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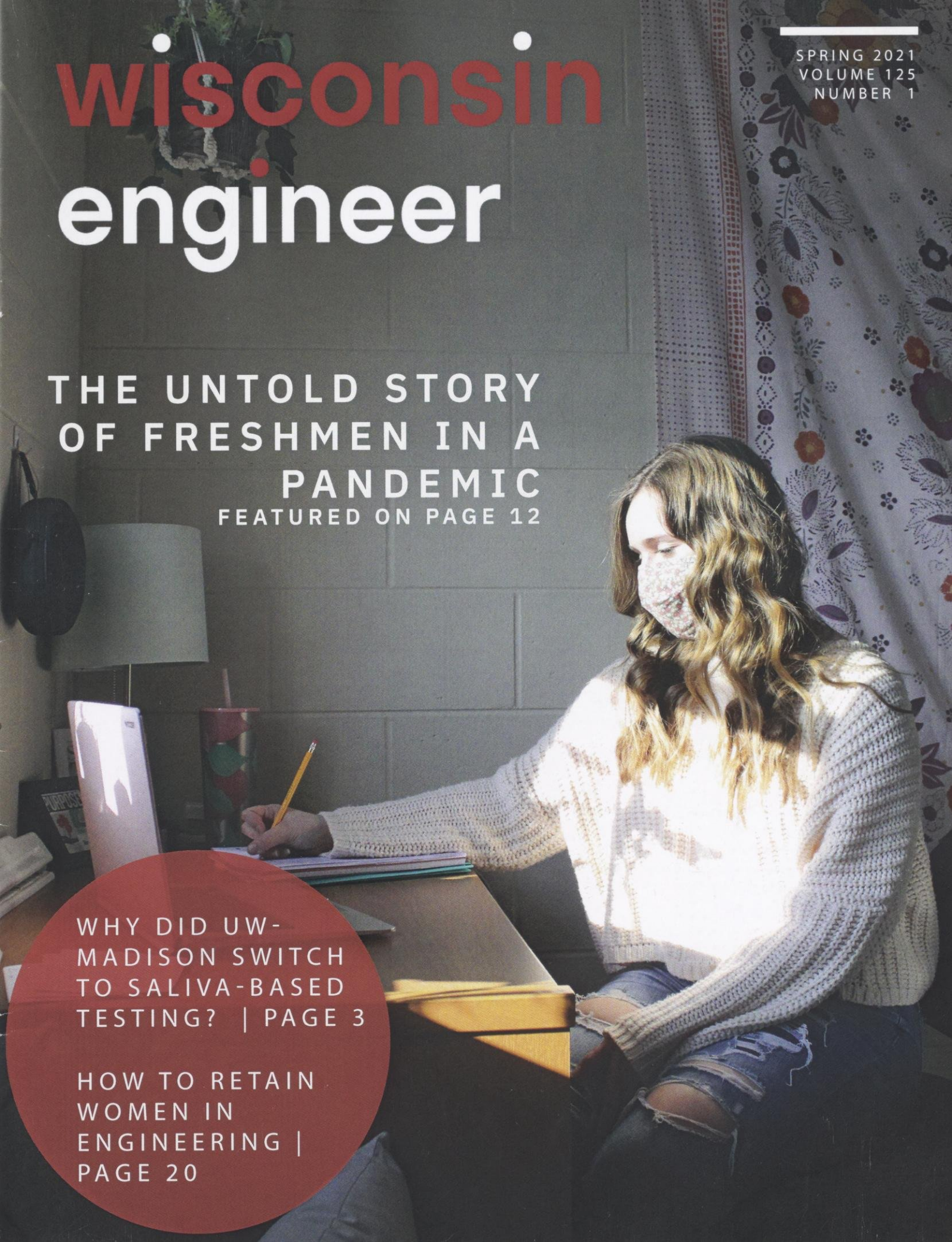
THE UNTOLD STORY OF FRESHMEN IN A PANDEMIC

FEATURED ON PAGE 12



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COVER PHOTO TAKEN BY: ANNIE KRILLENBERGER

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LETTER FROM THE EDITOR

Being involved in the Wisconsin Engineer Magazine has been pivotal to my undergraduate experience. Growing up, I was introverted with an inquisitive mind and endless imagination. The cultural differences I experienced when I moved from Kampala, Uganda to Woodbury, Minnesota made me even more introspective. Hence, the best form of expressing my thoughts about all these changes was putting them on paper. A curious young Jemimah also loved to tinker with miscellaneous items such as cardboard boxes and worn rubber sandals to build makeshift objects such as car prototypes ("prototype" is generous, considering the number of design flaws they had). Little did I know that this passion for innovation would eventually propel me towards an engineering career.

In my mind, writing and engineering were mutually exclusive. A running joke from other engineering students was that engineers usually disliked writing. I did not want to pick one interest over the other. Therefore, finding the Wisconsin Engineer Magazine booth at the organization fair solved that dilemma! I could pursue both my love for creative writing and innovative science. I still remember my excitement after my first article was published. I shared my articles with everyone I knew! That was just the beginning of incredible experiences that came with being a part of WEM. Over time, I not only developed my writing and interviewing skills, but also met incredible people with both shared and varied interests. As I sought out more leadership roles such as editor and editor-in-chief, my communication skills improved, and I learned to appreciate the value of teamwork. I strongly believe these experiences ultimately paved the way for me landing my dream engineering position.

With all this in mind, it is important to acknowledge the hardships that we all experienced in the past year. Living with these challenges necessitated a few adjustments. For instance, the magazine changed the frequency of publication from quarterly to semi-annually. The in-person social activities such as pizza night, bowling and skating were exchanged for virtual ones. Moreover, course rigor and academic expectations remained high. Low morale would have been completely justified! However, the members of the Wisconsin Engineer Magazine staff were flexible and resilient. The dedication of the staff and department heads through all the adjustments was a testament to the value of having a coherent team. I have never been prouder to be part of an organization. The most exciting part was seeing new faces, reminding me of when I first joined the magazine. I have learned so much from everyone in WEM and I am confident that the magazine will only get better. I would also like to thank our advisor, Mike Shapiro, who went above and beyond to provide support for the magazine staff.

As you read this issue, keep in mind the creativity, hard work and drive of the Wisconsin Engineer Magazine staff. Although my time as an undergraduate is coming to an end, I will always cherish my time being part of the Wisconsin Engineer. On Wisconsin!

-Jemimah

WHY DID UW-MADISON SWITCH TO SALIVA-BASED TESTING?

WRITTEN BY
TONY TOCZYCKI

Since the beginning of the spring semester, UW-Madison students living on campus or in the greater Madison area have been testing twice per week for COVID-19. After receiving a negative test result, a green check mark through the Safer Badgers app gives students access to buildings.

UW-Madison added saliva tests developed by UIUC Researchers to increase the number of tests available to students. For many students, this seemed like a downgrade when comparing the nasal swab tests used during the fall semester. The saliva test requires students to abstain from eating or drinking one hour prior to submitting a sample. The saliva test usually takes longer to complete and can keep lines long during busy hours. Additionally, the saliva test is not any quicker at getting results, as both tests have results available the next day.

However, UW-Madison has expanded its testing as a result of the switch. For the 2021 spring semester, 12 new testing locations have opened that use this newer testing method. The saliva tests cost around $25 per test, a decrease from the estimated cost of $100 per nasal swab test, which puts less stress on UW-Madison's estimated $320 million fiscal loss due to the pandemic.

Furthermore, the New England Journal of Medicine finds that saliva tests are slightly more accurate at detecting COVID-19 positivity when compared to nasal swabs. Better yet, a University of South Carolina pharmacologist notes that nasal swabs may yield positive results even when a person is not infectious, which helps UW-Madison students who may have otherwise received a false positive test result stay out of the isolation dorms.

Thanks to the increase in testing, both the student and employee positivity rate has dipped below 0.4 percent for the month of March. During the fall semester, a 2.5 percent positivity rate was seen, along with spikes nearing 10 percent in the middle of September and November. The rapid testing increase will quell any future spikes and help UW-Madison stay on course with the two-month statewide and nationwide decline in COVID-19 cases. Health specialists at UW-Madison will continue to innovate and adapt using the latest technological and medical advancements that provide the utmost safety and accessibility for students and staff. Although students have to watch what they eat before testing and may endure longer lines, the switch to saliva-based testing was an improvement overall.

ISHIKA MUKHERJEE COMPLETES THE NEW SALIVA TEST AT HELEN C WHITE HALL.

PHOTOGRAPHY BY
ANNIE KRILLENBERGER

GRAPHIC DESIGN BY
LUCAS BARTEL

WHERE ARE THEY NOW?

TWO UW-MADISON ENGINEERING ALUMNI SHARE THEIR DYNAMIC CAREER PATHS AFTER GRADUATION.

UW-MADISON ALUMNI TRACEY DRIESSEN (TOP) AND ETHAN PROPER (BOTTOM)
PHOTOS PROVIDED

WRITTEN BY
PAIGE DOLLEVOET

It's hard to know what the future will hold after college is over. Looking ahead, it is difficult to see past first internships, first co-ops, and eventually first jobs. It is easy to forget that there have been many generations of students who have walked the same halls and streets of UW-Madison, and who are now in places in their careers they never thought they would be. Tracey Driessen and Ethan Proper are both graduates of UW-Madison with bachelor's degrees in engineering. Though they both graduated from the UW-Madison College of Engineering, they have since had very different trajectories within their careers. They each look back over their paths in this article, which explores different journeys a UW-Madison engineering degree could take you.

Ethan Proper graduated from UW-Madison in 1996 with a bachelor's degree in electrical engineering. He, like many students, did not end up doing what he had planned. He enlisted in the Navy out of high school and was chosen for the Nuclear Enlisted Commissioning Program, which meant that he got his engineering degree

while active in the Navy. After graduating, he worked as an Engineering Duty Officer in Washington and went on to get his master's degree at MIT. In 2007, he started working for Navy Strategic Systems Programs, where he still works today. Strategic Systems Programs, or SSP, is responsible for the Trident II Strategic Weapon System, which is the primary weapon on the US OHIO-class submarines. The Navy has 14 OHIO-class submarines - defense submarines with long-range ballistic missiles that keep adversaries from using their weapons.

The Navy gave Proper valuable opportunities within the program, including moving to the United Kingdom for several years. After moving back to the United States, Proper began as a Missile Branch head working out of Washington, D.C. – a role he still holds today. His day-to-day roles include three main aspects: cost performance, schedule performance, and technical management. This keeps his schedule dynamic to the situation on any given day.

"In a non-COVID environment, I probably travel a quarter of the time," Proper says. He would travel to places such as Washington State, Florida, Georgia, and Colorado on a regular basis.

His advice for current students at UW-Madison is that if you have a hobby you really enjoy, try to make it into a career. "People can see the passion in what you want to be doing," Proper says. As proof that Proper is an example of being passionate about his work, he is now a Captain in the Navy, has won many awards including the Iraq Service Medal, and is also a co-owner of the Green Bay Packers.

Tracey Driessen graduated from UW-Madison in 1998 with a degree in civil and environmental engineering. She has always been interested in the environment and, when she first started college, expected to work as an environmental regulator at the EPA or DNR following graduation. However, she shifted her focus to the world of manufacturing after her internships and co-op led her to discover how much she enjoyed the way that she could have a direct positive impact on the environment as an environmental engineer working in industry.

In terms of getting internships and co-ops, Driessen says, "Career fairs are an amazing opportunity to put yourself out there, meet people from prospective companies, and get a head start on your career." Without getting the internships through UW Madison, she may not have realized that manufacturing was such a good fit for her.

Counting internships and post-graduate experiences, Driessen has worked for four different paper companies and is now considered a subject matter expert in the area of environmental compliance within the industry. She has also had the opportunity to work in Canada for two years, while her husband, also a UW-Madison College of Engineering Alum, was on an expatriate assignment. During that period, she worked for a regulatory entity, the Alberta Energy Regulator. This experience expanded her understanding and perspective of both sides of environmental regulatory issues.

"IF IN YOUR CAREER, YOU CAN FIND THE 'CENTER' OF A) WHAT YOU LOVE TO DO, B) WHAT THE WORLD NEEDS FROM YOU, C) WHAT YOU ARE GOOD AT, AND D) WHAT YOU CAN BE PAID FOR, YOU WILL FIND YOUR IKIGAI – OR YOUR 'REASON FOR BEING.'"

Driessen is currently based in Neenah, Wisconsin and works for Essity, a leading hygiene and health company where she holds the position of Environmental and Risk Manager for Essity's seven North America Professional Hygiene facilities.

She describes her days as very dynamic, which she enjoys. Two major parts of her current job entail leading projects that will improve environmental and sustainability performance of the sites, and ensuring the sites are aware of upcoming environmental regulatory changes and are in full compliance with these regulations.

Some advice Driessen has for college students is, "If you've never heard of the Japanese concept Ikigai, look it up. I was introduced to this concept while working for the regulatory entity in Canada. If in your career, you can find the 'center' of a.) what you love to do, b.) what the world needs from you, c.) what you are good at, and d.) what you can be paid for, you will find your Ikigai – or your 'reason for being.' If you can find this in your career, you will feel happy and satisfied. If any one of these is too far off center, you will feel unsettled, and there is likely a better fit for you elsewhere." She also emphasized not to despair if the first job you hold doesn't work out how you want it to. It is important to know when something is right for you and when to move on.

There are lots of options for what can be done with a degree from the UW-Madison College of Engineering. Though Proper and Driessen's paths were different, they both ended up successful and content with where they are today. This goes to show that a career path is very individualized. Everyone has the capability to be successful and happy in their future and to forge their own path.

GRAPHIC DESIGN BY LUJAIN AL JUMAH

Hydrodynamics of Renewable Energy and a Love for Teaching

Learn about Professor Franck's love for teaching and her research in the hydrodynamics of renewable energy!

WRITTEN BY
TEJA BALASUBRAMANIAN

Jennifer Franck is an assistant professor in the department of mechanical engineering, who joined UW-Madison approximately two and a half years ago. Her current research is molded from her experience as a postdoctoral scholar at Brown University. Her work is a combination of biology-inspired fluid dynamics and an exploration of ways to enhance renewable energy. In describing her projects, Franck states that her focus truly lies in the hydrodynamics of renewable energy and that "fluid dynamics is all around us – the wind, the water, the air". The research project that she is working on is really inspired by nature. While biologists are usually interested in taking an evolutionary perspective, Franck asks questions such as "how do creatures move through air and water?".

Professor Franck worked on her NSF postdoctoral fellowship at Brown University, where she worked on an interdisciplinary team of biologists and engineers, monitoring bat flight. The objective was to design a micro air vehicle prototype that could flap similar to a bat's flying motion. Franck was more involved with the modelling aspect of this research. Beyond bat flight, Franck looked at other ways that animal propulsion works in nature; for example, the way a fish swims can be modelled in an oscillatory manner. Through this concept, she began a project called Leading Edge. For this project, she designed an alternative to a hydrokinetic turbine, which she called an Underwater Oscillating Foil. A hydrokinetic turbine is essentially a wind turbine that works underwater, using the motions and forces of fluids in order to generate electricity. While all these projects were conducted at Brown University, Franck now at UW-Madison, continues to work on how different oscillatory motions can be combined to boost the total energy.

Franck's passion for fluid dynamics began during her junior year of her undergraduate degree at the University of Virginia, where she majored in Aerospace Engineering. She loved the physics aspect of her major and has always been interested in computers and programming. In her third year, she took her first fluid dynamics class and realized that she absolutely loved it and had a fascination with it. From there, she wrote her senior thesis and her research advisor encouraged her to apply to grad school. She got a fellowship to graduate school, which she attended at the Caltech Aeronautics department and attained her master's and PhD.

Professor Franck also had a love for teaching and participated in a lot of high school outreach programs. Her favorite part about being a professor at UW-Madison is interacting with students on all levels – from freshman to seniors to graduate students. She chose to work at UW-Madison because of its highly ranked engineering school, allowing for many opportunities for collaboration. Furthermore, she loves her students! Professor Franck also loves being in Madison, which is a prime location for a person who loves the outdoors. She enjoys cross country skiing in the winter and kayaking in the summer with her family.

PROFESSOR JENNIFER FRACK STANDING IN FRONT OF THE DESCENDANT'S FOUNTAIN

Being a woman in STEM is something that has made Professor Franck's journey more interesting. In her undergraduate class at University of Virginia, she was one of two women in her graduating class. At Caltech, she was also one of two women in her incoming class. She was the only female in her PhD research group. Being the mother of three young girls, Professor Franck is determined to bring attention to and eliminate the challenges that women in STEM face.

PHOTOGRAHY BY JASON LEONARDO

GRAPHIC DESIGN BY LUCAS BARTEL

THIS PODCAST WILL KILL YOU: A REVIEW

A QUICK DIVE INTO YOUR NEXT FAVORITE SCIENCE PODCAST.

ERIN WELSH, PHD AND ERIN ALLMANN UPDYKE, PHD, HOSTS OF THIS PODCAST WILL KILL YOU. PHOTO BY GRANT CZADZECK.

WRITTEN BY
BROOKE VERFUERTH

With the recent global events, there has never been a better time to educate yourself on disease science. This subject can be overwhelming for people without any background knowledge. For many, the COVID-19 pandemic has been an introduction to the scientific process; showcasing how much information there is to know and how much there still is to learn when it comes to epidemics and pandemics. Epidemics refer to the rapid spread of a disease to a large number of people in a specific population within a short period of time whereas pandemics affect populations on a much larger scale. So, if you're someone who is wanting to grow in your understanding of the science behind epidemics, look no further than the podcast called, This Podcast Will Kill You.

The podcast features two graduate students, Erin Welsh, PhD and Erin Allmann-Updyke, PhD, who are studying disease ecology or epidemiology. Their education partnered with their passion for studying epidemics makes the podcast a perfect starting place to learn about medical history and its impact on society over the years. They intertwine laughter, science, and society into entertaining and informative episodes. In their 67th show all about HPV (Human Papillomavirus), they make light of it by saying "My wart be with you? Excellent. Mm-hmm. and also, with you."

Their style of laid-back humor is perfect for anyone who loves science as much as they do, with each episode full of creative science puns, waiting to be made into hilarious memes.

Throughout the series, they talk about different epidemics in history as well as other medical mysteries. In order to make this podcast accessible to any audience, they take the time to thoroughly explain relevant terms and historical context. In addition to various epidemics in history, the duo also delves into virology, vaccinations, antibiotic resistance, long term effects of infectious diseases, and so much more. In response to the COVID-19 pandemic, the hosts of the podcast have been explaining the "anatomy of the pandemic " in a multi episode series. They have thoroughly investigated the various aspects of the COVID-19 pandemic, such as mental health, vaccination, updates, and other progressions.

If you are still on the fence about whether this podcast needs to be added to your repertoire of listening pleasures, maybe their extensive list of placeboritas will persuade you. These placeboritas are fun and creative ways to spice up your listening experience. In each episode they release a new drink recipe that you can make and enjoy while expanding your knowledge of disease ecology and the evolving world of biology. In their episode about the Ebola virus, their featured drink was coined The Spillover. The Erins quote, "We are drinking The Spillover, but the most important part of The Spillover is just make sure you fill it all the way to the brim of the glass so that it's about to spillover." This witty science humor is found throughout their whole podcast and each week they get increasingly creative in designing quarantinis to make the episode fun. This podcast offers all this from the comfort of your own home, while learning relevant science right from the professionals.

GRAPHIC DESIGN BY LUJAIN AL JUMAH

Placeborita Recipe :
The Cookie Doughn't
2 oz Root Beer
Scoop Vanilla Ice Cream
Dash of Almond Extract
Squirt of Chocolate Syrup

Blend with ice and rim glass with chocolate syrup and cookies

"THEIR STYLE OF LAID-BACK HUMOR IS PERFECT FOR ANYONE WHO LOVES SCIENCE AS MUCH AS THEY DO, WITH EACH EPISODE FULL OF CREATIVE SCIENCE PUNS, WAITING TO BE MADE INTO HILARIOUS MEMES."

ERIN WELSH AND ERIN ALLMANN UPDYKE ENJOYING SOME QUARANTINIS WHILE RECORDING THEIR PODCAST.
PHOTO BY BRETT UPDYKE.

NIH AND THE RACIAL DISPARITIES IN ACADEMIA

ALONG WITH 18 OTHER FEMALE STEM PROFESSORS, UW-MADISON'S KRISTYN MASTERS URGED NIH TO REMEDY THE RACIAL DISPARITY IN RESEARCH GRANT FUNDING IN A LETTER PUBLISHED IN JANUARY 2021.

PROFESSOR KRISTYN MASTERS

"NONE OF US SHOULD BE HAPPY ABOUT BENEFITTING FROM A SYSTEM THAT IS ALLOWING BIAS TO OCCUR."
-KRISTYN MASTERS

WRITTEN BY
MEREDITH BATTAILE

In the field of research, the most innovative and groundbreaking ideas from scientists of diverse backgrounds are trumped by the harmful grievances of their white counterparts. In academic medicine in the U.S., Black scientists are inexcusably underrepresented by about 6-fold.

The National Institutes of Health (NIH) is the largest research institute in America. While they fund and produce some of the most innovative scientific breakthroughs in the world, they seem to lack expertise in protecting their scientists against discrimination. According to a study by Science Magazine, Black Principal Investigators (PIs) have a 55% lower chance of receiving funding from the NIH compared to their white counterparts.

In January 2021, Kristyn Masters, a biomedical engineering professor at UW-Madison, joined 18 fellow professors in writing to the NIH to address these issues. While the NIH has attempted to implement some anti-discrimination measures, they have failed thus far, with no recent indication that the institution is attempting to achieve equality. The efforts to give more research grants to Black PIs have been unsubstantial. While some of these grants have helped Black PIs begin their research, there has been no further action taken to help sustain their success. "You don't just want to set someone up to get started, you want to set them up to continue to succeed," Masters says.

Meanwhile, the NIH has delegated more funding to research grants awarded to young scientists. Though this may solve the issue of senior scientists receiving a majority of funds, it begs the question as to why the NIH has failed to recognize the racial disparities in funding. Masters stresses that to close this funding gap, the NIH would only have to allot 0.07% of its annual budget to promote diversity, only having to fund about two additional Research Project Grant (RO1) applications per institute.

Masters and her colleagues have suggested different methods that would be effective in limiting this disparity. In a grant review panel, diverse teams would get additional points in their score to make up for the discrimination they face. This idea is plausible as it is already a benefit of the early-stage investigator program.

Some research scientists with unearned privilege have issued complaints due to the fact that they think more inclusive measures will take away from their success or earnings. This is a huge roadblock to the approval and implementation of these measures. Masters disagrees with these complaints. "None of us should be happy about benefiting from a system that is allowing bias to occur," Masters says.

To combat this issue, Masters and her co-authors believe that bias training

should be mandatory in all departments of the NIH. Currently, there is no requirement for bias training at NIH, although many other institutes do implement this type of training, as it is a very common prerequisite for doing many kinds of work. While the NIH may be able to fix its systemic racial disparity issue through funding and hiring, implicit bias must be targeted in a more upstream manner.

While people of color having a disadvantage is detrimental to the growth of diversity in science, what equally adds to racial disparities in funding is privileged scientists having an unearned advantage, what Masters refers to as positive bias. While White PIs might be as qualified as Black PIs for a certain position, their reputation could sway the review panel to accept their proposal over the competing Black PI. Whereas Black PIs have a more difficult time gaining notoriety due to racism in academia, and even though they might be very qualified for their proposed work, their proposals may not get reviewed as favorably as their White PI competitors'. Because of this "positive" bias, Black PIs have to write an estimated twice as many grants to achieve the same success rate as their non-Black colleagues, as well as doing more service.

Diversity is a very important aspect of science and research. Not only does diversity statistically increase innovation of a group, it also is vital to making sure research is well-rounded and caters to the diverse population. For example, Masters explains that pulse oximeters, a medical device that measures oxygen content in blood by passing a light through the skin, work poorly on individuals with darker skin, because the instrumentation was designed for white skin. The pulse oximeter is just one of many medical technologies that are white-centric and demonstrate the harm of systemic racism in research. If there is a more diverse set of scientists working on these technologies, then there will be better, more inclusive healthcare for our diverse population.

Since the letter's debut in January, as of early April NIH has recognized the systemic racism of their institution, but they have not made any significant steps to end the problems highlighted in Masters' letter.

PHOTOGRAPHY BY KENDRA BESSER

GRAPHIC DESIGN BY ELI GORDON

The Untold Story of Freshmen in a Pandemic

UW-MADISON FRESHMEN ARE EXPERIENCING THEIR FIRST YEAR QUITE DIFFERENTLY THAN STUDENTS BEFORE THEM.

WRITTEN BY
LUCY STEFFES

This year's freshman class began their college experience unlike their predecessors. First year mechanical engineering student, Vahagn Yengibaryan, was unable to live in Madison during the fall semester. Instead, Yengibaryan took classes from his native country of Armenia, in a time zone ten hours ahead of Madison. Katie Hickman, a political science student from Germany, was able to live on campus but not without quarantining three separate times when traveling to and from campus and during the lockdown of Sellery and Witte in September of 2020. Other students, especially local students, were able to choose to live on campus and have a somewhat-normal first-year experience in the dorms but not without added challenges. These challenges included increasingly relaxed attitudes toward the pandemic which caused international and legal studies student, Stella D'Acquisto, to move back home to Milwaukee, Wisconsin just five weeks into the fall semester.

When discussing the changes in the "normal" UW-Madison freshman experience, the idea of normal must be explored. For each student across campus, the normal experience varies as people find their priorities and work toward their desired future. It would be an understatement to say that students across campus have identical experiences; factors such as major, course rigor and involvement in extracurriculars can greatly vary from student to student.

Aside from the independence of living away from family, the freshmen discussed a variety of typical experiences that they missed out on due to precautionary measures set in place by UW-Madison. Most freshmen have yet to attend any sort of Badger sporting event and have never set foot in Camp Randall. Additionally, fewer first year students are joining student organizations. In one particular freshman's experience, by the time you get to the end of the day, you are too "Zoomed Out" to devote more time to online activity- no matter the purpose.

The lack of in-person classes has led to an entire class of students who cannot differentiate between Van Vleck and the Engineering Centers Building without the help of signs or Google Maps. While this problem will be resolved when classes return to an in-person format, some students lack knowledge about available study spaces since they are either off-campus or confined to their dorms or apartments. Another freshman, Grace Bauernfeind, expressed concern about her inability to explore the campus, despite having lived in Madison for the better part of a year. Furthermore, the shift to entirely online classes has made it more difficult to disconnect from school work in the evening. Trinity Manske, who is majoring in dance and nutritional sciences, explained that she found herself spending nearly all of her time during the fall semester doing work for her asynchronous classes - because it was always there. There is almost always something else that can be done, asynchronous Statics lecture videos to watch, Chemistry lectures to rewatch, or code to revise. With everything online, there is always the ability to make progress and it may feel like if work is not being done, then time is being wasted.

FRESHMAN GRACE BAUERNFEIND

Despite all the difficulties of living and transitioning to college in a pandemic, many freshmen shared their positive experiences, important lessons and coping strategies they learned. Students spoke of becoming more

TRINITY MANZKE STUDIES AT HER DESK FOR ONLINE LEARNING.

introspective and resilient as they were forced time and again to change their expectations that they held for the past year. They also discussed how the online learning format forced them to advocate for themselves better since asking questions about a class or attending office hours requires more effort. Taking breaks, minimizing time on social media, and designating time to step away from computers were some the coping mechanisms that the students shared.

"STUDENTS SPOKE OF BECOMING MORE INTROSPECTIVE AND RESILIENT AS THEY WERE FORCED TIME AND AGAIN TO LET GO OF THE HOPES AND EXPECTATIONS THAT THEY HELD FOR THE PAST YEAR."

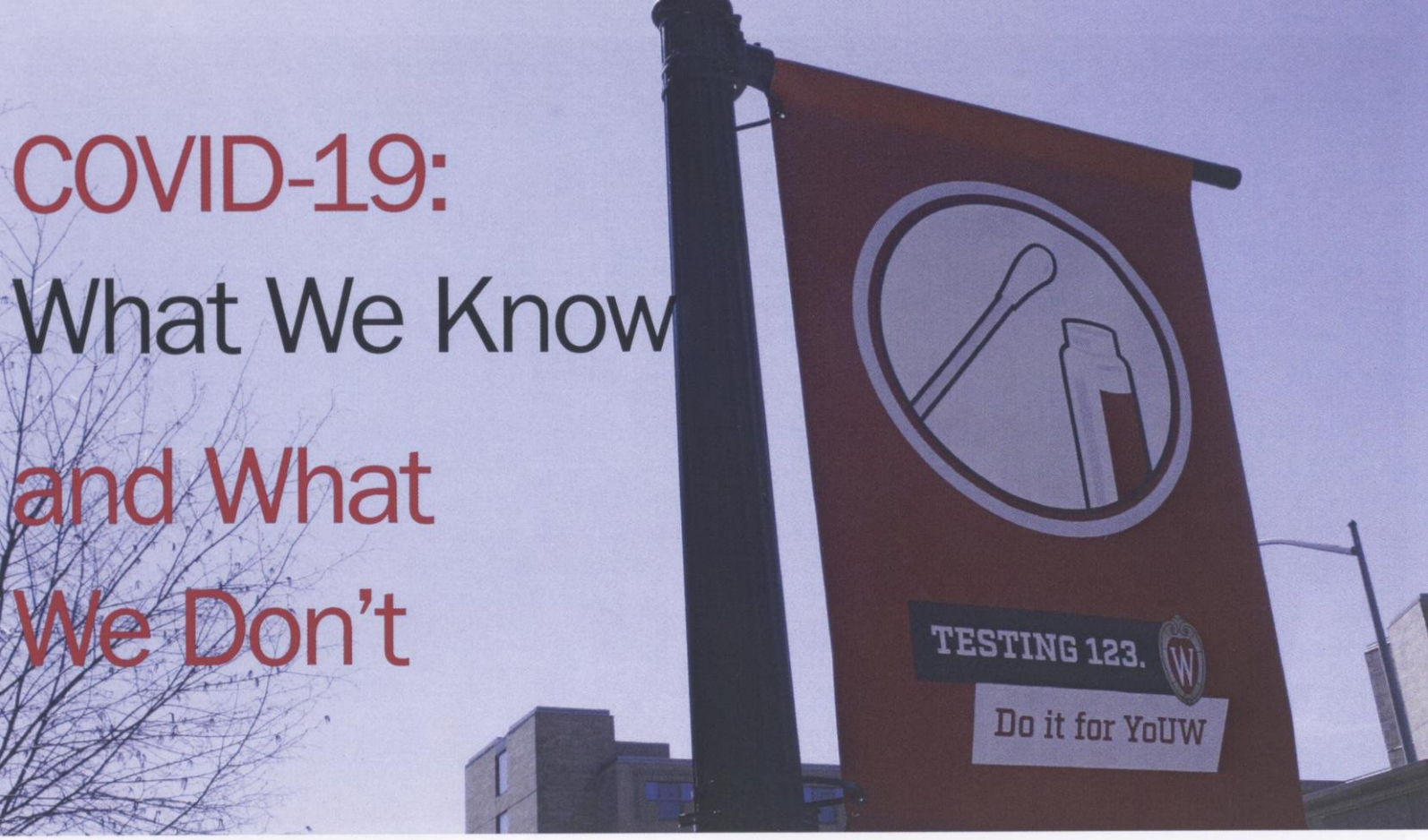
Many freshmen also discussed ways that their plans at UW-Madison changed due to the pandemic. While it is expected and common for plans to change, several students discussed joining the ROTC or adding a second major to add some stability and options for when they graduate. "You can't exactly be laid off from the military like you can in other jobs," Hickman points out. Other students expressed how their desire to find internships changed due to the predominantly online format. While remote employment opportunities are certainly easier to accommodate, the downfalls of being online outweigh the benefits for other students.

Above all, the freshmen explained that some of the most beneficial skills they learned from the pandemic were planning and organizing. Life is no longer structured by classes, commute time is non-existent; delays are only caused by Canvas crashing, slow internet connections, or forgetting about dual authentication to sign into meetings. Because of this, planning out time appears to be of the utmost importance to maintaining stability and balance in the lives of freshmen. Although a relatively short amount of time has passed between the freshmen years of 2019 and 2020, their experiences at UW-Madison differed substantially. However, the freshman class's experiences have led them to gain new and unique skill sets which will benefit them long after the pandemic is over.

PHOTOGRAPHY BY
ANNIE KRILLENBERGER

GRAPHIC DESIGN BY
LUCAS BARTEL

COVID-19: What We Know and What We Don't



Scientists have learned a lot about COVID-19 in the last few months but understanding its full impact on the human body will require several more years of research.

WRITTEN BY
BRIANNA FOTH

"The new normal."

Over the last year, Americans have been forced to grapple with a number of new realities: wearing masks, going to school online, and getting together with friends over Zoom. It may feel like, after a year of people in white coats frantically collecting samples to study under the microscope, we should know everything about the virus by now. But the truth? There's a lot we do know, but a lot we still don't. Here's what we know so far, and what scientists are still trying to figure out.

What we know: COVID-19 has made a lot of people very sick.

So far, there have been over 29 million cases of COVID-19 in the United States, and over 500 thousand deaths. These numbers are staggering considering that the United States saw its first few COVID-19 cases just a little over a year ago. Although the number of new cases each day has decreased since it reached a peak on January 8th, the CDC reports that there are still an average of 5 thousand new people being hospitalized with COVID-19 every day. Those who do become infected—particularly those who are older or have another condition such as diabetes or heart disease—are at risk of developing serious complications such as pneumonia, acute respiratory distress syndrome (ARDS), or acute respiratory failure. According to a report published by the World Health Organization (WHO), approximately 10-15% of COVID-19 cases progress to severe disease.

What we know: Novel coronavirus is markedly different from past viruses.

Novel coronavirus, officially known as SARS-CoV-2, is one of seven types of coronavirus, including those that caused the severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) outbreaks in 2003 and 2012 respectively. The other types include those that can cause the common cold. Unlike the other coronavirus types, novel coronavirus had not been seen in humans before 2019, meaning that those who become infected do not have antibodies prepared to fight the virus. This allows the virus to cause more cellular damage than other viruses are capable of, which means that it triggers a more severe inflammatory response from the body. This is what's especially dangerous about the virus: if the inflammatory response is strong enough, it can trigger cytokine release syndrome or a "cytokine storm." This happens when the immune system floods the bloodstream with inflammatory proteins called cytokines. They can kill tissue and damage organs, which is what leads to the severe illnesses that can ultimately lead to death. Even if someone survives such a severe inflammatory response, they can be left with significant damage to the heart muscle, lung tissue, and even to the brain and nervous system.

The novel coronavirus is also different from the influenza virus, which is what causes the common flu each year. Whereas a person infected with the flu typically develops symptoms 1 to 4 days after becoming infected, a person infected with novel coronavirus can develop symptoms anywhere from 2 to 14 days after becoming infected. This means that a person infected with novel coronavirus may spend a considerable amount of time going about life as normal before realizing they're even infected. This makes the novel coronavirus much more easily spread than other viruses.

What we don't know: What are the long-term health effects of a COVID-19 infection?

Most people infected with COVID-19 experience mild symptoms and typically recover after 2 to 6 weeks. However, some cases can result in prolonged illness, with symptoms that persist for weeks or even months. In a phone study published by the CDC, the most common symptoms reported to persist for more than 2 weeks were coughing, fatigue, congestion, shortness of breath, and loss of taste or smell. Scientists now refer to this condition of prolonged symptoms or health impairment as "post-acute sequelae of COVID-19," or "PASC". In December 2020, Congress approved $1.15 billion in funding over four years for the NIH to study the prolonged health effects of a COVID-19 infection.

After the SARS outbreak of 2003, similar studies were conducted to assess the long-term health effects of severe acute respiratory syndrome. One such study found that 52% of the people studied had persistent impairment of exercise capacity and health status 2 years after recovering from SARS, and 22% of them still had not returned to work at the time of the study. Until the NIH is able to conduct similar studies for SARS-CoV-2, it will be difficult to predict what the long-term effects of this new coronavirus will be. Just as we couldn't have predicted that chickenpox would lead to shingles, it's unlikely that we'll know what the long-term health effects of COVID-19 will look like until many years down the road.

The world has had to endure a lot of hardship over the last year, and it will still take some time before things finally start to return to a sense of normalcy. But one thing that can be counted on is that scientists around the world are learning more every day about how COVID-19 works and how it can be stopped—so that if and when a new disease outbreak happens, we'll be ready.

PHOTOGRAPHY BY
JASON LEONARDO

GRAPHIC DESIGN BY
LUCAS BARTEL

"Most people infected with COVID-19 experience mild symptoms and typically recover after 2 to 6 weeks. However, some cases can result in prolonged illness, with symptoms that persist for weeks or even months."

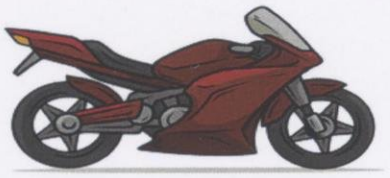
ISOLATION HOUSING FOR STUDENTS LIVING ON CAMPUS

YOU'RE SO SMART!

A 1954 ISSUE OF WISCONSIN ENGINEER MAGAZINE FEATURED BRAIN TEASERS TO ENTERTAIN READERS. TAKE A BRAIN BREAK AND TRY THESE!

WRITTEN BY
MAKENNA HALL

TRIAL BY MOTORBIKE



There are 50 bikes, each with a tank that holds enough gas to go 100 km. Using these 50 bikes, what is the maximum distance that you can go?

Answer: 350 km. Move all the bikes 50 km, then empty half the bikes' fuel tanks into the other to fill them up. Keep doing this until you have 1 bike with a full tank to finish the trek. The last bike of the 50 will have traveled 350 km in total.

WASTING WATER

If you had an infinite supply of water and a 5-liter and 3-liter bucket, how would you measure exactly 4 liters? The buckets do not have any intermediate markings.

Answer: Fill the 5-liter bucket first. Using that bucket fill the 3-liter bucket. This leaves 2 liters in the 5-liter bucket. Now chuck away the water in the 3-liter bucket and refill with the remaining 2 liters from the bigger bucket. Once again, fill the 5-liter bucket and then use this to fill the 3-liter bucket. This will leave you with 4 liters in

SOCKS, SOCKS EVERYWHERE!

There are 20 different socks, 10 pairs, in a drawer in a completely dark room. What is the minimum number of socks you should grab to ensure you have a matching

Answer: 11

BURNING ROPES

You have 2 pieces of rope, each of which burns from one end to the other in 30 minutes. If the 2 pieces touch, the flame will transfer from one to the other. Given only 1 match, can you use the ropes to time 45 minutes?

Answer: Place one of the ropes at the midpoint between the other and light. You can use either one rope in a circle or form them in a T shape.

GRAPHIC DESIGN BY MARY LAUDON

FACULTY SPOTLIGHT: NEW ASSISTANT PROFESSORS IN CEE

THREE NEW ASSISTANT PROFESSORS IN THE CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT ARE FOCUSING THEIR ENERGY AND RESOURCES ON STUDYING A RANGE OF SUSTAINABLE MATERIALS AND PROCESSES. THEY SERVE AS ROLE MODELS FOR YOUNG WOMEN IN ENGINEERING AND INSPIRE THEIR STUDENTS TO ENGAGE IN THEIR CLASSES.

WRITTEN BY
MARY RIKER

Within the last several years, three new assistant professors have joined the department of civil and environmental engineering. All three are women in engineering pushing into new frontiers in regard to science, sustainability, and the environment. Each truly enjoys working with students and colleagues on campus and teaching the next generation of engineers.

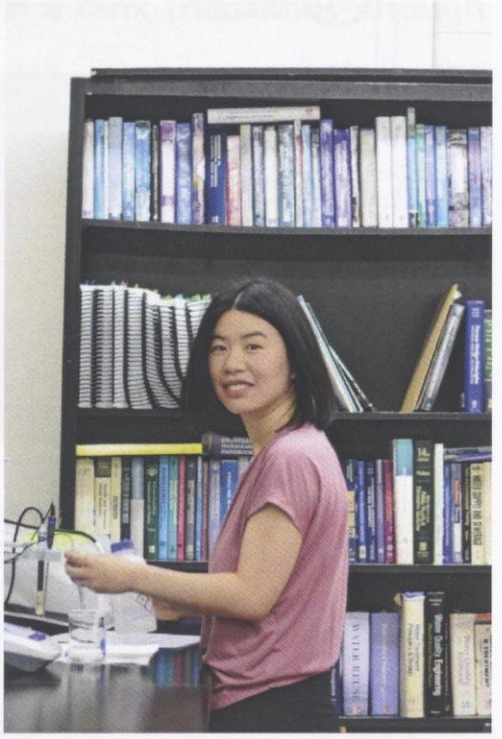
Dr. Mohan Qin, assistant professor of civil and environmental engineering, first became interested in her field after taking an introductory engineering course as an undergraduate student at Shandong University in China. She enjoyed the concepts presented in the class, which allowed her to connect environmental engineering to her other courses. She then went on to earn her master's from Peking University, also in environmental engineering, and her Ph.D. from Virginia Tech., in civil engineering.

Dr. Qin's research focuses on resource recovery from agricultural wastewater, specifically recovering ammonia from manure. Ammonia in manure can form nitrate, which contributes to climate problems such as acid rain. Her lab combines biological processes with electrochemical systems to remove ammonia from wastewater. Such systems bypass the standard industrial and energy intensive Haber-Bosch process for creating nitrogen-based fertilizer.

Dr. Qin highlighted the importance of teamwork in her research, especially between undergraduates, PhD students, and herself. She believes she can learn from all the students in her lab and says that working with students is the best part of her job. Since being hired in January, 2020, Dr. Qin has taught mostly online, which she describes as the most difficult part of being a professor. "Teaching online requires us to think one more step ahead and recognize that everyone is more stressed," Qin says. Despite these obstacles, Dr. Qin is looking forward to a return to normal classes and interaction with students next semester.

Dr. Pavana Prabhakar is an assistant professor in the civil and environmental engineering department with affiliate appointments in the engineering physics and material science departments. She always enjoyed math, physics, and mechanics in high school, and chose to study civil engineering as an undergraduate student due to its focus on structures. She earned her undergraduate degree from the National Institute of Technology in India and her master's from the University of California-Berkeley, both in civil and environmental engineering. She researched the mechanics of lightweight composite materials for her Ph.D. in aerospace engineering from the University of Michigan, which she earned in 2013. She then went on to a faculty position at the University of Texas at El Paso before coming to UW-Madison.

Dr. Prabhakar studies lightweight, architected polymer composites with many applications in the aerospace, marine, and automotive industries. These composites offer



DR. MOHAN QIN, ASSISTANT PROFESSOR OF CIVIL AND ENVIRONMENTAL ENGINEERING

an alternative to traditional materials such as steel and aluminum. They are already in use in aircrafts and high-end cars, but they are often overdesigned due to their ability to fail abruptly. Dr. Prabhakar's research focuses on how, when, and why these materials fail in extreme conditions. Her lab approaches these failures from an experimental and computational point of view and also studies additive manufacturing. They study novel designs for increasing efficiency, decreasing cost, and maintaining structural integrity while keeping the material lightweight.

Dr. Prabhakar enjoys the "seamless integration of research and teaching" at UW-Madison and says that one of the best parts of being a professor is watching students' evolution over time. She recognizes that "no one size fits all" in regard to teaching

and balances her mentoring style for different situations. She "wants to make sure it is exciting" and believes that keeping all her students invested in the required class she teaches, Structural Analysis I, is the best way to ensure their success.

Dr. Andrea Hicks is an assistant professor in the department of civil and environmental engineering and the interim Director of Sustainability Education and Research for the Office of Sustainability. She became interested in environmental impacts while attending Michigan Technological University, which led her to an undergraduate degree in environmental engineering. She studied the environmental impacts of small water treatment plants for her master's in environmental engineering from Clemson University and went on to earn her Ph.D. in civil engineering from the University of Illinois at Chicago. She then began studying nanomaterials while working as a postdoctoral supported by funding from the US Environmental Protection Agency.

Dr. Hicks's research focuses on sustainability and emerging technology, including nanomaterials, aquaponics, electric bicycles, COVID-19 PPE, and more. Her lab asks the question "should we be doing this?" from an environmental, economic, and societal point of view and looks at large problems faced by society. Her research combines theoretical and practical approaches to understand the impacts of human behavior from new technology and how that behavior may differ from what is expected during the engineering design process. She says her lab "wants to ask

interesting questions going forward about sustainability," especially on a large scale.

For Dr. Hicks, one of the best parts of being a professor is her interaction with students, both the undergraduates she teaches and the graduate students in her lab. She "misses seeing students in office hours and talking about tangentially related topics" from class. She recognizes teaching as a way to "mold her future colleagues" in engineering and sustainability and recognizes the importance of the opportunity. She also sees the passion many of her students and alumni carry for UW-Madison, the College of Engineering, and their disciplines. She recalls the respect her late father-in-law Spencer Hicks, a 1986 UW-Madison graduate of the electrical and computer engineering program and long-time supporter of the magazine, had for the university, its students, and the research done here.

DR. ANDREA HICKS, ASSISTANT PROFESSOR IN CIVIL AND ENVIROMENTAL ENGINEERING AND INTERIM DIRECTOR OF SUSTAINABILITY EDUCATION AND RESEARCH FOR THE OFFICE OF SUSTAINABILITY.

"IF YOU KEEP SOLVING PROBLEMS THE SAME WAY WITH THE SAME GROUP OF PEOPLE, YOU WILL GET THE SAME SOLUTIONS". -DR. ANDREA HICKS

All three professors value the kindness and collaboration present at UW-Madison. They find working with students to be a gratifying experience and recognize the difficulties students continue to face during the pandemic. When asked for advice for young women and other minority engineering students, they overwhelmingly said "you belong here." "Girls can do everything," Qin says. They remind these students to be brave, have confidence, and not let anyone put them in a predetermined box. As Dr. Hicks put it: "if you keep solving problems the same way with the same group of people, you will get the same solutions." Adding different perspectives from women and other minority groups in engineering will encourage new solutions and ultimately make the world a better place.

PHOTOGRAPHY BY HRIDYESH TEWANI
GRAPHIC DESIGN BY ELI GORDON

HOW TO RETAIN WOMEN IN ENGINEERING: A CONVERSATION WITH THREE FEMALE COE PROFESSORS

WHY ARE ONLY 18 PERCENT OF UW-MADISON COE FACULTY WOMEN? PROFESSORS KRISHNASWAMY, MURPHY, AND PAN TALK ABOUT HOW WE CAN IMPROVE THIS NUMBER IN THE FUTURE.

WRITTEN BY
SHIRENE SINGH

According to the American Society for Engineering Education's Engineering and Engineering Technology by the Numbers 2019 report, females make up only 18.1 percent of the total tenure/tenure-track faculty in engineering colleges in the U.S. While engineering colleges remain disproportionately filled by male faculty members, the disparity does not tell the whole story. Over the last few decades, a multitude of qualified women engineers have been hired in academia. As the number of female role models in colleges increases, more women are choosing to pursue an engineering degree and are more likely to complete that degree, setting in motion a positive feedback cycle that will ensure continuous growth in the number of women in engineering. "I think growing up seeing a lot of strong independent women motivated me. Without those female role models maybe, my path would have been different", shares Dr. Bhuvana Krishnaswamy, Assistant Professor in the department of electrical and computer engineering.

Unfortunately, despite an increased interest in engineering among women, there are still many challenges contributing to the gender imbalance. According to Nicholas St. Fleur's "Many Women Leave Engineering, Blame the Work Culture" piece on the National Public Radio, nearly 40 percent of women who earn engineering degrees either quit or never enter the profession. As a result, only a small proportion of women engineering graduates go on to pursue a Master's or a Doctorate

degree in the field. But why do many women who study engineering eventually decide to leave the field? According to Dr. Regina Murphy, a Kreuz-Bascom Professor and the R. Byron Bird Department Chair of chemical and biological engineering, UW Madison, women, on an average, are more interested in becoming socially responsible engineers when compared to men: "Women engineers tend to find working for consumer products, food, and pharmaceuticals industries more appealing. They tend to be more interested in doing good for the community or making the world a better place, which I think is a positive thing. And if women feel they are making that difference, the retention levels will be higher," Dr. Murphy explains.

DR. BHUVANA KRISHNASWAMY (LEFT)
Photo by Department
DR. REGINA MURPHY (TOP)
Photo by Hridyesh Tewani
DR. WENXIAO PAN (BOTTOM)
Photo by Department

Another reason women may be dissuaded from seeking a career in academia is the perception of work-life imbalance. However, Dr. Murphy disagrees, " I have always felt that my job is so flexible and that it actually made it easier for me to raise my kids [as compared to a job in industry]. I could take off in the middle of the day and go to my kid's awards ceremony and then go back to work." " It is important that women realize that being in academia doesn't mean that you will be working all the time. It needs to be communicated to women that academia is a doable path, so they don't feel discouraged," she further adds.

"I THINK GROWING UP SEEING A LOT OF STRONG INDEPENDENT WOMEN MOTIVATED ME. WITHOUT THOSE FEMALE ROLE MODELS MAYBE, MY PATH WOULD HAVE BEEN DIFFERENT."

So, what actions have schools and universities taken to create a more conducive environment, for women interested in engineering, and improve retention rates? Dr. Wenxiao Pan, Assistant Professor in the department of mechanical engineering, shares the benefits of UW-Madison's Women in Science and Engineering (WISE) Learning Community, "We have WISE on campus that supports and inspires women, undergraduate students. I have participated twice and served as a Faculty Guest for a small group discussion in their seminar. WISE also encourages women high-school and undergraduate students to do research with our faculty members," Dr. Pan says. "I think these kinds of groups and activities helped with engaging more women students in engineering majors".

In addition to WISE, the Women in ECE program at UW-Madison is another platform available to women at all levels in the ECE department to interact with each other. "Any next step is overwhelming; therefore, I think that Women in ECE is a good opportunity for undergraduate students, interested in graduate school, to talk to Ph.D. students. Similarly, graduate students interested in academia also get a chance to network with the faculty members and get guidance on their next steps," Dr. Krishnaswamy shares.

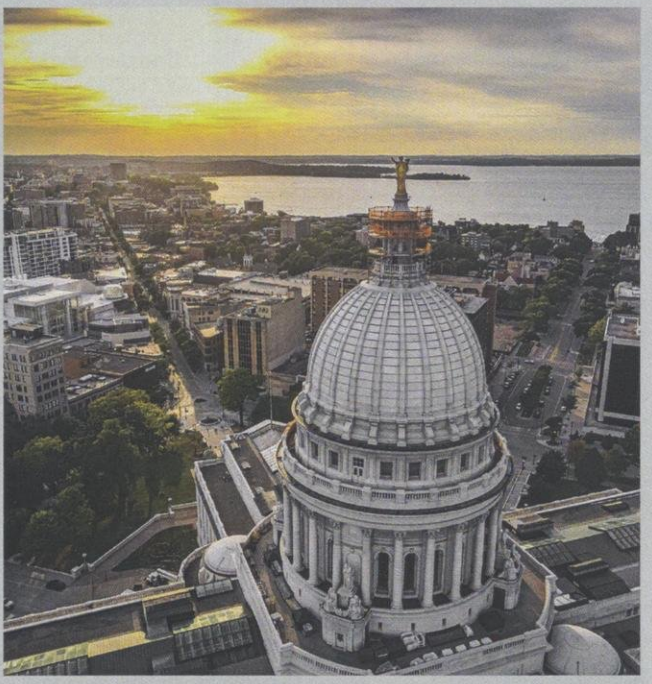
Through these various STEM university programs and other external organizations, as well as with family support, women in engineering are defying stereotypes every single day. However, developing and maintaining confidence is one of the most difficult challenges women engineers face in their careers. Though tackling this issue seems impossible – you can begin by self-reflecting on the factors that are impeding your progress and take small steps to address them. Never doubt that you possess the qualities and capabilities that make you an asset in your field. And remember that as a woman in engineering, you already stand out!

GRAPHIC DESIGN BY LUJAIN AL JUMAH

wisconsin engineer

Wisconsin Engineer Magazine's annual **photo contest** will be happening once again during the **Fall 2021 semester!**

Stay tuned and follow our social media accounts for more details!



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