Innovation unlocked
How the Fulton Schools is becoming the epicenter of idea generation
It’s hard to say what normal is right now, so it’s up to us as engineering leaders and educators to help define it. Our society has changed due to the COVID-19 pandemic, and as engineers, computer scientists, technologists and problem-solvers, we’re uniquely equipped to determine, build and solve for whatever lies ahead — a set of circumstances and opportunities that look different than might have been expected even just a short while ago.

One of our greatest strengths is the culture of innovation we’ve built at the nation’s largest and most comprehensive engineering school. Accelerated by our mindset and ability to adapt, I have never been more proud to be a part of the community of Fulton Schools faculty, staff, students and supporters who demonstrated our adaptability as we leveraged ASU’s national leadership in digital learning to deliver an immersive online educational experience for every learner — over 24,000 students at the conclusion of the spring semester — enabling them to safely and successfully pursue a great education.

COVID-19 has landed us in a new ‘normal’ and accelerated the deployment of new modes of learning that cross boundaries, demonstrating how in-person, live, remote and asynchronous education can connect seamlessly. Our adaptation to COVID-19 is bringing new opportunities for collaboration and technology that advance learning and will ultimately expand access to engineering education across global networks of learners and industry.

The pandemic also showed us how quickly our community of researchers can respond, using the tools we have developed to bring together people, research assets and industry partners to serve the public. Drawing on our top faculty and their ideas, we have developed new research methodologies for improved disease modeling, early warning systems for tracking traces of COVID-19 in city sewage systems, provided cleaning devices for PPE, and in a partnership with industry, our students and faculty networked all of the 3D printing and advanced manufacturing assets at the University to rapidly produce PPE for health care facilities and community organizations in need. These represent just a few of the dozens of solutions our faculty and students are developing.

Though the way we operate within the world has changed, our commitment to building partnerships, to seeking opportunities and to engineer a better world has not. As the Valley continues to emerge as an epicenter for innovation, engineering and the Fulton Schools will continue to be the engine driving solutions forward. Our faculty’s ideas and expertise, and the talented graduates we produce are the core of that positive momentum. With over 4,700 graduates this year, the Fulton Schools is leading the creation of the highly skilled, career-ready workforce to move solutions forward.

The world is in a place that critically needs engineers, technologists and the innovative skills and mindsets the Fulton Schools has come to be known for. So instead of getting back to ‘normal’, we are getting back to ‘different’, promoting the ideas and initiatives that will continue to define the future of engineering and education.

While the times are challenging, engineers and technologists are ready to meet those challenges and we will continue to advance the new discoveries and new methods of learning critical to our futures.

— Dean Kyle Squires

@KyleSquires
#1  Largest and one of the most comprehensive engineering schools in the nation

58,000+ Alumni

#8 Bachelor’s degrees awarded to Hispanics

3 Multidisciplinary graduate programs

7 Transdisciplinary schools

205 National Hispanic Scholars

5,227 Minority students

3,051 International graduate students

222 National Merit Scholars

5,295 Female students

#6 Women as tenure/tenure-track faculty

7,062 Online students

14 Online master’s programs

#11 Online engineering graduate programs for veterans

#13 Online engineering graduate programs

46 Graduate degree programs

25 Undergraduate degree programs

$115M Research expenditures FY 2018-2019

1M of research and educational facilities square feet

12 CAREER awards in the last 5 years!

12 in 2020

#5 Start ups

#7 Licenses and Options

#6 IP Disclosures

3,051 International graduate students
If the Ira A. Fulton Schools of Engineering at Arizona State University were its own university, it would be ranked #26 in the world with 79 utility patents.

$115M Research expenditures FY 2018-2019

#6 IP Disclosures

1M square feet of research and educational facilities

#5 Start ups

#7 Licenses and Options

41 CAREER awards in the last 5 years!
12 in 2020
ASU scientists searching sewers for traces of COVID-19

Smart Cities Dive
What researchers find — or don’t find — in wastewater could be critical to the success of plans to ease restrictions on public activity in response to the coronavirus pandemic. Professor Rolf Halden, director of ASU’s Center for Environmental Health Engineering, is exploring the advantages and challenges of wastewater-based epidemiology and the value of monitoring wastewater to help trace disease and viruses like COVID-19.

As Phoenix heats up, the night comes alive

New York Times
Phoenix is one of the country’s hottest cities and it’s getting hotter due to climate change and the urban heat island effect. Ariane Middel is an urban climate researcher using the city as a living laboratory to explore how warming cities can adapt to the meteorological changes and reduce the impacts of the rising heat.

Also featured in Rolling Stone.

How rattlesnakes collect water in the desert

ABC News
“Beautiful nano-labyrinths” are the secret to rattlesnakes’ ability to quench their thirst in dry climates where water is scarce, says Konrad Rykaczewski, an associate professor of mechanical engineering. A team of biologists and engineers, including Rykaczewski, has discovered how the diamondback rattlesnakes in Arizona’s Sonoran Desert become “living rain buckets” by collecting water when rain or snow is falling. The water droplets stay pinned to the snakes’ skin and their scales form a network of tiny channels that capture it. It’s suspected that the snakes evolved the precipitation harvesting anatomical trait as a survival mechanism in response to the desert environment.

Zoom expanding to Phoenix, hiring for hundreds of tech jobs

Fox 10 (Phoenix)
The videoconferencing leader Zoom Video Communications is locating one of two new research and development centers in the greater Phoenix area, and plan to hire hundreds of software engineers over the next few years. Zoom CEO said the decision to expand into Arizona was influenced by an “incredibly well-educated, skilled and diverse talent pool” provided by the state’s universities. With 4,500 engineering graduates each year and high caliber faculty, the Fulton Schools continues to draw companies looking for innovators in technological fields.

ASU Network connects health care providers to volunteers making protective gear

NPR (KJZZ)
Fulton Schools students are among volunteers working with an online service provided by ASU’s Luminosity Lab to make personal protective equipment for health care providers. Through the PPE Response Network, providers can request face shields, medical gowns and nasal swabs. Using more than 150 3D printers, sewing kits and various other items, students are responding to the growing need for PPE brought on by the COVID-19 pandemic.
Hello from Arizona: Where venture dollars are on the rise

Crunchbase
Arizona is quickly making a name for itself on the startup scene as new companies make their way into the state. With favorable tax credits, a comparatively low cost of living and access to an incredible depth of expertise and growing high-tech workforce coming from the Ira A. Fulton Schools of Engineering, the Valley is increasingly attractive to ventures looking for a home. Strong partnerships between the Fulton Schools, economic development partners, industry and state and local government put the Phoenix metro area on course to build a technology market that will soon compete with that of cities like Austin and Denver.

ABC Shark Tank
The Polytechnic School alumni Eric Goodchild and Jake Slatnick earned a deal for a big investment in their startup company, Aira, on the popular television program “Shark Tank.” Debuted at the 2020 Consumer Electronics Show, Aira’s FreePower technology powers a Qi-compatible wireless charging pad that can charge multiple electronic devices at the same no matter their position on the pad.

Also featured in Heavy and TechCrunch.

Sci-fi tech tackles climate change with fake trees

Fortune Magazine
Klaus Lackner, director of the Center for Negative Carbon Emissions, has developed carbon-capturing artificial trees that remove carbon dioxide from the air. In the ongoing debate about the ramifications of using technology to help clear the atmosphere of carbon dioxide, Lackner’s system is seen as part of a number of proposed geoengineering solutions to alleviate climate change problems. But critics contend these technologies could make industries complacent about taking steps to reduce pumping carbon dioxide into the atmosphere.

How innovation zone could be an East Valley game-changer

Arizona Big Media
Business leaders are viewing the ASU Polytechnic Campus Innovation Zone project as a catalyst for solidifying Arizona’s stature as a hotspot for technology and engineering startups. The ASU Polytechnic Campus, more specifically The Polytechnic School, gives tech companies convenient access to faculty expertise and engineering students being trained for careers in fields such as aerospace, alternative energy, human-technology integration, robotics and digital manufacturing and more.

Taiwan chipmaker TSMC’s $12 billion Arizona factory could give the US an edge in manufacturing

CNN Business
Taiwan Semiconductor Manufacturing Co., the world’s largest contract silicon chip manufacturer, has announced its plans to build a $12 billion advanced semiconductor factory in the greater Phoenix area, bringing more than 1,600 high-tech jobs to the state, bolstering Arizona’s manufacturing industry and providing new opportunities for Fulton Schools of Engineering graduates to contribute to the state’s growing high-tech workforce.
In the wake of the COVID-19 pandemic, ASU transitioned all in-person classes and activities to online delivery March 16.

Ira A. Fulton Schools of Engineering students, faculty and staff jumped into action to adjust to a new normal — trying new things, finding solutions and adapting to a new mode of learning.

The online videoconferencing tool Zoom helps bring students, faculty and university staff together during social distancing.

Christina Carrasquilla, a senior lecturer of graphic information technology in The Polytechnic School, makes extra effort to check in with how her students are doing.

“I start and end every remote lecture by asking the students how they are and if they’d like to share their experiences, both successes and challenges,” she says. “I think it’s validating to hear that others are having the same struggles and learning from tips and tricks the others have discussed.”

Olivia Burnsed, a lecturer of biomedical engineering in the School of Biological and Health Systems Engineering, says online classes have led to her to getting more feedback from her students and has given them more individualized instruction.

Jeffrey Kleim, an associate professor of biomedical engineering, is taking his classes to the popular streaming platform Twitch.tv with the help of a friend, a film and postproduction graphics editor.

“When the lockdown occurred, he showed me how to convert my living room into a greenscreen studio with fairly minimal investment and how to broadcast live on Twitch.tv,” Kleim says. “The students are loving it.”

Exams are also still going smoothly for Keith Hjelmstad, President’s Professor of structural engineering in the School of Sustainable Engineering and the Built Environment, even though they required paper and pencil.

Finding success in the new normal
During the online class period, Hjelmstad and his teaching assistants watched the students on Zoom to ensure there was no academic dishonesty, just as they would have done with an in-class exam. Then students scanned or photographed their test papers to turn them in.

“In many ways, I felt like I got a better view of the students than in an in-person exam,” Hjelmstad says.

For lab courses requiring the use of specialized equipment, instructors such as Mackenzie Boyer, a lecturer of civil and environmental engineering, are incorporating video demonstrations to bring the lab to students’ homes.

Boyer’s teaching assistant, graduate student Thiago Barbosa, recorded himself conducting a lab experiment and provided the data for students to use to calculate results.

“The students missed out on the opportunity to measure the dissolved oxygen in raw wastewater dilutions, but were still able to come away with a good understanding of concepts behind biochemical oxygen demand tests,” Boyer says. “If only Zoom could transmit smells too.”

As Fall 2020 registration began, advising activities also had to adapt to online delivery.

“Graduate registration for the fall semester started March 20, so we typically see a lot of students regarding classes for the fall semester,” says Lynn Pratte, academic success coordinator who advises graduate students in the School of Electrical, Computer and Energy Engineering.

Drop-in advising via Zoom is going well for Pratte and her colleagues, as Zoom offers features that mirror what it’s like to be in an advising office.

While many classes and university activities are running smoothly, there’s a lot going on behind the scenes.

The School of Computing, Informatics, and Decision Systems Engineering information technology team — including Brint MacMillan, a senior systems support analyst — has been hard at work preparing resources for students, faculty and staff to learn, teach, research and work remotely.

As IT staff for the largest of the six Fulton Schools, MacMillan and others have already been exploring remote systems to meet the needs of nearly 8,000 students. For example, racks of circuit boards with cameras pointed at them and virtual computing environments help computer science students remotely access equipment.

Outside of the classroom, student organizations that conduct community outreach are also adapting their activities for social distancing.

Cassidy Michaels, a biomedical engineering major and co-director of outreach for the Society of Women Engineers section at ASU, is working with SWE to create online tutoring and videos for parents, guardians and educators to facilitate fun engineering activities that can be done at home.

Michaels says, “We are hoping this initiative will allow us to continue to help and inspire the next generation of students through this challenging time.”
Apollo Arquiza
Lecturer, biomedical engineering
PhD, Cornell University
Design and simulation of biomedical devices, modeling of biomedical processes, thermodynamics and advanced life support for space exploration

Benjamin Bartelle
Assistant Professor, biomedical engineering
PhD, New York University
Molecular fMRI of neuroinflammation and degeneration, in vivo synthetic biology of reporters sensors and actuators, genetic and biomolecular circuits

Scott Beeman
Assistant Professor, biomedical engineering
PhD, Arizona State University
Quantitative MRI; biophysical modeling; imaging and metabolism

Dimitri Bertsekas
Professor, computer science and engineering
PhD, Massachusetts Institute of Technology
Network optimization; linear and nonlinear programming; data communication networks; parallel and distributed computation.

Maria Chavez-Echeagaray
Lecturer, engineering education
PhD, Arizona State University
Affective computing; engineering education; user experience; human behavior and human-computer interfaces

Michael A. Cirillo
Lecturer, aviation programs
MBA, University of Maryland University College
Aviation and air traffic management

Ivan Sanchez
Assistant Professor, electrical engineering
PhD, Arizona State University
Physical electronics and photonics; semiconductors; and electronic and mixed-signal circuits

Deliang Fan
Assistant Professor, electrical engineering
PhD, Purdue University
In-memory computing; deep learning neural networks; AI security; AI IoT cyber physical systems and neuromorphic computing

Michael Finder
Lecturer, software engineering
PhD, Wright State University
Software engineering

Samira Ghayekhloo
Lecturer, computer science and engineering
PhD, Eastern Mediterranean University
Computer science, IT, software engineering, advanced AI, data mining, data analysis, object oriented programming and machine learning

Mark Huerta
Lecturer, engineering education
PhD, Arizona State University
Engineering education research, human-centered design, humanitarian engineering and biomedical engineering

Wonmo Kang
Assistant Professor, mechanical and aerospace engineering
PhD, University of Illinois at Urbana-Champaign
Mechanics of bio- and nanomaterials for injury prediction and energy manufacturing applications

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Lecturer, industrial engineering
PhD, Old Dominion University
Risk management, systems engineering and engineering management

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Lecturer, construction management
MS, Arizona State University
Construction management with a focus on pre-construction and design phase processes

Leila Ladani
Professor and School Director, manufacturing engineering
PhD, University of Maryland-College Park
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PhD, Indiana University
Computational biology, bioinformatics and genetic variation

Michael Machas
Lecturer, engineering education
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Metabolic engineering, synthetic biology, molecular dynamics and engineering design

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Power electronics, energy conversion, optimization and reliability studies of power electronic systems

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PhD, Arizona State University
Haptic perception and haptic interface design for human augmentation, assistive and rehabilitative technologies for people with disabilities

Steven Millman
Professor of Practice, electrical engineering
PhD, Stanford University
Digital design

Alexandra Navrotsky
Professor, Chemical engineering
PhD, University of Chicago
Relating microscopic features of structure and bonding to macroscopic thermodynamic behavior in minerals, ceramics and other complex materials

Hasan Ozer
Associate Professor, civil, environmental and sustainable engineering
PhD, University of Illinois at Urbana-Champaign
Construction materials focused on pavement material characterization, pavement design, rehabilitation and preservation

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Hydrology, water resources management, numerical simulation and coupled natural-human systems

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Assistant Professor, computer science and engineering
PhD, Tsinghua University
Data-intensive distributed systems, machine learning systems, blockchain and development of dynamic applications
Dimitri Bertsekas reinforces computational decision-making

Throughout his career, Dimitri Bertsekas has enjoyed engineering’s rich variety of challenges and how many of them can be viewed through a “unifying mathematical lens.”

An avid researcher, author and educator, Bertsekas has used this approach to contribute to advances in multiple research areas, including optimization, reinforcement learning, machine learning, dynamic programming and data communications.

He has written many influential papers and books, and he has received key awards from the American Automatic Control Council and from the Institute for Operations Research and the Management of Science, known as INFORMS. In 2001, Bertsekas was elected Member of the U.S. National Academy of Engineering for “pioneering contributions to fundamental research, practice and education of optimization and control theory, and especially its application to data communication networks.”

“I found ASU to be an exciting place for research where I can work with outstanding colleagues,” says Bertsekas, who joined the ASU faculty in Fall 2019 as Fulton Chair of Computational Decision Making in the School of Computing, Informatics, and Decision Systems Engineering, one of the six Fulton Schools.

In January 2020, Bertsekas started teaching a research-oriented special topics class on distributed reinforcement learning and he is preparing a research monograph based on his lectures to be published this year.

Bertsekas’ main research focus is reinforcement learning — “a field that addresses large and challenging multistage decision problems, often with the use of neural networks and self-learning.”

The work continues to be rewarding because Bertsekas says reinforcement learning includes a large enough pool of methods that students and researchers can address engineering problems of enormous size and unimaginable difficulty.

New school director sees opportunity for global impact

When he agreed in mid-2018 to take on the interim director position for the School of Sustainable Engineering and the Built Environment, one of the six Fulton Schools, Ram Pendyala recalls he “indicated emphatically” he wasn’t interested in moving up to the director’s job.

But over time, Pendyala says, “My thinking evolved. I saw how fulfilling it is to engage more broadly with faculty and students and help them pursue their aspirations.”

Now he is intent on “seeing the school think bigger and contribute more vigorously across the many fields of engineering we encompass,” he says.

So, what better role than director to continue the work of “elevating the school’s place in the world through the impact we can bring to our profession and society at large,” he says.

Pendyala now oversees a school offering courses and research intertwining multiple branches of engineering and science — from construction engineering and technology, materials science and sustainability, to environmental, biological and energy engineering, among other related disciplines.

Pendyala is particularly accomplished in his own area of transportation systems engineering, planning and analysis. He has been a university educator and researcher for almost three decades, conducting more than $12 million in sponsored research and publishing more than 200 research articles that have been cited widely by his peers.

His work has garnered numerous honors and leadership roles with major organizations in his field. He is currently the director of a Tier 1 University Transportation Center sponsored by the U.S. Department of Transportation.

As a school director, Pendyala will continue to teach, conduct research and mentor students, so that he “stays connected” to faculty and students and pursues endeavors he has been passionate about throughout his career.

To better address future workforce needs, Pendyala intends not only to grow the school’s programs but also expand access to them by developing more online curricula, as well as more continuing education opportunities for professionals in the field.
Students **lead charge in industry productivity**

Other than a general interest in engineering, Ryan Milcarek says his career aspirations as an undergraduate lacked focus. That is until he joined the Industrial Assessment Center, or IAC, program.

“I had no idea about what I wanted to do when I started,” Milcarek says. “But the IAC just jibed for me right away. I had a fixed purpose from that point on. It was a huge turning point.”
Funded by the U.S. Department of Energy, IAC programs deploy teams of college students to provide primarily small to medium-sized manufacturing companies no-cost assessments of their operations to improve energy and water use efficiency, reducing resource waste and increasing productivity.

Milcarek’s two-year IAC experience at Syracuse University in New York “got me deep into the energy field,” he says, and became the catalyst that helped earn him a scholarship and later a research fellowship. Hen then pursued graduate studies, culminating with a doctoral degree in mechanical engineering.

After completing a postdoctoral research fellowship, Milcarek landed an assistant professor position in 2018 in the Fulton Schools. His job duties now include helping to provide similarly valuable educational and career boosts to students as one of two assistant directors of ASU’s IAC program, called IAC@ASU.

Students are getting to see what real life is like in the demanding world of competitive industry, says IAC@ASU director Rene Villalobos, an associate professor of industrial engineering in the School of Computing, Informatics, and Decision Systems Engineering.

The assessment projects “are not homework assignments,” Villalobos says. “We run things like a small business.”

Project manager Gamze Gungor-Demirci emphasizes that while the student teams are led and mentored by faculty members and support staff, they act as consultants and shoulder responsibility for completing and presenting assessments and making recommendations to the companies for improvements.

Their ultimate rewards, however, are the real-world experience and measurable progress they can add to their resumes.

Since its inception, IAC@ASU has completed nearly 500 energy assessments and provided more than 3,800 recommended actions. These recommendations have saved companies a cumulative total of more than $72 million in operating costs and more than 1,100 gigawatt-hours of energy — an amount roughly equivalent to what would be required to provide electricity to about 80,000 homes for a year.

Companies that have implemented the student assessment teams’ recommendations over the last four years have seen an average energy cost savings of almost $43,000 annually, and an average reduction in carbon emissions from the companies’ operations of 324 tons per year.

Patrick Phelan, a Fulton Schools professor of mechanical and aerospace engineering, directed IAC@ASU from 1997 to 2006.

“I don’t know of any other program that enables our students to have such an impact on our community, while at the same time aligning our educational and research efforts to solve practical problems,” says Phelan, who currently serves as one of the center’s assistant directors. ■
“One of the best aspects about working here is transforming good ideas into reality,” says Zachary Holman, an associate professor at Arizona State University. “Anyone developing an innovative new solution can find the support to make it happen. This sense of possibility permeates our culture.”

Holman directs the faculty entrepreneurship program at ASU’s Ira A. Fulton Schools of Engineering, where students, faculty and staff are all encouraged to find a way to make a difference in society. While the same might be said of their peers at universities across the country and the world, the Fulton Schools has a remarkable array of resources that create a unique hub of technical entrepreneurship in the nation’s largest engineering program.

“Academics spend a lot of time thinking about how to solve interesting problems,” Holman says. “But we traditionally devote much less time to determine whether those solutions matter to the broader world. Consequently, we want to create researcher-entrepreneurs at the Fulton Schools. We want people pursuing real impact.”

Cultivating an entrepreneurial mindset is central to the Fulton Schools’ mission. For example, beginning in the fall of 2020, newly hired faculty members will attend workshops that teach them how to pursue truly meaningful research, and get programmatic support if they wish to commercialize their work.

"Up to 40 of us gather each month to share experience and expertise," Holman says. "We call ourselves the Fulton Faculty Founders or ‘Triple-F Squad’. One person may know a good intellectual property attorney, while someone else may be able to help with lab space for rent. We promote best practices in support of new ventures across our cohort.”

The Fulton Schools also offers a “customer-discovery,” or market analysis, training program that prepares faculty-student teams to participate in a six-week, National Science Foundation Innovation Corps experience designed to help move research from the laboratory to the marketplace.

Additionally, up to three Fulton Entrepreneurial Professors fellowships are available each year to support faculty members who are at the cusp of technology
commercialization. Those chosen are awarded $100,000 annually for up to two years to accelerate the success of their ventures.

“The program releases you from teaching, and enables you to hire someone to make sure that your lab group remains stable while you devote time to getting your new company up on its own two feet,” says Visar Berisha, an associate professor with both the Fulton Schools and ASU’s College of Health Solutions.

Berisha was selected for a fellowship in 2017 and says the experience was vital to launching Aural Analytics, a business he co-founded to market an innovative new tool that diagnoses and monitors neurological disorders using speech patterns.

“It’s difficult to get people to invest in a concept if the founders can’t offer their undivided attention,” Berisha says. “So, this fellowship certainly made a difference to investors. In the end, we were able to be selective about which venture capital firm we wanted to work with.”

“At the same time, pursuing innovation with market value does not compromise your advancement as an academic here,” Berisha adds. “Even the guidelines for earning tenure within the Fulton Schools embrace entrepreneurship. This mindset is actually part of how we are evaluated.”

The entrepreneurial mindset extends beyond faculty circles and across the entire engineering community at ASU, which includes campus facilities not traditionally recognized as innovation hubs.

“We have a tremendous range of resources within our library system,” says Eric Prosser, the engineering and entrepreneurship librarian at ASU.

“I help our Fulton Schools students and faculty in searching through fewer proverbial haystacks to find more needles.”

“For example, we see some people with novel ideas who immediately want to obtain a patent. While a patent might be important at some point, getting one is often not your first priority,” Prosser says. “Do you know the current market for your idea? Are you aware of the relevant industry standards and any regulations related to developing your concept? These are crucial early questions, and my colleagues and I can help you to quickly find answers.”

“Beyond research support, libraries are uniquely positioned as a crossroads of all disciplines on campus,” Prosser says.

“So, I also seek to create broad partnerships that help our engineering students and faculty to develop their innovations with insights from peers in other ASU schools and programs who are doing complementary work.”

Making connections is overtly the goal of ASU’s Entrepreneurship + Innovation Career Fair. The inaugural event in March 2020 facilitated internship and hiring discussions among nearly 200 Fulton Schools students and 20 startup ventures, led by ASU faculty, students and alumni.

“It certainly exceeded my expectations,” says Holman, whose Swift Coat glass technology startup participated in the fair to hire three new engineers. “A panel of seasoned startup veterans shared real-world insights with the students and others attending, and the room was filled with conversation for hours.”

Fair attendees also received a glimpse into ASU’s new master’s degree in innovation and venture development. The program is offered through a partnership among three ASU entities—the Fulton Schools, the WP Carey School of Business and the Herberger Institute for Design and the Arts.

Starting in the fall of 2020, the first cohort of graduate students will collaboratively create and develop new ventures as they (continued next page)
explore a rigorous framework designed to instill entrepreneurial leadership.

The emergence and growth of a program like this one has the potential to raise the level of knowledge and competition within Venture Devils, the cornerstone of ASU’s extensive innovation development resource network.

Led by Brent Sebold, director of Entrepreneurship + Innovation at the Fulton Schools, Venture Devils helps founders commercialize new products and services.

“We actually think of Venture Devils as an inclusive league of practicing entrepreneurs,” says Sebold. “We open the door five times a year for anyone within our community who wants to start advancing a new venture. You need only a company name, a logo, a web landing page, a first-draft executive summary and a first-draft pitch deck. And there are plenty of resources available to get you to that point of admission.”

The low barrier to entry translates into high popularity. More than 400 startup ventures now populate the Venture Devils league, and fully half of them are the initiatives of Fulton Schools students, faculty and alumni.

“When you are in, you stay in,” Sebold says. “For as long as you want to drive your venture forward, you have access to dedicated mentoring, working space, labs and funding.”

On the funding front, more than a third of Venture Devils engineering startups compete for a share of $500,000 that is awarded through the fall and spring semester Demo Day competitions, during which teams pitch their nascent ventures to panels of judges.

“Funding entrepreneurial activity from the Fulton Schools community is certainly important. As well, a lot of skill development and professional networking happens through Demo Days and other high-profile events, such as our annual, outward-facing ASU Innovation Open tech startup competition. They all help innovators down the path to creating new businesses,” Sebold says.

“However, the scope remains broader than commercialization. It’s leveraging expertise in ways that maximize collective benefit. We actively embrace and promote that mindset.”

Forging a path to smart, sustainable cities

Smart technologies have the potential to make cities safer and more secure, healthier, more sustainable and resilient, and significantly improve the quality of life for citizens.

It is projected that by 2050, more than 60% of the world’s population will live in cities, making it critical to create environments that are efficient and well-organized. One way to achieve this is by developing “smart,” interconnected cities and regions.

In Spring 2020, Arizona State University announced the launch of the Zimin Institute for Smart & Sustainable Cities. The Zimin Foundation, a non-for-profit organization established to support education and science, selected ASU and the Fulton Schools of Engineering as the site for the world’s second Zimin Institute because of its record of innovating technology solutions, its entrepreneurial ecosystem and access to multidisciplinary expertise.

Established to help drive a people-centric vision for the future of cities, the Zimin Institute at ASU is focused on creating a world where the rich functionality and power of advanced technologies are seamlessly integrated into the physical spaces where people live, work, learn and play.

The institute connects researchers from disparate disciplines and applications spaces with collaborators in academia, industry, government and communities, and provides funding for aspects of smart cities-related ventures for which conventional federal, state, or industry funding may be inherently difficult to secure.

With a goal of supporting and growing the smart cities and regions ecosystem, the Zimin Institute grants funding to ASU faculty members to support their use-inspired and application-driven projects, which may be anywhere along the early-stage, mid-stage, or later-stage innovation value chain.

The vision of the institute is to identify needs and connect researchers with opportunities for funding to help group the smart cities ecosystem and engage communities with new, integrative solutions.

The Zimin Institute has four priority themes:

- Daily life and human connection, interaction and engagement;
- Sustainable and healthy environments and spaces;
- Inherent security, safety and public well-being; and
- Infrastructure surety, resilience and integrated functionality.
ASU Innovation Open showcases premier student ventures

Powered by the Ira A. Fulton Schools of Engineering, Avnet and Breakthrough Energy Ventures, the ASU Innovation Open is quickly becoming one of Arizona State University's most anticipated entrepreneurial events.

Open to student-led technology ventures from all over the world, the 2020 ASU Innovation Open competitors pitched for a chance to win up to $300,000 in funding — the most ever offered at the competition.

“Innovation Open represents ASU’s commitment to valuing entrepreneurship in all of its forms,” says Fulton Schools of Engineering Dean Kyle Squires. “For the fourth consecutive year, we have the opportunity to play a role in this impactful experience for young innovators as they move one step closer to bringing their ideas to the marketplace.”

The 2020 competition drew in more than 100 ventures representing 46 universities around the world. It was also the most diverse applicant pool the competition has seen with half the teams being led by minorities and 30% by women. Twenty-five semifinalists were selected to pitch before a panel of judges and industry professionals for their opportunity to win seed funding.

“This year we saw a meteoric rise in the number of applications since last year’s competition,” says Cody Friesen, an associate professor of materials science and engineering in the Fulton Schools and CEO of Zero Mass Water, one of ASU Innovation Open’s founding sponsors. “The talent among these competitors continues to impress us.”

Zero Mass Water is an ASU spinoff founded by Friesen in 2015. Friesen, who has developed a process that combines solar power, air and electricity to ignite a condensation process that draws water from the atmosphere, says his company is about technology that uplifts others. Designed to advance student-led startups that are tackling some of the world’s most challenging problems, undergraduate and graduate students arrive at the nation’s most innovative university to pitch their leading-edge technology solutions to a panel of startup leaders and industry experts in the annual competition.

Their ventures cover areas like artificial intelligence, autonomous transportation, agricultural and climate technology, health care, internet of things, photovoltaics, wearable technology and many more.

The 2020 competition had two grand prize winners that earned $100,000, and four $25,000 winners that coincided with different tracks of the competition.

The $100,000 Avnet Prize went to Sebastien Mannai, CEO of Acoustic Wells, who developed his technology during his PhD research at the Massachusetts Institute of Technology. He created a sensor that acts as a kind of “stethoscope” for oil wells, allowing them to be monitored remotely and cutting down on in-person inspections and thousands of miles of drive time.

Carlos Navarro, a chemistry PhD student at the University of Southern California, won the other $100,000 prize donated by Breakthrough Energy Ventures, an investment fund started by Bill Gates. Navarro’s venture, Closed Composites, uses chemicals to recycle carbon composite, a very strong, lightweight material used to make airplanes and cars. Currently, there’s no way to recycle the substance, which is typically shredded and burned.

Winners of the signature competition have continued to earn success with their ventures beyond ASU Innovation Open. The 2019 grand prize winner Katherine Sivoz was a featured speaker at the 2020 event. Since last year’s competition, the Stella Biotechnology CEO has gone on to win more than $33 million in seed funding. Stella Biotech’s proprietary biosensor technology and IoT capabilities provide a data-driven approach to ensure the quality of fresh produce through the food supply chain.

ASU Innovation Open embodies the community of innovation and entrepreneurship that permeates ASU and the Fulton Schools of Engineering. The competition is made possible with the support and industry expertise of a growing list of sponsors, partners that provide critical venture mentorship and funding to the student competitors.
New entrepreneurial master’s degree combines engineering, business and design

Arizona State University is offering a unique new degree to teach students from any background how to launch a successful venture.

The Master of Science in innovation and venture development is a transdisciplinary partnership among three schools at ASU: The Design School in the Herberger Institute for Design and the Arts, the W. P. Carey School of Business and the Ira A. Fulton Schools of Engineering.

With its first cohort beginning Fall 2020, the one-year, on-campus program is experiential. Students will participate in several intensive studio courses and work in teams, according to Cheryl Heller, the director of design integration, a joint position among the business, engineering and design schools.

The degree has a STEM certification, which activates additional financial aid for students who are veterans and also allows international students to stay in the U.S. an extra year to get work experience.

Students enrolled in the program will “choose an issue or a pain point, research it, identify a solvable problem, develop ideas, fail, prototype, develop a business model and learn the essentials of scaling the venture,” said Heller, who also is a professor of practice in innovation design.

Project identification and prototyping are key aspects of solution development that Fulton Schools students are exposed to, both in their classes and through professional development programs offered by the school.

The program is being funded by Tom Prescott, an alumnus of ASU and the former CEO of Align, the company that produces the Invisalign teeth straightening system. Prescott has been involved in entrepreneurship at ASU for several years through the Tom Prescott Student Venture Fund and announced the new degree program at the recent ASU Innovation Open pitch competition.

Students will have milestones they have to meet, and the studio courses are meant to be responsive. The program builds on principles of entrepreneurship and innovation, two crucial aspects of the engineering and solution development process.

The students also will learn the “soft skills” of entrepreneurship — high-performance teamwork, ethics and leadership.

Graduates of the program will be equipped with the skills they need to lead cross-disciplinary teams in solving real-world problems, and combining engineering problem-solving with a business entrepreneurial mindset.
Capstone projects confirm student readiness for industry

Many students in the Fulton Schools devote a large part of their last year to completing a capstone project, which demonstrates the insights and skills they have developed at ASU. Working in teams of two to seven people to solve a practical industrial problem, the experience is both a significant challenge and a source of substantive growth.

“It’s an opportunity to practice professionalism and engineering design in a low-risk environment,” says Ryan Meuth, a capstone project coordinator and a senior lecturer in the School of Computing, Informatics, and Decision Systems Engineering, one of the six Fulton Schools. “Students can learn from their mistakes without any real career impact. So, the capstone course offers a meaningful transition from the academic world to the professional one.”

For many students, capstone work involves direct contact with members of industry who sponsor a project and liaise with student teams as they tackle the challenges of solving their assigned problem.

Brett Goldsmith, an electrical systems engineering major, and his capstone team are pursuing a design opportunity posed by NMG Aerospace, an Ohio-based engineering and manufacturing business with a significant presence in Arizona. He and his team are working with NMG to explore the possibility of improving a flight-critical airliner safety system.

“This project has shown me how a lot of the things I have learned in my program are directly applicable to potential career opportunities,” Goldsmith says.

Other capstone projects include a Mayo Clinic initiative to enable a mobile diagnostic tool to scan patient retinas, a General Dynamics Missions Systems effort to apply quantum science to detect eavesdroppers in communications links and a Maricopa County Department of Transportation plan to design a robotic traffic cone placement system to improve safety during emergency incident responses.

At The Polytechnic School, the capstone project process culminates at the Innovation Showcase, an impressive gathering of students, faculty and other stakeholders to review the results of each team’s work.

“We celebrate our students’ abilities to bring together all the components of their education to produce something innovative,” says Darryl Morrell, associate professor of engineering at The Polytechnic School and a capstone project coordinator. “We also build bridges to our industry partners, which benefits our students with increased job opportunities, as well as our programs through added expertise and resources.”
New tool navigates brain’s addiction mechanism

Opioid addiction is a widespread and complex issue, both in society and in the brain.

Barbara Smith, an assistant professor of biomedical engineering, is helping the research community better understand how addiction affects the brain at the cellular level to better combat this debilitating condition.

With support from a 2020 National Science Foundation Faculty Early Career Development Program (CAREER) Award, Smith and her research team are pioneering a new tool to identify and target specific brain cells in a way that has not been possible until now.

“My laboratory is focused on establishing an accurate and scalable technology to better understand fundamental ways the brain communicates across widespread neurocircuitry,” Smith says. “These tools are being developed to explore the underlying mechanisms of opioid addiction and other neurological disorders and diseases.”

Part of what makes the brain amazing is its neuroplasticity, or its ability to change over the course of our lives. These changes can be positive, such as when abilities are remapped after an area of the brain is damaged by a debilitating event like a stroke.

But neuroplasticity can also be negative. In the case of addiction, the mesolimbic dopamine system—the brain’s reward system—can be reprogrammed in a way that keeps a person dependent on drugs such as opioids.

A certain type of neuron (brain cell) in the mesolimbic dopamine system plays a key role in addiction and programming the brain to view opioid use as rewarding. To find ways to address this, it is necessary to understand the function of those cells, how addiction makes changes in them and how the cells are communicating with other cells in a circuit around different areas of the brain.

Smith and her team are pioneering the development of a first-of-its-kind targeting tool called FLuoro-
Acoustic Multipipette Electrodes, or FLAME. The tool improves upon the limitations of existing techniques by incorporating light with acoustics to navigate to specific cell types and get a high-resolution view of what’s happening in those cells, even when they are in deeper regions of the brain.

FLAME integrates a new targeting mechanism into existing micropipette electrodes — tiny glass tubes that have a tip the fraction of the size of a cell. The technology integrates photoacoustics (sound generated by light) and fluorescence (indicators that contrast targets from their surroundings) to navigate toward a specific cell of interest. Once the cell of interest is identified, FLAME can record its electrical activity at a high resolution.

By efficiently targeting cells of interest and recording their activity, FLAME will help researchers to better understand how addiction affects the brain at a cellular level. This enhanced understanding is an important step to developing preventative medicine and effective treatments for opioid addiction in the future.

“Knowledge gained from FLAME will support scientists to make future discoveries within currently unknown areas of neuroscience,” Smith says. “It can open the door to an understanding of the actual workings of deep-brain neurons as they impact addiction, traumatic brain injury, Alzheimer’s disease and pain.”
Professor and alum aim to elevate construction education

Associate Professor Jim Ernzen found his professional passion more than 23 years ago when he began teaching construction management at Arizona State University.

He realized even then how much students need beyond classroom instruction to get a solid education and jump-start on their careers.

Especially vital to students' success, Ernzen says, are mentorships, internships, research training and connections to industry leaders.

"You need to deeply engage your professional community. You need to strengthen generational connections with alumni." Ernzen says "That's how to open a wider path for our students to get the kind of education we want for them."

Ernzen is leading the charge to achieve these goals as the first PENTA Building Group Professor for Construction in the Del E. Webb School of Construction.

Ernzen's overall directive in the position is to enhance the experience of undergraduate students in the school, which is part of the School of Sustainable Engineering and the Built Environment.

Ernzen is working with faculty advisors and student organizations to increase student interaction with alumni and industry, and support students' participation in industry events.

Support for Ernzen's new position comes from ASU construction management alumnus Jeff Ehret, CEO of The PENTA Building Group — a nationally recognized commercial building contractor — and his wife, Mary.

The Ehrets' contributions have helped fuel the advance of ASU's construction education programs for most of the past two decades.

Since 2005 they have funded a scholarship for an undergraduate student pursuing a degree in construction management or construction engineering.

The PENTA Building Group was also a significant donor to the capital campaign to fund construction of the College Avenue Commons building where the Del E. Webb School is housed.

Jeff Ehret says the company's success has enabled him to put his philanthropy to work at ASU, where he earned a bachelor's degree in construction management in 1976 and an MBA three years later.

His donations are "all in the spirit of giving back to an institution that absolutely prepared me well to accomplish what I've done in my profession," Ehret says.

"We want to make sure our graduates walk out of here with a thorough knowledge of what they will do in their jobs and what they need to do to advance in their careers," Ernzen says.
Aashay Arora and Matthew Aguayo’s new technique to make buildings more energy efficient emerged from a very different project. As engineering doctoral students, Arora and Aguayo worked with Fulton Schools professor Narayanan Neithalath to develop a concrete pavement that would be highly resistant to cracking under thermal stress. What they created was a pavement mixture that makes use of phase change materials, which can transform from solid to liquid and from liquid to solid and be used to store or release heat. They found the physical and chemical properties of the phase change materials kept the concrete significantly cooler, and thus much less likely to crack.

Arora and Aguayo decided to explore whether adding phase change materials to paint, plaster and stucco — three of the most common coatings for buildings — could help maintain comfortable temperatures inside buildings.

That project led to the startup EnKoat, Arora and Aguayo’s shorthand for their energy-saving coating. They and Neithalath see the material as a potential gamechanger in the energy efficiency technology industry.

The phase change materials do their work inside the coatings at a microscopic scale, while the surface texture of the coating on walls and roofs remains unchanged.

Beyond making EnKoat a successful business, Arora and Aguayo aspire to see their venture make a positive, widespread environmental impact. By reducing the need for electrical power to run conventional heating and air conditioning units, Enkoat’s founders say if the company can go global, it would help keep millions of metric tons of harmful carbon emissions from entering the atmosphere every year.

Arora and Aguayo received their doctoral degrees in civil, environmental and sustainable engineering, with concentrations in structural and materials engineering at the end of the Fall 2018 semester.

Only a little more than a year later, the promising outlook for EnKoat landed the founders on Forbes magazine’s 30 Under 30 list as innovators who are “figuring out how to make new materials do amazing things.”
WORD SEARCH FUN

Adaptive  Aerospace  Autonomous  Biomedical  Challenge  Chemical  Civil  Cognitive  Collaborate  Computer
Construction  Cyber  Data  Digital  Dynamic  Efficiency  Electrical  Energy  Entrepreneur  Environmental
Industrial  Infrastructure  Innovate  Integration  Invest  Machine  Materials  Mechanical  Nano  Quantum
Partnership  Power  Reliable  Renewable  Research  Robotics  Scalable  Signal  Software  Solar
Solution  Sustainable  System  Transform  Technology  Venture

Find the answers at engineering.asu.edu/answers
An ASU team consisting of three mechanical engineering doctoral students, Faizan Ejaz, Munku Kang and Gokul Chandrasekaran placed among the top five finalists out of 21 teams worldwide in a heat sink competition sponsored by General Electric.

As a third-year chemical engineering student, Alexis Hocken was the lead author of a paper published in a special issue of Industrial and Engineering Chemistry Research, a journal of the American Chemical Society.

Sooraj Kumar A.O. Nair, a civil engineering doctoral student, earned the Student Innovation Fellowship from the Thornton Tomasetti Foundation for innovation in structural engineering and applied mechanics practice. The $5,000 prize will help fund his work on to 3D print cement-based materials and develop a robotic-arm-assisted concrete 3D printing system.

Jayden Booth, an electrical engineering graduate student, and Michael Öberdorf, an electrical engineering major and four-year U.S. Air Force veteran, are among four students from the Fulton Schools who participated in collaborative solar energy research as a part of the NSF’s International Research Experiences for Students program.

Chris Harsh, Riley Tallman, Shabab Siddique, Tyriq Hayes and Xina Tang, all computer science majors, took first place in the inaugural Arizona-wide Robo Hackathon. Team Light Speed, combined knowledge of robotics, internet of things and machine learning skills with the cutting-edge technologies and platforms provided by AWS, Nvidia and SparkFun. The competition was hosted by the University Technology Office through strategic partnerships with the Fulton Schools of Engineering at ASU and the Smart City Cloud Innovation Center, which includes partners such as Amazon Web Services.

Biomedical engineering major Maya Eleff and computer science students Brightan Hsu and Cyrus Hunter worked on an implantable microelectrode system that stimulates the brain in a grid pattern to assist people with extreme vision loss as part of the Grand Challenges Scholars Program.

Desert WAVE, the all-female underwater robotics team of Fulton Schools students made a splash by winning third place at the 2019 International RoboSub Competition. This was a major feat by the first-time competitors who were up against 55 teams from more than 12 countries tasked with designing and building an autonomous underwater vehicle. Their standing made Desert WAVE the highest-ranked from the United States.

Phoebe Henson, who earned an electrical engineering degree in 2015, is helping find effective solutions for astronauts who experience breathing problems during long periods of time inside spacecraft. Recent doctoral graduates Aashay Arora and Matthew Aguayo, founders of the startup EnKoat, are developing coatings embedded with phase-change materials that reduce energy use while regulating temperature in buildings.

Three former Fulton Schools alumni made the Forbes magazine’s 2019 30 Under 30 list.

Three former Fulton Schools alumni made the Forbes magazine’s 2019 30 Under 30 list.
Giving back to the future

When we ask kids what they want to be when they grow up, “engineer” isn’t usually among the top answers. However, many of the dream jobs they do name rely on engineers, computer scientists and other technology professionals to succeed.

So introducing STEM concepts in fun ways and getting to meet engineering students and professionals can spark young people’s interest in these careers.

In fact, engaging outreach activities are what led many current engineering and computer science students to study at the Fulton Schools. Some of these students are now returning the favor and mentoring youngsters through the same programs that introduced them to engineering.

Throughout the school year and over the summer months, the Fulton Schools conducts outreach activities for kindergarteners through high schoolers.
Students can “tap into their curiosity and explore and develop what we call engineering habits of mind, which include creativity, collaboration and problem-solving,” says Jennifer Velez, coordinator senior of the Fulton Schools student outreach and recruitment programs.

ASU also partners with non-profit organization FIRST® (For Inspiration and Recognition of Science and Technology), facilitating robotics programs across the state of Arizona. University students as well as alumni and industry professionals often mentor these teams.

Laura Grosso, coordinator senior for Fulton Schools student organization and outreach retention programs, says FIRST programs teach technical skills as well as “the courage to tackle these really challenging areas of study.”

Zach Smith, a computer science student at ASU, says he knew he wanted a computer-related career as early as third grade. That’s when he began participating in FIRST LEGO League in Flagstaff, Arizona.

Smith became familiar with the college engineering experience as his FIRST Robotics Competition team competed in tournaments hosted at ASU. Talking with undergraduate students and seeing what life could be like as a computer science major at ASU made him all the more eager to study engineering.

The Fulton Schools outreach team also helps middle school and high school students see themselves as engineers through the beginner version of its Engineering Projects in Community Service, or EPICS program. Through EPICS High, ASU student mentors help guide the middle and high students to make an impact in their community by completing a project that applies engineering concepts and human-centered design skills.

Seth Mazza, now an aerospace engineering major, was already interested in engineering, but his two years of EPICS High experience gave him a new perspective and motivation to pursue engineering as a career. The experience of working with stakeholders encouraged Mazza to join the college-level EPICS program.

Not only did Smith and Mazza end up attending ASU, but their early experiences encouraged them to give back by returning to the same outreach programs as mentors for the next generation of budding engineers.

“I wanted to make sure other EPICS High students gained everything I did in the program and more,” says Mazza, who has now mentored EPICS High teams at his former high school for two years.

Mentors can make a huge difference in the lives of others, making mentorship a perfect fit for Smith who volunteers with FIRST programs, helping students who are the same age he was when he started the program.

“Seeing these students grow in the same way I did gives me hope for future engineers,” Smith says. “I know they have the skills necessary to solve the problems of tomorrow.”
Women in engineering

Resilience in materials and life
No stranger to resistance, Regents Professor Aditi Chattopadhyay has forged her own path in aerospace engineering to design resilient materials capable of withstanding the rigors both here on Earth and beyond. Chattopadhyay’s tenacity has informed her approach not only to novel materials, but also the teaching ethos and the culture in her lab, the Adaptive Intelligent Materials and Systems Center.

EPICS students look to improve usability of an Arizona treasure
When students Arianna Comes and Julie Larsen learned about the E. coli contamination at Slide Rock State Park in northern Arizona as high school students, they knew they wanted to do something about it. As part of the EPICS High program, the two developed an autonomous alert system to help inform researchers when E. coli levels exceed U.S. Environmental Protection Agency criteria. Now students in the Fulton Schools, Comes, a chemical engineering major, and Larsen, an aerospace engineering major, are continuing their project at the university level in the Fulton Schools Engineering Projects in Community Service program, known as EPICS.

Making a difference in the community
Fulton Schools alumnus Yung Koprowski was appointed to the town council of Gilbert, Arizona. Koprowski, the founder and principal of Y2K Engineering, brings her experience as a traffic operations engineer and a road safety professional to the post. She is helping community leaders employ technologies to improve traffic efficiency and minimize traffic problems. In 2019, Koprowski was named among the Phoenix Business Journal’s 40 under 40 young professionals list.

DIVERSITY
In January 2019, the Fulton Schools launched an initiative focused on diversity and inclusion for with the goal of becoming a global leader in diversity, equity and inclusion for engineering.

A task force of faculty and staff across the Fulton Schools began the important work of supporting underrepresented groups and promoting their involvement in engineering fields. This work means building and maintaining a student body that is inclusive of all backgrounds and supportive of all dimensions of diversity.

It also means empowering faculty members, staff and students to promote diversity, equity and inclusion.

From 2020 to 2022, the Fulton Schools has developed a plan to meet a number of objectives, including:

- balancing the diversity of students to represent population statistics,
- fostering a culture of inclusion among graduate and undergraduate student bodies,
- providing training to students and faculty to improve diversity awareness, and
- recognizing accomplishments in promoting diversity, equity and inclusion.

As part of this effort, the Fulton Schools also plans to improve K-12 outreach, focusing on schools that serve large numbers of underrepresented minority students, and increase participation in events supporting women in engineering.
“The Baroque Cycle” by Neal Stephenson
Keith D. Hjelmstad, President’s Professor of civil, environmental and sustainable engineering, recommends this series of novels that provide an entertaining and insightful romp through important periods in the early evolution of science, mathematics and engineering.

“The Pleasure of Finding Things Out” by Richard Feynman
Dragica Vasileska, professor of electrical, computer and energy engineering, recommends this work by the renowned American physicist, in which he ruminates about computing technologies, the atomic bomb, nanotechnology, 3D architectures and life in general.

“Astrophysics For People In A Hurry” by Neil deGrasse Tyson
Christopher Buneo, associate professor of biomedical engineering, says the well-known astrophysicist’s description of the magnitudes of the distances and forces at play in the universe can put our own lives in a different light, providing us a very grounding cosmic perspective.

“Our Stolen Future” by Theo Coburn, Dianne Dumanoski and John Peterson
Otakuye Conroy-Ben, assistant professor of civil, environmental and sustainable engineering, recommends this investigation of how chemical pollutants impact our environment and health — including the anthropogenic chemicals used in consumer products.

“Grit: The Power of Passion and Perseverance” by Angela Duckworth
Nikhilesh Chawla, Fulton Professor of materials science and engineering, recommends this as a compelling analysis showing talent and intelligence alone are not enough to succeed. It also takes grit — the ability to persevere and be persistent — to be the best you can be.

“True Genius: The Life and Science of John Bardeen: The Only Winner of Two Nobel Prizes in Physics” by Lillian Hoddeson and Vicki Daitch
Jennie Si, professor of electrical engineering, recommends this biography of a man that defied the stereotype of a genius physicist by being an everyman who never sought the spotlight.

“How To Be Here” by Rob Bell
Brooke Coley, assistant professor of engineering, says this book — subtitled “A Guide to Creating a Life Worth Living” — helps readers contemplate their passions and what’s most important to them and inspires them to pursue those things wholeheartedly.

“The Fourth Industrial Revolution” by Klaus Schwab
Gail-Joon Ahn, professor of computer science and engineering, says this look at past industrial revolutions and advances in technology that sparked major societal change offers lessons about coping with the challenges of today’s ever-changing technological world.

Fulton Schools faculty and staff members recommend these reads to offer insights, inspiration and delight to the ever-curious minds of aspiring engineers and anyone eager to learn something new.

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Need inspiration? Encouragement? A compelling story to engage your heart and mind?
Fulton Schools faculty and staff members recommend these reads to offer insights, inspiration and delight to the ever-curious minds of aspiring engineers and anyone eager to learn something new.