ESM CONNECTIONS

A twenty-year ESM legacy

Alumni, faculty, staff, students, and friends:

After twenty years at the helm of the Department of Engineering Science and Mechanics, I was approved for a sabbatical year and will return to the ESM faculty in fall 2023. I am proud to announce that **Vincent Meunier**, Gail and Jeffrey L. Kodosky '70 Chair, professor of physics and material science, and head of the Department of Physics, Applied Physics, and Astronomy at the Rensselaer Polytechnic Institute, will assume the position on July 1. I invite you all to extend a warm welcome to Vincent, our newest ESM family member, at vincent.meunier@psu.edu.

As I look back, I am amazed and humbled by our collective achievements. We doubled our undergraduate honors program, founded in 1953 as one of the three original Penn State honors programs. We are proud of our sixty-nine-year heritage as an engineering honors program and the recognition many of our students received as members of the Penn State Schreyer Honors Program, founded in 1980, and Schreyer Honors College, established in 1997. We doubled our graduate student population, expanded our faculty beyond expectations, and explored interdisciplinary research placing ESM at the frontiers of science and engineering, with our faculty achieving national and international acclaim.

For me, the most exciting part of ESM was working with the most gifted and innovative people I've ever encountered. Building on our heritage of theoretical and applied mechanics, advanced materials, microelectronics, and nanotechnology, we pioneered new links between engineering, the life sciences, and medicine through bionanotechnology research. We took on the complex challenges of mechanobiology and brain-related research by founding a new University-wide Center for Neural Engineering. New generations of wearable and in-body microelectronic systems were developed to improve disease diagnosis, therapeutic interventions, and health monitoring. Our expertise in powder materials and laser-based manufacturing contributed significantly to the growth of additive manufacturing for custom-built components, aerospace, and defense applications. Our 3D bioprinting of bone, cartilage, skin, pancreas, and heart cells, among others, raises the potential for organ repair and even the development of artificial organs.

Moving into the next phase of ESM's strategic plan, we are hiring leaders in Penn State's quantum initiative—quantum optics, quantum informatics, and quantum computing. We're incorporating artificial intelligence, machine learning, data science, and neuromorphic computing into our research areas. Major thrusts in sustainable materials, sustainable manufacturing processes, and the circular economy are envisaged. We've become more entrepreneurial, and many of our graduates are developing highly successful startup companies. The next decade promises great success for ESM.

These accomplishments were only possible with the support of our dedicated alumni. After the highly successful 2006 ESM Centennial celebration, multiple alumni formed an advisory board the following May, the Penn State Engineering Science and Mechanics Alumni Society. Under the leadership of its founding chair, **Mike Erdman**, PSESMAS organized communications, alumni speakers, philanthropic support, social events with students, career guidance, and leadership training. Mike was still championing the ESM honors experience with students until he passed away this year on May 29. A tribute to Mike follows in this newsletter. We owe him and his wife, Donna, a huge debt of gratitude for their contributions to our programs, their legacy of service, and their efforts in making ESM such a welcoming family. PSESMAS is as vibrant today as it was in 2007.

As I begin the next phase of my career, I want to recognize ESM staff, who've gone the extra mile to advance the department and celebrate our students' successes. My sincere thanks to you all.

The last twenty years were the most professionally rewarding of my career. I look forward to exploring new research horizons and to returning refreshed as a faculty member in fall 2023. Have a wonderful summer!

Judith A. Todd

Judith A. Todd

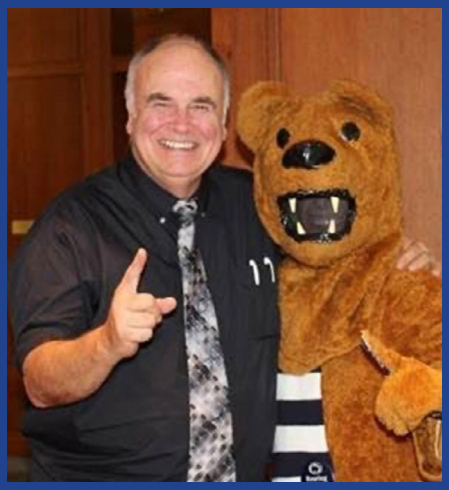
Judith A. Todd Fund for Engineering Science and Mechanics

The Judith A. Todd Fund for Engineering Science and Mechanics was established by alumni, faculty, and ESM family in honor of **Judith Todd** to advance the Department of Engineering Science and Mechanics through the support of programs, undergraduate students, and visionary initiatives. If you'd like to make a gift to support the department in her honor, visit raise.psu.edu/toddfund.

PennState College of Engineering | ENGINEERING SCIENCE AND MECHANICS

Innovation lives where disciplines meet.

In This Issue



"Mike was an amazing and kind person, doing just about anything he could to help others. I was better for knowing him for sure. He inspired, encouraged, and made others become the best versions of themselves."
— Casey Moore
('89 CE)

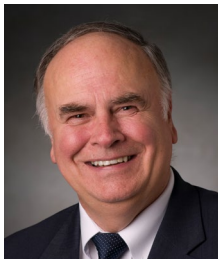
"Mike was a great person to talk to about life during my time with him as a mentor."
— Jillian Woolridge
('10 B.S. ES, '11 M.S. ESM)

"Mike was a great person, a truly great gentleman. He always tried to bring out the best in everybody and looked for the best in everyone."
— Barbara Covolus Faust
('64 B.S. ESM)

"His passion and commitment to the students was obvious during recruitment exercises for the students."
— Brent Wagner
('84 B.S. ESM)

"Mike never said no. Anytime I asked him to do something for me, he always said, 'I will be there for you, 100%.'"
— Rudy Haluza
('16 B.S. ES, '17 M.S. ESM)

In memoriam: Mike Erdman



The ESM community is mourning the loss of **Andrew Michael "Mike" Erdman**, retired professor of practice, who died on May 29 at the age of 74. His enduring dedication to Penn State and engineering was recognized with the college's highest honor, the Outstanding Engineering Alumni Award, in March.

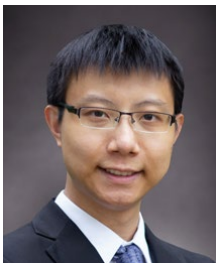
Erdman ('69 B.S. ES) was a self-described lifelong advocate for Penn State and spent much of his 34-year career in industry recruiting Penn State engineering graduates to the General Electric Company and Lockheed Martin. After retiring from Knolls Atomic Power Laboratory, Erdman returned to Penn State as a professor of practice in ESM.

Erdman held several leadership roles for Penn State alumni groups, including serving as president for the Penn State Engineering Alumni Society; founding chair of the Penn State Engineering Science and Mechanics Alumni Society; president of the Centre County Chapter of Penn State's Alumni Association; and presiding over the ESM Industrial and Professional Advisory Council. He was also the founding adviser for the Penn State Engineering Leadership Society.

"Mike was my rock—he was one of the first people to welcome me to Penn State in 2002," said ESM Department Head **Judith Todd**. "When he retired from industry, we welcomed him into ESM as a faculty member. He introduced new design courses for our students, taught leadership skills, became active in humanitarian engineering, and served as the Walter L. Robb Director of Engineering Leadership Development (ELD). Mike mentored everyone in the most positive, enthusiastic, and supportive manner. He made us all feel special and proud to be part of the Penn State family. We will miss him very much." bit.ly/erdman-mem

Mike was a self-described lifelong advocate for Penn State and was well known for connecting with students.

Faculty spotlight



Yang Yang receives NSF CAREER Award

Yang Yang, assistant professor of engineering science and mechanics, earned a five-year, $550,000 NSF CAREER Award for a project titled "Characterization and understanding of point defect evolution during corrosion-induced grain boundary migration." This research facilitates the prediction of failure due to rust in engineering systems and infrastructures to help prevent rust-induced accidents. In addition, by understanding the motion of grain boundary migration during rusting, Yang seeks to advance engineering methods to make low-cost, high-performance, and damage-resistant alloys for application in advanced energy and transportation systems.

"My long-term goal is to establish Penn State as a leading center for the study of interfaces in extreme environments, with unique advanced characterization systems that will benefit all materials researchers at Penn State and beyond," Yang said. bit.ly/nfs-yang

Huanyu "Larry" Cheng named to MIT Technology Review's Innovators Under 35 China list

Huanyu "Larry" Cheng, Dorothy Quiggle Career Development Assistant Professor of Engineering Science and Mechanics, was named to the 2021 MIT Technology Review's Innovators Under 35 China list. Cheng was recognized in the inventor category for his development of stretchable, wireless, self-powering sensors with potential applications in health monitoring and more. He designed a graphene foam-based gas platform capable of continuously monitoring multiple components in a gas mixtures. Cheng also developed simple, generally applicable fabrication methods to print circuits on skin without heat and on irregular surfaces. In addition, he invented a flexible microfluidic sensing platform that can collect and analyze biological fluids in health monitors. bit.ly/cheng-MIT-Inno

Osama O. Awadelkarim testifies on microelectronics before congressional subcommittee

Osama O. Awadelkarim, professor of engineering science and mechanics and the UNESCO Chair on Building Innovation and Manufacturing Capacities through Advanced Technology Education at Penn State, testified before the U.S. Congressional Subcommittee on Research and Technology in February. The hearing, titled, "Strengthening the U.S. Microelectronics Workforce," was called to explore the barriers, and the potential solutions, to building awareness of and preparing workers for semiconductor manufacturing jobs in the U.S. Awadelkarim discussed the importance of integrated circuits and the worldwide shortage of the technology. bit.ly/micro-cong

Corina Drapaca recognized by former student

Corina Drapaca, associate professor of engineering science and mechanics, was recently highlighted by Andrew Tamis, a former student of Drapaca's who graduated with a bachelor's degree in 2021.

"I first took Dr. Drapaca's ESC 261 class and then worked with her to write my thesis in engineering science: 'Mathematical Modeling of Cerebral Nitric Oxide Dynamics,'" Tamis wrote. "Both as a teacher and a research mentor, she was very enthusiastic, kind, and guided me through the entire process, while still letting me discover and learn on my own. Her mentorship is a large reason as to why I decided to continue a career in research and pursue a Ph.D. in physics. I wanted to take a small moment to highlight this outstanding professional as she has made a tremendous mark on my academic path."

Student spotlight

Engineers develop new software tool to aid material modeling research

A new software tool can accelerate materials science research by cutting out tedious background research on material properties. **Anubhav Roy**, a doctoral student in engineering science and mechanics and first author on the paper published in the *Journal of Applied Crystallography,* and **Christopher Kube**, assistant professor of engineering science and mechanics, developed propSym, an open-source software on the programming platform MATLAB, to calculate the fundamental constants needed to describe the physical properties of solids, such as metals, ceramics, or composites. bit.ly/roykube-res

Lauren Katch wins best paper award at international conference

Lauren Katch, doctoral candidate in engineering science and mechanics, won the best student paper award in structural acoustics and vibrations at the 181st Meeting of the Acoustical Society of America. Katch's paper, "High frequency ultrasonic scattering from cracks in orthotropic silicon wafers," focuses on the research she is conducting with **Andrea Argüelles,** assistant professor of engineering science and mechanics and Katch's adviser. Katch uses ultrasonic waves to detect microscale cracks in silicon wafers that are commonly used in the photovoltaic industry. bit.ly/katch-asa

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 **August 31**, 2022. More information, including the nomination form: bit.ly/esm-earlyawardsemester

WE ARE ... HIRING

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

Please visit **esm.psu.edu/department/job-opportunities.aspx** for more information.

Wenjing Song receives Leighton Riess Graduate Fellowship

Wenjing Song, a graduate student in engineering science and mechanics, received the Leighton Riess Graduate Fellowship from the Penn State Center for Biodevices. The fellowship program supports outstanding graduate students who are conducting research in biological or biomedical-related areas of inquiry. Song's adviser is **Cunjiang Yu**, Dorothy Quiggle Career Development Associate Professor of Engineering Science and Mechanics.

Jeremy Keirn named spring 2022 student marshal

Jeremy Keirn was named the spring 2022 student marshal for engineering science. Keirn, a Schreyer Honors Scholar, graduated with honors in engineering science and minors in engineering mechanics and music technology. As a Schreyer Honors Scholar, Keirn completed an honors thesis titled "Widening the Frequency Stop-Bandwidth of Metasurfaces for Controlling Lamb Wave Propagation."

Keirn earned several awards and scholarships while at Penn State. These include the President Walker Award, President Sparks Award, Evan Pugh Scholar Award, Kearns-McNitt Award, H. Thomas and Dorothy Willits Hallowell Scholarship, Bayard D. Kunkle Scholarship, and more. After graduation, Keirn plans to continue his education at Penn State pursuing a graduate degree in engineering science and mechanics. bit.ly/keirn-sp22

Students take second place in Ben Franklin TechCelerator Pitch

Graduate students **Jackson Meeks** and **Wanquing Zhang** received second place and $2,500 in the Ben Franklin TechCelerator Pitch for "Functional Circuits," which develops flexible, wearable electronics targeting the health care industry. Meeks and Zhang are advised by **Huanyu "Larry" Cheng**, Dorothy Quiggle Career Development Assistant Professor of Engineering Science and Mechanics. Prior to the pitch event, competing teams attended a 10-week virtual, business startup bootcamp offered by Ben Franklin Technology Partners of Central and Northern Pennsylvania, in partnership with Invent Penn State.

Congratulations on the new role, Lisa!

Join us in congratulating **Lisa Spicer**, who was promoted to alumni relations and stewardship officer for the College of Engineering's development and alumni relations team. Her last day with ESM is Friday, June 24.

For almost four years, Lisa was the mainstay of all our development and alumni activities, plus ESM Today. We will all miss her very much but are reassured that she will not be far away in Hammond. We wish Lisa every success in her new position.

2022 ESM Today symposium

ESM graduate students and faculty met for the nineteenth annual engineering science and mechanics research symposium on February 26. ESM Today, organized by the ESM Graduate Student Council, enabled students to showcase their research through oral and poster presentations, connect with others to foster interdisciplinary research opportunities, and combine creativity with technical achievement in the Art-in-Science exhibition.

The day's events kicked off with a welcome breakfast and introduction from **Judith Todd**, P.B. Breneman Chair and head of the Department of Engineering Science and Mechanics, followed by a keynote address by **Doug Evans**, president and CEO of Lungpacer Medical Inc. Evans, a 1986 engineering science alumnus, has an extensive background in medical devices, with patents covering devices that have been used to support more than 15 million patients around the globe. Evans shared his perspective with students on how an ESM degree can influence and broaden career opportunities and assist in pursuing entrepreneurial goals.

Following the keynote lecture, students participated in presentations. Thirty-two oral presenters gave ten-minute PowerPoint talks on their research, followed by a short question and answer segment. Eight students in the poster competition were tasked with visually compiling their research into a large poster, as well as presenting and answering questions about the poster. For the Art-in-Science competition, nine students submitted slides aimed at representing their research in an aesthetically appealing manner. Work in 2D materials, machine learning, additive manufacturing, and more comprised the research shown in the competitions.

The Safety Olympics, an informal competition including games of Pictionary and trivia, challenged teams to test their knowledge of laboratory safety procedures. Several teams competed for a $250 prize.

ESM Today culminated with an awards ceremony, with winning participants receiving more than $6,500 in prize money.

From left to right: Nailah Oliver, Olivia Cook, Department Head Judith Todd, Lisa Spicer, Rahul Pendurthi, and Shiva Subbulakshmi Radhakrishnan

Oral Presentations
Four concurrent sessions

First Place
- Lauren Katch
- Harikrishanan Ravichandran
- Farshad Ghanbari
- Avery Brown

Second Place
- Faheem Ershad
- Akhil Dodda
- Stephen Moxim
- Lalith Sai Srinivas

Third Place (includes ties)
- Fedor Sharov
- Adam Alavi
- Aaryan Oberoi
- Linying Gao
- Dipanjan Sen
- Prabhav Borate
- Youngwen Sun

Poster Presentations

First Place
- Rahul Pendurthi

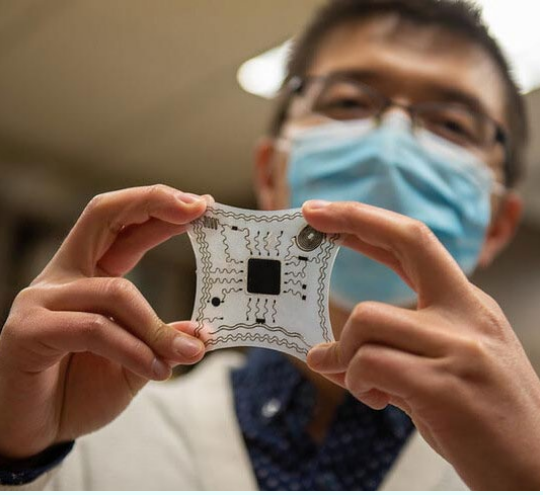
Second Place
- Arnab Chatterjee

Third Place
- Akshay Wali

Art-in-Science Competition

First Place (includes tie)
- Luis Rivas
- Rahul Pendurthi

Second Place
- Nazmiye Celik



Huanyu "Larry" Cheng receives Trailblazer grant

Huanyu "Larry" Cheng, Dorothy Quiggle Career Development Assistant Professor of Engineering Science and Mechanics, received a $619,556, three-year Trailblazer award from the National Institute of Biomedical Imaging and Bioengineering to develop a smart skin graft that can both improve the monitoring process and expedite healing in chronic wounds. bit.ly/Cheng-ss-grant

Cheng honored with Young Leaders Professional Development Award

Cheng was also chosen as the recipient of the 2022 Young Leaders Professional Development Award, presented by The Minerals, Metals & Materials Society Functional Materials Division. The award encourages young, professional members of TMS to advance in the field of materials science through participation in society activities.

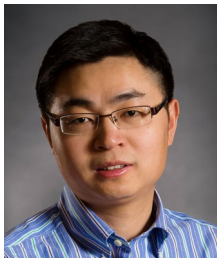
Faculty news

Company founded on Penn State invention named winner of microfiber challenge

Tandem Repeat Technologies, a company spawned from research conducted by **Melik Demirel**—the Lloyd and Dorothy Foehr Huck Chair in Biomimetic Materials, the director of the Center for Research on Advanced Fiber Technologies and professor of engineering science and mechanics—on a composite fiber synthesized from the proteins in squid ring teeth, was named a winner of the Microfiber Innovation Challenge. Each of the winning companies will receive $150,000. Demirel and his team's work also was featured in a documentary series, "Evolve: The Future is Animal," which aired in January. bit.ly/trt-winner

Şahin K. Özdemir named fellow of Optica, the international optics society

Şahin K. Özdemir, associate professor of engineering science and mechanics, was elected a 2022 fellow of Optica, the international professional society formerly known as OSA. The 2022 fellows class includes 106 members from 24 countries. Fellows are selected based on their distinguished contributions to education, research, engineering, business, and serving the community. Özdemir was recognized for his research contributions that focus on optical physics and quantum photonics—the broad study of how photons behave and interact with matter—as well as the applications of this understanding to new technologies. bit.ly/intl-optics



New faculty, Cunjiang Yu, joins the department

Cunjiang Yu joined the Penn State College of Engineering as the Dorothy Quiggle Career Development Associate Professor of Engineering Science and Mechanics and Biomedical Engineering on January 1. Yu received his doctorate in mechanical engineering from Arizona State University. Prior to joining Penn State, Yu was an associate professor at the University of Houston since 2013. Yu's research concerns the fundamentals and applications of soft and curvy electronics, including flexible electronics and sensors; wearable and implantable bioelectronics; inorganic and organic electronics; and optoelectronics and sensors. bit.ly/yu-joins

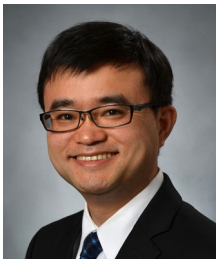
Judith A. Todd featured in ASM International

Judith A. Todd, department head, P.B. Breneman Chair, and professor of engineering science and mechanics, was prominently featured in the latest edition of ASM International's *Advanced Materials & Processes* magazine. Todd is currently serving as the president of ASM International. The feature was written by Todd's spouse and former ASM International President, Stephen M. Copley. Todd wrote a similar feature for Copley during his term in the December 1990 issue of *Advanced Materials & Processes*. bit.ly/todd-ASM-intl

Parisa Shokouhi receives two awards

Parisa Shokouhi, associate professor of engineering science and mechanics and acoustics, received the Institute for Materials Science Distinguished Faculty Scholar Award from the Los Alamos National Laboratory in New Mexico. The Federal Highway Administration also honored Shokouhi, along with Agnimitra Sengupta, a doctoral student in civil engineering, and S. Ilgin Guler, assistant professor of civil and environmental engineering, for their paper, "A State Based Markov Model Approach to Impact Echo Signal Classification," which was selected as the first-place winner in the bridge category of the 2020-21 Long-Term Infrastructure Performance Student Data Analysis Contest.

Alumni news



Xiaoyun Ding recognized by Graduate School for early career achievements

Alumnus **Xiaoyun Ding** ('13 Ph.D. ESM) received the 2022 Graduate School Alumni Society Early Career Award, which recognizes alumni who have demonstrated exceptional success in their chosen field within the first ten years after obtaining their graduate degree. Ding earned a doctoral degree in engineering science and mechanics in 2013. Currently, he is the Bruce S. Anderson Assistant Professor at the University of Colorado Boulder. Ding conducts interdisciplinary research at the frontiers of biomedicine, microfluidics, acoustics, drug delivery, electronics, and micro/nano engineering. In 2021, he earned a $1.8 million grant from the National Institutes of Health to help improve cancer-fighting tools and cut patient costs, exploring ways to streamline delivery of lifesaving treatments into immune cells.

Douglas G. Evans receives Distinguished Alumni Award

Alumnus **Douglas G. Evans** ('86 B.S. ES), president and chief executive officer of Lungpacer Medical, Inc., was selected by the Penn State Board of Trustees to receive the Distinguished Alumni Award, the University's highest honor. Evans earned his bachelor of science in engineering science in 1986. Learn more: bit.ly/Evans-award

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

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.

Keep in touch on our LinkedIn group, too! bit.ly/ESMGroup

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

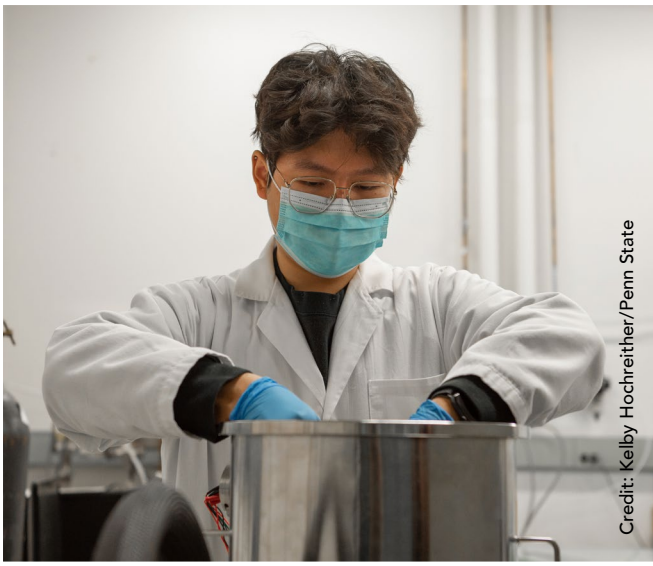
Master's Degrees in Additive Manufacturing and Design
- M.S.: Resident program; thirty credits
- M.Eng.: Online program; thirty credits

bit.ly/ems-pros-grad

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

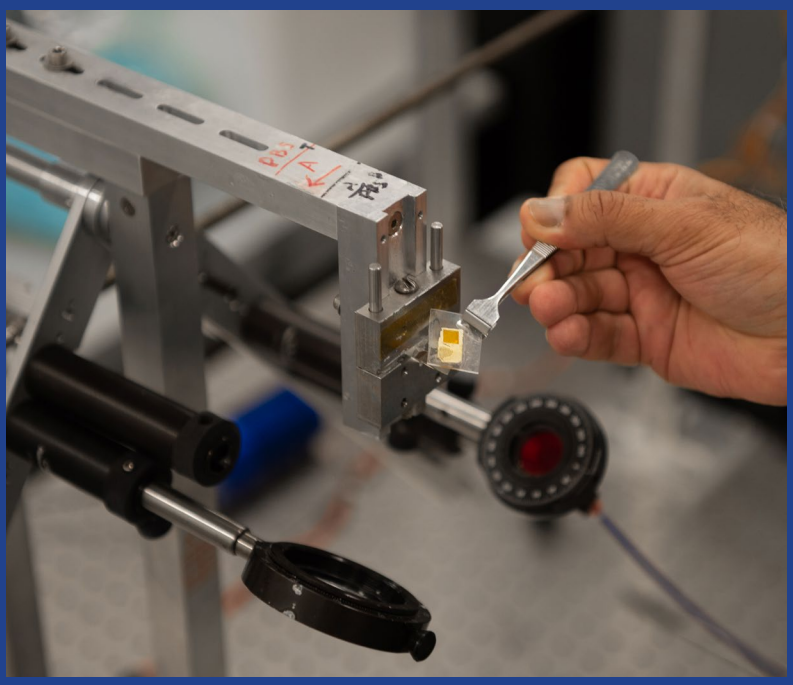
bit.ly/penn-state-esm

Latest News



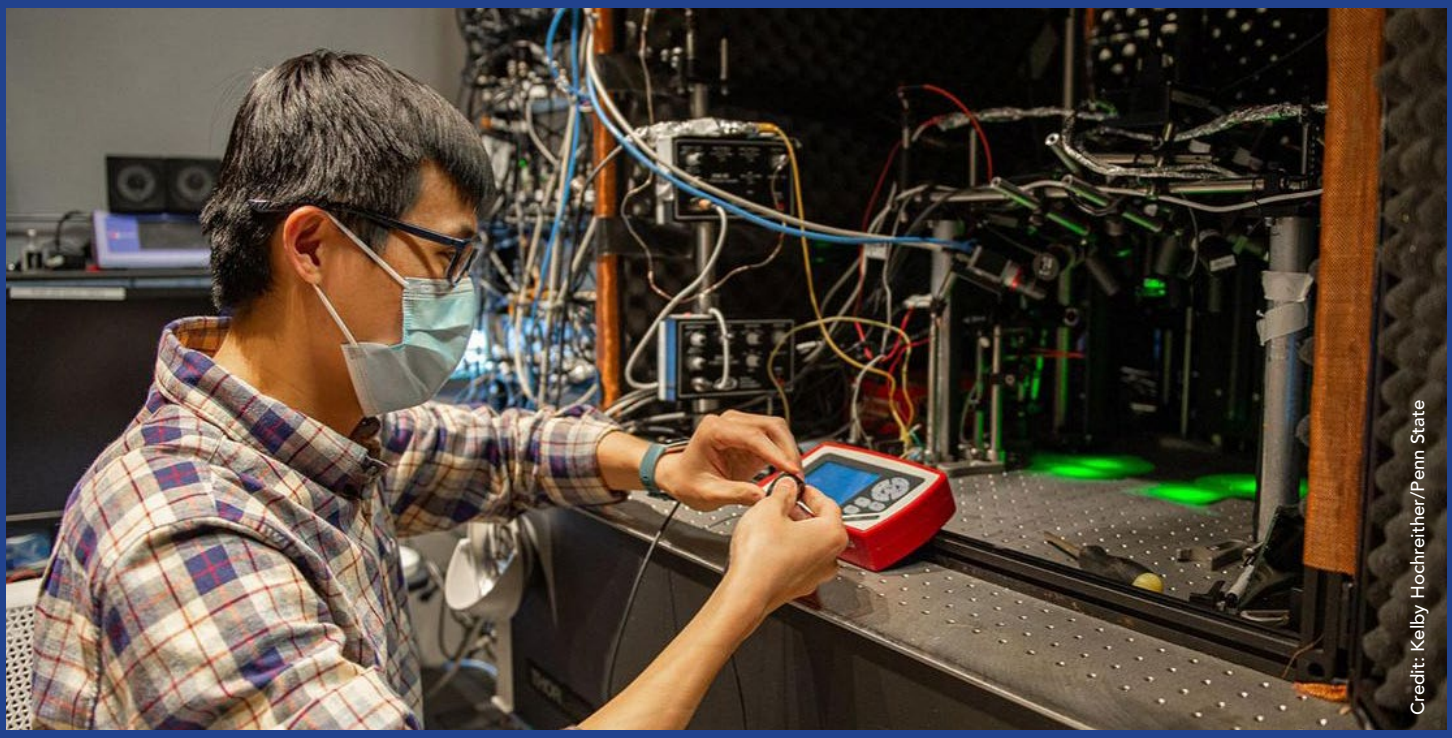
Credit: Kelby Hochreither/Penn State

Engineer to develop fingerprints into 3D holograms



Typically recorded in photographs, fingerprints at a crime scene can help identify perpetrators and ensure they are brought to justice. But a photo of a fingerprint may not deliver the most comprehensive picture possible, according to **Akhlesh Lakhtakia**, Evan Pugh University Professor and Charles G. Binder Professor of Engineering Science and Mechanics. With a grant from the Criminal Investigations and Network Analysis Center, Lakhtakia will collaborate with researchers from the University of Dayton to explore a technique for creating 3D hologram of fingerprints.

To create the 3D image, the researchers will first deposit fingerprints on a number of materials, including glass, wood, and polyethylene. They will then age the fingerprints for each material in different environmental conditions—humidity, dryness, cold, and room temperature. The researchers will then coat the fingerprint with a very thin layer of metal, chosen to best suit the underlying material, in a method developed by Lakhtakia and his collaborators in earlier research. This metal layer will preserve the fingerprint pattern so it will withstand the energy from an optical laser scan, which is used to construct a 3D digital holograms of the fingerprint pattern. bit.ly/finger-holo



Credit: Kelby Hochreither/Penn State

Researchers publish how-to guide for monitoring and analyzing brain activity

Patrick Drew, Huck Distinguished Associate Professor of Neural Engineering and Neurosurgery and associate professor of engineering science and mechanics, and **Qingguang Zhang**, assistant research professor in engineering science and mechanics, are part of a research team that developed a set of tools and methods to better monitor and analyze sleep-related signals and fidgeting in rodent brain studies. They published a how-to guide complete with their tools, code, and images of the lab setup in *Neurophotonics*.

The toolkit allows researchers to monitor behavioral variables such as the rodent's heart rate, pupil diameter, and whisker motion during observational studies, as well as a set of codes to measure and analyze the data. This research could have implications for human sleep studies and other aspects of neuroscience. bit.ly/drew-brain

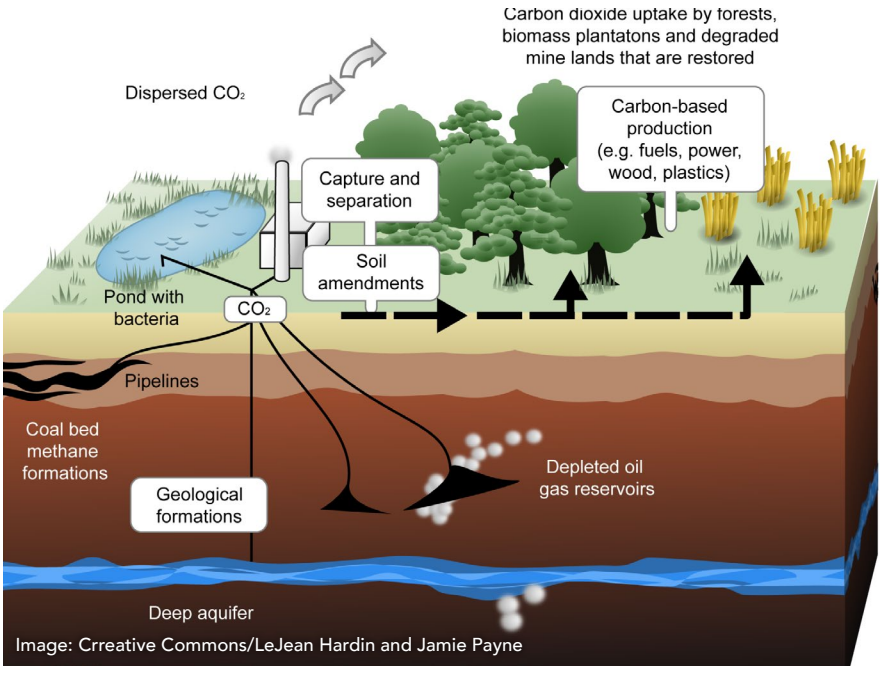


Image: Crreative Commons/LeJean Hardin and Jamie Payne

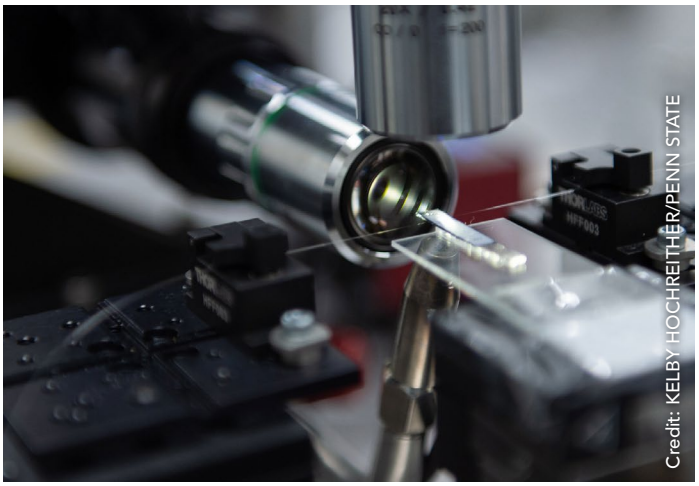
Physics-informed deep learning to assess carbon dioxide storage sites

Pumping carbon dioxide underground may help combat the warming of the atmosphere but finding appropriate underground sites that could safely serve as reservoirs can be complicated. **Parisa Shokouhi**, associate professor of engineering science and mechanics, leads a research team that is addressing this complexity by combining an artificial intelligence technique with a new understanding of physics to develop an efficient, cost-effective predictive modeling approach. bit.ly/carbon-site

From the ground up: Taking 3D printing technology to the next level

Ibrahim T. Ozbolat, associate professor of engineering science and mechanics, biomedical engineering and neurosurgery, is using 3D printing to create a range of materials for use in human health. Ozbolat and his lab group have reported success in 3D printing both bone and soft tissue onto the skulls of rats and are working with neurosurgeons, craniomaxillofacial surgeons, and plastic surgeons at Penn State Hershey Medical Center to translate this research to human applications. In addition to repairing skin and bone, Ozbolat and his team are using 3D bioprinting to help in the study of breast cancer. bit.ly/3d-print-next

Credit: Patrick Mansell/Penn State



Credit: KELBY HOCHREITHER/PENN STATE

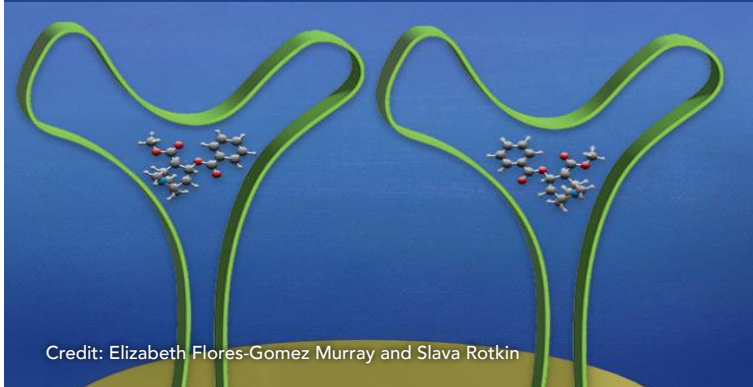
Scientists develop 'exceptional' surface to explore exotic physics

By demonstrating exceptional control of an open optical system, an international research team has provided a path to experimentally measure and test exotic phenomena and gain insights into new physics with exquisite sensitivity. **Şahin Özdemir**, associate professor of engineering science and mechanics, joined Michigan Technological University, Vienna University of Technology, and other Penn State researchers to create a stable surface of 'exceptional' points—notoriously finicky singularities that exhibit peculiar properties—and used it to facilitate and observe the perfect absorption of light in a coherent, chiral system. They published their findings in *Nature Communications*. bit.ly/exo-physics

Speedy, on-site drug detection key to reducing impacts of addiction crisis

Slava V. Rotkin, Frontier Professor of Engineering Science and Mechanics, is a co-author of a review paper in the nanotechnology journal *Small* that posited biosensors as a potential on-site, real-time monitoring solution to combat the addiction crisis.

"The first goal of our review paper is to draw attention to the problem so someone working in drug prevention can access hundreds of references," Rotkin said. "The second goal is because review papers are typically read more often than the original paper, we hope that we can reach a larger audience of both researchers and the general public via media attention. And we present biosensors as a possible solution." bit.ly/drug-detect



Credit: Elizabeth Flores-Gomez Murray and Slava Rotkin

Latest news: Larry Cheng sensor research stories

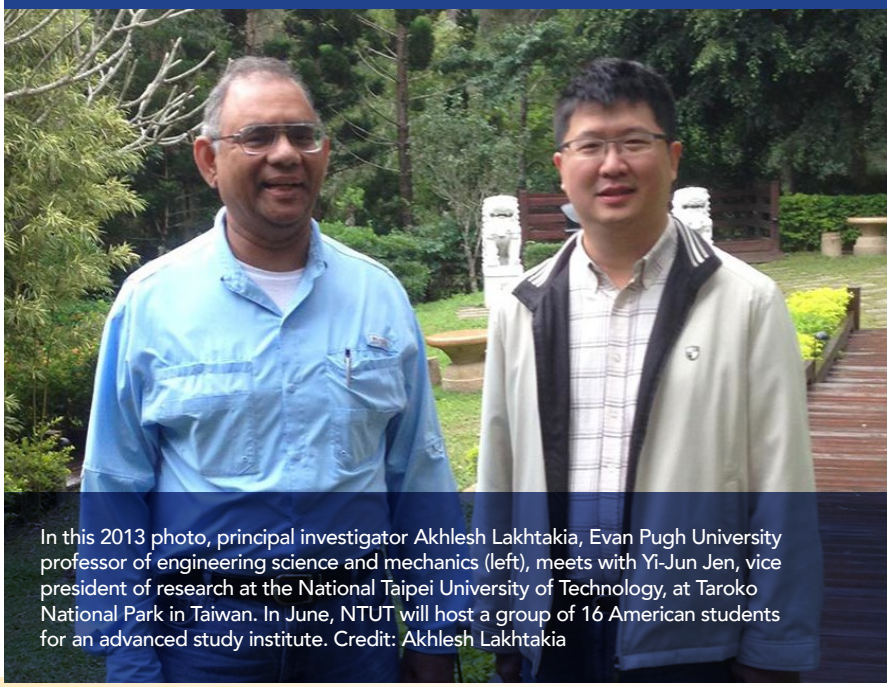
Huanyu "Larry" Cheng, Dorothy Quiggle Career Development Assistant Professor of Engineering Science and Mechanics, conducts research on flexible electronics that could be used in health monitoring and other smart device applications. Here are the stories written about his work:

- ***SCIENCE CHINA Technological Sciences***
  Graphene made with lasers for wearable health devices bit.ly/graphene-wearable
- ***Biosensors and Bioelectronics***
  Monitoring glucose levels, no needles required bit.ly/mon-glucose
- ***Applied Physics Review; ACS Applied Materials & Interfaces; Chemical Engineering Journal***
  Self-powered sensors are key to more accurate, continuous health monitoring bit.ly/wm-sens
- ***International Journal of Applied Mechanics***
  Simulating a "net" flexible electronic bit.ly/net-flex

Institutes for graduate students on next generation display technology

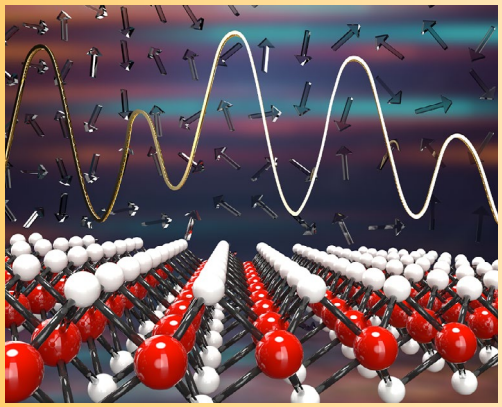
The United States lags behind other countries when it comes to manufacturing displays used in televisions, computers, mobile phones, and more. To engage students and begin equipping them with the skills needed to develop next-generation displays, Penn State and the University of Dayton will lead two advanced studies institutes in Taiwan. Funded with a $300,000 National Science Foundation grant, 16 graduate students from the United States will go to Taiwan to learn from experts and network with peers in the field.

"Our goal is to nucleate a technical workforce to design and manufacture next-generation display products in the U.S.," said **Akhlesh Lakhtakia**, principal investigator on the grant and Evan Pugh University professor of engineering science and mechanics and **Jian Hsu**, professor of engineering science and mechanics. bit.ly/nfs-gen-tech



In this 2013 photo, principal investigator Akhlesh Lakhtakia, Evan Pugh University professor of engineering science and mechanics (left), meets with Yi-Jun Jen, vice president of research at the National Taipei University of Technology, at Taroko National Park in Taiwan. In June, NTUT will host a group of 16 American students for an advanced study institute. Credit: Akhlesh Lakhtakia

Solving the "big problems" via algorithms enhanced by 2D materials



Credit: Jennifeer M. McCann

Important optimization algorithms that are designed to solve large-scale problems such as airline schedules and supply chain logistics may soon get a boost from 2D materials that will enable the algorithms to better solve the problems and use less energy, according to **Saptarshi Das**, associate professor of engineering science and mechanics and primary investigator for a study published in *Advanced Materials*.

The researchers propose using a simulated annealing algorithm to find the ground state of an Ising spin glass system, which is a magnetic system characterized by the randomness in spin orientations. To do this, they need to do high-end computational operations, and to carry out these computations, they used 2D materials, which are materials that are only a few atoms thick. The use of 2D materials-based transistors allow for ultra-low power operation, saving energy. bit.ly/algo-2d-mat

Message from your alumni society chair

In one sense, engineering science and mechanics at Penn State can claim a history back as far as 1905, when a program in "mechanics and materials of construction" was created. In fact, a series of photos on display in the ESM department recognizes nine different leaders since that time. Two of the earlier leaders, Joseph Marin and John Sauer, collaborated on a textbook. I wonder how many generations of Penn State engineers used "Marin & Sauer" in their strength of materials class.

A degree in engineering science was first offered in 1953, by invitation only, to twenty-five students. That first class graduated in 1956. Early classes stayed small, presumably so that all could enroll simultaneously in the required courses. I learned about the program in 1957 before my freshman year and immediately switched from the College of Chemistry and Physics to the College of Engineering to become eligible.

An engineering mechanics department seems to have existed at least as early as the 1940s, but a degree in engineering mechanics was not formalized until 1959. John Mentzer's engineering science program ran in parallel with the mechanical side until 1974 when they merged into the ESM department, with Mentzer as its head. In 1977, the separate engineering mechanics degree was phased out.

In 1981, John Mentzer passed the reins to Rich McNitt, one of his early students. I was personally delighted because I had known Rich from the days when both of us were working on our doctoral degrees at Purdue.

In 2002, Judith Todd took over from McNitt. As you may have seen elsewhere in this newsletter, she is now ready to return to teaching and research after a sabbatical. I believe that the entire ESM alumni board shares my admiration of her leadership in growing the ESM student enrollment and faculty. Furthermore, because two of my students from Penn State York continued in ESM, I have seen her knowledge of and concern for individual students. She will be difficult to replace.

Chuck Gaston ('61 B.S. ES)

Please join me in thanking Dr. Todd for her 20 years of leadership on the Judith Todd Kudoboard. bit.ly/jt-kudo

Contact ESM and stay in touch

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