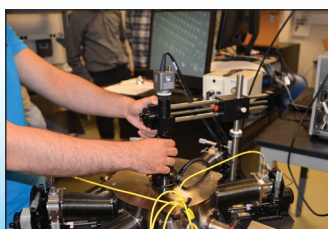




Taking the Fight to the Bite

ESM alum Bill Warren is using a powerful combo to better understand and overcome mosquito-borne diseases, such as dengue, that affect almost half the world's population.



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With more than one million people dying from mosquito-borne diseases every year, Bill Warren ('86 E SC, '90 Ph.D. E SC) knows he's in for an enormous battle—one he can't fight with traditional methods. That's why he's combining two critical areas to help drive innovation in vaccine development: engineering and science.

"To gain a greater understanding of the mechanisms underlying specific mosquito-borne diseases and to propel advancements in vaccine development, we, as scientists, can no longer be ultra-specialists in one discipline," said Warren. "We need to have a deep understanding of vast amounts of literature and data to disentangle the unknowns into knowns."

As Vice President and Head of Innovation in R&D at Sanofi Pasteur, Warren is incorporating multiple disciplines and using cognitive technologies to unravel and discover the "greater truth" about diseases.

"There is so much information and thousands of variables such as weather patterns, social media, and socioeconomic factors where machines can find the interrelationships that humans can't see," said Warren.

By stitching together algorithms that reflect how a human learns, along with large amounts of clinical and preclinical data, Warren hopes to analyze the information more rapidly

and accurately, thereby accelerating vaccine development.

Unlike traditional science, where hypothesis bias may creep in, cognitive technologies allow for the creation of multiple hypotheses that are bias-independent towards the data. They advance the understanding of mosquito-borne diseases so immediate action can be taken to overcome them.



Warren credits his education in engineering science for providing him both the broad and deep knowledge and expertise he's applied throughout his entire career and in his current role.

"Engineering science is a very powerful combination. It gave me the ability to speak multiple scientific languages and apply my learnings to engineer vaccine solutions for diseases that impact humans across the globe," said Warren. "No other major affords you that. That's why engineering science and mechanics is THE degree of the 21st century."



Message from the Chair



Thirteen ESM alumni were recognized at our Golden Decade Reunion held on June 1, 2016, and led by 1966 Class Champion, Ed Heckman. A fun evening of reminiscences and life stories was enjoyed by all.

After 11 years in ESM, Tony Huang has joined Duke University as professor of mechanical engineering and materials science. Fortunately, this is not farewell, as Tony will continue to be an adjunct professor in ESM. We wish Tony every success in his new position.

This semester, we welcomed Cheryl Stamm as our new undergraduate assistant. We also celebrated three staff promotions: Scott Kralik to facilities operations manager, Melissa Fink to ESM department head assistant, and Tammy Coval to ESM graduate assistant. Congratulations to all for their outstanding contributions.

More than 40 students graduated with bachelor's degrees in engineering science this year, seven with double majors, including electrical engineering, energy engineering, mathematics, music technology, and physics. Twenty-four students completed 27 minors. Fifty-three percent will pursue careers in industry, government, and the private sector, and 47 percent will attend graduate or medical school. Well done graduates!

Wishing you all the joys of summer.

Warm regards,

Judith A. Todd

Judith A. Todd



Cheryl Stamm



Scott Kralik



Melissa Fink



Tammy Coval

Faculty Spotlight

Dr. Lucas Passmore Named Top 10 Professor at Penn State

Assistant Professor Lucas Passmore was ranked seventh on CollegeMagazine.com's list of Top 10 Penn State Instructors based on student opinions and rankings from RateMyProfessor.com.

Passmore, who also serves as the engineering science undergraduate program coordinator, instructs approximately 500 students each semester in his E MCH 211 and 213 classes and advises numerous first- and second-year students as the department's representative for the Engineering Advising Center.

"Being named amongst the top instructors at Penn State based on student feedback was very rewarding. Knowing that the students appreciate my attitude and the way my classes are run validates both my approach and the rest of the team who make it all possible," said Passmore.

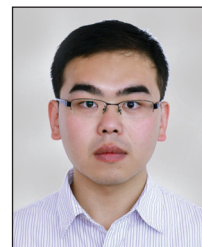


Graduate Spotlight

Huang and Guo Take Home Penn State Graduate School Awards

Po-Hsun Huang (top), Ph.D. candidate, received a 2016 Penn State Alumni Association Dissertation Award for his dissertation titled "Lab-on-a-chip systems enabled by acoustic streaming effects." His research is focused on acoustofluidic technologies that can control and manipulate fluids at the micro/nanoscale.

Feng Guo (bottom), post doctoral fellow, received the 2016 Thomas and June Beaver Fund Award which will support his research on 3D and reusable acoustic tweezer technologies. This research could have a significant impact on medical diagnostics and biological research.



Undergraduate Spotlight

ESM Team Earns "Memorable" Consecutive Win at 2016 Regional Rube Goldberg Contest

For the second year in a row, ESM's Society of Engineering Science (SES) team took first place and the People's Choice Award at the Penn State Regional Rube Goldberg Machine Contest.



This year's national challenge was to design and build a machine that opens an umbrella in 20 or more steps. SES's decade-themed machine took the audience from the 1920's to the present day, incorporating iconic items and historical figures such as Amelia Earhart, VHS tapes, and a Magic 8 Ball.

Team co-captain Ryan McFadden, an engineering science junior and Schreyer Scholar, said the team came up with the decades theme to be able to "tell an even better story than they did with last year's machine," which erased a chalkboard.

Outstanding “Poster Child”

Howard Witham ('85 EE, '88 M.S. E SC, '93 Ph.D. ESMCH), Vice President of Texas Operations for Qorvo, was honored as one of 12 Penn State alumni who received a 2016 Outstanding Engineering Alumni Award.

“Computers were all the rage when I came to Penn State,” recalls Witham. “My dream job was to work at IBM.”

Witham was bitten by the “microchip bug” and progressed through his educational career at the University doing research in microelectronics, device physics, and materials science.

By the time he graduated with his doctoral degree, he realized that IBM would not be a good fit after all. “They were starting to downsize their chip and hardware business and moving toward software,” he explains.

Instead, Witham accepted a position at STMicroelectronics near Dallas, TX, as a process and development engineer. One of his first assignments was to help with the process development and manufacturing transfer of the inkjet chip for HP.



Howard Witham receiving his award from Dean Amr Elnashai

Witham spent the next 17 years at STMicroelectronics in various engineering and operations management positions, including plant manager of the company's manufacturing facilities in Ottawa, Canada, and Phoenix, AZ. “At age 36, I was the youngest plant manager in the company. No one wanted to go freeze in Canada,” he jokes.

During those years he was also responsible for the facilities operations of eight STMicroelectronics factories in the United States, Europe, and Asia.

In 2009, he decided it was time to move on. That year, he joined TriQuint Semiconductor (now Qorvo), a global leader in scalable and dynamic RF solutions for mobile, infrastructure, and defense applications, as Vice President for Texas Operations. In his role, he is responsible for the safety, quality, and financial performance of the company's wafer fabrication facility in Richardson, TX, which specializes in building chips for major smartphone and defense systems manufacturers and employs more than 1,200 people.

A native of State College, PA, Howard says he is a “poster child” for the way Penn State prepares students for success in their careers. “The engineering science and mechanics department was small enough that the professors knew me and cared about me. That meant a lot and gave me the confidence to go out and succeed in the technical world.”

Alumni Recognition

Patrick Mather ('89 E SC, '90 M.S. E MCH), Milton & Ann Stevenson Professor of Biomedical & Chemical Engineering at Syracuse University, was named the new dean of the College of Engineering at Bucknell University, effective July 1, 2016.



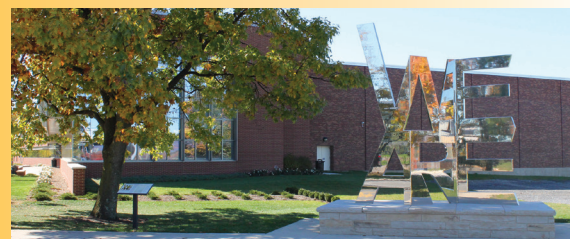
Photo credit: Gordon Wenzel

John (Jack) Carpenter ('57 E SC) co-authored and published a book titled “Elements of Slow-Neutron Scattering” that provides readers a comprehensive and up-to-date introduction to the theory and applications of slow-neutron scattering and equips them with the fundamental principles of neutron studies, including the background and evolving development of neutron sources, facility design, neutron scattering instrumentation and techniques, and applications in materials phenomena.

Michael House ('90 E SC, '92 M.S. E MCH) was promoted from his position as business operations manager at AECOM to vice president for power and industrial work. In his new role, he will help utilities and industrial clients solve complex engineering and environmental issues.



Krishna Kandarpa ('75 Ph.D. E MCH) is now Director, Research Sciences & Strategic Directions, at the National Institute of Biomedical Imaging and Bioengineering.



Attention ESM Alumni!

What are you doing . . . now?? If you have some exciting news or a success story, we want to hear about it—and share it with our community of alumni and peers.

Email alumnirelations@esm.psu.edu and tell us what you've been up to lately.

ESM Research Highlights



ESM Today 2016 Showcases Tomorrow's Innovators and Leaders

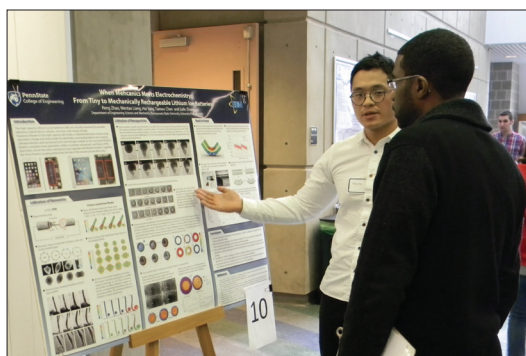
From acoustofluidic mixing and optical diagnostic techniques to erosion-corrosion behaviors of multilayer coating systems and high energy density electrochemical capacitors, a wide range of ESM graduate students' research was on display at the 13th Annual Engineering Science and Mechanics Research Symposium, held February 27, 2016.

The event, organized by the ESM Graduate Student Council, gives graduate students the opportunity to present their work through oral and poster presentations to peers, colleagues, and faculty; exchange ideas across the various research disciplines; and hone their presentation skills.

More than 60 people attended this year's event to see 31 students give a total of 10 oral presentations and 16 poster presentations. Presenters are required to explain their work in a way that is easily understandable to both engineers and scientists who are not specialists in a presenter's discipline.

Oral presentations were split into two groups, with first prize in Group 1 going to Adem Ozcelik for his paper titled "Rotational Manipulation of Single Cells and Organisms Using Acoustic Waves." First prize in Group 2 resulted in a tie between Christine Truong for her paper titled "Feeling the Flow: Optical Diagnostic Techniques to Characterize Turbulent Behavior" and Nitesh Nama for his paper titled "Experimental and Numerical Investigation of Surface Acoustic Wave Driven Microparticle Acoustophoresis."

Amir Aref took home first prize in the poster contest with "Development of High Energy Density Electrochemical Capacitors for Low Power Energy Harvesting Platforms."



This year's keynote address was given by Professor A. Michael Erdman ('69 E SC), Walter L. Robb Director of Engineering Leadership Development at Penn State.



From left: Melissa Showalter, Dale Mosier, Sulin Zhang, and Judith Todd, Department Head and P.B. Breneman Chair

2016 PSEAS Award Winners

On April 27, the College of Engineering, in conjunction with the Penn State Engineering Alumni Society (PSEAS), held its annual PSEAS Awards reception to honor faculty, staff, and alumni for their outstanding teaching, research, advising, and service.

The ESM department was proud to have four recipients among this year's winners: Akhlesh Lakhtakia, Charles Godfrey Binder Professor in Engineering Science, Outstanding Teaching Award; Professor Sulin Zhang, Outstanding Research Award; Melissa Showalter, coordinator for alumni, development, and advancement, Rising Star Award; and Dale Mosier (B.S. '67), Distinguished Service Award.

ESM Frontiers

Tipping the Scales with 2D Materials

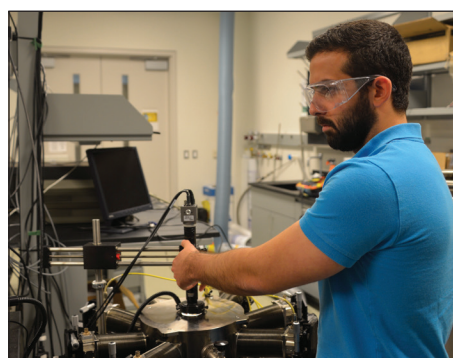


Left to his own novel devices, new faculty member Saptarshi Das is ushering in the next generation of ultra-low-power electronics and display technologies.

Saptarshi Das, assistant professor of engineering science

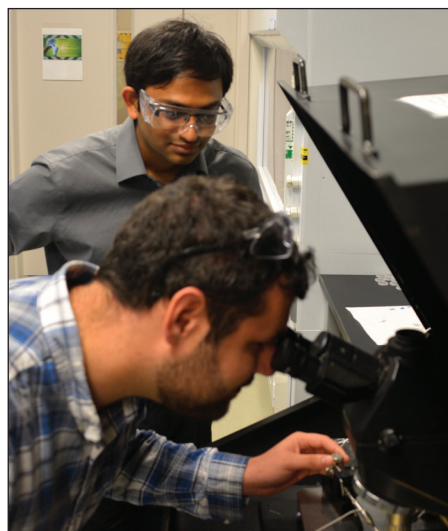
and mechanics, joined the ESM department in January 2016, believing the future of ultra-low-power, high-speed electronic devices lies in Happy Valley—not Silicon Valley.

“Silicon Valley chip manufacturers achieved unprecedented success because of their use of silicon,” said Das. “But now we’re seeing an end of an era because of its fundamental limitations as a bulk, 3D material and its scalability limitations. We now have an urgent need for alternative materials to support future technology and prevent the industry from stalling.”



Graduate student Joseph Nasr measures a 2D transistor in a low temperature, vacuum probe station with magnetic field capability

“The success of emerging technology and the Internet of Things (IoT) will depend on the integration of low dimensional systems, or 2D materials, into innovative devices,” said Das. “To me, Penn State is the leader in the fabrication and characterization of these materials, and the ideal place to help shape the future of nanoelectronics.”



Graduate student Danile Schulman observes 2D devices for performing electrical characterization

2D materials have recently received significant attention for use in electronic and optoelectronic devices because of their unique electrical, mechanical, thermal, and optical properties, which may hold the key to solving critical technological problems.

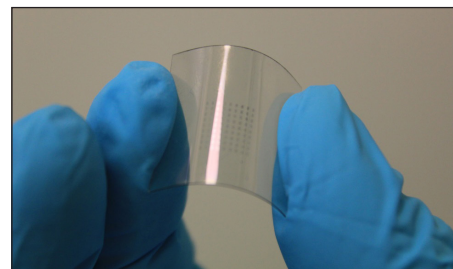
“Voltage scaling stopped around 2005, and length scaling beyond the 10 nm gate length is nearing a stopping point in the industry; these are the two biggest challenges in designing an energy-efficient device,” stated Das. “A transistor consumes a certain amount of power, and if you continue to reduce the size of the transistor but not the voltage, you run the risk of a meltdown.”

“Because of their ultra-thin body nature, 2D materials such as graphene, black phosphorus, and molybdenum disulfide allow aggressive dimension scaling,” said Das. “Also, new physics like straintronics, piezotronics, and tunneling phenomenon offer superior

voltage scaling, thus, reducing power dissipation, and you have many more quantum effects.”

Successful experimental demonstration of these novel device concepts based on 2D materials will pave the way for energy efficient/green computing.

Experts estimate the IoT will consist of almost 50 billion objects by 2020. Das has already made a major contribution to the advancement of the electronics industry. In 2014, he created the world’s thinnest (10 atomic layers thick) flexible, see-through 2D thin-film transistor (TFT). TFTs will form the backbone of future display electronics and could be implemented in virtually all smartphones and TVs.



Thinnest field effect transistor on flexible PET substrate

Das believes the University is the “ideal place” for his research, and he will benefit greatly from the Two-Dimensional Crystal Consortium, a new Penn State facility, funded by the National Science Foundation, and one of only two national Materials Innovation Platforms in the country.

He might be working on a “small scale,” but the impact of Das’s research on the next generation of high-performance electronic devices is expected to be huge.



Message from Your Alumni Society Chair

First, the kudos—it's “déjà vu all over again,” as Yogi Berra used to say. For a second consecutive year, our amazing ESM students won first place and the People's Choice Award at the Regional Rube Goldberg competition.



2016 Penn State Regional Rube Goldberg Contest Winners

Second, congratulations to ESM alum Howard Witham ('93 Ph.D. ESMCH), who received a College of Engineering Outstanding Engineering Alumni Award, and to Bill Warren, who received a 2016 Alumni Fellow Award, the most prestigious award given by the Penn State

Alumni Association. Bill's research is further proof that ESM graduates continue to make life better, employing real-world problem-solving skills learned in our ESM major.

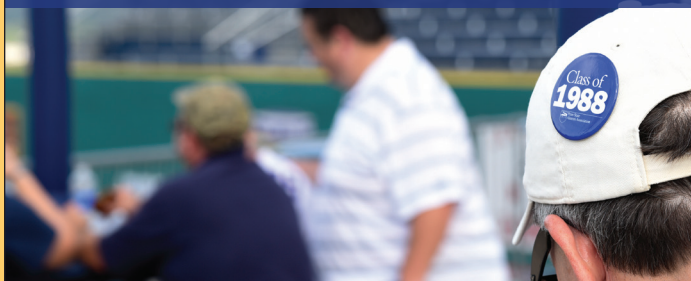
Importantly, current ESM students have voiced a desire for guidance from alums regarding full-time and internship employment planning and career planning. We are starting to bootstrap a mentoring program by developing an official list of mentors and mentees. Please contact Melissa Showalter in the ESM office if you are interested in participating. Along those lines, if your company has internship opportunities, let the ESM department know.

Surely there are a lot of interesting things our ESM alums are doing in industry and academia . . . we would like to hear about your exciting activities or accomplishments so we can feature them in upcoming ESM Connections issues or on our ESM website.

Finally, our students' ESM thesis classes strive to feature alumni coming back to offer lessons-learned lectures. We constantly seek volunteers to return to Penn State and enlighten our students with what awaits them in the real world.

Rick Schutz ('72 E SC)

College of Engineering Alumni Tailgate



September 17 • Penn State vs. Temple

Medlar Field at Lubrano Park. Doors open 4 hours before kick-off.

REGISTER: <http://www.cvent.com/d/rfq54v>

2016 ESM Recruitment Mixer

**September 14, 2016
5:30 p.m. - 7:00 p.m.
EES lobby**

Recruit world-class engineers trained in the ESM department.

The cost to participate is \$50. For more information, contact Melissa Showalter at mus41@psu.edu or 814-867-1569.



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