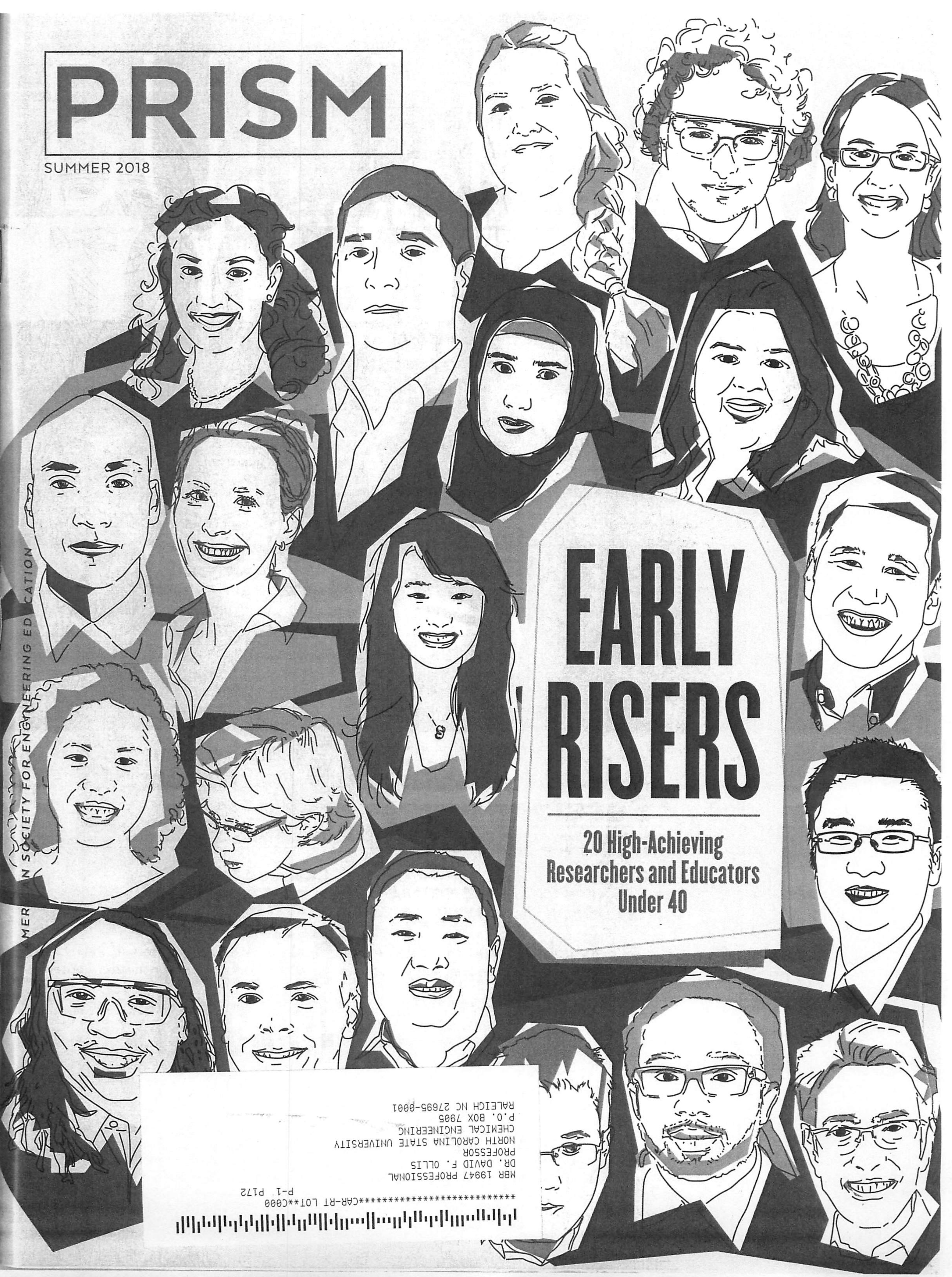
PRISM

SUMMER 2018

AMERICAN SOCIETY FOR ENGINEERING EDUCATION



EARLY RISERS

20 High-Achieving Researchers and Educators Under 40

20 UNDER 40

YOUNG PACESETTERS

Today's early-career faculty are transforming classrooms, technology, and society.

By Thomas K. Grose, Pierre Home-Douglas, Kathryn Masterson, Mark Matthews, Mary Lord, and Jennifer Pocock

They grew up in places as varied as the American midwest, an oil town in northwest China, and Sicily. Their research topics are equally diverse, from food-bank logistics to emergency medicine, and from solar energy to spacecraft. One holds several patents for inventions aimed at reducing fossil-fuel emissions. Another works in a multidisciplinary field on the biomedical frontier: immunoengineering.

What these 20 accomplished under-40 academics all share, however, is a demonstrated talent for teaching, research with real-world impact, or—as is often the case—both. They were selected to highlight the vital role of engineering and engineering technology programs in generating solutions to society's big challenges and shaping a globally competitive workforce. The individuals profiled on the following pages had not turned 40 by December 31, 2017 and were chosen based on recommendations by their schools and colleagues, plus research by *Prism* staff. It is not a scientific sample. Rather, these rising stars represent a balance of geography, discipline, personal background, and type of institution. The common denominator is ingenuity. Some see an obvious void and seek to fill it. Take Manu Platt, an associate professor in the joint Georgia Tech-Emory University bioengineering program founded by past ASEE president Don Giddens. Combining the study of cell biology, hematology, and biomechanics with statistics and computer modeling, he and his team have pinpointed a possible cause for the strokes that impair many children with sickle-cell anemia and found a chemical signal for aggressive breast-cancer tumors.

Miguel Jaller's engineering training makes him challenge how things are routinely done. Reflexive donations after natural disasters, he's found, can result in mountains of unsorted clothing and collection-site "garbage dumps" that complicate, rather than help, recovery efforts.

Engineering education is a prime focus for several researchers. At Tufts University, Kristen Bethke Wendell, an associate professor of mechanical engineering and endowed chair of engineering education, already has shifted her colleagues' pedagogy since joining the faculty in 2016. Her secret? Small steps that evidence shows can make a big difference, such as increasing active problem-solving by training undergraduates as peer-to-peer "learning assistants." At Boise State University, Marc Jankowski spearheaded an effort to incorporate computation throughout the materials science and engineering curriculum.

Another driver of change is the passion for inclusion. Seeing her students segregate themselves, Betul Bilgun, a gregarious assistant professor of chemical engineering at the University of Illinois at Chicago, began randomly assigning groups to collaborate on projects. By semester's end, "everyone knows everyone," she notes. Jenni Buckley, an associate professor of mechanical engineering at the University of Delaware, disrupts groups inclined to divvy up project roles based on gender. Rather than assuming familiarity with tools, she requires all students in her computer-assisted design class to complete a lab in which they practice with every power tool and earn a badge.

As with *Prism*'s 20 Under 40 class of 2014, federal funding—particularly money that offers a leg up for young faculty struggling to see their ideas bear fruit in the lab, classroom, hospital, or marketplace—looms large. That's because the path-breaking work described here, in such areas as cheap solar cells, disaster relief, and safer autonomous vehicles, would not have happened without the basic research dollars that flow from the National Science Foundation, the Department of Defense, and other government agencies.

Thomast K. Grose is Prism's chief correspondent, based in the United Kingdom. Pierre Home-Douglas is a freelance writer based in Montreal. Kathryn Masterson is a freelance writer based in Chicago. Mark Matthews is editor of Prism. Mary Lord is deputy editor of Prism. Jennifer Pocock is associate editor of Prism.

Fanxing Li — EMISSIONS WIZARD

Fanxing Li's methods to improve chemicals sometimes seem more magic than science. An associate professor of chemical engineering at North Carolina State University, he works to eliminate harmful byproducts by turning them into valuable resources, exploring techniques like capturing emitted carbon dioxide and turning it into carbon monoxide—a valuable chemical used in product manufacturing.

Growing up in a small oil town in northwestern China, surrounded by refinery smoke and machinery, Li was fascinated by energy and emissions early on. Concerned about the global increase in population and energy consumption, and what that means for the air, he says, "We need to mitigate any unintended environmental consequences while allowing people to enjoy a higher standard of living." He's not looking into biofuels, though—he wants to make fossil fuels better "because in my opinion, fossil energy won't go away anytime soon." He believes that his research can make "significant impacts" on people's quality of life. Case in point: shale gas.

Li's team recently received a $1.4 million grant from the American Institute of Chemical Engineering's RAPID Institute to figure out how to use some byproducts of fracking. "We are looking at converting the shale gas components that would otherwise be burned and wasted into liquid fuel," he explains. That would save the ethene and other valuable chemicals that would otherwise contribute to global warming.

Another of Li's projects, soon to be commercialized, is a lower-energy way to turn ethene into ethylene. This is important because ethylene is one of the most prolific chemicals in manufacturing—used to make plastics, clothing, and myriad other everyday products.

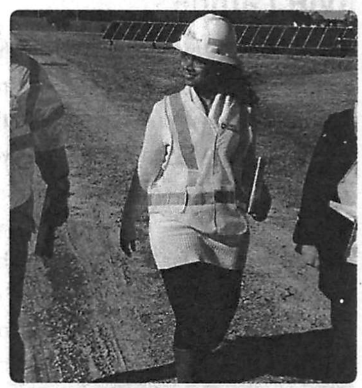
"Worldwide, we consume 150 million tons of ethylene every year," Li says. "To make one ton of ethylene, they emit about 1.2 to 1.6 tons of CO_2. The reason for the emission is because they burn a lot of methane." Li has found a way to skip the burning altogether, increase the amount of ethylene made, and come out with just one byproduct: water.

Li came to the United States when he was 24 to pursue a Ph.D. at Ohio State University after earning bachelor's and master's degrees in chemical engineering at Tsinghua University in Beijing. Now 37, he holds five patents (with 10 more pending) and has won $8.9 million in grants, including an NSF CAREER award and awards from the Departments of Energy and Defense for his emissions reduction technologies.

Saniya LeBlanc — HEART OF AN EDUCATOR

Fixated "from a very young age" on becoming a mechanical engineer, Saniya LeBlanc had an equally clear vision of her future after graduating from Georgia Tech: Join a big company like General Electric, get on the leadership track, maybe earn an M.B.A., and work her way up to executive management. "No one could tell me otherwise," says LeBlanc, who was born in Kansas and reared in Atlanta by Bangladeshi parents. That she is now an assistant professor of mechanical and aerospace engineering at George Washington University, heading a nanomaterials and energy lab, she attributes to several "very determined professors" who nudged her toward a Churchill Scholarship to Cambridge University, Georgia Tech's first.

Still, academia remained a tough sell. Though she'd conducted research as an undergraduate, including in energy giant Schlumberger's Paris office, LeBlanc didn't find the experience inspiring. Instead, she deferred entering a graduate program at Stanford University to teach math and science in a multicultural, inner-city D.C. public high school with Teach for America. That K-12 experience, while "tough on me," equipped LeBlanc with the lesson planning and real-world classroom skills to be an effective-yet-caring instructor. She soon realized that getting pupils to master geometry was a small part of a broader, more critical mission. "To create a safe space and show them there was a world beyond the world they knew—that was my job," she says. Among her proudest achievements: developing an after-school advanced physics class for a group of students who aspired to study engineering. All but one have since completed their degrees. "She clearly has the heart of an educator," attests Santiago Solares, LeBlanc's departmental colleague and mentor.



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After earning a Ph.D. and a stint at an energy-technology start-up, LeBlanc, 37, joined GW in 2014. She developed and teaches a popular, National Science Foundation-funded nanotechnology practicum designed to train undergraduates and younger students on new fabrication tools and techniques. Her lab conducts pioneering research on energy-conversion technologies and nanomaterials that could vastly improve efficiency and reduce the cost of electricity—while also helping her campus draw more power from renewables and meet its sustainability goals. In teaching four undergraduate and two graduate courses and helping students with research showcases and conference presentations, LeBlanc stresses the importance of precision, accuracy, and mastering underlying physics concepts. She herself learned that lesson early in grad school, when a tiny error in an otherwise flawless fluid-dynamics calculation yielded the wrong number. Had she been designing a bridge, her professor warned, it would have fallen down.