

PRISM

WINTER 2023

ENGINEERING + LAW

AI INVESTMENT



Metamorphosis

Institutions aim to reshape education by helping students connect learning to purpose.



The Future of Engineering Education

2024 ASEE Annual Conference

Join us at the 131st ASEE Annual Conference in Portland (June 23–26)! Celebrate engineering education with teachers, students, professors, and professionals. Stay tuned for details on sessions and speakers.

Don't miss this empowering event!



Register today

#ASEEannual

FEATURES

14 COVER

LEARNING FOR LIFE

An engineering education pioneer pinpoints what students need and colleges seldom deliver: a guide to future job satisfaction and personal fulfillment.

By Thomas K. Grose

18 FEATURE

SPIRIT OF THE LAW

A master's program for STEM professionals provides valuable legal context for engineers and innovators.

By Pierre Home-Douglas



© MIT Media Library/Freepik

14 Cover

DEPARTMENTS

2 FROM THE EDITOR

5 HERITAGE MONTH

6 FIRST LOOK

10 DATABYTES
Stop or Go?
Compiled by Jennifer Pocock

12 UP CLOSE
Best of Both Worlds
By Christina Folz

13 INSIGHTS
Frankenstein Lives!
By Benjamin Laugelli

22 ON MY SHELF
Tech Troubles, STEM
Romance, Life in Review

23 CAREER CORNER
Author, Edit Thyself
By Natalie Schriefer

24 ASEE TODAY
From the CEO's Desk
Elections and
Constitutional Changes
ASEE Fellow Nominations
Hall of Fame Awardees
130th Gala

28 OUT OF THE ARCHIVES

SYMBIOSIS



“The whole is greater than the sum of its parts.” The statement is a cliché, but for good reason. It contains a timeless message about the benefits of joining disparate elements. A number of the articles in Winter 2023 *Prism* carry out that theme.

Our cover feature by Thomas Grose examines an initiative launched by Olin College of Engineering’s retired founding president, Richard K. Miller. With the innovative, entrepreneurial spirit Olin is known for, Miller started the Coalition for Transformational Education to help revamp higher education and its overall impact on students. Bringing together a range of institutions for mutual support and

learning, CTE hopes to spark a broad movement in which students not only earn a degree but also cultivate a lifelong sense of purpose and well-being.

Northwestern University has also innovated its way to a unique, collaborative offering. As Pierre Home-Douglas writes in our second feature, the university’s master of science in law program helps engineering and other STEM professionals better understand the legal, regulatory, and intellectual property implications of their work. Students don’t aim to become lawyers but to expand the knowledge they can apply to their careers.

While the Northwestern program is reported to be one of a kind, the integration of liberal arts and engineering is well established. Our Up Close profile highlights an engineering educator who has made a career out of merging these two, seemingly very different, areas—and her students gain from the efforts. In the InSights column, another engineering professor describes how he brings literature—specifically Mary Shelley’s *Frankenstein*—to bear on his teaching. In studying the novel, students learn important lessons on engineering ethics. Finally, STEM mixes with romance in a series of books by an ASEE member; read about her series in On My Shelf.

Also stronger due to its individual parts: ASEE. Each of you plays a key role in that. Vote in our upcoming Board election, review proposed constitutional changes, and submit nominees for the next group of ASEE Fellows. More information on these ways to contribute is on p. 25.

We had a blast celebrating with some of you at our 130th Gala in October. Don’t miss the list of 2023 Hall of Fame inductees announced at the Gala on p. 26, and some excellent photos from the night on p. 27.

I wish you a holiday season greater than the sum of its sometimes-stressful parts. May you enjoy your time off and may it incorporate the key elements of family, friends, and fun.

EVA MILLER
e.miller@asee.org

POINT.

CLICK.

YOU’RE THERE!

PRISM ONLINE.

www.asee-prism.org

ASEE PRESIDENT'S AWARD

JAMES H. MCGRAW AWARD

ASEE LIFETIME
ACHIEVEMENT AWARD

JOHN L. IMHOFF AWARD

BENJAMIN GARVER LAMME
AWARD

DONALD G. NEWMAN
NATIONAL ENGINEERING
ECONOMY TEACHING
EXCELLENCE AWARD

CHESTER F. CARLSON
AWARD

NATIONAL OUTSTANDING
TEACHING AWARD

CLEMENT FREUND AWARD

CONSTITUENT DIVERSITY,
EQUITY, & INCLUSION
AWARD

ROBERT G. QUINN AWARD

DUPONT MINORITIES IN
ENGINEERING AWARD

SHARON KEILLOR AWARD

FREDERICK J. BERGER
AWARD

WILLIAM ELGIN WICKENDEN
AWARD

ISADORE T. DAVIS AWARD

NATIONAL ENGINEERING
TECHNOLOGY TEACHING
AWARD

CALL FOR AWARD NOMINATIONS

ASEE acknowledges the exceptional accomplishments of engineering and engineering technology educators annually through its Awards Program. ASEE award winners demonstrate the best in engineering and engineering technology education through their commitment to their profession, desire to expand the Society's mission, and involvement in civic and community affairs.

The nominations for the 2024 Awards Program open November 1, 2024, and close February 15, 2024.

The presentation of the awards will be at the 2024 ASEE Annual Conference and Exposition in Portland, Oregon (June 22–25, 2024).

Additional information can be found at www.asee.org/awards. For questions on the awards or nominations process, please contact Sylvie Nguyen-Fawley, ASEE's Senior Governance and Office Services Manager, at awards@asee.org.



PUBLICATION STAFF

Editor
Eva Miller

Freelance Editors
Mark Matthews
Deborah Lee Rose
Jennifer Pocock

Graphic Design and Production
Toni Rigolosi
Lung-I Lo

Copy Editor
Liz Prouty

Chief Correspondent
Thomas K. Grose (Europe)

Contributing Writers
Beryl Lief Benderly
Charles Q. Choi
Pierre Home-Douglas (Canada)
Mark Matthews
Deborah Lee Rose

EDITORIAL ADVISORY BOARD

Chair: Marilyn Dyrud
Professor Emerita, Communication Department,
Oregon Institute of Technology

Paul Basken
Americas Editor,
Times Higher Education

Robin Cogger
Provost,
East Carolina University

Letha A. Hammon
Retired Ethics and Compliance Officer;
Program Manager for Records Management, DuPont Co.

Michael C. Loui
Visiting Professor, School of Engineering Education,
Purdue University

Thomas W. Peterson
Professor and Chair of Civil and Environmental Engineering
University of California-Merced

ADVERTISING

Prism Advertising and Classifieds
Kristin Torun
kristin.torun@cision.com

Rafael Gerena
Publisher

ASEE BOARD OF DIRECTORS

Doug Tougaw, President
Grant Crawford, President-Elect
Jenna Carpenter, Immediate Past President
Elliot Douglas, First Vice President;
Vice President, PICs; Chair, Professional Interest Council I
Carrie Berger, Vice President, Institutional Councils; Chair, Engineering Research Council
Martin Gordon, Vice President, External Relations
Christi Patton Luks, Vice President, Member Affairs
Teri Reed, Vice President, Finance
Donna Riley, Vice President, Scholarship
Lynn Albers, Chair, Professional Interest Council III
Kenneth Ball, Chair, Engineering Deans Council
P.J. Boardman, Chair, Corporate Member Council
Kathleen Luchini Colbry, Chair, Professional Interest Council II
Eric Davishahl, Chair, Council of Sections, Zone IV
Peter Golding, Chair, Professional Interest Council V
John Irwin, Chair, Engineering Technology Council
Tariq Khraishi, Chair, Council of Sections, Zone III
Bala Maheswaran, Chair, Council of Sections, Zone I
Charles McIntyre, Chair, Council of Sections, Zone II
Kaitlin Mallouk, Chair, Professional Interest Council IV
Jacqueline El-Sayed, Chief Executive Officer and Executive Director

ASEE HEADQUARTERS

1818 N Street, NW, Suite 600
Washington, DC 20036
Phone: (202) 949-6726
www.asee.org

Jacqueline A. El-Sayed, Chief Executive Officer
Rafael Gerena, Chief Messaging Officer
Patricia Greenawalt, Chief Operations Officer
Monique Maddox, Chief Administrative Officer
Joseph Roy, Chief Data and Technology Officer
Jaime Ulloa, Chief Financial Officer
Monique Ayala, Director of Conferences and Exhibits
Yvette Deale, Director of Technical Product Management
Sarah DeLeeuw, Director, Innovation and Strategic Direction
Ashley Krawiec, Director of Event Sales
Tim Manicom, Director, Membership
Eva Miller, Editorial Director and Editor
Alexandra Sharpe, Director, Education and Career Development

ASEE *Prism* (ISSN 1056-807), is published four times during the year: Fall, Winter, Spring, Summer (October, December, February, April) by the American Society for Engineering Education, 1818 N Street, NW, Suite 600, Washington, DC 20036. ©2023 by the American Society for Engineering Education. Periodicals postage is paid at Washington, DC, and additional mailing offices. NON-MEMBER/LIBRARY SUBSCRIPTION RATES: \$225 (domestic), \$275 (foreign). Email prism@asee.org to subscribe. PERMISSION TO REPRINT: Address requests to the Editor. Individual readers of this magazine, and nonprofit libraries acting for them, are freely permitted to make fair use of material in it, such as making a single copy of an article, for nonprofit use. Statements and opinions expressed are not necessarily those of ASEE. Change of address notifications must be received at least six weeks in advance. POSTMASTER: Send address changes to ASEE Prism, 1818 N Street, NW, Suite 600, Washington, DC 20036. Printed in the USA.



MARLENE WATSON



Photo Courtesy of Derrick Yazzie/AISES

November is *National Native American Heritage Month*, celebrating the contributions of Native Americans, Alaska Natives, and Native Hawaiians.

Marlene Watson is from the Navajo Nation; her clans are Kinlichii'nii (Red House People) and Nakai Diné (Mexican Clan People). Over her 38-year career, her work has focused on developing sustainable communities. Watson is currently a civil engineer for the Department of Interior's Tribal Transportation program, providing Alaska Native villages with technical assistance on road, bridge, and transit projects. She has been a longtime leader in the American Indian Science and Engineering Society (AISES) and earned its 2023 Ely S. Parker Award, the society's highest professional honor recognizing service and achievement.

This interview has been edited for length.

What does winning this award mean to you?

It brings home what's been driving me since I was a young person: to make sense from all my family has been through. Being relocated off the reservation as a small child, my mom ... and my dad. To use that sense of loss to know that there's a lot to share with others.

My parents also taught me about community involvement and to help. And so [those are] the values that AISES brought to me in my early 20s when I joined. To see Native professionals that went before me and the work they did inspired me. I could do great things [like them].

You have degrees in both engineering and architecture. Why?

I was a structural engineering major at 16 [years old] at UC Berkeley. I went up to my upper division courses and then I switched over to architecture. Solar daylighting and AutoCAD came around, and I wanted to be able to help the Native community from beginning to end, conceptual design to occupancy.

I got my master's in architecture. My engineering advisor said, "What are you doing over there in architecture? You're an engineer!" I said, "Wait one more year and I'll get my master's, and then I'll come back." By [then] they had the Civil Engineering/Construction Engineering Management Program. So I did that and got my master's in civil engineering.

Talk about your current role.

We have a lot of work to do. We're five civil engineers, and we oversee all the projects in Alaska with 231 tribes. So we're constantly moving, especially with that big infrastructure bill. I'm working with a tribe with a \$2.5 million bridge!

What do you enjoy about the job?

Helping build the economic capacity of the tribal members. And providing safe environments, because the weather changes and visibility can be challenging in the villages. [For example,] trail markers so they can see where they're going in the winter.

Can you discuss your student engagement?

When I worked with the AISES chapters, I contacted smaller schools and asked if they had any students [with] an engineering interest. They connected me to one student, and I [provided funding to attend the AISES conference in Washington, DC].

He was a single dad. He said it changed his life. He said "I can really do this." Before, it was just an idea, but attending this conference made it a reality. He said, "I'll go beyond community college and be able to provide for my little one and do all the things I wanted to do."

AISES aims to get more Native people into STEM. What needs to happen?

It's exactly what these regional conferences do. They allow students to see that their ambitions [are] attainable. Bringing people together, and them seeing the importance of the culture they came from. That they're visible. They matter. They can become a leader. They can apply their technical, social, and cultural identities all together into making a difference.

[NATIVE PEOPLE] ARE ENGINEERS AND ARCHITECTS, WE ARE DESIGNERS, BECAUSE OF OUR RELATIONSHIP WITH OUR ENVIRONMENT AND SELF-SUBSISTENCE.

This award, it shows that, innately, [Native people] are engineers and architects, we are designers, because of our relationship with our environment and self-subsistence.

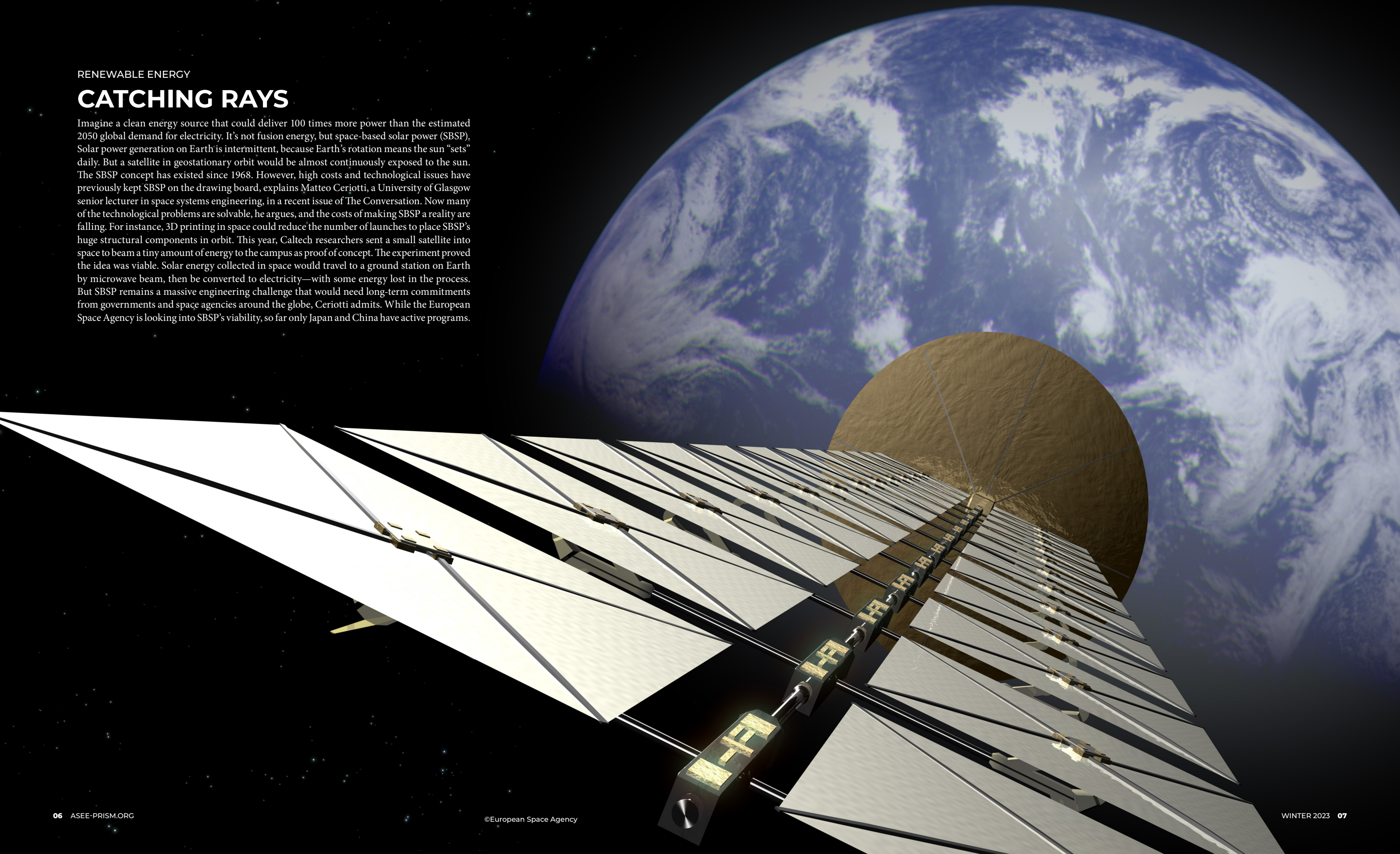
What takeaways would you like to leave our readers?

My brothers were carpenters; that's what inspired me in the building part. But my brother went to Vietnam at 16 years old. I thought if he could serve our country at that age, I could go to the number one engineering school in the world at 16! That was my inspiration. So everyone has a story. You can learn from that.

RENEWABLE ENERGY

CATCHING RAYS

Imagine a clean energy source that could deliver 100 times more power than the estimated 2050 global demand for electricity. It's not fusion energy, but space-based solar power (SBSP). Solar power generation on Earth is intermittent, because Earth's rotation means the sun "sets" daily. But a satellite in geostationary orbit would be almost continuously exposed to the sun. The SBSP concept has existed since 1968. However, high costs and technological issues have previously kept SBSP on the drawing board, explains Matteo Ceriotti, a University of Glasgow senior lecturer in space systems engineering, in a recent issue of *The Conversation*. Now many of the technological problems are solvable, he argues, and the costs of making SBSP a reality are falling. For instance, 3D printing in space could reduce the number of launches to place SBSP's huge structural components in orbit. This year, Caltech researchers sent a small satellite into space to beam a tiny amount of energy to the campus as proof of concept. The experiment proved the idea was viable. Solar energy collected in space would travel to a ground station on Earth by microwave beam, then be converted to electricity—with some energy lost in the process. But SBSP remains a massive engineering challenge that would need long-term commitments from governments and space agencies around the globe, Ceriotti admits. While the European Space Agency is looking into SBSP's viability, so far only Japan and China have active programs.

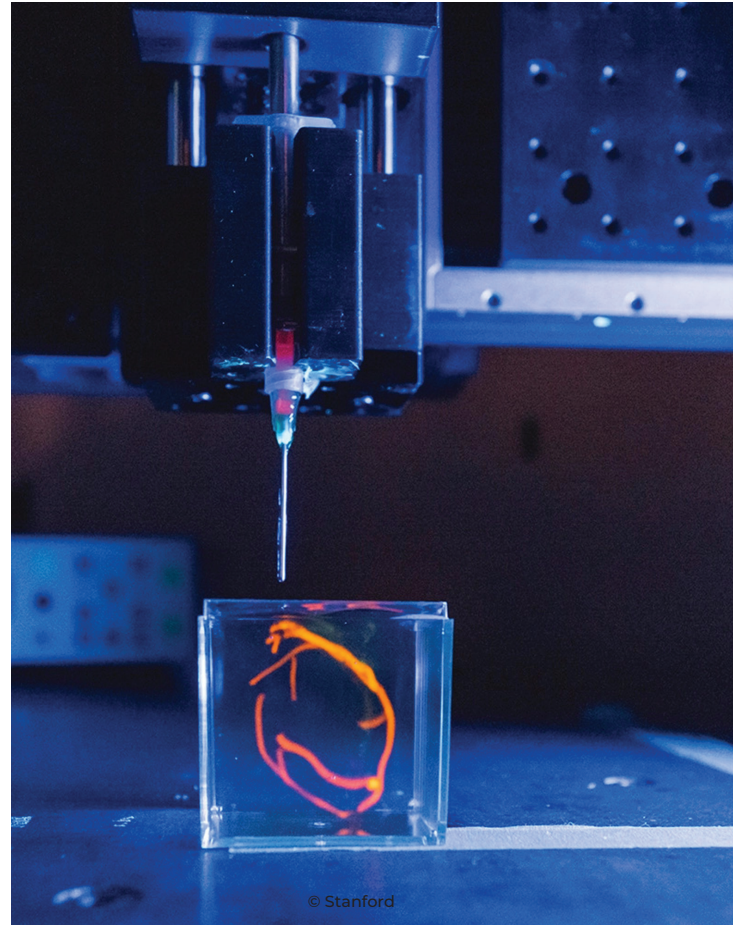


FIRST LOOK

BIOENGINEERING

CHANGE OF HEART

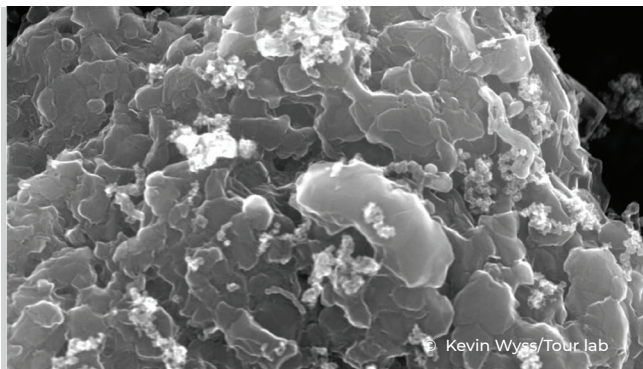
The dream of using 3D bioprinters to create human organs for transplant is steadily becoming a reality. Last year, scientists in Poland placed bioprinted pancreas prototypes, complete with vascular systems, into 14 pigs and maintained stable blood flow in all of them for two weeks. Now the US Advanced Research Projects Agency for Health has given \$26.3 million to Stanford University researchers for a collaborative effort to bioprint a fully functional human heart and implant it into a pig within five years. The bionic heart will be transplanted into a pig with immunodeficiency, to avoid rejection. Recent advances in stem cell science, cell production, and 3D bioprinting have placed the dream of bioprinting human hearts within reach, says principal investigator Mark Skylar-Scott, an assistant professor of bioengineering working with colleagues in engineering, medicine, and computer modeling. Bioprinters use a mix of hydrogels and stem cells as their “ink” to print out, layer by layer, tissue imbued with blood vessels. The billions of cells needed for a human heart will be mass-produced by banks of bioreactors. Some will be specialized conduction cells that comprise a heart’s sinus node, or pacemaker; some will be smooth muscle cells; and some will be vascular cells. Ultimately, human patients’ own stem cells would be replicated in the bioreactors, which should increase the likelihood a patient’s body will accept the finished bioprinted heart. “That is the dream,” Skylar-Scott says. If his multidisciplinary team succeeds, their proof of concept will hasten the day when human hearts and other organs can be designed and bioprinted “from scratch” and matched to individual transplant patients.



BIG DATA

FULL SPEED AHEAD

Globally, more than 1.3 billion cars traverse the world’s roads. But often they’re not moving, resulting in added greenhouse emissions and wasted fuel. Damaged surfaces, heavy traffic, vehicle accidents, and construction slowdowns can cause backups, but many result simply from poor timing of traffic signals. With pollution at intersections 29 times higher than on open roads, keeping traffic moving at signals can help protect the environment and conserve energy. Internet search giant Google has launched Project Green Light to help cities better coordinate and time their traffic signals, reports online news site New Atlas. The company gathers reams of data from the Android devices and in-car navigation systems using its Google Maps app, which constantly reports location data. Google engineers have built a system that uses artificial intelligence and Maps data to model individual intersections and their signals and patterns. The models are then expanded to include nearby intersections so they can be synced to better coordinate the lights. So far, Google estimates the effort can reduce stops and starts by 30 percent and cut emissions at intersections by 10 percent. The new free tool can analyze thousands of intersections simultaneously to keep city traffic flowing optimally. Google has set up pilot programs in 12 large cities worldwide, including Seattle, Hamburg, Haifa, and Hyderabad, and plans to give many more cities the green light to join the project soon.



GREEN HYDROGEN

PROFITABLE PLASTIC

Among efforts to decarbonize energy, hydrogen is getting a second look as a means to reduce greenhouse gas emissions in hard-to-electrify industries like heavy transport as well as steel and fertilizer manufacturing. Yet most hydrogen is derived from natural gas, and this process, though cheap, releases 12 tons of carbon dioxide into the atmosphere for each ton of hydrogen created. In a green energy future, hydrogen will have to be produced using water and renewably generated electricity. As of now that's an expensive proposition, but experts are confident green hydrogen's cost will fall quickly. According to two Rice University materials science and nanoengineering researchers, hydrogen can be produced at no cost using a low-emissions process they've developed to convert waste plastics into hydrogen. (Polyethylene, for instance, is 86 percent carbon and 14 percent hydrogen.) The conversion also produces graphene, a two-dimensional supermaterial composed of carbon atoms. If the resulting graphene were sold at only 5 percent of current market value, it would still generate so much income that the hydrogen could be given away. The researchers exposed mixed waste plastics to rapid flash Joule heating (hitting temperatures up to 3,100 Kelvin) for around four seconds. This left graphene and vaporized hydrogen; up to 68 percent of the vaporized hydrogen was recovered as a gas that's 94 percent pure. Their discovery offers not only the possibility of no-cost hydrogen but also another way to turn the world's growing pile of plastic junk into clean and useful products.

© Gettyimages



MATERIALS SCIENCE

A NEW SPIN

Synthetic, plastic-based materials like polyester are used in about 60 percent of clothing, and these togs generate around 35 percent of the microplastics released into the environment. These cheap, durable synthetics can be made so tough that some are woven into specialty materials like Kevlar and used for bulletproof vests and protective work gear. The textile industry has long wanted to harvest spider silk as a natural replacement for many synthetics, since spider silk is comparably strong. But while harvesting silk from silkworms is a huge commercial business that uses well-established techniques, harvesting silk from spiders is a nonstarter so far. Spiderwebs take up large amounts of space, spiders don't spin out great quantities of silk, and spiders are cannibalistic, so they need to be separated. Research from biological engineers at China's Donghua University may offer a novel solution, according to the website Technology Networks. The investigators used CRISPR-Cas9 gene-editing technology and hundreds of thousands of microinjections to insert spider protein genes for more than 100 amino acids into the DNA of fertilized silkworm eggs. The resulting bionic spider silk, spun by the silkworms, had the same tensile strength and toughness as natural silks produced by orb-weaving spiders. Beyond having potential to replace some synthetic fabrics, the genetically modified silk could have many critical applications, from surgical sutures to smart materials.



© Gettyimages

AUGMENTED REALITY

TECH TOUCHDOWN

Gallaudet University, serving deaf and hard-of-hearing students in Washington, DC, has fielded a successful football team for most of its 150-year history. The Bison have won the Division III Eastern Collegiate Football Conference twice recently. As the *Washington Post* reports, Coach Chuck Goldstein uses American Sign Language (ASL) to call plays for his team. So Bison players have to keep their eyes on him, which is not easy from some field positions. The university worked with AT&T to invent a football helmet that can display plays in augmented reality. With a tablet computer, Goldstein sends quarterback Brandon Washington the plays using 5G wireless technology. The plays are displayed via a tiny lens within the helmet. Goldstein can also hit the exclamation point on his tablet to trigger a red light, which tells Washington to look back to his coach. Once the quarterback has the play, he in turn communicates it to his teammates using ASL. The NCAA has given Gallaudet permission for a trial of the technology in one game so far, which the Bison won 34-20, ending a four-game losing streak. If Gallaudet receives permission to use the helmet permanently, it will literally be a game-changer. "It's not going to level the playing field for us," Goldstein says, "but it's going to bridge the gap."

STOP or GO?

Since the launch of ChatGPT and similar tools last year, generative AI has been the subject of endless debate. The technology has inspired intrigue and outrage at a volume that makes artificial intelligence feel both ubiquitous and inevitable. Technology heads in higher education, however, are taking a more cautious approach. *Inside Higher Ed* polled 140 institutions' chief technology/information officers (CIOs) on whether—and how—they use AI. Only a handful (16 percent) reported that investing in AI was a "high priority" or "essential" to their institutions, while the majority (69 percent) deemed it a low or medium priority.

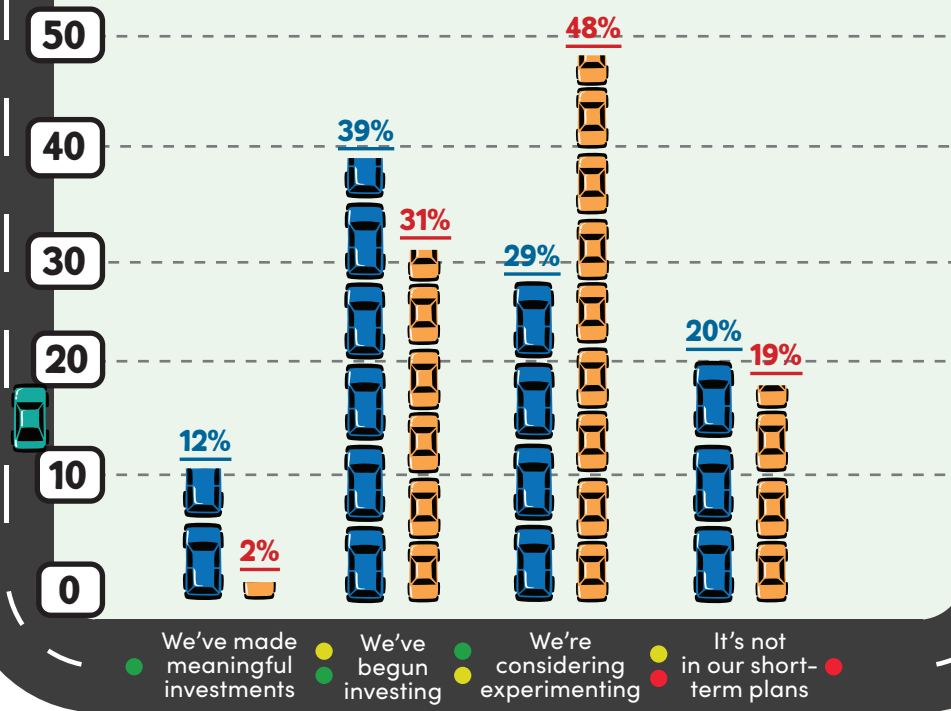
About a third (38 percent) of respondents expressed an interest in experimenting with the technology before investing; another third (35 percent) reported small investments. The overwhelming majority expressed concern over the ethical, security, and privacy implications of using such tools as ChatGPT and Bard: 44 percent were "moderately" concerned about these issues, while 36 percent were "very" or "extremely" concerned.

However, *Inside Higher Ed* points out the discrepancy between investment in and use of AI tools. Despite current hesitancy to invest in the technology, about 40 percent of CIOs reported their school was using generative AI for instructional purposes or "simple administrative tasks." About a quarter (28 percent) said their institution was using the tools to help with research.

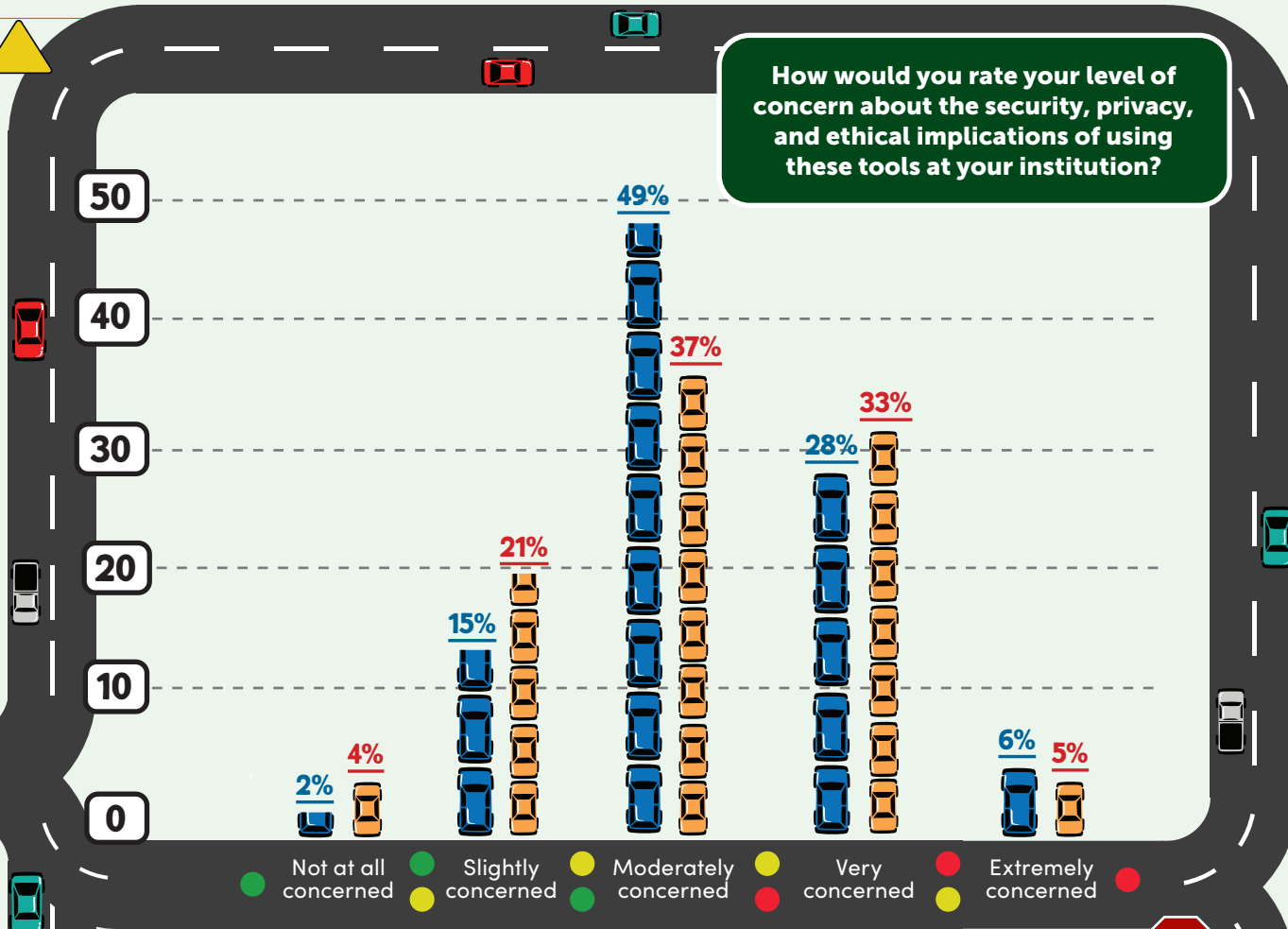
Sources: "Few Campus IT Leaders See AI as a Top Priority," *Inside Higher Ed*, and the publication's 2023 Survey of Chief Technology/Information Officers



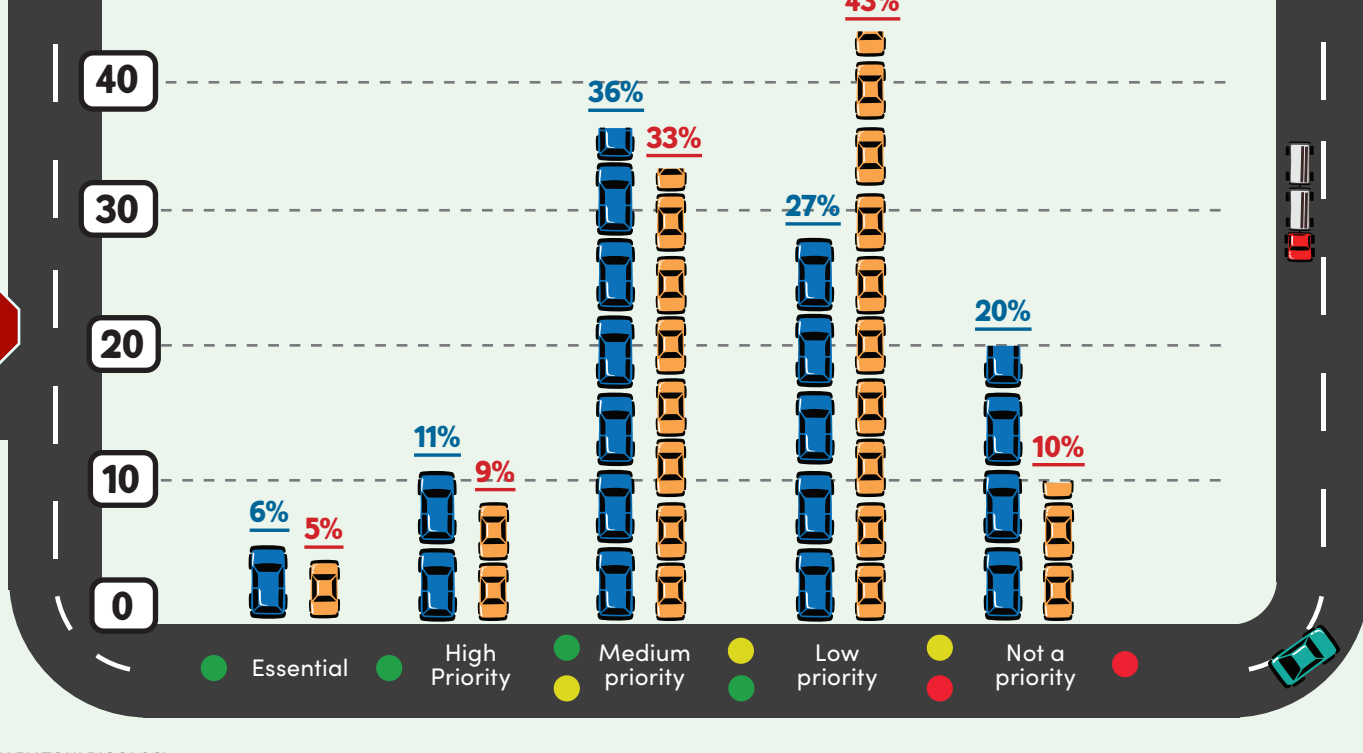
How would you describe your institution's experimentation/ investment in artificial intelligence?



How would you rate your level of concern about the security, privacy, and ethical implications of using these tools at your institution?



How much of a priority is investing in artificial intelligence currently for your institution?



BEST OF BOTH WORLDS

Pursuing dual passions, an engineering professor broadens her students' perspective.



Headshot courtesy of Jenn Stroud Rossmann

Like many future engineers, Jenn Stroud Rossmann built with LEGO as a child. Yet, she wasn't sure if she'd found her place. She didn't see herself as visually or mechanically gifted, and she also loved crafting stories.

Now, as a mechanical engineering professor at Lafayette College, Rossmann joins together her interests in both engineering and liberal arts. For example, she co-led a course on the art and science of fluid mechanics with an art professor, and she offers classes examining the cultural history of engineering.

Since 2016, Rossmann has also written the "An Engineer Reads a Novel" essay series for Public Books, an online magazine of "ideas, arts, and scholarship." The essays examine representations of engineering in fiction. "The more widely you read fiction in particular, the more you develop empathy for people not like yourself," says Rossmann, "and empathy is core to engineering values."

The educator herself published a novel, *The Place You're Supposed to Laugh*, in 2018, as well as numerous short stories in literary journals.

In school, Rossmann's instructors helped convince her to pursue STEM. "Their enthusiasm ... was just electric," she says. For example, her high school physics teacher delighted in the big questions like *how* and *why*.

At first, though, Rossmann heeded the conventional wisdom that STEM and liberal

arts represent distinct—and incongruent—career paths. She kept her two selves separate.

Once she began teaching, Rossmann began to see the benefits of a wider view. She recalled her own engagement when a professor pointed out the similarities between I-beams and railroad tracks and she considered why they might share traits. "The way we do engineering and the artifacts we produce depend on the context," she says. "We live in the cultural context, the historical context, the environmental context."

Rossmann believes that teaching engineering from a holistic perspective is key to moving the field forward. "I try to help students appreciate that engineering is not just a monolith of equations that fell from on high," she says. Instead, "it was made by people who were trying to understand the world and improve people's lives, and sometimes they got it wrong."

That idea may not, at first, seem inspiring. But thinking about engineering as a socially constructed discipline opens students to the possibility that they can shape the field in positive ways.

The educator encourages students to embed their own values—such as racial justice and sustainability—into engineering. "There have been lots of 'triumphs' of engineering that have involved extractive and exploitative practices," she notes. For example, developing

the railroad system that crisscrosses the United States "involved ... disingenuously getting land from the Indigenous people and exploiting Black and immigrant labor."

Rossmann sees liberal arts education as vital to achieving equitable and inclusive engineering learning cultures. She is the founding codirector of Lafayette's Hanson Center for Inclusive STEM Education, one of only two such centers in the country. There, faculty in engineering, math, neuroscience, and women's and gender studies work together to support students and faculty who are underrepresented in STEM. They also help STEM faculty develop more inclusive pedagogies and reading lists.

In 2021, Rossmann and colleague Mary Armstrong received ASEE's Best Paper Award for their work exploring the impact of women's and gender studies coursework on minoritized STEM students. They found that learning about the biases within engineering had a powerful impact on the students' confidence and agency.

Rossmann is Division Chair-Elect of ASEE's Liberal Education/Engineering & Society Division, and she received the Society's 2023 Sterling Olmsted Award for her contributions to liberal arts in engineering education.

She is grateful to have landed at Lafayette, where she's been a faculty member since 2005. The institution has long embraced an interdisciplinary approach to learning. Lafayette's engineering studies program, now 50 years old, results in an AB degree rather than a bachelor of science. Rossmann believes the program exemplifies engineering as a liberal art.

Liberal arts should be about "combining different ways of knowing," the professor emphasizes. Using multiple disciplinary lenses can help students "appreciate the full range of questions they want to consider."

Christina Folz is a freelance writer and editor based in Springfield, Virginia.

FRANKENSTEIN LIVES!

Mary Shelley's novel offers engineering students important ethical lessons.

Written more than 200 years ago, Mary Shelley's foundational work of science fiction remains relevant today as a cautionary tale about unethical practices in science and engineering. Critical editions of the novel published for its bicentennial have underscored its ongoing value as an ethical text in STEM.

Inspired by the novel's capacity to foster moral imagination among engineers, I developed the undergraduate engineering course "Technology and the Frankenstein Myth." Students read *Frankenstein* and reflect on its implications for their work as designers and stewards of innovative technologies. Class discussions center on Victor Frankenstein's unethical practice of techno-science.

The brilliant and ambitious scientist-engineer discovers the source of life as a university student and develops a "proof of concept" in the creature he assembles. Much of the novel is told by a somewhat older, chastened Victor about the follies of that undertaking. He hopes that those who listen will "deduce an apt moral from my tale."

In my experience, teaching *Frankenstein* in the engineering classroom can help students develop a professional identity—in contrast to that of Victor Frankenstein—oriented toward more ethical, socially responsible engineering practices.

Below are a few themes my students reflect on.

Irresponsibility: After Victor animates the creature in his workshop, he recoils in horror at the implications of his actions. He flees, refusing to take responsibility for the creature's care. That experience of painful rejection and neglect has a powerful effect on the creature, fueling his murderous rage. Victor's irresponsibility illustrates the consequences of technological designers neglecting the duty of care they owe to their creations. Such neglect risks turning innovations from beneficial designs that enhance human well-being into harmful, even monstrous, technological terrors.

Presumption: Victor admits that he acted presumptuously in making the creature, failing

to consider the social consequences of his work and the ethical obligations of creating a new life: "In a fit of enthusiastic madness . . . [of] senseless curiosity," he concedes, "I created a rational creature." Victor acknowledges that he's brought to life something he doesn't fully understand, which has a will of its own, whose actions he can't control or predict. Ultimately, the creature turns on Victor and takes from him everything he holds dear. So, when engineers are urged to "move fast and break things," Victor's story cautions them to slow down, reflect, and consider the potential impacts of their designs before they take on a life of their own.

Isolation: When Victor discovers the source of life, he isolates himself from his university professors, friends, and family. He works alone, day and night, in his "workshop of filthy creation." He admits, "I shunned my fellow creatures as if I had been guilty of a crime." Does Victor work in secrecy because, at some level, he suspects that his actions can't be justified? If no one knows what he's doing, then no one can hold him accountable or intervene. Victor's isolation warns against science and engineering work that is performed in secret, that is non-transparent, and that leaves the public uninformed of the risks and unable to provide feedback or consent.

Bias: In Victor's creative process, there is something, or rather someone, conspicuously absent: a woman. Victor succeeds in bringing the creature to life alone without a female partner, a solitary act of human reproduction. Victor's project effectively sidelines women from participation in scientific inquiry and technological design. In doing so, it robs women of the opportunity to contribute meaningfully to fields of inquiry in which all humans have a stake. Victor's actions thus warn against biased practices of science and engineering that minimize or exclude the contributions of women.

Among his various unethical practices, Victor Frankenstein got one thing right: scientists and engineers have "astonishing . . . power placed within [their] hands." How can engineering programs encourage our students



VICTOR'S STORY CAUTIONS ENGINEERS TO SLOW DOWN, REFLECT, AND CONSIDER THE POTENTIAL IMPACTS OF THEIR DESIGNS BEFORE THEY TAKE ON A LIFE OF THEIR OWN.

to use the power of engineering design for social good? Reflecting on Shelley's cautionary tale can provide rich conceptual resources for students to construct professional identities, in contrast to that of Victor Frankenstein, that embody ethical values of care and responsibility, circumspection and forethought, transparency and accountability, and equity and inclusion.

Benjamin Laugelli is an assistant professor of engineering and society at the University of Virginia. He teaches courses that analyze social and ethical aspects of engineering design and practice. This article is adapted from his 2023 ASEE Annual Conference paper "Rogue Engineering: Teaching Frankenstein as a Parable of (Un)ethical Engineering Practice."



Learning for Life

An engineering education pioneer pinpoints what students need and colleges seldom deliver: a guide to future job satisfaction and personal fulfillment. + BY THOMAS K. GROSE +

These are tough times for US colleges. In a sign of growing public skepticism, a July Gallup poll found that just 35 percent of respondents had “a great deal” or “quite a lot” of confidence in the value of a college degree, down from 57 percent in 2015. Humanities and social science programs, in particular, have become culture-war targets. A college diploma remains a ticket to better jobs and higher earnings over time—but not for everyone. Georgetown researchers reported in 2021 that 14.3 percent of high school graduates earned at least as much as the median pay for bachelor’s degree holders. And amid rising costs and debt, plus persistent racial and gender inequities, it’s taking longer for students to see a return on investment.

Meanwhile, many indicators point to a mental-health crisis on campuses. A 2022 Harris poll found that three in five college students had been diagnosed with mental-health conditions, with 43 percent experiencing anxiety and 33 percent depression. Suicide is now the second leading cause of death among those of college age, according to the World Health Organization.

The costs, questionable benefits, and emotional challenges of earning a degree are just “the tip of the iceberg” when it comes to the difficulties confronting students, says Richard K. Miller, the retired founding president of Olin College, the innovative engineering school in Massachusetts. “Different audiences are more affected by different pieces of that, but the collective paints a really dark picture.”

Miller, elected to the National Academy of Engineering in 2012 for “establishing a new paradigm for undergraduate engineering education,” came to see higher education overall as “a house on fire.” Six years ago, he took his first steps to douse the flames. After sharing ideas at an ad hoc meeting of some 20 educators in Chicago, he resigned from Olin to create the Coalition for Transformational Education (CTE). Funded by the Kern Family Foundation and the Argosy Foundation, CTE today comprises 20 (and counting) colleges and universities committed to experimenting, individually and collectively, with the aim of ensuring that all students “have a transforming educational experience that enhances their wellbeing and work engagement throughout life,” as its website states. The purpose of a college degree, CTE says, should be giving students not only financial security and careers that contribute to society, but also a roadmap for obtaining a lifelong sense of worth and personal development.

BACK ON TRACK

“The coalition hopes to make a contribution to restoring the social contract between higher education and the public,” explains CTE Executive Director Keith Buffinton, a mechanical engineering professor emeritus and the former engineering dean at Bucknell University. One way to do that, Miller says, is going back to basics. “Historically, higher education has been about opening doors for the next generation,” he says. “But I think the purpose of higher education has been hijacked a bit in the last number of years” as schools aspired to raise their standing as research institutions.

Miller approached fixing higher education like an engineer. He scoured the Gallup-Purdue Index (now called the Gallup Alumni Survey), an annual survey of college graduates that measures and evaluates what constitutes long-term success for them. Miller drew two main takeaways from what alumni said best prepared them for life: they had at least one instructor who cared about them as a person, and they had opportunities to apply what they were learning in the real world. In CTE’s formulation, that means “access to emotionally supportive faculty mentors who both advise and encourage students’ hopes and dreams” and applied-learning experiences for every student “through extra-curricular programs, co-curricular activities, cooperative learning opportunities, and internships.”

CTE asks its members to generate evidence-based, scalable solutions that will give students a sense of belonging, agency, and purpose in life. The goal, Miller says, is the creation of experiential courses and programs that allow students to “connect the dots” between what they’re learning and how it can help them contribute to

their communities. Coalition members range in size—from the small Olin and Bates College, a selective school in Maine, to Arizona State University, Georgetown, and MIT.

START BY EXPERIMENTING

Like CTE, Olin began without a prescribed teaching method. Newly hired faculty spent a year inventing new ways to educate, testing their ideas on an initial cohort of 30 student “partners” and evaluating the results. Olin’s embrace of its signature problem-based learning (PBL) program, Miller says, “evolved through experimentation as being more effective than other competing ideas.” It wasn’t long after the school’s doors opened in 1997 that Miller began hearing from parents about how transformed their children were, how they suddenly seemed sure of what they wanted to do with their lives and were committed to improving the world. “And they were different people,” he says. “In my view, they were now mission-driven.” That outcome, Miller says, was the result of Olin’s PBL approach.

Miller doesn’t want CTE members to mimic Olin, but rather to come up with their own innovations in experiential learning, tailored to their school’s culture. CTE members are asked to give their faculty the opportunity “to experiment with ideas that address the fundamental issues that we see as transformational, and then spread them in their institution” and ultimately to other schools—a sharing of best practices. To help make that happen, CTE initially funded the schools’ various projects with \$25,000 mini-grants. (There’s a temporary pause on the grants now, due to a shortage of staff to oversee them.)

Eighteen member projects are currently underway. They range from the Ethos Project at the University of Southern California’s engineering school, which is a set of cocurricular and extracurricular courses and programs that aim to help students develop ethical values (see sidebar), to the CLIMBING project at Embry-Riddle Aeronautical University, an experiential-learning program for second-year students that lets them work on high-impact projects attuned to their interests.

Faculty must show evidence their innovations are effective. “You have to assess,” Miller says, “so it’s not just an idea and you pat yourself on the back. You need data to show that it’s actually working.” Gallup has devised an assessment tool for the coalition that faculty investigators can use. It’s based on surveys of current students at member schools. Only two surveys have been conducted so far, Buffinton says, but the early results indicate that current student responses closely match those in the alumni surveys. “The correlation is that the same kinds of experiences that alumni talk about are also incredibly important to current students in establishing their path” for a lifelong sense of value, control, and focus.

MEANING AND PURPOSE

Commonplace at engineering schools, experiential learning is also growing at liberal arts colleges—for instance, with classes that give undergraduates opportunities to work at archaeological digs or in



“We’re betting that you could prevent a lot of this. Our kids would find that somebody cared about them as a person. We could see improvement in suicide rates.”

**— RICHARD K. MILLER,
CTE FOUNDER**

Videos to Relieve Career Anxiety



Many engineering students experience what Harlynn Ramsey, an associate professor of technical communication practice at the University of Southern California's Viterbi School of Engineering, calls a "readiness gap." Too often, new graduates have huge misconceptions about what their future employers will expect of them—particularly in the non-technical areas of communication skills and teamwork. "It's a step into the unknown," as she puts it. To address that problem, Ramsey came up with Vision Venture, a series of short videos in which early-career engineers answer questions about their work.

Students who have watched the videos typically come away with a sense of reassurance and relief after hearing the recent graduates' stories. One, for example, said career worries had triggered feelings of loneliness and isolation, and watching the videos helped remove some of those concerns. Ramsey has since been awarded a \$200,000 National Science Foundation grant to expand the project.

Vision Venture is part of the school's CTE-funded Ethos Project, which comprises one cocurricular and three extracurricular interventions aimed at helping their undergraduate engineering and computer science students develop humanitarian values and ethical practices. Ramsey, whose academic field is English, works in Viterbi's Engineering in Society Program, which houses the Ethos Project. The school sees the project as the first phase of a larger effort to embed the humanities within engineering education.

One of the Ethos extracurricular programs, The Good Life, is a series of three group chats every semester, each involving around 20 students. Moderated by two graduate students, the sessions allow students to discuss issues of their choosing, ranging from social responsibilities to diversity within the profession.

In the cocurricular course, part of the school's Freshman Academy, teams of three to five students use the school's maker space to design and create a prototype potential solution to a National Academy of Engineering Grand Challenge of their choosing. Students can use the design processes they've been taught in classes.

Steve Bucher, director of the Engineering in Society program, says the Ethos Project has been "a keystone" for a larger effort, which includes plans for an Ethos Lab.

— THOMAS K. GROSE

psychology labs. Bates College's Purposeful Work project, which helps students align their personal views and interests with the careers they choose, offers "infusion" classes connecting "course content and meaning, purpose, work, and/or careers."

Today's students are different from those of decades ago, Buffinton says, so CTE wants member schools to "meet our students where they are"—something colleges haven't done well in the past. Yannis Yortsos, USC's engineering dean, agrees. Unprecedented technological advances "impact in previously unforeseen ways the landscape of higher education," requiring new thinking about "offering a transformative lifelong education to our students," Yortsos says. "The CTE is driven by this realization."

Social media plays a big role in students' lives. The upshot, says Buffinton, is that students have a lot of virtual contacts, but fewer face-to-face connections. That leads to many having a "sense of loneliness and a lack of belonging. And I think that contributes to wanting to be part of something bigger—they want to be part of a community purpose." And while there are many reasons for the mental-health crisis afflicting campuses, a sense of isolation is likely a big factor. Miller thinks lessons that give students an immediate sense of a wider purpose in life can help ease the problem. But it's also important to have empathetic instructors who are willing to act as mentors. "We're betting that you could prevent a lot of this," he says. "Our kids would find that somebody cared about them as a person. We could see improvement in suicide rates."

WINNING OVER SKEPTICS

Selling CTE to America's colleges is proving to be easy. As of November, the coalition had five large universities awaiting approval for membership, and Miller expects the number will hit 50 within two years. The schools seeking to join see the need for new ways of teaching. "What they get," he says, "is access to colleagues who are on the same journey" and an opportunity to share ideas "to make it better for all of our kids. It's a very altruistic group."

A harder sell will be restoring what Buffinton calls the "social contract" with a skeptical public, including populations that view colleges as captive to a leftist "woke" agenda. Even if the coalition makes headway in changing higher education for the better, it will take time for that success to show up in surveys of alumni. In the meantime, the group has contracted a public-relations expert to "find ways to get our message out to those bigger audiences" via the media, Buffinton says. He and Miller hope that CTE's messaging may at least gain traction among prospective students and eventually their parents. "I think that the only tool I can think of that has a chance, that's powerful enough to turn this around, is the bond between parents and their own children," Miller says. "If you think your own kids will be better because of this, you might give it a try." Persuading highly ranked colleges of CTE's value is a promising place to start.

Thomas K. Grose is Prism's chief correspondent. He is based in the United Kingdom.

Spirit of the LAW

A master's program for STEM professionals provides valuable legal context for engineers and innovators.

By Pierre Home-Douglas

With degrees in electrical and computer engineering and technology management, Neil Misak ascended the ranks at Microsoft. The former technical sales leader oversaw more than 700 salespeople and the \$3 billion Azure cloud enterprise, working at the intersection of technology and business. But, increasingly, he dealt with issues outside those two worlds. Intellectual property was a prominent topic in crafting custom global agreements with customers, Misak explains. "It was at the forefront of how we differentiate ourselves from the competition." In addition, the area was "central" to his interest in becoming an entrepreneur.

Misak realized that his training was missing an essential component: legal knowledge. In the past, acquiring that knowledge would have meant investing three years to earn a JD degree and become a lawyer. Instead, Misak found what he needed in a program offered by Northwestern University: a master of science in law (MSL) geared to STEM professionals.

Today, the 33-year-old Misak is cofounder and chief technology officer at REUSO, whose software promotes reusability in the food and beverage sector. He is "thrilled" to be working on that mission, he says, while wearing all three hats—engineering, business, and law. The role allows him to help "promote a circular economy and prioritize the global community over the wasteful ways of the past," he says. "I couldn't have done that without what I learned at Northwestern."

Not for Lawyers

This year, the MSL program celebrates its 10-year anniversary. The only degree of its kind in the US focused on STEM professionals, the initiative developed out of an experience director Leslie Oster had as an associate professor in Northwestern's Pritzker School of Law. She was teaching an interdisciplinary class on medical issues that included engineering students, doctors, and science students. "I was watching how all the various members of the team were interacting," she recalls. "A medical student would come up with the idea for a particular medical device, an engineer would figure out the best way it could be built, and a law student would say 'but if you design it that way you would face certain regulatory hurdles.'"

Oster recognized the need to provide STEM professionals with legal, regulatory, and intellectual property knowledge. The program is not for budding lawyers, she emphasizes. "It's for STEM professionals who want to understand all the legal issues that may impact what they are doing in their job."

With Northwestern's dean of law and another faculty member, Oster helped launch the master of science in law program in 2014. Since then, more than 600 students have graduated. One hundred students are enrolled in the 2023–24 cohort. Eighty percent of them are pursuing the degree online, which typically takes two to four years. Those who study full-time at Northwestern's Chicago campus can complete the program in nine months.

The program offers 80 different courses, including eight mandatory ones that give students a basic legal background, such as classes in contract law, legal and regulatory processes, and intellectual property fundamentals. The rest of the credits are chosen from a list of electives ranging from Negotiation Skills and Strategies to Medical Devices: Regulation and Compliance.

Oster explains that the online program and the residential version "have the same requirements, same faculty, and the same subject matter." She adds that 100 percent of the online students have work experience, whereas around a half to two-thirds of the residential students do. Online students tend to have more advanced degrees and, on average, they are a decade older than residential ones.



IMAGES COURTESY OF JASMIN SHAH
DESIGN BY TONI RIGOLSI



“A medical student would come up with the idea for a particular medical device, an engineer would figure out the best way it could be built, and a law student would say ‘but if you design it that way you would face certain regulatory hurdles.’”

— MSL Director Leslie Oster explaining the genesis of the program

Different Languages

Matthew Wilson, 45, chose to study online because he couldn't afford to take nine months off of his job as chief engineer at Trek Bicycle. The classes fit in well with his work schedule and the program is well-organized, he says. “I had taken some online classes prior to the pandemic and they were hit and miss, but every one of the courses I have taken for the MSL is really solid.” As someone with cochlear implants for hearing issues, he finds the accessibility of the online classes a bonus. “In-person classes can be problematic for me, and that's one thing I really liked about the online version. I could control the environment and be on the same level as everyone else.”

Wilson had worked at Trek for 10 years when he enrolled in the MSL program in 2021. He was propelled by his desire to understand more about an important issue at his company: liability. A host of regulations govern bicycle manufacturers in Europe and the United States. As Wilson points out, “bicycles obviously don't have air bags,” which partly explains why they are actually classified as “hazardous materials” in the US. The former triathlete says a lot of design work focuses—proactively and reactively—on minimizing safety issues for consumers and legal risk for Trek, based in Wisconsin.

In the MSL program, Wilson learned subtle meanings of terms that “seem generic” but aren't. As the engineer explains, “a term like ‘reasonable person standard’—what a reasonable person can be expected to do with a product—has a specific legal meaning, but it also has a conversational meaning. Engineers typically hear just the conversational meaning, but the legal meaning has an impact on the work we do.” Wilson says that his understanding of such legal particulars enables him to serve as an effective liaison between Trek's legal team and the 100 or so engineers who work at the company.

Choppy Waters

Several of the lawyers who teach in the MSL program also have a background in engineering. David Schwartz, a Northwestern law professor, was previously a chemical engineer. He has taught in the program from its inception and says his students fall into two basic cohorts: the recent engineering graduates “who are maybe thinking like I was before I went to law school, ‘I don't want to just design products during my career, but I want to be close to technology and I want to see what else is out there.’” Then there are the experienced engineers—people who have worked in the field for 10 or 20 years. They've gotten a taste of some skills that others have, such as understanding intellectual property strategy—“how you can protect what you have created, how to build a moat around our property so other competitors can't get in.” They want to gain that skill, even if they remain engineers.

According to Schwartz, the program emphasizes communication: writing and speaking clearly, persuasively, and succinctly. “That’s a useful skill for any engineer,” he says, whether they’re angling for a promotion or raise, or trying to convince colleagues about the merits of a project.

The professor notes that many engineers don’t realize they enter choppy legal waters even before they start working at a company, whatever discipline they practice. “Everybody signs employment agreements. Understanding what those rights are and which ones you may be giving away is really useful,” he says. Although companies commonly own the rights to any projects completed during work hours, engineers with side projects done on their own time may inadvertently give away the rights in a boilerplate employment agreement. If you have other projects, you should be careful about what you sign, Schwartz stresses. Don’t think, “Oh, this is a nine-page agreement. I don’t really know what it is. I signed it just like I signed my health-care document.”



Entrepreneurs or Employees

Like many MSL students who are engineers, Cheyenne Cazaubon wanted to start her own company. She loved watching the TV show *Shark Tank*, in which people with startup ideas pitch their concepts to venture capitalists. A lot of the courses she took in the program aligned with her interest in entrepreneurship. “I knew I didn’t want to practice law; I just wanted to apply it in a business setting,” she says. The Georgia Tech industrial engineering graduate managed to launch a health-tech startup while pursuing the MSL full-time and doing an internship at GE. Working with a couple of cohort peers, Cazaubon created an AI platform that focuses on improving pregnancy outcomes. Her company Edith Technologies was chosen as a semifinalist for VentureCat, Northwestern’s business plan competition for student founders.

Before Neil Misak generated the idea for REUSO, he created several startups while in the MSL program, including an ed-tech platform for high school entrepreneurship students and a DJ company.

He believes that what he learned at Northwestern would still prove valuable for engineers who prefer to work for an established firm. “It used to be that the best engineers became engineering managers, but in 2023 that’s not how it works,” he says. “The leaders of the team are often the ones who can wear the most hats and who can understand what’s going on in the other silos of the business.

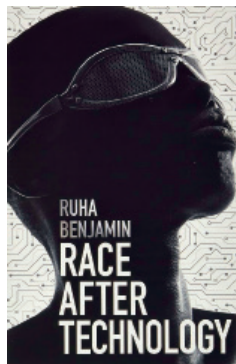
“Whatever you produce, whether it’s code or pharmaceuticals or chemical compositions, you need others to rally around that cause,” Misak says. “STEM professionals want to change the world,” he adds. “But the perfect product will sit on the shelf if you don’t know how to go out and move and shake it. And that involves not only technical knowledge but [also] business acumen and legal training.”

Pierre Home-Douglas is a Montréal-based freelance writer and frequent Prism contributor.



TECH TROUBLES, STEM ROMANCE, LIFE IN REVIEW

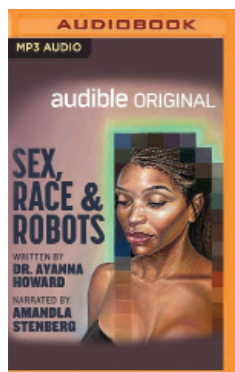
Four book recommendations:



Race After Technology: Abolitionist Tools for the New Jim Code

By Ruha Benjamin
Polity, 2019

This book is a great read on apps and algorithms and how they can reinforce white supremacy, social inequity and injustice, and discrimination.



Sex, Race, and Robots: How to Be Human in the Age of AI

By Ayanna Howard
Audible Originals, 2020

Artificial intelligence is all the rage right now, so conversations about the realities of what AI is and is not are very important. This book discusses the effect of racial and sexual biases on AI and the impact the technology has on gender and race.

First Responder Fairytales

By Carlotta Ardell
Rebellion LIT

These Black STEM romance novels are written by me, [ASEE Fellow] Carlotta Berry, with a goal to center Black women in STEM experiencing success and trials in their personal and professional lives. I wanted to normalize hearing from diverse voices in STEM. There are two in the series so far:

Book 1: *Elevated Inferno: Monet's Moment* (2022)

Monet is on her way to her dream job internship at a robotics company when the elevator breaks down. Rhys is the handsome firefighter who rescues her and turns her life upside down.



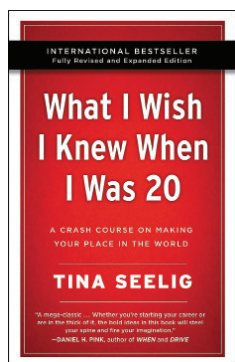
Book 2: *Breaking Point: Chandler's Choice* (2023)

Chandler is a nursing intern focused on taking care of her daughter and supporting her mom after the death of her father. Moses is the handsome firefighter she meets right before graduation, and she gets more than she bargained for in a summer fling.



Carlotta Berry
Chair and Professor of Electrical and Computer Engineering
Rose-Hulman Institute of Technology

Editor's note: Read more about Berry's books in her Up Close profile, Fall 2022 Prism.



What I Wish I Knew When I Was 20: A Crash Course on Making Your Place in the World

By Tina Seelig
HarperOne, 10th anniversary edition,
2019

This book reignited my professional goals and excitement about my STEM writing career long after I turned 20. I wish I had first read it in college, but I still find inspiration and empowerment

with each rereading. Seelig's insights, honed in her work as director (now emeritus) of the Stanford Technology Ventures Program at Stanford Engineering, and at Stanford's Hasso Plattner Institute of Design (d.school), stand the test of age and time. She underscores

that "uncertainty is the fire that sparks innovation and the engine that drives us forward" and that we can all initiate actions that "take you places you couldn't have imagined and provide a lens through which to see problems as opportunities."

Deborah Lee Rose
Author of STEM books for young readers
Prism contributing writer and editor

Have a good book to recommend? Email prism@asee.org with a brief writeup of a mainstream read (not textbook) that would be useful, interesting, or enlightening to fellow engineering educators. Please include why you recommend it. Wildcard submissions are also welcome (a non-job-related book that you think others should read, such as a poetry compilation, humor collection, or novel). We will run a selection of submissions in Prism. Writeups may be edited for length and clarity. Looking forward to your recommendations!

AUTHOR, EDIT THYSELF

Feel more confident about publishing your research with these tips.

Publishing is a critical step in academic career advancement. But submitting your scholarly work can be daunting—even more so if your institution doesn't offer any support.

Some academics create their own writing groups; others share their work with spouses, partners, or friends. But a few easy steps you can take on your own will improve both your writing and its chance of acceptance.

Read your work aloud. You may feel silly announcing headings like “Abstract” or “Literature Review” within earshot of others, but this exercise can be incredibly helpful for picking up typos on the page.

Software and apps can highlight major errors, such as a missing “u” in “Conclusion,” but grammar- and spell-check features may miss less obvious mistakes, such as inconsistent verb tenses across sentences. To catch this kind of inconsistency, you'll need to rely on your eye—and perhaps your ear, too.

The practice of reading aloud to catch errors has been well vetted. See, for example, “Reading Aloud Improves Proofreading (But Using Sans Forgetica Font Does Not),” a study published last year in the *Journal of Applied Research in Memory and Cognition*.

Batch your reference list. Reference lists and bibliographies can inspire dread. It's easy to overlook a comma or use italics instead of roman type. The combination of short turnaround times, complicated formatting rules, and vague feedback from peer reviewers, such as “Reference page needs formatting,” can be overwhelming.

One fix: Batch your reference page by citation type. For example, take one afternoon to review only book citations. Check the capitalization, the year, the publisher information, and so on, ensuring all items are ordered and formatted correctly. The easiest way to do this is to split your screen or use multiple monitors. On one side, pull up your reference page. On the other, an example citation, preferably from the citation style website.



anmadesigns/wi (Freepik)

Once you've worked your way through the first citation type, take a break. You've earned it! Depending on your deadline, that break could be 10 minutes or a full day. But give your brain a chance to rest. Then, move on to the next citation type, perhaps journal articles. Tackle each category until you've worked through the full bibliography. Batching like this lets you focus on one set of formatting rules at a time.

Batch your in-text citations, too. Consider reading your article once just for in-text citations. On this pass, don't worry about anything else. Here are a few formatting questions to consider as you read:

- Do your direct quotes have both opening and closing quotation marks?
- Have you used “et al.” where appropriate? Does “et al.” have a period only after the “l”?
- Are block quotes formatted appropriately?
- Do parenthetical citations include all of the appropriate information? Or, for superscript citations, are they all numbered correctly?

Format tables and figures carefully. First, review the publication's submission and manuscript guidelines. That may sound obvious, but in my experience, errors with these components are extremely common.

Getting table and figure formatting right won't guarantee acceptance, but making a good impression will never hurt. The best way to do so is to find (and follow!) those formatting guidelines, usually available on each publication's website.

While you might expect that the requirements differ across fields, they can also vary drastically within a single one. That means careful checking for authors resubmitting a manuscript previously rejected by a different publication. For example, the chance that two journals will have the same formatting guidelines is nearly zero. You may be tempted to rush the submission process, but it's worth your time and energy to confirm that your manuscript meets each publication's requirements.

In the end, will a peer reviewer reject your research based solely on a dropped quotation mark or incorrectly formatted citation? Probably not. But spending a little extra time editing can help you feel better about pressing “send”—knowing that your hard work has been presented in the best possible light.

Natalie Schriefer is a freelance writer and editor with a focus on academic articles and creative manuscripts. She lives in Trumbull, Connecticut. This article is adapted with permission from “When the Little Things Matter,” published in Inside Higher Ed.



STRONG FINISH

ASEE ends the year with a variety of successes and exciting projects ahead.

By Jacqueline El-Sayed

Greetings! What a year it has been!

I have so enjoyed meeting and interacting with our members and stakeholders this year as I attended our many ASEE events as well as various convenings of the STEM educational community. I look forward to continuing this engagement as I launch a listening tour to hear more about your thoughts on ASEE and the goals we should set for the future. Since our 2020–2023 strategic plan is sunsetting, this is one component of the upcoming strategic planning exercises that will inform the development of our future organizational goals to be approved by the ASEE Board of Directors in 2024.

ASEE's membership is unique, spanning the breadth and depth of the engineering education community. Our members are individuals and institutions focused on engineering education, reaching across all engineering disciplines and affinity groups, from P–12 to undergraduate and graduate education, and through industry. Together, we are creating knowledge to impact today's students and educators while also steering thought leadership to define the future of engineering education.

In fall of this year, we held our 130th Gala celebration, hosting more than 250 attendees and announcing the 2023 Hall of Fame inductees (see p. 26). Our 2023 Annual Conference achieved record-breaking numbers across all categories. ASEE's other offerings continue to be in high demand, including council conferences and PI meetings, print and electronic publications, Learning Services courses, Profiles and other data reports, and national efforts, such as the ASEE Diversity Recognition Program (ADRP).

In addition, we have aligned our externally funded initiatives under the umbrella of ASEE's mission to enable engineering education community members to engage in professional development and thought leadership at no expense:

- ASEE became a partner on the National Science Foundation's (NSF's) Engineering PLUS (Partnerships Launching Underrepresented Students) Alliance, to increase the number of women and BIPOC graduates through national systemic change. engplusalliance.northeastern.edu
- The Society will hold a conference on "Strengthening the Community College Pathway to Baccalaureate Engineering" in 2024, sponsored by NSF.
- The Engineering for One Planet Mini-Grant Program (EOP-MG), funded by the Lemelson Foundation, continues to support faculty teams in integrating sustainability into their curriculum. eop-mgp.asee.org
- The Minority Mentorship Program (MMP), focused on women faculty of color and funded by Chevron, kicked off with an outstanding event in which many amazing mentors gave their time to support junior faculty. mmp.asee.org
- The Archival Publication Authors for Engineering workshop was held a second time, funded by the Kern Foundation. It helps aspiring authors learn about the scholarship of teaching and learning (SOTL) and entrepreneurial mindset (EM) and submit manuscripts to engineering education journals. apa-eng.asee.org
- The NSF ADVANCE KnowLEDGE project builds on the work of the Engineering Deans Council's EDGE initiative to help women faculty of color successfully navigate the promotion and tenure process. knowledge.asee.org
- The eFellows Engineering Postdoctoral Fellowship program, funded by NSF, is launching applications for the third cohort to place new PhDs on campuses. The impact of the eFellows program has been documented on a new website. efellowsimpact.asee.org
- The Computer and Information Science and Engineering Minority-Serving Institutions Research Expansion program (CISE-MSI), funded by NSF's CISE directorate, continues to help faculty and sponsored research offices build their research enterprise. The first PI meeting in 2024 will bring together members of three cohorts with successful NSF grants. cise-msi.asee.org
- The reports from the Industry 4.0 Summit and the Defining and Building the Engineering Workforce of the Future convenings, both funded by NSF's Directorate for Engineering, focus on student competencies and educational operational plans. They will be released in the near future.
- Former ASEE President Sheryl Sorby's work on mindset builds on the Society's transformative Grinter Report. ASEE held convenings, funded by NSF, over the past year in collaboration with the National Academy of Engineering. The writing team is gearing up to complete the next report that will provide a blueprint for the future of engineering education.

On behalf of ASEE HQ, I invite you to peruse *Prism's* exceptional articles, additional examples of the value the Society provides not only to its members but to the overall STEM community of practice across the nation and world.

Jacqueline El-Sayed is CEO and Executive Director of ASEE.

ASEE BOARD ELECTIONS

Presented on this page are candidates for offices to be voted on in the 2024 ASEE elections. These candidates were selected by the 2024 Nominating Committee, chaired by Past President Adrienne R. Minerick. The nominations were received by the executive director as required by the ASEE Constitution. The Nominating Committee believes that the candidates offered here are eminently qualified and deserve the close consideration of members. Additional nominations of eligible candidates may be made by petition of at least 200 individual members. Nominees so proposed must indicate a willingness to serve before their names are placed on the ballot. Write-in votes will be accepted for all offices. In all cases, a simple plurality constitutes election. The official ballot will be furnished to each individual member mid-January and returned mid-February.

PRESIDENT-ELECT

Agnieszka Miguel
Seattle University

Christi Patton Luks
Missouri University of Science and Technology

VP OF MEMBER AFFAIRS

John Brocato
University of Georgia

Pritpal Singh
Villanova University

ZONE II CHAIR

Nicolas Baine
Grand Valley State University

Todd Schweisinger
Clemson University

ZONE IV CHAIR

Jessica O. Perez
Cal Poly Pomona

Colleen E. Bronner
University of California, Davis

Access the candidates' bios and statements at <https://bit.ly/47GTcxL> or scan the QR code below.



2024 CONSTITUTIONAL CHANGES

Changes to the ASEE Constitution will also be on the 2024 ballot. Read about them at <https://bit.ly/47GTcxL> or scan the QR code below.



ASEE FELLOW NOMINATIONS OPEN

The grade of Fellow Member is one of unusual professional distinction. The ASEE Board confers it upon members with outstanding and extraordinary qualifications and experience in engineering, engineering technology education, or an allied field, including appropriate and significant individual contributions. Special attention is given to an individual's contributions within ASEE.

Nominees must be ASEE members and must have been a member of the Society in any grade for at least 10 consecutive years.

The deadline for nominees to submit a complete nomination and for references to submit their letters of recommendation is **February 15, 2024 at 11:59 PM EST**.

For more information on the online nomination process, please visit ASEE's Fellow Member page, <https://bit.ly/3T5TZEd>. Questions can be sent to fellows@asee.org.

2023 HALL OF FAME INDUCTEES

For more than a century, ASEE has been proud to support the engineering educators whose work has modernized society.

In celebration of the Society's 130th year, ASEE requested nominations for its 2023 Hall of Fame. This designation honors the engineering and engineering technology education standouts whose work has made a significant impact. The selected inductees were announced at the Society's 130th Gala on October 10.

The inductees' areas of influence are broad, with expertise in pedagogy, broadening participation, research, leadership and service, entrepreneurship, and more.

Congratulations to ASEE's 2023 Hall of Fame inductees!

Howard G. Adams

Founder and CEO of H.G. Adams & Associates, Inc.
Executive Director, National Consortium for Graduate Degrees for Minorities in Engineering and Science
University of Notre Dame

Bernard Amadei

Distinguished Professor and Professor of Civil Engineering
University of Colorado, Boulder

Jenna P. Carpenter

Dean and Professor of Engineering
Campbell University

Marjan J. Eggermont

Teaching Professor
University of Calgary

Jacqueline El-Sayed

Chief Executive Officer and Executive Director
American Society for Engineering Education

Stephanie Farrell

Experiential Engineering Education Professor and Founding Department Head
Rowan University

Richard M. Felder

Hoehchst Celanese Professor Emeritus of Chemical Engineering
North Carolina State University

Leah H. Jamieson

Ransburg Distinguished Professor of Electrical and Computer Engineering
Purdue University at West Lafayette

Julie P. Martin

Director
Engineering Education Transformations Institute
University of Georgia College of Engineering

Adrienne R. Minerick

Professor of Chemical Engineering & Affiliated Professor of Biomedical Engineering
Michigan Technological University

William C. Oakes

Assistant Dean for Experiential Learning
150th Anniversary Professor
Professor of Engineering Education and Director of the EPICS Program
Purdue University at West Lafayette

Matthew W. Ohland

Dale and Suzi Gallagher Professor and Associate Head of Engineering Education
Purdue University at West Lafayette

Joseph J. Rencis

Interim Department Head of Mechanical Engineering
The University of Texas Dallas

Stephen J. Ressler

Professor Emeritus
United States Military Academy

Larry Richards

Professor Emeritus
Department of Mechanical and Aerospace Engineering
University of Virginia

Donna M. Riley

Jim and Ellen King Dean of Engineering and Computing
University of New Mexico

Karl A. Smith

Emeritus Professor of Civil, Environmental, and Geo-Engineering, Morse-Alumni Distinguished University Teaching Professor, and Faculty Member, Technological Leadership Institute
University of Minnesota - Twin Cities

Ruth A. Streveler

Professor Emeritus
Purdue University at West Lafayette

Douglas Tougaw

Dean, College of Engineering, and Professor of Electrical and Computer Engineering
Valparaiso University

Phillip Wankat

Clifton L. Lovell Distinguished Professor Emeritus of Chemical Engineering and Professor Emeritus of Engineering Education
Purdue University at West Lafayette

Bevlee A. Watford

Professor, Associate Dean for Equity and Advancement, and Executive Director, Center for the Enhancement of Engineering Diversity
Virginia Polytechnic Institute and State University

Julia M. Williams

Professor of English
Rose-Hulman Institute of Technology

Team: Katy Luchini Colbry and Dirk Colbry

Michigan State University

Team: Jon Leydens and Juan Lucena

Colorado School of Mines

Team - K-12 STEM Center at the University of Southern California's Viterbi School of Engineering

University of Southern California

A GLORIOUS GALA: ASEE CELEBRATES 130



ASEE members, staff, and friends joined together in October to commemorate the Society's 130th birthday. It was a night of joy, dancing, great food, and play. Old friends and colleagues reunited to toast the venerable institution and its bright future.

1) ASEE CEO, Executive Director, and new Hall of Fame inductee Jacqueline El-Sayed addresses 2) the audience in the dining room enjoying the festive atmosphere. 3) Following dinner and speeches, members danced the night away to the DaBassics band, featuring ASEE's own Senior Meetings Manager Wayne Davis on bass (far right). 4) ASEE Fellow Laura Bottomley takes her chances at roulette as Program Director Ray Phillips and others cheer her on. 5) Brooke Coley (left), founding executive director of the ASU Center for RARE JUSTICE, laughs with Rochelle Williams, NSBE chief programs and membership officer (right). 6) Attendees "gamble" for raffle tickets with engineering education superstars, such as ASEE Past President Stephanie Adams.

Thanks to everyone who made the evening magical. We're looking forward to celebrating many more birthdays with you!



Our Winter 2023 Career Corner article discusses how to self-edit research for publication to peers. Ten years ago, columnist Rosemarie Wesson wrote about another important communication skill for engineers: the ability to develop and give a concise and relatable “elevator speech” about their work. (For more on communicating with the public, see the 2022 Prism article “Show and Tell,” <https://bit.ly/418gryw>.)

Develop an Elevator Speech

Attorneys and medical doctors train to interact with the public. Why not engineers?

Recently I was at an event where someone asked my job responsibilities as a program director at the National Science Foundation. In my usual engineer’s lingo, I replied that I manage the Chemical and Biological Separations Program and provide funding for fundamental research in the area of Separations.

As the questioner’s eyes glazed over, I knew I needed to regroup.

I recalled previous discussions about being able to communicate the details of an idea or one’s profession in the time span of an elevator ride, i.e., developing an “elevator speech.” If you can spark someone’s interest in 30 seconds, the span of a typical elevator ride, then the conversation may continue.

I then said the program I manage funds universities to perform research in areas such as removing impurities from water and separating DNA from blood. I looked into my questioner’s eyes and saw a glimmer of recognition. I continued and said that one researcher in particular was investigating how to use natural cactus “sap” to provide clean drinking water in rural areas. At this point the individual was able to relate to the description and began to ask questions regarding the research.

For the future’s sake, it’s important we make the most of every opportunity to convey the difference engineering makes in people’s lives. This means learning to speak concisely to maximize that next elevator ride or holiday party.

Some scientists and engineers have discovered and mastered this technique. I’m sure you can think of professors or colleagues who appear to have a natural ability to relate to the general public. But not everyone is a natural Bill Nye or Neil deGrasse Tyson. In fact, neither are they. It takes practice.

Scientists and engineers are trained in technical writing for professional journals. We receive accolades for the number of papers and the journals in which these papers are published. We are taught to make comprehensive but concise technical presentations to our peers. We become experts at “preaching to the choir.” However, how often are we trained to write for or speak to the general pub-



NOT EVERYONE IS A NATURAL BILL NYE OR NEIL DEGRASSE TYSON, BUT NEITHER ARE THEY. IT TAKES PRACTICE.

lic? How many times have we observed a renowned scientist or engineer and felt uncomfortable with how he or she interacted with the general public? How difficult is it to explain our profession to our neighbors?

Imagine if rather than referring to you as “some kind of engineer,” your neighbor said you were a chemical engineer responsible for replacing glass baby bottles with safe, unbreakable plastic alternatives. Or that you were a mechanical engineer responsible for developing electric vehicles.

This is where discovering an eleva-

tor speech detailing your job comes in.

For engineers and scientists, training to communicate with the public is as important as any other type of training. Attorneys and medical doctors are trained to do so. Why not engineers?

How often have we visited a physician and found him or her unable to tell us in layman’s terms the reason for our ailments? I suspect rarely. If an attorney cannot speak directly to his or her client in language that the client understands, the attorney will not be successful.

Training of engineers to learn to relate to the general public and to discover elevator speeches should be a part of the undergraduate and graduate student experience. Within existing courses, faculty could encourage not only the mastery of technical writing and presentation skills but also the incorporation of everyday communication skills appropriate for the general public.

For those of us no longer in school, there are other resources out there. The National Academy of Engineering has free, research-based advice in *Messaging for Engineering*. The American Association for the Advancement of Science offers an online tool kit for engineers and scientists.* The Web is full of materials and opportunities like this.

So, tell me. What’s your elevator speech?

* <http://communicating-science.aaas.org/>

Rosemarie D. Wesson, Ph.D., P.E., is a program director in the National Science Foundation’s Directorate for Engineering and an adjunct professor of chemical engineering at the University of Maryland, College Park.



FIND YOUR FACULTY THROUGH PRISM

YOUR CLASSIFIED AD IN
PRISM WILL REACH MORE
THAN 12,000 EDUCATORS
AT ALL LEVELS AND
IN EVERY DISCIPLINE
OF ENGINEERING AND
ENGINEERING TECHNOLOGY.

For further information and to get
a price quote, please contact:

Kristin Torun, Director, Advertising Sales
Bulletin Media, a Cision company
kristin.torun@cision.com or 571.420.2014

UPCOMING EVENTS

Don't miss
these exciting
ASEE events!
Registrations
are now open.

REGISTER NOW!

Go to www.asee.org and
click on the Events tab.

Public Policy Colloquium (PPC)

February 5–7

Washington, DC

This colloquium is organized by a Public Policy Committee, comprised of engineering deans—members of the Engineering Deans Council. The Colloquium has a dual role: to strengthen the discussion of engineering education and research issues between the deans of engineering and key public policy makers, and to enable the deans to refine their public policy agenda. Attendance is open only to deans of engineering and their federal/government relations representatives*.

*University federal government relations representative has to be registered for the conference by their dean

Conference for Industry and Education Collaboration (CIEC) 2024

February 7–9

Garden Grove, California

Since 1976, this annual conference has included workshops, technical sessions, training, and plenary keynote and panels emphasizing the long and mutually beneficial partnerships among education, industry, and government.

The ASEE Conference for Industry and Education Collaboration (CIEC) is organized by the Cooperative and Experiential Education Division (CEED), the College Industry Partnership Division (CIPD), the Continuing Professional Development Division (CPDD), and the Engineering Technology Division (ETD).

Collaborative Network for Engineering and Computing Diversity (CoNECD)

February 25–27

Crystal City, VA

CoNECD is the only conference dedicated to all the diverse groups that comprise our engineering and computing workforce.

The vision of the CoNECD (pronounced “connected”) Conference is to provide a forum for exploring current research and practices to enhance diversity and inclusion of all underrepresented populations in the engineering and computing professions, including gender identity and expression, race and ethnicity, disability, veterans, LGBTQ+, 1st generation and socio-economic status.

Research Leadership Institute (RLI)

March 3–6

Arlington, VA

The institute exists to support and enhance research in engineering, technology, computing, and applied science in educational organizations. It includes exciting speakers and opportunities to connect with colleagues on topics critical to the success of research leadership.

Engineering Deans Institute (EDI)

April 14–17

San Diego, CA

Exclusively tailored for engineering deans, this institute provides a rare opportunity for these visionary leaders to convene and deliberate on the pivotal challenges facing their academic institutions and the engineering profession at large. Over the course of several days, EDI offers a meticulously crafted program that fosters profound discourse, bringing together engineering deans, industry luminaries, and research and government stakeholders.