

**"tools to not be afraid of  
an epic problem"**

– Ben Ross

**"opened a world of  
possibilities"**

– Guneet Sethi



**"incredible technical and  
professional opportunities"**

– Jason Ryan

**"perfectly unique  
and eclectic exposure"**

– John Waldeisen

# ESM CONNECTIONS

FALL 2021

## 40 Under 40 Alumni Award honors four ESM graduates

The Penn State College of Engineering has selected the first cohort of honorees as part of its new 40 Under 40 Alumni Award program, which recognizes graduates who are 40 years old or younger for their early career impact and are nominated for the distinction. In subsequent years, the number of honorees in the program at any one time will grow to 40. Out of the initial 22 recipients, four earned their degrees in the Department of Engineering Science and Mechanics (ESM). Congratulations to the winners!

"We are so proud to count these four exceptional individuals among our alumni," said **Judith Todd**, head of engineering science and mechanics. "They have translated their engineering science and mechanics education into transformational innovations that will benefit society for years to come."

The four ESM 40 Under 40 Awardees shared their experiences from their time at Penn State.



From left to right: Benjamin Ross, Jason Ryan, Guneet Sethi, and John Waldeisen.

**Benjamin Ross** ('06 B.S. ESC, '07 M.S. ESC) is the founder and chief technology officer of POWR.io. "Penn State engineering gave me the tools to not be afraid of an epic problem, but instead to break it into little achievable pieces," Ross said.

**Jason Ryan** ('06 M.S. ESC, '10 Ph.D. MATSE) is the project leader of magnetic resonance spectroscopy at the National Institute of Standards and Technology. "I attribute my early career success mostly to the incredible technical and professional opportunities I received during my time as a student," Ryan said. "I'd especially like to acknowledge Professor Lenahan, my dissertation adviser and, still to this day, mentor."

**Guneet Sethi** ('04 M.S. E MCH, '08 Ph.D. ESMCH) is the senior manager of hardware reliability engineering at Amazon. "The College of Engineering provided me opportunities to work in new, cutting-edge technology areas," Sethi said. "The college had a wide variety of courses that I could choose from during my graduate and doctoral studies. Not only did these courses enhance my knowledge but also opened a world of possibilities for me."

**John Waldeisen** ('07 B.S. ESC), is an entrepreneur. "The vastly interdisciplinary major, engineering science and mechanics, offered a perfectly unique and eclectic exposure of subject areas that continue to be tangibly useful to me in my everyday life as an entrepreneur," Waldeisen said.



**PennState**  
College of Engineering

**ENGINEERING SCIENCE  
AND MECHANICS**

### In This Issue

- |                           |                                      |
|---------------------------|--------------------------------------|
| 2 Message from the chair  | 4 Faculty news/honors/awards         |
| 2 Faculty spotlight       | 6 Alumni news                        |
| 2 Graduate spotlight      | 7 Latest ESM news                    |
| 3 Undergraduate spotlight | 12 Message from alumni society chair |

**Innovation lives where disciplines meet.**

## Message from the chair



Dear alumni, friends, faculty, and students,

After twenty years in ESM, I will be stepping down as department head and going back to teaching and research as a faculty member in summer 2022. I have requested a sabbatical year to re-hone my

teaching skills, develop new proposals related to my research, and to expand the horizons of our students. It has been my greatest privilege to serve as a leader of ESM and to see our interdisciplinary research activities, honors undergraduate program, and the number of graduate students grow beyond all expectations and recognition within Penn State and far beyond. I will be forever grateful for the support of ESM alumni in our ventures.

When I came to ESM in 2002, I saw an environment that enabled multidisciplinary thinkers, like me, to thrive in a close-knit family environment. As a woman who started her academic career in 1982, I was frequently told that I did not “fit.” When I came to ESM, the warm welcome immediately reinforced that this was my natural home—a legacy I have passed on to all who join us. I encouraged “out-of-the-box” thinking, entrepreneurial activities, fostered new centers and interdisciplinary activities, and aimed for the highest educational scholarship. Our faculty and students have always stepped up to the plate.

I am privileged to have worked with the most brilliant and expansive minds in science and engineering. I am in awe of their accomplishments, and they have pushed me far beyond my horizons. I will be forever grateful to have served in this capacity. Finally, I must recognize Mason Walsh, who endowed the P.B. Breneman Chair in honor of his grandfather’s legacy as the first chair of ESM. Without the Breneman Chair support, ESM would not have advanced to today’s internationally recognized scholarship of our faculty and students. We Are!

Wishing you a happy Thanksgiving and winter holiday!

*Judith A. Todd*

Judith A. Todd

## Faculty spotlight



### **\$7.5 million grant positions Penn State as physics leader**

**Sahin Ozdemir**, associate professor of engineering science and mechanics, was awarded a U.S. Department of Defense-funded Multidisciplinary University Research Initiative grant to lead a cross-university physics research program. With \$7.5

million in funding over five years, Ozdemir and Penn State colleagues will work with Yale University, Michigan Technological University, University of Central Florida, Washington University in St. Louis, University of California, Berkeley, and the University of Southern California. The collaborators will focus on developing approaches to control quantum binary systems, an achievement that would have implications for quantum computing and data security.



### **Robert Harbaugh earns national lifetime achievement award in neurosurgery**

**Robert Harbaugh**, senior vice president, Penn State Health Medical Group, Distinguished Professor of Neurosurgery, and professor of engineering science and mechanics, received the 2021 Harvey

Cushing Medal, the highest honor awarded from the American Association of Neurological Surgeons (AANS), a scientific and educational organization with more than 10,000 members worldwide. The Cushing Medal honors the lifetime contribution of AANS members for their surgical, scientific, and humanitarian accomplishments. [bit.ly/harbaugh-aans](https://bit.ly/harbaugh-aans)

## Graduate spotlight



### **Lauren Katch wins first place in research pitch contest**

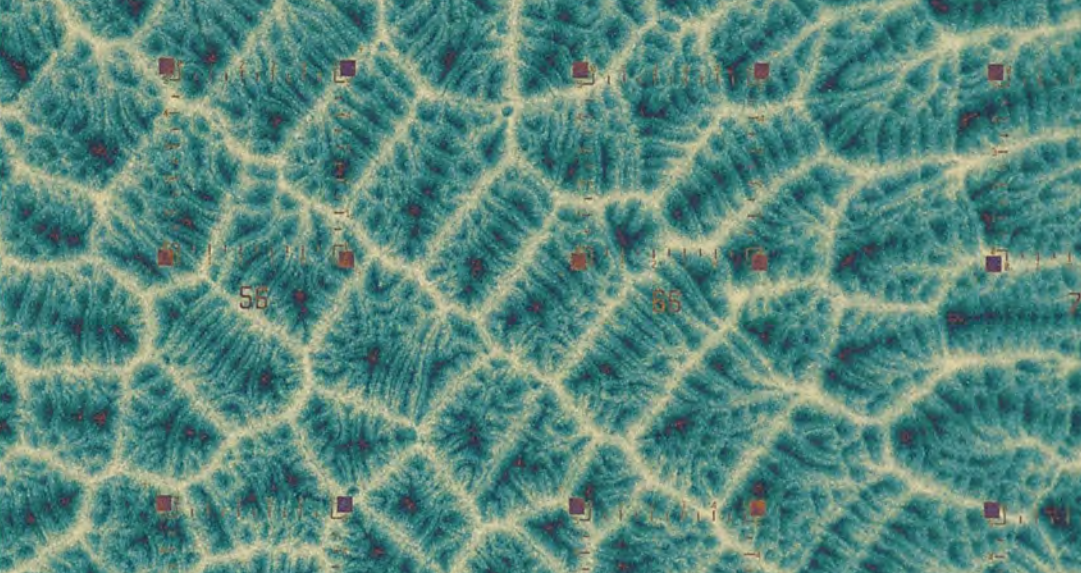
**Lauren Katch**, doctoral student in engineering science and mechanics, won first place and a \$750 prize in the finals of the Millennium Café PPG Elevator Pitch Competition, held virtually on May 18. Finalists presented their research in two minutes or less to judges

from companies including PPG, Corning, Dow, and Murata. The competition’s opening round was held virtually May 13, also as part of the [Millennium Café](https://bit.ly/catch-pitch) series organized by the [Materials Research Institute](https://bit.ly/catch-pitch).

In her winning pitch, Katch outlined her research using ultrasound waves to detect cracks in silicon wafers. Silicon wafers are used to create microchips for electronics.

“The audience had the opportunity to learn more about the research that I do and why I do it,” Katch said. “We are so surrounded by technology that it can be difficult to appreciate all the research that goes into making these parts. I hope that the audience took away a greater understanding of these intricacies.” [bit.ly/catch-pitch](https://bit.ly/catch-pitch)





The art-in-science competition winning image captures the liquid-phase exfoliation of MoS<sub>2</sub>, a transition metal dichalcogenide. Credit: Amritanand Sebastian

## Art-in-science competition winner

**Amritanand Sebastian**, doctoral student in engineering science and mechanics, tied for first place in the [College of Engineering Research Symposium \(CERS\)](#) art-in-science presentation competition. He tied with Chinmay Sankhe, a chemical engineering doctoral student, and received \$125 for the recognition. One of three submission categories for CERS, the art-in-science award recognizes the role of aesthetics in scientific fields.

CERS was held virtually April 14 and organized by the Penn State Engineering Graduate Student Council. This year's competition was sponsored by [MathWorks](#), the Penn State College of Engineering, and the Penn State University Park Allocation Committee. [bit.ly/CERS21-winner](http://bit.ly/CERS21-winner)

## Undergraduate spotlight



### Olivia Cook named student marshal for spring commencement

**Olivia Cook** was selected as the student marshal for the engineering science baccalaureate degree program for the Penn State spring commencement ceremony on May 7. Cook, a Schreyer Scholar, received a bachelor of science in engineering science and a minor in engineering mechanics. Andrea P. Arguelles, assistant professor of engineering science and mechanics, was Cook's faculty marshal. [bit.ly/marshals-21](http://bit.ly/marshals-21)



### Keith Griffith receives departmental award for research in fiber optic pressure sensors

**Keith Griffith**, fourth-year engineering science student, received the P.B. Breneman Best Design in Research Award from the Department of Engineering Science and Mechanics for his research in the development of standardized procedures for the verification and primary analysis of fiber optic pressure sensors for their use as measurement devices in recording the connection between intra-abdominal and intracranial pressures. "

It is an honor to be recognized for this award, and I want to thank my adviser, Dr. Patrick Drew, and those who helped along the way," Griffith said.



## One year could change your career

### Earn a one-year master's degree from ESM

#### Graduate Certificate in Laser-Materials Processing and Laser-Based Manufacturing

- Prepares students to integrate laser-materials processing into the concurrent design and manufacturing of multiscale components

#### M.S. in Engineering at the Nano-scale

- Non-thesis program; thirty credits
- Significant hands-on nanofabrication experiences

#### M.S. in Engineering Science and Mechanics

- Residence-based program; thirty-two credits

#### M.Eng. in Engineering Mechanics

- Professional degree program; thirty credits

#### Master's Degrees in Additive Manufacturing and Design

- M.S.: Resident program; thirty credits
- M.Eng.: Online program; thirty credits

## WE ARE ... HIRING

The ESM department is seeking applicants for postdoctoral and graduate student openings.

Please visit [esm.psu.edu/departments/job-opportunities.aspx](http://esm.psu.edu/departments/job-opportunities.aspx) for more information.





## Undergraduate spotlight (cont.)

### Support ESM

Donations to the department allow us to continue our tradition of excellence by supporting current and future world-class engineers, leaders, and innovators who can impact and advance the well-being of global society.

[bit.ly/esm-giving](https://bit.ly/esm-giving)



### What have you been up to?

If you have some exciting news you'd like to tell us about, send it our way so we can share it with our community of alumni and peers: [alumnirelations@esm.psu.edu](mailto:alumnirelations@esm.psu.edu).

Keep in touch on our LinkedIn group, too! [bit.ly/ESMGroup](https://bit.ly/ESMGroup)



### Hear about careers in engineering science from faculty, students, and alumni

[bit.ly/penn-state-esm](https://bit.ly/penn-state-esm)

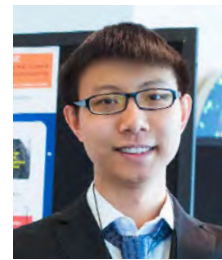


### 2021 graduate Andrew Tamis receives research achievement award

to pursue a doctorate in physics.

**Andrew Tamis**, a 2021 graduate with dual bachelor's degrees in engineering science and physics, received the Douglas G. and Regina C. Evans Award for Research Achievement in the Schreyer Honors College for his senior thesis, "Mathematical Modeling of Cerebral Nitric Oxide Dynamics." Tamis recently began studying at Yale University

## Faculty news/honors/awards



### Yang Yang joins engineering science and mechanics as assistant professor

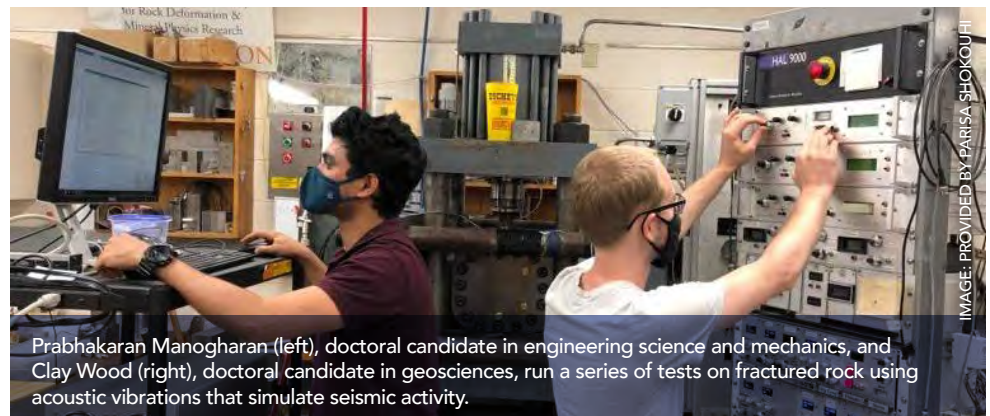
**Yang Yang**, a researcher in the field of structural materials and electron microscopy, joined the Penn State Department of Engineering Science and Mechanics as an assistant professor on June 1. As a part of Yang's appointment, he also will serve as a faculty member in the Materials Research Institute. Yang's research focuses on the degradation of structural materials in harsh environments, such as high temperature, mechanical deformation, corrosion, and radiation damage. He uses advanced electron microscopy to study how microstructures and defects in materials respond to extreme conditions. This research will help in the development of more robust materials to be used in structures such as bridges, aircraft, and advanced energy systems. [bit.ly/yang-structural](https://bit.ly/yang-structural)



### Researchers awarded grant to advance geothermal energy science



**Parisa Shokouhi**, associate professor of engineering science and mechanics and of acoustics at Penn State, and her team began their research in advancing geothermal energy science in 2017 with a grant from the U.S. Department of Energy's Basic Energy Sciences program. Now, the program has renewed the grant for a total funding amount of nearly \$1.2 million. By using seismic waves to predict rock fracture properties, Shokouhi, Jacques Riviere, assistant professor of engineering science and mechanics, and the team will better understand how fluid flows through fractured rock to create more efficient methods of monitoring geothermal energy production. [bit.ly/shokouhi-geothermal](https://bit.ly/shokouhi-geothermal)



Prabhakaran Manogharan (left), doctoral candidate in engineering science and mechanics, and Clay Wood (right), doctoral candidate in geosciences, run a series of tests on fractured rock using acoustic vibrations that simulate seismic activity.

IMAGE: PROVIDED BY PARISA SHOKOUI



### **Laura Cabrera participated in elite summer data immersion program**

**Laura Cabrera**, Dorothy Foehr Huck and J. Lloyd Huck Career Chair in Neuroethics and research associate in the [Penn State Rock Ethics Institute](#), participated in the Michigan Center for Contextual Factors in Alzheimer's Disease [Summer Data Immersion Program](#), which took place in mid-June. Cabrera was part of an elite group of forty-five, selected from 120 applicants. In accordance with the theme "Family Care: Racial/Ethnic and Contextual Factors," the program provided training in the use of publicly available data to address Alzheimer's disease and related dementias.



### **Akhlesh Lakhtakia joins peer review ambassadors of IOP Publishing**

**Akhlesh Lakhtakia**, Evan Pugh University Professor and Charles Godfrey Binder Professor of Engineering Science and Mechanics, joined a team of ten other senior researchers working to train the next generation of publication and manuscript peer reviewers. The team leads the Institute of Physics (IOP) Publishing's Peer Review

Excellence workshops and provides other physical science researchers with the experience and training they need to become peer reviewers.

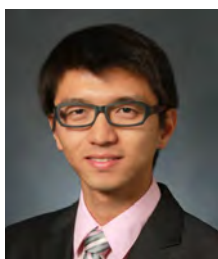
### **Lakhtakia receives seed grant for research in sustainable materials**

Convergence Center for Living Multifunctional Material Systems (LiMC2), in partnership with the University of Freiburg's Cluster of Excellence for Living, Adaptive and Energy-autonomous Materials Systems (livMatS), announced the recipients of the inaugural Living Multifunctional Materials Collaborative Research Seed Grant Program. Three joint faculty teams from Penn State and the University of Freiburg were selected for the program. Lakhtakia and Günter Reiter from the University of Freiburg received a grant for their project, "Scalable Nanomanufacturing Technique for Bioinspired Nonpigmented Colored Fabrics." [bit.ly/LiMC2-grant](https://bit.ly/LiMC2-grant)



### **Slava Rotkin named fellow of international society**

**Slava V. Rotkin**, Frontier Professor of Engineering Science and Mechanics with an appointment in the Materials Research Institute, was named a 2021 fellow of the Electrochemical Society (ECS). He was honored at the 240th ECS Meeting in October.



### **Huanyu "Larry" Cheng selected as finalist for Falling Walls Foundation contest**

**Huanyu "Larry" Cheng**, Dorothy Quiggle Career Development Professor in Penn State's Department of Engineering Science and Mechanics, was recently selected as a finalist for the Falling Walls Foundation's [Science Breakthroughs of the Year 2021](#). Cheng's submission was

part of the science and technology category, which includes research applicable to everyday life, such as artificial intelligence, information technology, and mechanical engineering. Cheng plans to attend the Falling Walls Science Summit virtually in November.



### **Vijay Varadan awarded U.S. patent for vertical standing nanosensors**

**Vijay K. Varadan**, Distinguished Professor Emeritus of Engineering Science and Mechanics, was awarded a U.S. patent in June. Filed in September 2017, the patent is for the "methods, processes, and apparatus for depositing nanosensors on low surface energy substrates," of which Varadan is credited as one of three inventors. Varadan is co-founder, inventor, and chief innovation officer of [Nanowear Inc.](#), headquartered in New York City with research, development, and manufacturing based out of Innovation Park at Penn State. Nanowear is the leading developer of patented, wireless textile-based nanosensor technology with applications in the cardiac, neurological, diabetic, sleep disorders, sleep apnea, and sports medicine/performance diagnostic markets.

Nanowear recently announced [a commercial distribution partnership](#) with a surgical device-manufacturer for its "SimpleSENSE" platform, an over-the-shoulder sash which functions to enhance patients' post-surgery recovery by providing real-time monitoring for patients and their medical teams. The sash, featured in the [Wall Street Journal](#), captures and analyzes patients' biomarker data points multiple times a day, replacing the need for conventional health monitoring. Mass production of SimpleSENSE began in September.





## Want more ESM news and highlights?

Read about the accomplishments of ESM graduate students and postdoctoral researchers in our new ESM Foundations newsletter, published exclusively online each semester starting fall 2021.

[bit.ly/esm-foundations-21](http://bit.ly/esm-foundations-21)

## Alumni News



### Feng Guo receives Outstanding Junior Faculty Award

**Feng Guo** ('15 Ph.D. ESMCH), [recently received the Outstanding Junior Faculty Award from Indiana University \(IU\)](#). The award identifies promising tenure-track faculty who have not yet been awarded tenure and provides resources to further develop their research programs or creative activity. [Guo](#) is an assistant professor in the Department of Intelligent Systems Engineering within the Luddy School of Informatics, Computing, and Engineering at IU. Along with the award, Guo will receive a \$15,000 grant to support future research.



### Don Heaney named fellow of materials society

**Don Heaney** ('91 B.S. ESC, '93 M.S. ESC, '97 Ph.D. MatSE) was named a fellow of ASM International (formerly, the American Society for Metals). Fellows are recognized for distinguished contributions in the field of materials science and engineering. Heaney, president and CEO of [Advanced Powder Products, Inc.](#), was given the award for seminal contributions to the engineering and science of metal injection molding and 3D metal printing, leading to the successful commercialization of the technology, according to the award citation. He will be honored at the 2022 ASM annual meeting held in St. Louis, Missouri.



### Nitesh Nama joins University of Nebraska-Lincoln engineering faculty

**Nitesh Nama** ('17 Ph.D. ESMCH), is currently completing a postdoctoral fellowship at the University of Michigan in the Department of Surgery. Nitesh joined the Department of Mechanical & Materials Engineering at the University of Nebraska-Lincoln this fall.

## Nominations open for ESM Early Career Recognition Award

The ESM Early Career Recognition Award recognizes alumni who have graduated in the past ten years who have distinguished themselves in academia, the workplace (e.g., academia, industry, government, military), and/or in their community. Nominations are due on February 15, 2022. More information, including the nomination form: [bit.ly/esm-earlyaward](http://bit.ly/esm-earlyaward)



## Latest News

### Waste to wear: Squid's role in material revolution

**Melik Demirel**, Penn State Lloyd and Dorothy Huck Chair Professor in Biomimetic Materials and professor of engineering science and mechanics, leads a research team investigating how to mimic nature in an effort to mitigate damage caused by humans. For the last decade, this work has focused on using squid proteins to make self-healing, sustainable fibers. This year, he co-advised a senior capstone project, and the students used "Squitex" fiber to produce the first squid protein-based yarn. [bit.ly/squid-wear](http://bit.ly/squid-wear)



### Red blood cell "traffic" contributes to changes in brain oxygenation

Adequate blood flow supplies the brain with oxygen and nutrients, but the oxygenation fluctuates in a distinct, consistent manner. Penn State researchers have identified inherent randomness of red blood cell flow as one cause of these fluctuations. The team, including **Patrick Drew**, Huck Distinguished Associate Professor of Engineering Science and Mechanics, Neurosurgery, and Biomedical Engineering, and **Qingguang Zhang**, assistant research professor of engineering science and mechanics, monitored the blood flow, oxygenation, and electrical signals produced by brain activity in awake mice. With microscopy and modeling tools, the researchers found that the red blood cells flowed and stalled much like car traffic. Better understanding of this patterning of blood flow and subsequent transport of oxygen could help researchers improve medical technology and explore causes of diseases such as Alzheimer's in the future. [bit.ly/cell-traffic](http://bit.ly/cell-traffic)

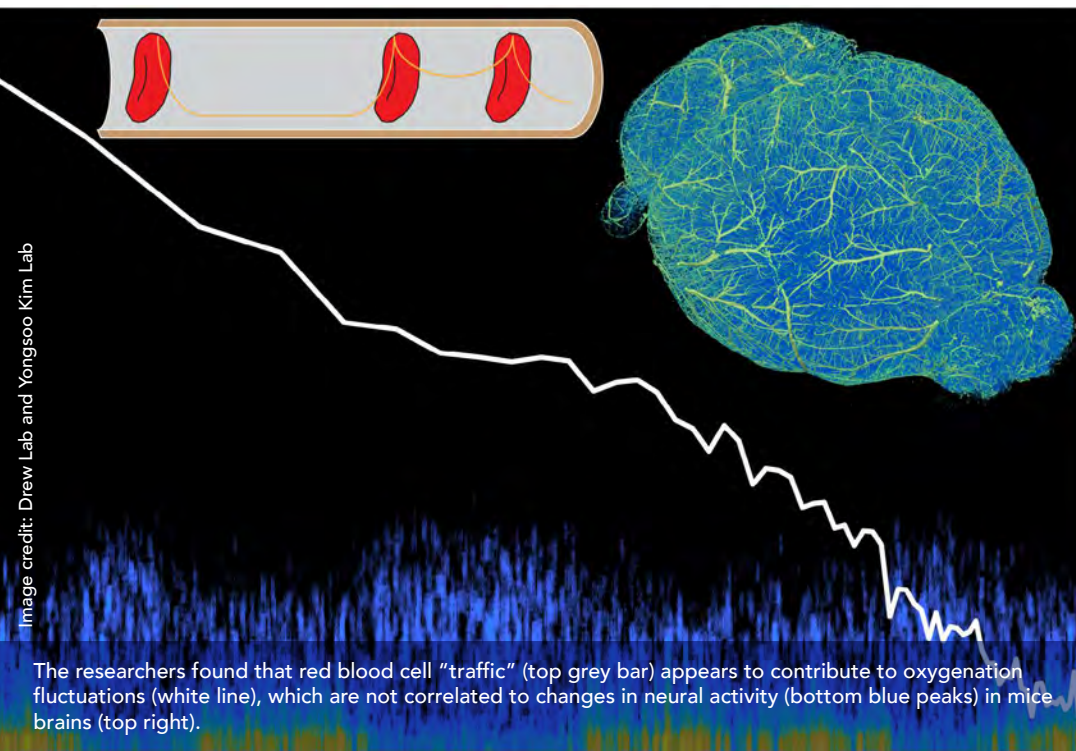


Image credit: Drew Lab and Yongsoo Kim Lab

The researchers found that red blood cell "traffic" (top grey bar) appears to contribute to oxygenation fluctuations (white line), which are not correlated to changes in neural activity (bottom blue peaks) in mice brains (top right).

### Laura Cabrera recognized as first author on *Psychiatric Quarterly* article

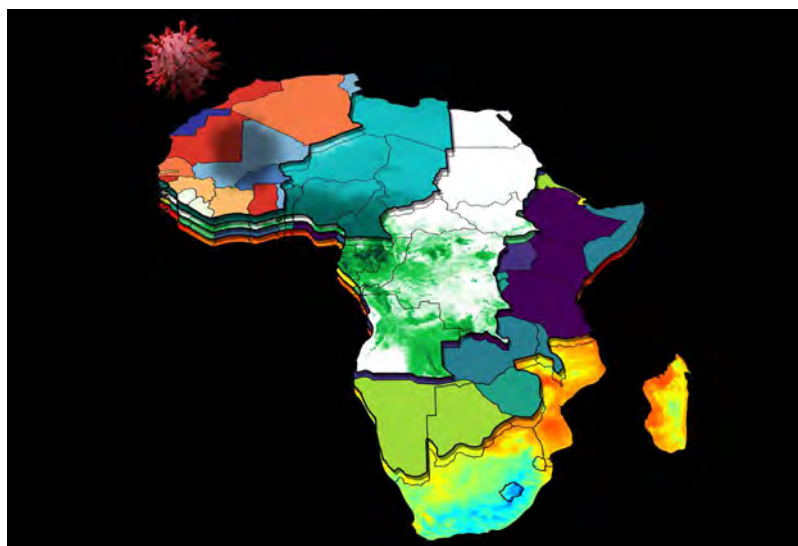
**Laura Cabrera**, Dorothy Foehr Huck and J. Lloyd Huck Career Chair in Neuroethics and research associate in the [Penn State Rock Ethics Institute](http://Penn State Rock Ethics Institute), was recognized as the first author on a paper, "[Beyond the Cuckoo's Nest: Patient and Public Attitudes about Psychiatric Electroceutical Interventions](#)," with four collaborators from Michigan State University. Published by *Psychiatric Quarterly* in June, the study examines attitudes about psychiatric electroceutical interventions (PEI), which include electroconvulsive therapy, transcranial magnetic stimulation, and deep brain stimulation among patients with depression and members of the general public through qualitative interview analysis. The researchers found that patients and the public were cautious toward PEIs and that education was needed to fill the gaps in patients' and public knowledge, particularly for those who may benefit from such types of treatments.



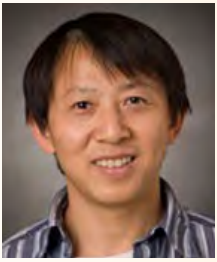


## Predictive tool helps mitigate COVID-19 in Africa

As the first COVID-19 cases were diagnosed in Africa, **Steven Schiff**, Brush Chair Professor of Engineering and professor of engineering science and mechanics, and his research partners across the globe saw an opportunity to apply what they were learning from their [ongoing efforts](#) to track and control infectious disease and provide countries such as Uganda with more information to help guide policy to mitigate the viral pandemic. The result was a multi-country collaboration to develop a surveillance modeling tool that provides a weekly projection of expected COVID-19 cases in all African countries, based on current case data, population, economic status, current mitigation efforts, and meteorological sensing from satellites. Developed in collaboration with Uganda's National Planning Authority (NPA), the country's senior organization for development and economic planning, the tool's COVID-19 projections use openly available data to provide a projection of cases, as well as lower and upper ranges to help the country decide if mitigation policies need to be implemented or modified. They published their work in the [Proceedings of the National Academy of Sciences of the United States of America](#). [bit.ly/schiff-africa](https://bit.ly/schiff-africa)

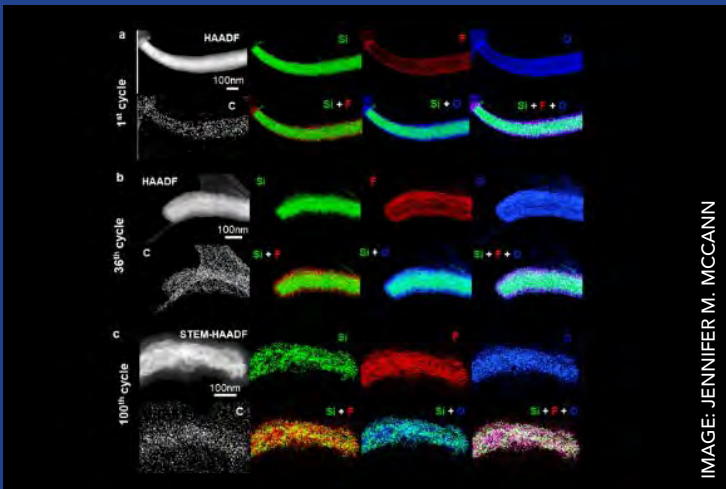






## Sulin Zhang discovers new tissue-closure model that may promote faster wound healing

**Sulin Zhang**, professor of engineering science and mechanics and biomedical engineering, published a paper in *Proceedings of the National Academy of Sciences* on a newly discovered biological mechanism for closing gaps in living tissue. Specifically, biological tissues repair themselves through a rubber band-like ring at the wound front, which is constantly remodeling. With this knowledge, surgeons may be able to adjust their methods so a wound can close faster with less scarring.



## Novel method of imaging silicon anode degradation may lead to better batteries

A novel method of characterizing the structural and chemical evolution of silicon and a thin layer that governs battery stability may help resolve issues that prevent using silicon for high-capacity batteries, according to a group of researchers, led by **Sulin Zhang**, professor of engineering science and mechanics and of biomedical engineering. The research focuses on the interface of the anode, a negative electrode, and the electrolyte, which enables the charge to move between the anode and the positive electrode, the cathode. A solid-electrolyte interphase (SEI) layer usually forms on the surface of an electrode between the solid electrode and the liquid electrolyte and is vital for the electrochemical reaction in batteries, along with governing the battery's stability. Using silicon as an anode would enable a better rechargeable battery.

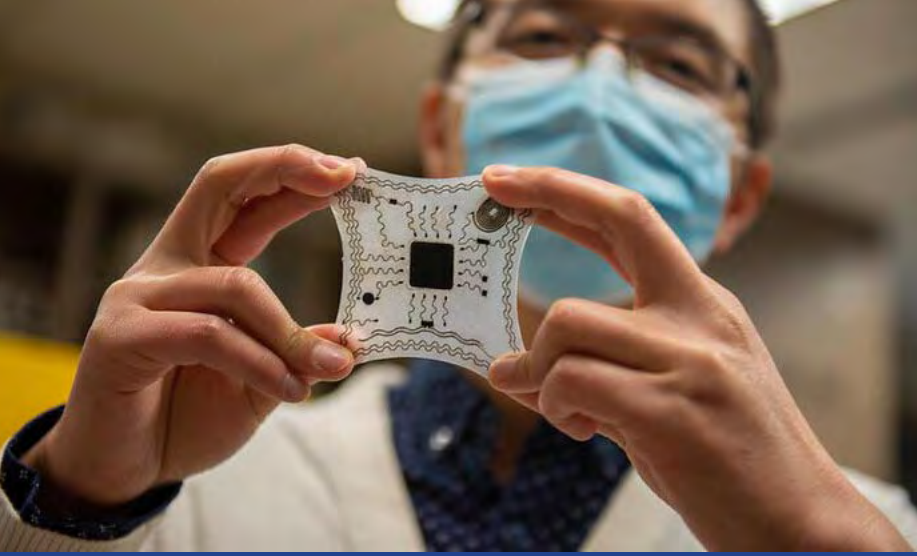
"In the last ten years, silicon has attracted a lot of attention as a high-capacity negative electrode for rechargeable batteries," Zhang said. "Current commercialized batteries use graphite as an anode material, but the capacity of silicon is about ten times that of graphite. There are tens of millions, hundreds of millions even, of dollars invested in silicon battery research because of this." [bit.ly/silic-batteries](http://bit.ly/silic-batteries)

## Normal brain growth curve for children developed

**Steven Schiff**, Brush Chair Professor of Engineering and professor of engineering science and mechanics, led a multi-institution team to analyze 1,067 brain scans of 505 healthy children, ages thirteen days to eighteen years old. As they developed normal brain growth curves based on the scans, they found that regardless of size or sex of the child, the ratio between the size of the child's brain and volume of fluid within the child's head was universal.

The revelation may have implications for diagnosing and treating childhood brain disorders, infections, and injuries. Their work was published in the *Journal of Neurology, Pediatrics*. [bit.ly/schiff-brain](http://bit.ly/schiff-brain)





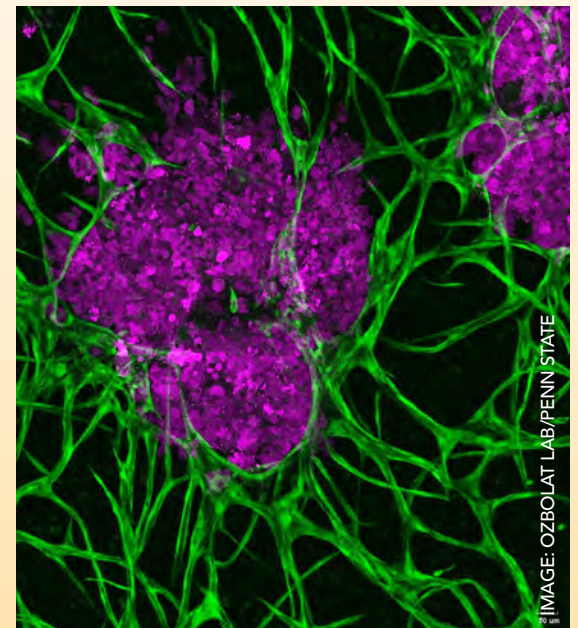
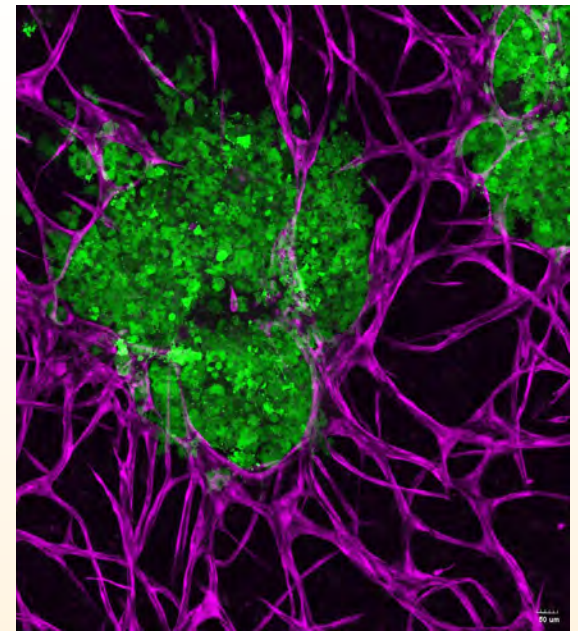
## Latest news: Larry Cheng sensor research stories

Huanyu “Larry” Cheng, Dorothy Quiggle Career Development Assistant Professor of Engineering Science and Mechanics, conducts research on flexible electronics that could be used in health monitoring and other smart device applications. Here are the stories written about his work.

- **International Journal of Extreme Manufacturing**  
Review of modern approaches and ongoing improvements in wearable sensors. [bit.ly/cheng-flexwear](https://bit.ly/cheng-flexwear)
- **Materials Today Physics**  
Researchers harvest energy from radio waves to power wearable devices. [bit.ly/waves-wear](https://bit.ly/waves-wear)
- **Materials Today**  
Printing circuits on irregular surfaces with pulses of light. The artwork for this paper was chosen for the inner cover of *Materials Today*. [bit.ly/circuits-print](https://bit.ly/circuits-print)
- **Nano-Micro Letters**  
Wearable antenna bends, stretches, compresses without compromising function. [bit.ly/nano-letters](https://bit.ly/nano-letters)
- **Materials & Design**  
Enabling further antenna customization with constant variables. [bit.ly/nano-letters](https://bit.ly/nano-letters)
- **ACS Applied Materials & Interfaces**  
Intentional cracks and wrinkles provide low-cost option for medical screening. [bit.ly/med-cracks](https://bit.ly/med-cracks)



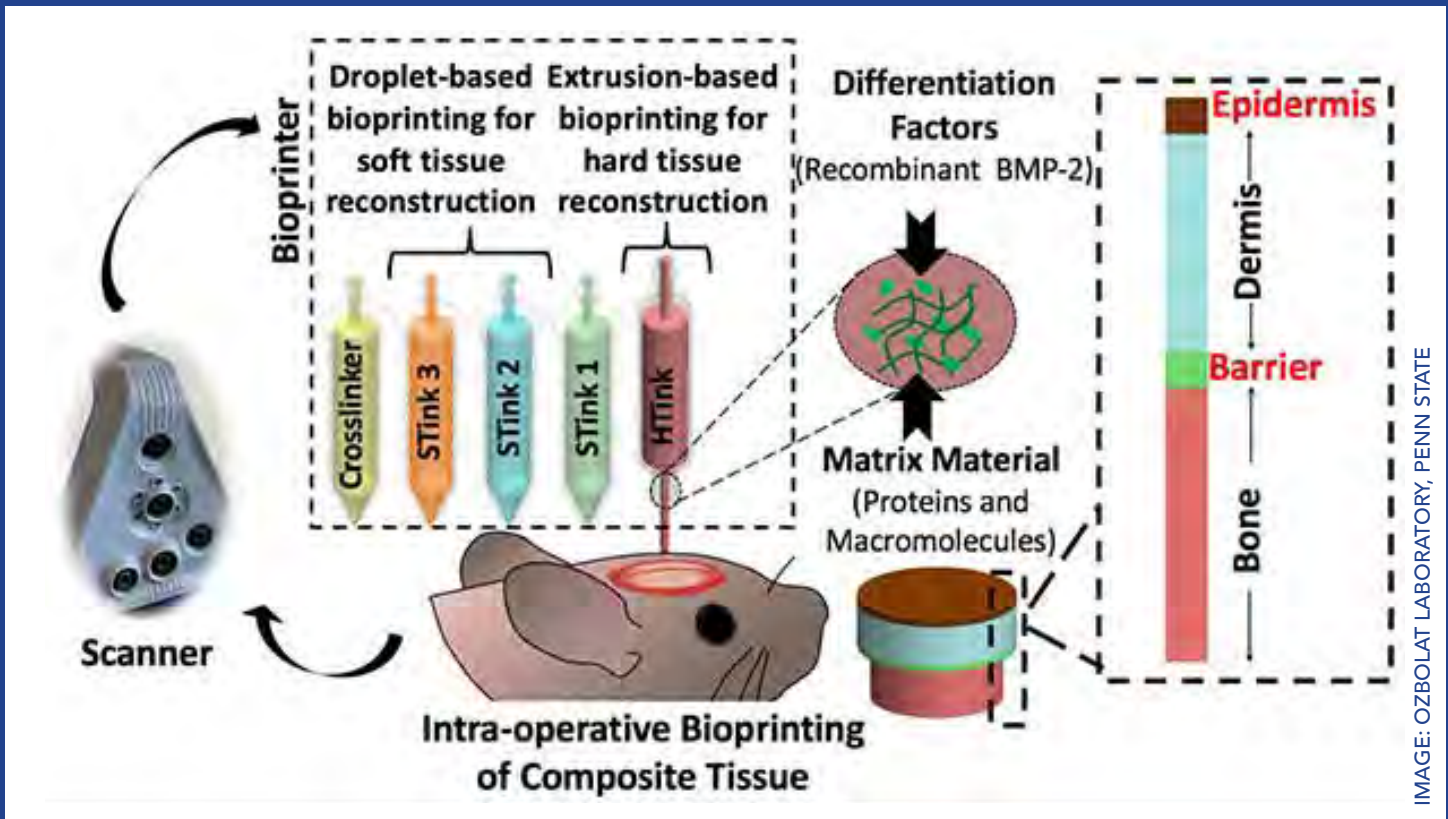
This artwork was chosen for the inner cover of *Materials Today*.



## Researchers model breast cancer in three dimensions

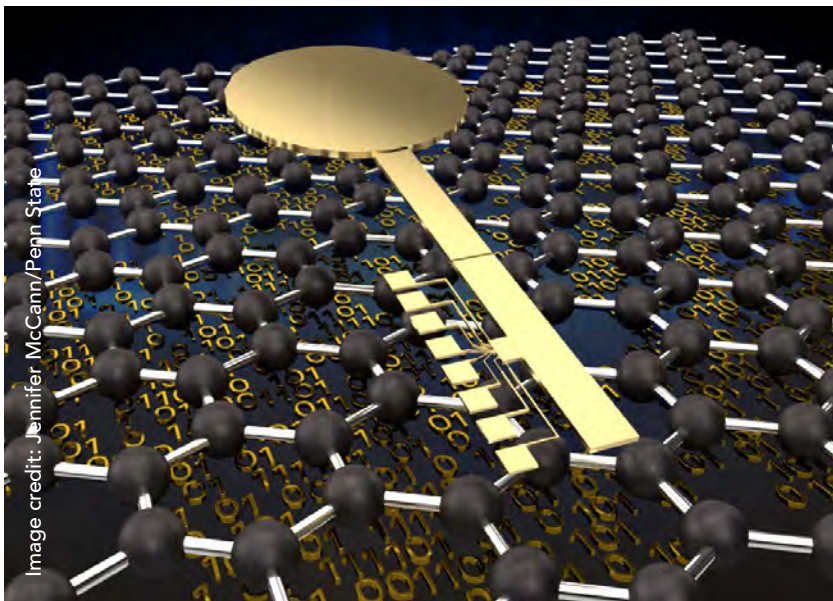
A team led by **Ibrahim T. Ozbolat**, associate professor of engineering science and mechanics and biomedical engineering, developed a way to study the relationship between solid, difficult-to-treat tumors and the microenvironment they create to support their growth. They 3D-printed tumor models in near-native microenvironments to analyze how distance from the environmental signals might influence tumor growth. The platform has potential as a testbed for drugs and other anticancer treatments, according to the researchers. They published their approach in *Advanced Biology*. [bit.ly/ozbolat-cancer](https://bit.ly/ozbolat-cancer)





## Skin and bones repaired by bioprinting during surgery

**Ibrahim T. Ozbolat**, associate professor of engineering science and mechanics and biomedical engineering, led a team of researchers who repaired typically hard-to-heal, multi-layered traumatic skin and bone injuries using bioprinting during surgery. Their work was published in *Advanced Functional Materials* and may lead to faster and better methods of healing skin and bones, since there is no surgical method to repair soft and hard tissue at once. [bit.ly/ozbolat-bioprint](http://bit.ly/ozbolat-bioprint)



## Graphene key for novel hardware security

Penn State researchers developed a novel low-power, scalable, reconfigurable hardware security device with significant resilience to artificial intelligence (AI) attacks. The physically unclonable function (PUF) device is the first demonstration of a graphene-based PUF, according to **Saptarshi Das**, associate professor of engineering science and mechanics. The team found that AI could not develop a model to crack the encrypted device, which relies on inherent randomness arising from the production process for security. The PUF device also cannot be reverse engineered for future exploitation—unlike conventional silicon devices. [bit.ly/graph-key](http://bit.ly/graph-key)



## Message from your alumni society chair



In the previous issue of [ESM Connections](#), I mentioned a 1957 tug-of-war between first- and second-year students that took place around where new engineering buildings are now under construction. That event was just one of the Penn State traditions that have long since

disappeared. At the beginning of the fall semester, first-year students were expected to wear a little beanie called a “[dink](#),” and a large sign that announced the person’s name and some other information that I don’t clearly recall. I don’t know how long the dink or name tag tradition persisted, but 1957 was definitely the last tug-of-war. It was held on a field where the Blue Band practiced, with spectators watching from the towers that band directors used. Somehow, the tug moved sideways and toppled one of the towers. Injuries of those hit by the falling tower included some broken bones. At a mixer the next evening, a gal introduced herself to me the way she had been listed in the Daily Collegian: “Suzie Wertz, multiple contusions and abrasions.”

There were major engineering events at Penn State when I was a student, including the construction of Hammond Building and the move of Beaver Stadium.

From its location near the Nittany Lion Inn, the 30,000-seat steel structure was disassembled into 700 pieces, moved to its present location and expanded to 46,000 seats between the 1959 and 1960 seasons. At that point, it was still an open U-shape with a track surrounding the field. There have been multiple subsequent expansions. The original portion was raised, adding lower seats where the track used to be. The open end was filled, completing the oval. A deck was added overhanging the north end. Today, seating capacity has topped 107,000.

We encourage our alumni to get involved with Penn State alumni organizations. To clarify the hierarchy of alphabet soup: PSAA (Penn State Alumni Association) is for all alumni; PSEAS (Penn State Engineering Alumni Society) is just for engineering alumni. Under PSEAS are multiple APGs (Affiliate Program Groups), including departmental groups such as PSESMAS (Penn State Engineering Science and Mechanics Alumni Society). If you would like to explore greater involvement with either engineering group, you can learn more here about [PSESMAS](#) and [PSEAS](#).

Chuck Gaston ('61 ESci)

## Contact ESM and stay in touch

Judith A. Todd  
Department Head and  
P. B. Breneman Chair  
814-863-0771 • [jtodd@psu.edu](mailto:jtodd@psu.edu)

Chuck Gaston  
Alumni Society Chair  
717-468-5935 • [cgaston@aol.com](mailto:cgaston@aol.com)

Lisa Spicer  
Alumni, Development, and Advancement  
814-867-1569 • [lms8@psu.edu](mailto:lms8@psu.edu)

ESM website: [esm.psu.edu](http://esm.psu.edu)  
PSESMAS website: [esm.psu.edu/alumni](http://esm.psu.edu/alumni)  
PSESMAS operations: [alumnirelations@esm.psu.edu](mailto:alumnirelations@esm.psu.edu)  
Digital newsletter: [bit.ly/esm-connections2021](http://bit.ly/esm-connections2021)



**PennState**  
College of Engineering

**ENGINEERING SCIENCE  
AND MECHANICS**

