of this swift response.

CSE alumni have continued to support us in many ways including the CSE Response Fund that has helped to fund students in need, instructional equipment, and research.

This year has also cast a spotlight on diversity, equity, and inclusion issues, and I am pleased to report that our Fall 2020 first-year class includes a strong number of women and record numbers of Black, Hispanic/Latinx, and Asian students. In the story “Beacons of Light,” you will meet current CSE students who are inspiring diverse students to consider STEM careers. In “People with Purpose,” we show the great impact of our alumni in making lasting change in their communities.

What this pandemic has reinforced is the critical work of engineers and scientists—and we have some of the best. Several CSE faculty were recognized recently at the highest levels. Among them are Professor Graham Candler (aerospace engineering and mechanics) who was inducted into the National Academy of Engineering and Professor Marc Hirschmann (Earth and environmental sciences) who was inducted into the National Academy of Sciences. Professor Hirschmann and former Professor Laura Gagliardi (chemistry) were also inducted into the American Academy of Arts and Sciences. In addition, we’ve had three professors elected to the National Academy of Inventors—Professor Georgios Giannakis (electrical and computer engineering) in 2019 and Professor George Barany (chemistry) and Professor Keshab Parhi (electrical and computer engineering) in 2020.

For more than a century, University of Minnesota scientists and engineers, as well as our alumni, have pioneered research and innovation during difficult times. This is one of the few cases where 2020 was no different.
ON THE COVER
Ph.D. student Rafael Placucci getting in position to use an aerodynamic particle sizer on principal trombone R. Douglas Wright as he starts playing. In a series of experiments at Orchestra Hall in downtown Minneapolis, researchers in our Department of Mechanical Engineering measured aerosol spread from different instruments to help the Minnesota Orchestra maximize safety during performances.

Watch what they learned: z.umn.edu/mnorchstudy
**TECH DIGEST**

**AI algorithm helps analyze chest X-rays for COVID**

A team of University of Minnesota researchers, including computer scientists, recently developed and validated an artificial intelligence algorithm that can help evaluate chest X-rays to diagnose possible cases of COVID-19. All 12 M Health Fairview hospitals use the new algorithm. [z.umn.edu/Alalgorithm](z.umn.edu/Alalgorithm)

**Research could help millions with ‘ringing in the ears’**

In the largest clinical trial of its kind, researchers show that combining sound and electrical stimulation of the tongue can significantly reduce tinnitus, commonly described as “ringing in the ears.” The findings could potentially help millions of people. [z.umn.edu/tinnitus](z.umn.edu/tinnitus)

**Researchers piece together puzzles from the past**

University mathematicians are working with anthropologists, using advanced mathematics and machine learning to reassemble and analyze broken animal bones from ancient human sites. [z.umn.edu/bones](z.umn.edu/bones)

**Researchers 3D print micro-scale fluid channels for medical testing**

In a groundbreaking new study, researchers have 3D printed unique fluid channels at the micron scale that could automate production of diagnostics, sensors, and assays used for a variety of medical tests and other applications. [z.umn.edu/3Dprintedmicrofluidics](z.umn.edu/3Dprintedmicrofluidics)

**Black hole collision may have exploded with light**

An international team of astronomers, including researchers from the University of Minnesota, have seen what might amount to the first light ever detected from a black hole merger. [z.umn.edu/blackholecollision](z.umn.edu/blackholecollision)
**T. rex had growth spurts, other dinos grew ‘slow and steady’**
A team of researchers has discovered that dinosaurs like *Tyrannosaurus rex* and its closest relatives had an awkward adolescence during which they got huge, while the *T. rex*’s more distant cousins grew a little bit every year. [z.umn.edu/dinogrowth](https://z.umn.edu/dinogrowth)

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**University receives $18M grant for materials research**
The National Science Foundation has awarded $18 million in renewed funding over the next six years for the University’s Materials Research Science and Engineering Center (MRSEC). [z.umn.edu/MRSECrenewal](https://z.umn.edu/MRSECrenewal)

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**Researchers 3D print a working heart pump with real human cells**
Researchers have 3D printed a functioning centimeter-scale human heart pump in the lab. The discovery could have major implications for studying heart disease, which kills more than 600,000 people a year. [z.umn.edu/heartpump](https://z.umn.edu/heartpump)

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**‘Fool’s gold’ may be valuable after all**
In a breakthrough new study, scientists and engineers have electrically transformed the abundant and low-cost non-magnetic material iron sulfide, also known as “fool’s gold” or pyrite, into a magnetic material. This could be the first step in creating valuable new magnetic materials for more energy-efficient computer memory devices. [z.umn.edu/magnetism](https://z.umn.edu/magnetism)

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**U and collaborators receive $26M for new NSF center**
The National Science Foundation awarded the University of Minnesota Institute for Engineering in Medicine and Massachusetts General Hospital $26 million over five years to fund a new center to develop and deploy breakthrough bioengineering technology. [z.umn.edu/ATP-Bio20](https://z.umn.edu/ATP-Bio20)

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**U of M to lead NSF-funded ‘Global Quantum Leap’**
The University of Minnesota will lead a five-year, $2 million grant from the National Science Foundation to create an international “network-of-networks” that seeks to accelerate the discovery and development of quantum information systems. [z.umn.edu/quantumleap](https://z.umn.edu/quantumleap)

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**CSE professor bolsters post-wildfire recovery pipeline**
A University of Minnesota engineer is working with West Coast researchers to help communities address water pipeline contamination in the aftermath of wildfires. [z.umn.edu/wildfire](https://z.umn.edu/wildfire)
ALLISON CHANG: Sunshine state to snowy plains

Minnesota winters don’t bother Allison Chang. In fact, the electrical engineering senior, who was raised in California and Hawaii, frolics outside when the sun is bright and snow is on the ground. “The cold doesn’t really bother me,” she said. “The air reminds me of mountain air, and I really like that. It actually feels great to experience changing seasons. Except for the occasional thin sweater, I only had summer clothes before.”

Chang has also grown fond of the people she’s met in the Midwest. Over the past three years, she’s connected with supportive professors in her department and other young women across the college. The Society of Women Engineers (SWE) chapter and the 3M-sponsored SWEekend on the Twin Cities campus were her first face-to-face introduction to CSE. The Women in Science and Engineering (WISE) Living and Learning Community was her first home away from home.

“I toured other schools, but I just felt like the personality of everyone I
met matched mine,” explained Chang, a recipient of CSE’s Skaar Family Scholarship and Boeing Scholarship. “I felt like I could really fit in the community here.”

Chang, who credits her high school biology teacher, Nicoline Chambers, for inspiring her to pursue engineering, made more friends by joining the IEEE Women in Engineering student organization. As co-president last year, her responsibilities included planning career development events and organizing STEM outreach activities to engage youth. This year, she serves as the group’s membership coordinator.

The COVID-19 pandemic hasn’t stopped the IEEE members from gathering. Regular Zoom meetings, texting, and FaceTime bring them together. In April, for instance, a month after the University sent students home, Chang led a Zoom event with Brooksource on how to find and interview with companies that are still hiring for online summer internships.

“Being part of IEEE really helps me build my leadership skills on top of connecting with other women,” she said.

“I’m really interested in leadership and getting an MBA in my future because one of the biggest problems I’m seeing right now is the lack of engineers and scientists in politics. Engineers and scientists need to have a seat at the table.”

Another significant concern on her mind—the lack of women in the field.

“I’m really passionate about building a community of engineers, and electrical engineers in particular, because the numbers are still not equitable,” she said.

According to the National Science Foundation, women’s share of bachelor’s level engineering degrees has only increased from 18 to 21 percent over the past two decades.
“When I told my mom I wanted to be an engineer, she expressed concern that although I may be capable, working in a male-dominated field may cause unneeded stress,” Chang recalled. “She was afraid that I would be taken less seriously than my peers and would have to fight an unnecessary battle. Gladly, I have been met, mostly, with only positive experiences. However, I don’t want other women to ever think that there is a position in the world that they are incapable of holding. It has been proven that more diverse teams find more creative solutions.”

Engineering, after all, Chang noted, is about problem solving.

“When we bring women, people of color, and other minorities into STEM fields, we only get better,” she said. “All engineers should be judged by their passion for problem-solving, their work ethic, and their ability to work in a team and not by their gender, color of their skin, or sexual orientation.”

Upon graduation this May, Chang will join Medtronic. She landed a full-time position among the first cohort of its Technical Leadership Rotational Program while completing a three-month virtual internship in summer 2020.

“It was an offer I could not refuse,” she said. “I am going to be traveling to a new team every nine months for two years to build up my network and to learn how many of the company’s businesses work. The goal is to help speed up my path to leadership positions and develop my leadership skills through private and group training along the way.”

For Pauly Soulia, life and land are interconnected. And those of us privileged to walk on this planet and breathe the air it provides have a right to keep it healthy for generations to come. His life’s vision is clear: “I want to help protect the land that we live on.”

The mechanical engineering junior, who enjoys hiking and canoeing in the northwoods of his home state of Minnesota, is looking at a future in which he can implement more efficient forms of renewable energy, eliminate plastic pollution in the ocean, and remove harmful aerosols in the atmosphere.

“As a child, I was interested in sustainability in the environment and I did well in STEM subjects,” Soulia explained. “My parents were pretty open about what I could study, but I knew that for the problems I was interested in solving, engineering was the way to go.”

Soulia’s decision to come to the University of Minnesota was “a happy coincidence” made easier with financial aid, including CSE’s Frederick McKinley Jones Scholarship. In addition to being close to family in the suburb of Roseville, the Twin Cities campus offered a good engineering school and sat squarely in one of the largest urban areas in the Midwest for indigenous people.

Nağı Obitika is Soulia’s Dakota name. It means “strong spirit.” Soulia received it when he was 18, right after graduating high school. But ties to his native ancestry go back to sixth grade—when his mom found her birth mother in South Dakota on Lake Traverse Indian Reservation, which is home to the Sisseton Wahpeton Dakota people.

It’s important to show kids what’s possible—that someone who looks like them can succeed in a STEM degree.
“There is a strong indigenous presence on campus because there are people who care enough to build community and preserve indigenous space for students on campus,” he said. “But the indigenous population while I have been a student has always been less than one percent at CSE and the U, which is kind of backwards because this entire campus is built on stolen Dakota land and we’re adjacent to a major city with indigenous people—and all these charter schools with indigenous kids ready for outreach.”

Visit days and tutoring sessions were part of the 2020 plan for AISES under Soulia’s leadership. Then the pandemic hit.

“My hope is to offer them when we can,” he noted. “Right now, we’re all kind of in limbo. But it’s important to show kids what’s possible—that someone who looks like them can succeed in a STEM degree. I struggled with imposter syndrome when I first came to the U. I kept thinking: Do I even belong here? Can I do what everyone’s doing, like building robots? If I can feel this way as an inner-city kid from an upper-middle class family, I can only imagine someone from the reservation having the same feelings.”

This leads us back to Soulia’s life vision. In his wish to protect our lands dwells a hope—he calls “lofty”—for all who live on it.

“Feeling included, or like you belong, is a basic human thing,” he said. “The more we can empathize with that and do something about making things more equal or fair when we see injustice, the more we can help everyone understand that everyone—each one of us—deserves the same kind of treatment.”
For me, it’s important to listen to the issues of people with identities outside of mine so I can be an ally and stand in solidarity.

SYLVESTER NWOSUJI
SYLVESTER NWOSUJI: African roots, global view

As a child, Sylvester Nwosuji Jr. liked tinkering with things. When the TV wouldn’t work, for example, he would think of ways to fix it. “Every time I was successful, I imagined what else my brain could do,” said the graduate student in biomedical engineering, with minors in electrical engineering and industrial and systems engineering.

That curiosity led Nwosuji, who was raised in both Enugu State, Nigeria and Columbia Heights, Minnesota, to discover that he was pretty good at math and science too. Nwosuji chose the pre-med track during his undergraduate years at the University of St. Thomas. However, his thoughts of becoming a doctor evolved prior to earning his degree in neuroscience with minors in mathematics and physics in 2019.

“When I heard about biomedical engineering in my sophomore year, I couldn’t believe it,” he recalled. “There was actually a way to combine engineering and medicine. I remember spending many nights just reading up about this field and watching a lot of videos just to learn more about it. I even found a mentor, a biomedical engineer at Integer, a company in Plymouth [Minn.] to answer all my questions about the field, be a support system, and give me career guidance. I later joined him as another graduate student in the biomedical engineering program at the University of Minnesota.”

Today, Nwosuji eagerly shares this passion for his newfound field—and STEM in general—with others. Being an active role model is one way he’s done this.

Nwosuji is a teaching assistant in the 2000-level “Programming for Biomedical Engineers” course for undergrads, and he serves as Academic Excellence Chairperson in the UMN National Society of Black Engineers (NSBE). “My role is to make sure that Black engineers are well prepared academically and career wise,” he explained. “For example, I planned and led a GRE prep event. I give tips and tricks on time management and how to prepare for grad school through my other events, which I can personally share because I have been through the process of being a prospective graduate student.”

Mentoring children is close to his heart as well. Whenever opportunities arise to do this, he jumps at it.

“I feel like our youth have so much to give, and there is untapped potential especially in the Black and brown communities,” said Nwosuji, who lost his father when he was 13 years old. “When I was young, I didn’t see a lot of Black men in healthcare until I was older. Now I have a platform to inspire kids to do STEM, healthcare, or anything they put their minds to. This is important to me because someday it will be me passing the baton and them taking over what I do when I get older.”

Besides NSBE, Nwosuji divides his free time among several groups on campus, including the African Student Association, Black Graduate and Professionals Student Association, Society for the Advancement of Chicanos/Hispanics and Native Americans in Science, Community of Scholars Program, and other multicultural organizations.

“I like to interact and be in the company of others who are similar to me, and also different from me,” he said. “I feel like sometimes the biases we have limit us—and we only see ourselves fitting in with one group. I don’t limit myself. For me, it’s important to listen to the issues of people with identities outside of mine so I can be an ally and stand in solidarity.”

In a year of discontent—brought on by a pandemic and fueled by racial injustice and uprisings, as well as political polarization—Nwosuji’s open-mindedness is refreshing.

“I’m trying to make sure that even if an injustice didn’t happen in my own backyard, I still fight for the people and the communities who face it,” he noted, “whether they’re here in the U.S., in Nigeria, or somewhere else in the world—in every way I can. Without overstepping boundaries, each of us can learn what we can do to be helpful.”
The year 2020 will be one for the history books.

In March, the arrival of COVID-19 triggered the shutdown of businesses and schools across the country. In May, the death of George Floyd in Minneapolis sparked protests and a collective reckoning with our nation’s history of racial inequality.

This year has called for resilience and optimism in the face of massive and often unprecedented challenges. It’s called for innovation to confront new problems that have no obvious solutions. And it’s revealed that individuals can make a difference even when systems are strained and breaking.

Education strives to give students the foundation and tools to meet life’s challenges. Here are three alumni who drew on their experiences at the University of Minnesota to not only survive 2020, but also make it better for the people around them.

Azira Rivera: Mathematical and emotional support

Even in the best of times, Algebra 2 is hard for many of Azira Rivera’s students. Now, they’re trying to learn about polynomials and quadratic equations in a video Zoom class while balancing family responsibilities.

“One day, one of my students stepped away from the screen. I was like ‘Where did you go?’ And he said ‘Oh sorry. I had to change my nephew’s diaper,’” said Rivera (Math ’17), a public school math teacher outside of Phoenix, Arizona. “My students are caring for their younger siblings, making them lunch, making sure they’re online when they’re supposed to be. I have so much respect for them and everything they are juggling.”

Since the coronavirus hit in mid-March, Rivera has taught her 120 students remotely, with the exception of three weeks in-person this fall until rising COVID-19 cases forced a return online. Agua Fria High School, where Rivera started teaching four years ago through Teach for America, is two-thirds Latino, and more than half the students receive free or reduced-price lunch. Many parents work throughout the pandemic in service and labor jobs. A few families have lost grandparents to COVID-19. Rivera says during this time of stress, her expectations are different, and her praise flows more freely.

“I want them to know that I support them mathematically and emotionally,” she said. “I realize we’re in a pandemic and I don’t want my class to be another stressor in their lives.”

Rivera sees herself in her students. She was the first in her family to attend college, ending up at the University of Minnesota almost by chance after an application arrived in the mail. She filled it out and received CSE’s Richard M. Kruger Scholarship. “I felt like they reached out to me and saw what I was capable of,” she said.

As a first-year student, she lived in the Women in Science and Engineering (WISE) Living Learning Community. “I met astonishing and brilliant
minds,” she said. “I learned about books to read and shows to watch, and a hundred nerdy things I never would have explored on my own.”

She initially intended to study chemical engineering, but ended up pursuing math with a focus in physiology and a minor in neuroscience. Although she said at times she felt like “an imposter,” she was supported by programs designed for first-generation students. The North Star STEM Alliance connected her to Yaniv Brandvain, a University of Minnesota associate professor of plant and microbial biology, which led to Rivera presenting a paper about plant genetic mutations in Washington, D.C.

“It was my first experience with academic research, which is something I want to pursue,” she said. “But I don’t think I could have had the courage to even say that without North Star STEM.” She also was able to study abroad in Guam, where her father is from, and received academic support from the TRIO McNair Scholars Program. All those experiences created a driving force for her to become a teacher, she said.

Rivera thought she’d teach accelerated math, but she was assigned to co-teach in special education classes. “I realized this is the population I wanted to work with,” she said. “I want to teach kids who have struggled with math, who need the support and who have all those questions that I’m more capable of answering because I know math at a deeper level.” Rivera is currently pursuing a master’s degree in math.

The pandemic has made some teachers more aware of the burdens faced by lower-income students of color, and
she hopes this will lead to more support. “It doesn’t matter who you are, or what your home looks like on Zoom,” Rivera said. “You still deserve the best education.”

Kayiita Johnson: Build up Black product managers

In May of this year, Kayiita Johnson (Electrical Engineering ’13) launched PM While Black, a website devoted to increasing the number of Black product managers in the tech field. It went live just as the news of George Floyd’s death at the hands of a white Minneapolis police officer hit the country.

“It was crazy,” said Johnson, who works as a product manager (PM) at Google in San Jose, Calif. He started getting emails and phone calls from friends, acquaintances, and people he didn’t even know offering to promote his effort. “People in my bubble were waking up to racism in all its multiple forms. They wanted to do the right thing. People were asking, ‘Should I go protest on the street?’ ‘Hey, should I donate money?’ They were asking ‘What can I do to fix this?’”

PM While Black explains what a product manager does and dishes out advice on how to become one. As Johnson is fond of saying, “Product management is like SoHo House—even if you know about it, good luck getting in.”

The effort grew out of Johnson’s experience of often being the only Black man in the room and devoting “several hours a week” offering career advice and encouragement to younger people of color. “I’ve really been supported by so many people and I always try to give back,” he said. “I want to make sure I pay it forward.”

Johnson chalks up his success to the support he’s received from family and programs that help underrepresented groups. His mother is a nurse who came to the United States from Uganda at age 18. His father is a physics professor with Swedish and Finnish ancestry. They both emphasized the importance of education and exposed him to STEM. “My dad would take me to quantum mechanics lectures when I was like eight,” he said. “I was programming video games and learning how to hack in high school.”

Before his freshman year in CSE, Johnson participated in Summer Bridge, a STEM diversity initiative that introduced him to faculty and other students. He also participated in the North Star STEM Alliance and an Engineering Co-op Program with Cooper Power Systems, now Eaton Cooper Power, where he worked on smart thermostat technology. “From those internships, I knew I wanted to do something that combined tech skills with interpersonal, persuasion, and leadership skills,” he said.

After graduating with a degree in electrical engineering and a minor in Chinese, Johnson, who received CSE’s Frederick McKinley Jones Scholarship, was hired by Texas Instruments and ended up selling semiconductors to startup companies in New York City. The environment was intoxicating—full of steep challenges and exposure to the world of entrepreneurism and venture capital. But he realized he wanted to nurture a single project from concept to launch. Friends said they knew exactly what he should do—form a company.

“I said, ‘OK that makes sense, but what’s a lower-risk version of that?’ And that’s how I learned about product management,” he said.

“I’ve really been supported by so many people and I always try to give back. I want to make sure I pay it forward.”

KAYIITA JOHNSON

After earning his MBA at Stanford, Johnson landed a job at Google. He started in August 2018 on the same day the company announced the brand merger of Google and Nest, the maker of smart thermostats and smoke detectors. He’s working on the next generation of Google’s Nest Hub, the touchscreen display that functions as a voice-controlled smart speaker. He can’t say much about his work, only that he also works on projects like ensuring the voice commands “Hey Google” or “Okay Google” respond to us and not a random commercial.
In the end, being a product manager is about anticipating what customers will want and then building the team of researchers, engineers, user experience designers, and other specialists to get it made. Johnson thinks it requires a skillset that many African Americans have honed simply through being part of a marginalized group.

“There are so many Black people I know who would be excellent product managers,” he said. “I feel like Black people can be really good product managers because a lot of times, things aren’t really designed for them. They have this personal experience with that gap in the user experience. So, as a profession, I think we’re really underutilizing people who could help make products better for everyone.”

Bret Weiss: Invest in people, innovate in everything

When Bret Weiss (Civil Engineering ’87) co-founded WSB in 1995, the young company had to compete against other design and consulting firms that had more resources and had been around for decades.

“We really focused on our staff and leaned into innovation,” said Weiss, who became CEO in 2000. “We’re still doing that to this day. That’s our secret sauce.”

Today, the Minneapolis-based company has 525 employees and offices in Minnesota, Arkansas, Colorado, North Dakota, and Texas. Their approach to investing in people and thinking outside the box has helped the company meet the challenges of 2020. This spring, in the midst of the coronavirus pandemic, WSB graduated its first class of nine students in a new program called Opportunity+ designed to bring more women and people of color into his company and ultimately, into the field of civil engineering.

“Our industry is not very diverse,” said Weiss, who served on CSE’s Department of Civil, Environmental, and Geo-Engineering Advisory Board. “It’s white, male dominated.” In part, it’s a pipeline problem. In 2019, for example, only four percent of undergraduate engineering degrees in the United States were awarded to African Americans, a portion that hasn’t changed much over the last decade, according to the American Society for Engineering Education. About 23 percent of degrees were given to women.

Weiss felt he and his colleagues needed to do more.

“There was a sense of ‘we’re not getting blamed for this, so why does this matter? What could we do?’ I felt like our industry was hiding behind the fact that the universities were not producing as many graduates who are minorities or women,” he added. “I don’t mean that as a slam against universities. But I think we’ve used them as the scapegoat.”

Weiss realized that if WSB wanted to hire underrepresented groups, it couldn’t rely on referrals from existing employees, nor count on technical school programs, which can be prohibitively expensive. They needed to recruit and introduce people to the field. After two years of planning, WSB launched a four-month evening class. It was offered free of charge, with 200 hours of training in surveying and materials testing, and a stepping stone to high-demand jobs that pay $17 to $20 per hour with full benefits and opportunities to move up. Seven of the nine graduates are people of color and four are women. Although COVID-19 slowed progress, WSB hired two of the graduates and is working to place the two others who showed interest, Weiss said.

In some ways, bringing diversity to the company is simply about building a winning team, and Weiss knows all about that. As an undergraduate at the...
University of Minnesota, he played a year under legendary football coach Lou Holtz.

“I would say in a lot of ways Lou Holtz really shaped who I am and how I think,” Weiss said. “He was an amazing leader.” In particular Holtz hammered home teamwork and humility. Weiss recalled him saying that the best running back in the nation can only do his job if he has people up front blocking and laying the path.

“So while there is individual talent, there is also collective talent,” Weiss said. “That just really resonated with me.”

“Companies that are more diverse are more successful,” Weiss said. “Our work supports different communities, and if we have a diverse staff, it’s going to make us more successful as we think about how we deliver and design projects.”

Weiss realizes two hires doesn’t sound like much. “But that’s a start,” he said. “We hope that next year when we graduate another nine that we place all nine of them, and that 10 years down the road we have hundreds of people who are Opportunity+ graduates who are working in our industry.”
Since the coronavirus pandemic began in early 2020, it’s hard to imagine life without face masks, strictly outdoor dining, and virtual happy hours. Yet, questions still remain. Are we effectively maximizing the safety of our frontline workers? Is six feet always enough? How dangerous are indoor restaurants?

Scientific knowledge about the disease known as COVID-19 continues to evolve—and faculty from the College of Science and Engineering have evolved with it. From addressing personal protective equipment (PPE) shortages and safety regulations to grappling with a rapidly emerging mental health epidemic, CSE researchers are helping society to not only understand COVID-19 but to live with it.

A SWIFT RESPONSE

When the coronavirus hit in March 2020, shortages in medical equipment grew. Hospitals lacked sufficient ventilators to treat patients, and medical personnel lacked the PPE they needed to provide care safely. Faculty and industry leaders at the University of Minnesota’s Institute of Engineering in Medicine (IEM) started brainstorming.

“Professor David Odde (biomedical engineering) reached out to our industry advisory board because there was an urgent lack of PPE in the supply chain,” explained IEM director John Bischof. “Everybody hopped on a call and started talking about ways they could help.”
A team of University of Minnesota biomedical engineering students designed and produced 350,000 hospital gowns for M Health Fairview employees in a matter of months—one of the many projects organized by IEM to provide personal protective equipment to health workers during the pandemic.

Formed in the 1990s along with the University’s Department of Biomedical Engineering, the institute has since evolved, bringing together U of M researchers in CSE and the Medical School to foster collaboration and improve healthcare. Bischof, both the Carl and Janet Kuhrmeyer Chair in Mechanical Engineering and the Medtronic-Bakken Endowed Chair for Engineering in Medicine, reports to the deans of both schools in his leadership role. As an engineer with projects in the Masonic Cancer Center, his work bridges both engineering and medicine.

Bischof, along with IEM clinician engagement faculty directors Will Durfee (mechanical engineering) and Brad Benson (medical school), began assembling teams to address COVID-related needs in the medical community. They worked closely with the vice presidents of supply chain management at M Health Fairview to determine where and what PPE was needed most. Within weeks, University researchers designed three different types of face masks, dubbed the MNmask, from repurposed filtration material. At the same time, a team in IEM’s Earl E. Bakken Medical Devices Center constructed a low-cost ventilator alternative for physicians to use.

By May 2020, an IEM team led by mechanical engineering professor Chris Hogan had developed a respiratory procedure box to protect healthcare providers treating COVID-19 patients and a phone booth-like structure to improve virus testing processes. Biomedical engineering students also produced...
disposable protective gowns for health workers, of which 350,000 have now been made. And the list goes on—most of the designs are also available online (z.umn.edu/IEMcovid) for researchers and health professionals around the world to use.

According to Bischof, this swift, organized response to the coronavirus pandemic wouldn’t have been possible without IEM.

“There’s no other umbrella organization for biomedical engineering like this on campus that can do this,” he said. “It’s been a way to connect people and give a coherent response to COVID, because we can help engineers meet clinicians, we can help fund some of these initiatives, and we can connect to industry. We have enough resources that we can have multiple programs to serve faculty and do things that are bigger than individual research programs.”

Since March, IEM, in collaboration with the Minnesota Robotics Institute and the Clinical Translational Science Institute, has given out about $300,000 in grants for U of M faculty to work on COVID-related issues. Thanks to its umbrella structure, grant-writing services, and wide-ranging connections on both the medical and engineering fronts, the institute allows researchers to collaborate more efficiently and effectively on projects and writing grants.

“We faculty are hired into departments to focus on specific research, teaching, and service. While this focus creates individual excellence in faculty, it does not always facilitate larger initiatives,” Bischof said. “We’re in a moment right now with COVID where we can focus on and support larger initiatives, build teams, and work together to build community in academics. I think IEM is the ideal vehicle for that.”

**Year-round inspiration**

The Institute for Engineering in Medicine’s commitment during the pandemic spans even further than medical devices and PPE. Its Inspire Conference, which has engaged 400-500 high schoolers in STEM annually since 2018, took place virtually in November.

The event offered interviews and discussions with leaders of various IEM COVID-19 projects. It will also be expanded into a more robust Inspire Program led by U of M faculty Rhonda Franklin (CSE, pictured here) and Chris Pennell (Medical School), who both received IEM Abbot Professorships in Innovative Education and are working with IEM staff lead for Inspire Ken Rosen to support these outreach efforts. Instead of just an annual conference, students throughout Minnesota will soon be able to participate in year-round activities such as in-person seminars, laboratory training, and visits to research centers on the Twin Cities campus.

“We’re trying to inspire, literally, students to engage with and stay in STEM,” said IEM director John Bischof. “I’m really excited about where Rhonda, Chris, and Ken are taking this. They are turning Inspire into a whole program, connecting with our vibrant urban, rural, suburban, and even tribal communities and collaborating with existing University of Minnesota-based groups to grow this program.”
The pandemic has been hard on not only our physical health but also our mental wellbeing. The Centers for Disease Control (CDC) reported in June 2020 that more than 40 percent of adults in the United States experienced symptoms of at least one adverse mental or behavioral health condition since the outbreak began. Anxiety disorder was three times more common in 2020 than in 2019, and depression was four times more prevalent.

According to CSE’s Evan Suma Rosenberg, virtual reality (VR) might be able to help. Suma Rosenberg is an assistant professor in the Department of Computer Science and Engineering and heads up its Illusioneering Lab, which focuses on immersive technologies like VR and augmented reality.

“What can virtual reality do to help people, improve our lives, and improve our work in a situation where our social lives are so degraded?” he asked. “Virtual reality may not be the solution to all the problems of the world, but can it play a role here?”

Funded by a grant from the University of Minnesota Medical School, Suma Rosenberg and his Ph.D. student Danhua Zhang spent the summer researching more immersive alternatives to video conferencing. The result was gophervr.org, a web-based VR chatroom where students, faculty, and staff can interact remotely—no six-feet rule required.

“Everyone is represented with customizable avatars,” Suma Rosenberg explained. “It enables other types of

A team of students is working with assistant professor Evan Suma Rosenberg on more immersive options to video conferencing. One result is gophervr.org, a virtual reality (VR) chatroom (top right) that users can visit with a VR headset (bottom right), smartphone, or desktop.
interactions that you can’t really get in something like Zoom, such as looking directly at the person you are talking with and pointing or gesturing to objects of interest in a shared 3D space. And because you have spatial audio, the closer you get the louder the audio gets—which means if two people want to just talk amongst themselves, you can organically move away and have a side conversation.”

The web infrastructure can house up to 20 people per virtual room, and it isn’t limited to those with VR headsets. Users can join with their smartphones or computers too. Although the experience for phone or desktop users is more akin to a first-person video game, they can still move around in the 3D space and benefit from spatial audio.

Suma Rosenberg said that virtual reality can provide a more enriching, immersive experience for social interaction.

“The technical term for it is the sense of presence,” he said. “It’s the subjective experience of being there and being transported to a different place. Looking at something on a computer screen can be engaging, but virtual reality can elevate this feeling to a whole new level, which can cause people to respond to the virtual experience more like they would in the real world.”

This summer, Suma Rosenberg organized a National Science Foundation (NSF) undergraduate research symposium with gophervr.org, hosting 150 college students nationwide. He hopes the virtual space will continue to be used during the pandemic, whether by student groups or for work meetings across the U of M.
Minnesota Orchestra principal trombone R. Douglas Wright getting the aerosol concentration of his instrument measured by mechanical engineering Ph.D. students Rafael Placucci (holding an aerodynamic particle sizer), Siyao Shao, and Ruichen He (far right).
Suma Rosenberg is also working with associate professor Richard Landers in the College of Liberal Arts’ psychology department to study the impact of VR-facilitated social interaction on users’ mental and emotional health. Then, they hope to see whether VR can also influence the public’s compliance of social distancing regulations. Their collaboration is funded by an NSF COVID-19 RAPID grant.

“The real thing I want to look at here is whether this way of being able to interact with people virtually will actually elevate moods and fill some of those social needs,” Suma Rosenberg said. “VR may not be a perfect solution, but it can get closer to some of the real world social experiences that we are currently not able to have safely.”

THE AIR WE BREATHE

Restaurant booths divided by Plexiglass, masked trips to the grocery store, socially distanced students in sanitized classrooms—these images have grown more and more familiar as society struggles to cope with the coronavirus pandemic. Yet, the question remains: how dangerous are these indoor activities? CSE faculty members Jiarong Hong and Suo Yang aim to find out.

Since the pandemic began, the pair have been analyzing how the coronavirus can spread indoors, from classroom settings to the Minnesota Orchestra Hall. Their findings have provided insight for businesses and schools as they reopened this fall and helped the Minnesota Orchestra devise a plan to maximize the safety of their musicians onstage.

“You have heard a lot about regulations of social distancing in different places, but they’re all talking about six feet,” said Hong, an associate professor in the Department of Mechanical Engineering. “There’s been no quantification of how this rule should be adjusted under different indoor environments. Social distancing of six feet might not apply because it depends on how the aerosol particles accumulate and are transported in that space.”

Scientists largely agree that the main culprits of COVID-19 transmission are aerosols, which are ejected from our mouths when we exhale or speak. When an infected person does this, the SARS CoV-2 virus can hitch a ride on those aerosols as they land on nearby surfaces or are inhaled by another person. In the CSE researchers’ first study, Hong and his team of graduate students measured the concentration of aerosols generated by people breathing and speaking. Then, Yang used that data to produce simulations of how those aerosols would travel throughout different indoor spaces—an elevator, classroom, and supermarket. They found that the strength and placement of vents plays a key role in how the particles disperse and deposit on the floor and walls.

“We learned that ventilation matters a lot,” said Yang, an assistant professor of mechanical engineering. “You need to do proper ventilation, otherwise it can make things worse. The location, the distribution of the vents all matters.”
Shortly after they began this work, the researchers were connected with the Minnesota Orchestra through Medical School colleague John Hallberg. The orchestra wanted to know how dangerous it would be to play instruments as a group onstage, and what they could do to mitigate this risk.

Hong and his team got to work. They organized on-campus experiments to measure the aerosol concentration produced by 15 musical instruments, and eventually conducted tests in Orchestra Hall to visualize where the aerosols traveled after they exited the instruments. The researchers also found that bell barriers (the technical term for instrument masks) and portable air purifiers could further mitigate the spread of particles.

Their findings were crucial in helping the orchestra develop its plan for fall, which involves COVID testing, light quarantining, musicians wearing masks, physical distance between the musicians, and the potential use of bell barriers and air purifiers onstage.

Now, Yang’s lab is working to create simulations based off Hong’s initial measurements of aerosol concentration from instruments. His goal is to show how the aerosols would travel throughout the auditorium, and where audience members would be more at risk if the orchestra held a socially distanced performance.

“I think that indoor air quality overall is a very important issue, but it’s been heavily ignored in the past,” Hong said. “That’s why this research is important, so that people understand the importance of ventilation. It’s not just COVID, but in the future, other infectious airborne diseases could also be associated with indoor air quality.”

Alumnus leads vaccine development

Moderna, Inc., a Cambridge, Massachusetts-based biotech upstart led by Stéphane Bancel (chemical engineering M.S. ’95), was one of the first companies in the world to react to the COVID-19 outbreak. Its Messenger RNA (mRNA) vaccine entered Phase 3 clinical trials in July. By November 16, the first interim analysis showed an efficacy of 94.5 percent. For the latest developments or to watch a video of how this mRNA works: z.umn.edu/modernamilestones

Bancel is a former student of professor Wei-Shou Hu. When asked what he remembers about the multilingual Bancel, Hu said, “Stéphane was very creative and charming. He returned to the U to give the Fredrickson Lecture to students, faculty and staff five years ago when he had just started Moderna. He convinced many that he would take it to fruition, as he has accomplished now.” Hu, who still stays in touch with Bancel, is also busy with COVID-19 work. He is collaborating with the University of Minnesota Medical School to create a cell line that produces SARS CoV-2 spike proteins.

“Engineers have a mindset of systems,” Hu said. “We integrate. We synthesize. And that perspective is really important for translating scientific discoveries to something that directly impact the society.”

Learn more about Hu’s research: z.umn.edu/hucovidstudy
Why are air circulation and filtration important in reducing the spread of COVID-19?

When we say air circulation, we typically mean ventilation, and ventilation doesn’t just mean a fan mixing the air around. It means bringing new air into a space and taking the air that we’ve been inhaling and exhaling out as quickly as possible. This is important, not just for COVID but for human health in general, because it keeps the CO₂ levels low.

But if there’s anything infectious that can be spread—through what is called an aerosol route, which just means that the particles or droplets expelled are small enough to stay in the air—we need to clear those out. And the quicker we can do it, the more we can mitigate risk of infection. Bringing clean air in and taking air out is where filtration comes in. Filters will collect particles because the particles really can’t pass through them. They just stick and stay there.

What are some strategies we can use to mitigate COVID in our homes?

The number one strategy is to not bring people into your home because minimizing face-to-face contact is the best way to stop the spread of COVID-19. But, you can try to increase the air change rate in your home, which is the number of times per hour that the air in a room is refreshed.

A good modern office will probably have around five, maybe upwards of seven, air changes per hour. Most homes do have some sort of recirculating air system for ventilation, but probably not a great level of control on it, and most homes just don’t have the pump capacity to install high-efficiency filters directly in the air handling system.

If you’re in a situation where you have someone in your home who you’re not commonly exposed to, giving that air a good path to enter and exit by opening multiple windows will give you a really high ventilation rate, actually. It’s hard to beat that. Of course, this is harder to do in the winter, and you may want to look into getting a recirculating air purifier to increase the ventilation rate in a certain room.

How effective are recirculating air purifiers in rooms?

The technology that goes into them is usually very efficient in removing particles and droplets from an aerosol. In general, HEPA filters, or High Efficiency Particulate Air filters, have to undergo certain testing to even have that rating, which means that they are 99.97 percent efficient or better. With a recirculating air purification system of a high enough flow rate, without leaks and with a good filter, you can increase the air changes per hour in the room you place it in.

Four air change rates per hour means 98 percent of the particles originally in the room are removed over that hour, so that’s pretty good. If you can get to that level with the air purifier, that helps—and that should be almost additive with the natural air change rate.

Where it wouldn’t help is if you were in a big open space. What will help there is exploiting that open space to keep your distance from the person and then minimizing exposure time. The volume there is so big that [using air purifiers] is a drop in the bucket. It’s not going to do very much.

Air filtration and your home

CSE professor and aerosol expert Chris Hogan weighs in

Interview by Olivia Hultgren

When mechanical engineering professor Chris Hogan began studying aerosols in 2003, the majority of researchers in the field were focused on how the small particles impact outdoor air. But after the pandemic, things changed. Hogan, who is editor-in-chief of the Journal of Aerosol Science, has been studying the impact of recirculating air purifiers on virus aerosols and how they disperse throughout indoor spaces.

We met him via Zoom for tips on staying safe—at home and in the office—this winter.
In 2011, CSE joined the University’s Driven campaign and embarked upon an ambitious project to raise $250 million in support of scholarships, fellowships, faculty, and community outreach. Thanks to you, our alumni and friends, we met that initial goal and boldly embarked upon an effort to raise a total of $285 million for CSE.

Today as I write this toward the end of 2020, to say that much has changed since then would be quite an understatement. Yet one thing remains constant: the resolve and dedication, which our community of 75,000+ alumni and friends continue to show toward our college and to the future of its students and faculty. Throughout these past nine years, this community has come together in extraordinary ways to help ensure that the legacy of innovation, curiosity, and discovery—which is integral to all that we do in CSE—continues for generations to come.

Your overwhelming generosity is a crucial factor in helping the college weather these unpredictable times.

The rapidly changing world in which we live has forced so many of our priorities into sharper focus. In CSE, we have redoubled our commitment to our core mission—educating future scientists and engineers. Our students and faculty can overcome the challenges of today because they know that they need not do so alone. From the Dean’s Town Hall to virtual Lunch and Learns and regional alumni gatherings, I remain humbled and heartened by the many ways in which our community remains engaged.

When the pandemic forced an abrupt shift to the University’s spring 2020 semester, CSE alumni were among the first to come forward to ask how they could help us navigate a new reality.

Our Mentor Program saw an overwhelming outpouring among alumni volunteers who were eager to lend their expertise and perspective to students embarking upon an unprecedented fall semester.

Together, you helped to launch the first-ever CSE Response Fund, providing essential support to students and supplies and equipment that enhance remote learning outcomes. Benefactors are ensuring that scholarship and fellowship support provides students of all economic backgrounds access to achieve their educational dreams and that our faculty can continue to advance novel curriculum delivery in this nontraditional academic year, while also pushing the boundaries of research discoveries that will impact our lives and our world for years to come.

To those of you who have joined us already, thank you. CSE’s work continues today because of your past generosity. We invite you to walk alongside us as we look toward the new year and the successful completion of our campaign in June 2021.
Tax-wise opportunity in charitable giving

Alumni and friends who wish to support CSE can receive added tax benefits this year for charitable gifts made before December 31, 2020.

Under the CARES Act, donors may be able to deduct cash gifts of up to 100 percent of their Adjusted Gross Income (AGI), and contributions in excess of your AGI carry forward for five years subject to the 60 percent of AGI limit. Even if you don’t itemize, you can claim up to $300 for a cash gift as an “above the line” deduction in 2020.

For more tax-wise giving strategies, z.umn.edu/csetaxtips.

Closing in on campaign goals

Driven: The Campaign for the College of Science and Engineering is on its final stretch—with only a few months left to June 2021.

It was launched nearly 10 years ago, with a goal of raising $250 million for students, faculty, facilities and infrastructure, and outreach. That original goal was met this past summer, but a new target was set—$285 million—in order to support Dean Kaveh’s initiative to increase the size of the student body.

Since 2011, CSE alumni, friends, and corporate partners have provided substantial gifts and commitments that will support the recruitment of top students and faculty—two of our five campaign priorities.

- **28** new chairs, professorships, and faculty fellowships
- **51** new graduate student fellowships
- **182** new scholarships

Learn more about all five campaign goals at cse.umn.edu/give.

Bentson Scholarship Challenge

The Bentson Foundation is matching funds for new undergraduate scholarship endowments to keep the University affordable and accessible to all Minnesotans. If you accept the challenge, your gift will help more Pell-eligible students, sooner. Contact a member of the CSE External Relations team for details.
Giving back to student scholarships
Sezzle, Polaris, and 3M’s matching program foster the next generation of scientists and engineers—with CSE alumni behind those gifts

SEZZLE: One full scholarship for a new student each year
Sezzle’s connection to the University of Minnesota runs deep. The co-founders of the rapidly growing fintech company—that offers American and Canadian consumers digital payment plans at online stores and select in-store locations—are Charlie Youakim (MechEng ’99, MBA ’10), Paul Paradis (MBA ’10), Killian Brackey (studied computer science 2013-2017), and Mia Bernard (currently pursuing her MBA in Carlson School).

The gift from the Minneapolis-headquartered Sezzle includes a $124,000 donation to fund a full, four-year scholarship to a deserving student interested in data science, computer science, or computer engineering.

“Our goal in creating the Sezzle Scholars program is to do our part to solve a problem in the hopes that our actions will spur other technology partners to follow suit,” explained Youakim. “Diversity, equity, and inclusion are areas of focus for Sezzle, and it is our belief that supporting underrepresented groups in the pursuit of a technological career will help solve a systemic problem, one graduate at a time.”

For this year’s Sezzle Scholar, the impact of the scholarship is clear.

“This is a big deal, not only for me, but for my family,” said Jonathan Olaleye, a freshman in computer science and a budding entrepreneur who has designed apps and his own gaming system. “It removes so much stress associated with the financial side of college. There are a lot of things that I want to do over the next few years and after I earn my degree. Not having to worry about money, in the way that I otherwise would have, lets me focus on those things. Right now, all I can be is extremely grateful and make the most of this opportunity.”

Sezzle will continue to fund a full-ride scholarship for a new student each year.

POLARIS: A gift for hands-on learning and leadership activities
The Polaris scholarship was heaven-sent for computer engineering senior Beau Carlson. With mounting debt from medical issues, he had reached the point where he had to choose between his health and education.

“Youth are no longer able to support my college fees,” he said. “Fortunately, with this scholarship, I no longer had to make this decision. To me, this means I can now graduate!”

Polaris Inc. donated $1 million to CSE to expand educational and experiential opportunities in STEM. The gift includes $50,000 annually for 10 scholarships aimed at...
underrepresented students. The Polaris Scholars will also get to connect with company employees for networking and mentoring.

“Investing in the success of local students as they work toward a future in science and engineering is important to me personally and professionally,” said Ken Pucel (ME ’89), executive vice president of Global Operations, Engineering and Lean, and CSE Dean’s Advisory Board member. “As a part of the Polaris team, I’m grateful for our company’s commitment to giving back and fostering growth in our local communities. Polaris is proud to collaborate with the U of M Foundation to help build a diverse pipeline of future engineers and high-tech workers.”

As part of the donation, the 2,000-square-foot space in the Mechanical Engineering Building was named the Polaris Student Machine Shop. It is part of CSE’s Anderson Student Innovation Labs.

The Polaris gift, which will be distributed over the next five years, builds upon the company’s past contributions to the University of Minnesota that now total more than $3 million. Previous gifts also supported College of Science and Engineering student programs, such as LeaderShape and the CSE Winter Light Show.

3M: An employee match to transform the future

Jayshree Seth has 70 patents to her name—and holds two roles at 3M, which allow her to combine her technical expertise and creativity with her love of science.

“As a corporate scientist, I work with other engineers and scientists to break down complex problems and find solutions that stick,” she said. “As the company’s chief science advocate, I hope to help people of all ages around the world learn to appreciate science in their daily lives.”

Seth and her husband, Raghu Padiyath, division scientist in the company, are funding the Sankofa scholarship—in part with 3M’s matching gift program—to support Black students in CSE.

Their gift was motivated by a year that heightened the pervasive nature of racism.

“Racial disparities resulting from systemic racism impact many aspects of Black lives, including the lack of representation in STEM,” Seth noted. “We feel that this inequity must be addressed since STEM professionals and academics have a huge influence in shaping our future world.”

The couple, both graduates of Clarkson University in Potsdam, New York, knew of a CSE scholarship by their colleague and friend Dave Yarusso (ChE ’78), a 3M scientist for nearly 35 years. Yarusso is credited with developing a solventless process for making masking tape. In 2011, he and his wife, Barb (ChE ’78), established the Barbara J. and David J. Yarusso Scholarship for students majoring in chemical engineering or material sciences who have “overcome significant adversity in their life.”

The Sankofa scholarship is named after a term that resonated with Seth during her trip to Ghana for a 3M-sponsored service project, just before COVID-19 limited international travel. Sankofa in the Akan Twi language signifies that the past can illuminate the present.

“We hope that the horrific events in Minnesota in 2020, unmasking systemic racism,” she said, “will inspire many to commit to change and use one’s own pockets of privilege to ensure a just and equitable future for all.”

Raghu Padiyath and Jayshree Seth with 3M CEO Mike Roman (EE ’82)

Seth is the author of The Heart of Science—Engineering Footprints, Fingerprints, & Imprints. All proceeds from the book go to a scholarship for underrepresented minority women in STEM administered by the Society of Women Engineers.
Robert “Bob” Gore was born an entrepreneur. Raised in Newark, Delaware, he helped his parents kick start their now multinational manufacturing company W. L. Gore & Associates, Inc. as a college sophomore. Gore earned his bachelor’s degree in chemical engineering from the University of Delaware and both his master’s and Ph.D. in chemical engineering from the University of Minnesota in 1963. He died on Sept. 17 at his home in Maryland. He was 83.

Gore’s scientific discoveries spawned the groundbreaking GORE-TEX® Fabrics, the world’s first waterproof breathable outerwear, and paved the way for advancements in industries as varied as performance fabrics, medical devices, space exploration, and filtration. During his career, he received nine patents for his work with fluoropolymers. He was elected to the National Academy of Engineering in 1995 and inducted into the National Inventors Hall of Fame in 2006.

“Bob’s innovative spirit shaped our enterprise from the very beginning,” said Bret Snyder, his nephew and company board chair. “We will continue to build on his legacy with a commitment toward breaking new ground and developing solutions that make the world a better place.”

The Gore Annex in Amundson Hall, which includes research and teaching labs, was funded in part by a $10 million gift from Bob and his wife, Jane.

Watch a film on Gore’s work: z.umn.edu/scientistsyoumustknow

If you completed our international survey earlier this year, thank you! Based on your feedback, we have:

• Updated contact information to reach you in the ways you prefer.

• Created a web page that’s regularly updated with creative ways you can engage with the college and larger University from wherever you are: cse.umn.edu/college/virtual-engagement-opportunities

• Developed more content for our website and social media channels in the areas you are most interested in—college news, faculty research, and images of our beautiful campus.

• Offered many virtual events, and recorded the events and posted them to the college’s YouTube channel so alumni across the world can watch these programs, lectures, and presentations on-demand. Check out what we’ve been up to at www.youtube.com/user/umnCSE.

——Paul Dauenhauer (ChE Ph.D. ’08) in his MacArthur Fellows video after receiving the $625,000 “genius grant.” The Lanny Schmidt Honorary Professor is known for turning organic materials into chemical compounds used in everyday products.

Watch the video at z.umn.edu/2020CSEgenius.

Learn about his work in 14 minutes: z.umn.edu/CSElecturepd2019
Gopher contributions are legion—and it’s hard to recognize them all. But each year, the University of Minnesota does its best. Among its 2020-21 honorees are four distinguished CSE alumni.

Outstanding Achievement Award for leadership and distinction in their chosen fields

Franklin “Lynn” Orr (ChE, Ph.D. ’76) is the Keleen and Carlton Beal Professor of Petroleum Engineering Emeritus at Stanford University. In 2009, he created the Stanford Precourt Institute for Energy, which he has led since its founding. Before that, he served as dean of the Stanford School of Earth Sciences and later started the 10-year Global Climate and Energy Project to research options for reducing greenhouse gas emissions from energy use. Orr was named Under Secretary for Science and Energy at the U.S. Department of Energy in 2014.

Angela Wilson (Chemical Physics, Ph.D. ’95), president-elect of the American Chemical Society, is the John A. Hannah Distinguished Professor of Chemistry at Michigan State University, associate dean for strategic initiatives in its College of Natural Sciences, and director of Center for Quantum Computing, Science, and Engineering. She is renowned for her work in computational/theoretical chemistry. Her primary research focuses on the development and application of quantum mechanical methods. From 2016 to 2018, she served as division director of the National Science Foundation’s Division of Chemistry.

Alumni Service Award for impact on the University, its colleges, or the University of Minnesota Alumni Association

Mary Kurth (Physics ’72, Accounting ’74, MBA ’76), vice chair of the CSE Alumni Society Board, was vice president of finance at Cargill for 22 years. She volunteers on the University Senate’s Social Concerns Committee and student mentoring programs at Carlson, CSE, and the UMN Society of Women Engineers chapter. She has also served on Carlson School’s Alumni Advisory Board and Undergraduate Advisory Board. Her endowments to support UMN students include the Douglas B. Kurth Scholarship Fund and Jeffrey P. Kurth Scholarship Fund.

U40 Alumni Leader Award for a graduate who has excelled in a career and is 40 years of age or younger

Nick Halla (ChE ’05) was the first employee of the California startup Impossible Foods. His creative vision helped forward its goal of developing plant-based meat alternatives that feed the world’s growing population in a way that is healthy for both people and the planet. Today, in his current position as senior vice president for international operations, Halla leads the company’s global market expansion.

Read more about him in “The Impossible made Possible” at z.umn.edu/CSEmagsum2019.
IN A WORLD TURNED SIDEWAYS, WE ADAPT—MUCH AS WE HAVE IN THE PAST

Jumping in to lend expertise is embedded in the DNA of our college—and in the minds and hearts of those who teach here, research here, and study and graduate from here. As we approach the 12-month mark since COVID-19 led to stay-at-home orders and a new way of life for most of us, we can rest knowing there are those in our community of scientists, engineers, and mathematicians who continue to keep their eyes focused on this deadly virus.

Their acts of trying to understand the virus, model it, tame it, and help in numerous other ways—such as developing personal protective equipment—reflect past behavior. For more than a century, University of Minnesota scientists and engineers have pioneered research, innovation, and technology.

Here is a sample of four other important crossroads in history when our University community worked to meet the challenges of our nation.

World War II

As many young men were drafted during World War II, women in CSE—then known as the Institute of Technology—stepped up. In 1943, more than 100 female students were trained to work as aeronautical engineers for the Curtiss-Wright Corporation. Dubbed the Curtiss-Wright Cadettes, the women provided a creative solution to the industry’s dwindling supply of engineers at the time.

CSE researchers and alumni were also hard at work on technological innovations that would revolutionize the war. Chemistry professor Izaak Kolthoff developed a technique for making synthetic rubber for the military industry. Alumnus Walter Spievak (Aero ’36) helped design the B-25 bomber plane at Boeing, and alumnus Edgar Piret (ChE ’32) invented a dehydrated meat product for troops to pack as combat rations during the war. Physics professor Alfred O.C. Nier pioneered research on fissionable uranium isotopes that would eventually assist Manhattan Project scientists in creating the atomic bomb.
Global competition spiked during the Cold War era, leading to the inevitable “space race” in the 1960s. Jeannette Piccard and her husband, University of Minnesota aeronautical engineering professor Jean Piccard, laid the groundwork for piloted space flights decades earlier when they set a record altitude of 57,979 feet in a high-altitude balloon in 1934.

CSE’s involvement in the space race continued when professor Helmut Heinrich developed supersonic parachutes that contributed to the Apollo moon landings. In 1969, earth science professor V. Rama Murthy and physics professor Robert Pepin became the first scientists to study rocks from the Apollo 11 moon landing. Alumnus Donald K. “Deke” Slayton (Aero ’49) later commanded the Apollo-Soyuz space mission in 1975.

In 1972, Seymour Cray (EE ’49) founded Cray Research and led the development of supercomputers. Former faculty member John Bardeen won his second Nobel prize in physics that year for developing the theory of superconductivity. In the late 1980s, Mark McCahill (Chem ’79) led the University of Minnesota team that developed POPmail, one of the first popular Internet e-mail clients. He also steered the Gopher protocol development team, which included another CSE alumnus, Paul Lindner (CompSci ’91).

“In its heyday, Gopher demonstrated the potential of the Internet as an information system for the [average person], beyond its status as a tool (or toy) for tech enthusiasts, academics, and high-level researchers,” according to an article by The Chronicle of Higher Education. The Gopher, an information organization and transmission system—often regarded as a precursor to today’s Internet—was initially released in 1991.

By 1918, the year of the devastating influenza pandemic, eight CSE departments had been established: civil engineering (1910), biosystems and agricultural engineering (1909; later renamed bioproducts and biosystems engineering), mechanical engineering (1898), mathematics (1894), chemistry (1893), astronomy (1892), electrical engineering (1891), and physics (1889). The University became a military training camp for more than 3,200 soldiers and the University Health Service, now Boynton Health, saw 100 patients each day.

One-third of the world’s population, or about 500 million people, became infected. Control efforts globally were limited to isolation, quarantine, good personal hygiene, use of disinfectants, and restrictions on public gatherings. For more on the University’s response then, which mirrors COVID-19 efforts today, see z.umn.edu/mndaily1918flu.
Certainty in uncertain times.

Getting a college education is an exciting prospect—and one that is often accompanied by uncertainty. Uncertainty related to classes and schedules. Dorms and apartments. Jobs and internships.

Now, students and their families are also navigating the most serious public health crisis in a century. A CSE Alumni Scholarship can provide the financial stability they need to focus on what matters: the student’s health and education.

Learn more about the CSE Alumni Scholarship at cse.umn.edu/giving.