



Photo credit: Illumina



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PennState
College of Engineering

**ENGINEERING SCIENCE
AND MECHANICS**



Tousi Elected to National Academy of Engineering for Engineering Leadership

At the intersection of innovation and urgency, ESM alumna Susan Tousi ('91 E SC) is helping clear a path to the \$100 genome and improve personalized health care.

Fifteen years ago, it cost a staggering \$3 billion to sequence the first human genome. Today, it costs around \$1,000 as a result of innovations in technology under the leadership of Susan Tousi, senior vice president of product development for Illumina, the global leader in next-generation sequencing technology.

However, Tousi is not content to stop there. With the recent launch of Illumina's NovaSeq system, the most powerful sequencer on the market, she believes the platform will one day enable the \$100 genome and a deeper understanding of, and better treatments for, complex diseases.

"High throughput sequencing and a reduction in sequencing cost is incredibly important," said Tousi. "By making genomes more accessible—and affordable relative to any medical test today—health care professionals can have personalized information about an individual's genetic code, helping to more accurately identify underlying conditions and provide specific treatments."

Although more than 90 percent of all sequencing data ever generated has come from Illumina's products, Tousi, who leads a team of approximately 800 people worldwide, knows



*The NovaSeq 6000 System;
Photo credit: Illumina*

that driving breakthroughs in precision medicine through innovation requires a large-scale collaborative effort.

"As an undergraduate student in the engineering science program, I learned that no engineering or scientific problem is a single disciplinary problem," said Tousi. "In most situations, you're going to need an interdisciplinary team, with a multitude of engineers and scientists who have different perspectives. I'm fortunate

to work with the world's best scientists and engineers and be able to bring them together to help achieve our goal of reducing sequencing costs."

Although honored to be elected into the National Academy of Engineering for her leadership, Tousi isn't driven by accolades but by a desire to make gene sequencing a standard of care that will alter the course of health care and improve quality of life.

"I couldn't ask for a better career path and a more inspiring way to live my work life," said Tousi. "What really drives my passion is knowing that our efforts could lead to the end of disease and reduce suffering from health care that is administered without personalization."

Message from the Chair



Fall 2018 began with much excitement—more than 60 entering juniors, four new faculty members, and three new staff members. We welcomed Lisa Spicer, coordinator for development and alumni relations, Jessa Leskovansky, undergraduate assistant, and Amber Guenot, receptionist.

It was an exceptional semester for ESM's brain research. Steve Schiff received an NIH Director's Transformative Research Award (\$8.1M) for research on brain infections. His ambitious program will engage climate scientists, demographers, neural engineers/neurosurgeons, and data scientists to analyze and interpret years of climate and population data, identify past and anticipate future outbreaks of brain diseases, and propose point-of-care treatment in rural areas of Uganda.

Patrick Drew, with Yongsoo Kim (PI) and Keith Cheng, attracted a \$3M NIH Blueprint for Neuroscience Research grant to study 3D mapping of blood vessels in the brain. M.D./Ph.D. student, Scott Tucker, orthopaedics, received the 2018 Young Investigator Award at Penn State's Pediatric Research Day.

As our semester comes to an end, please consider supporting ESM's two priorities: (1) our redesigned 3rd and 4th floor lobbies to provide urgently needed student collaboration spaces; (2) the increasing need of our undergraduate honors students. Please give back if you can.

Wishing you a very happy holidays and New Year.

Judith A. Todd

Judith A. Todd



Lisa Spicer



Jessa Leskovansky



Amber Guenot

Faculty Spotlight

Awadelkarim, CNEU Receive NSF Award to Support Minority Students

Led by Professor and UNESCO Chair **Osama Awadelkarim**, the Penn State Center for Nanotechnology Education and Utilization (CNEU), along with Norfolk State University and Tidewater Community College, recently received National Science Foundation funding to establish the Southeastern Coalition for Engagement and Exchange in Nanotechnology Education (SCENE) Louis Stokes Regional Center of Excellence in Broadening Participation.

SCENE will support recruitment and retention of underrepresented minority students studying science, technology, engineering, and mathematics (STEM) by strengthening students' skills and knowledge in nanoscience through outreach, curriculum improvement, student-centered research, and training.

"Our vision is to realize an environment in which students are able to pursue STEM careers without barriers," said Awadelkarim. "Nanotechnology education is an effective pathway to prepare them for modern challenges in research and development, and to meet high-tech industry demands."



Graduate Spotlight

Jung Awarded for Innovation

Ph.D. candidate **Huihun Jung** received the 2018 Rustum and Della Roy Innovation in Materials Research Award from the Penn State Materials Research Institute. The award honors interdisciplinary materials research at Penn State which yields innovative and unexpected results. Through his research under the advisement of Professor Melik Demirel, Jung has investigated structure-property relationships in protein-based programmable materials and their composites, with applications to enhanced mechanical, chemical, and optical properties to create the next generation of fibers. Jung was honored at a ceremony on October 25 at the Millennium Science Complex.

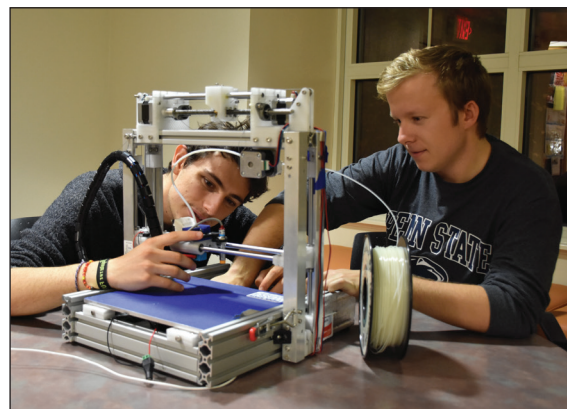


Undergraduate Spotlight

Lipsky, Przyjemski Developing 3D Printer for Humanitarian Relief

Through the Penn State Humanitarian Engineering and Social Entrepreneurship Program, seniors **Simon Lipsky** (left) and **Andrew Przyjemski** (right) are designing a 3D printer that can print relief materials and supplies onsite in disaster areas.

The students' goal is to design a foldable, portable printer with an environmental enclosure that runs off a battery pack to print in any harsh environment. Success of their project would enable disaster relief organizations to provide necessary materials in hours versus weeks and eliminate shortages of items. Lipsky and Przyjemski intend to send a prototype to a humanitarian relief organization for feedback and hopefully, future use.



2018 Golden Decade Reunion

The annual ESM Golden Decade Reunion was held May 31-June 1, 2018, at Toftrees Golf Resort, in conjunction with Penn State's We Are Weekend. Approximately 40 ESM alumni, faculty, staff, and students attended the celebration banquet on Thursday evening to recognize ESM alumni who graduated in '68, '73, '78, '88, '98, and 2008.

Friday's half-day program consisted of a state of the department address by Judith Todd, department head; a welcome and College overview by Justin Schwartz, Harold and Inge Marcus Dean of Engineering; a meet & greet with ESM students; and a "Meet the Dean" luncheon.

We look forward to seeing you at the 2019 Golden Decade Reunion, May 30-31, 2019. For more information or to



register, contact Lisa Spicer, coordinator for alumni, development, and advancement, at 814-867-1569 or alumnirelations@esm.psu.edu.

Alumni News and Recognition



Photo: University of Michigan

Ellen Arruda ('85 E SC, '88 M.S. E MCH), professor of mechanical engineering, has been appointed chair of the mechanical engineering department at the University of Michigan. A member of the National Academy of Engineering, Arruda's groundbreaking research and teaching have secured her position as a world leader in the areas of theoretical and experimental mechanics of molecular materials, including polymers, elastomers, composites, soft tissues, and proteins, and in tissue engineering of soft tissues and tissue interfaces.

Zakaria Al Balushi ('11 E SC, '12 M.S. ESMCH) will join the University of California, Berkeley as a tenure track assistant professor in materials science and engineering on January 1, 2019. He is currently a Resnick Prize Post-doctoral Fellow at the California Institute of Technology.



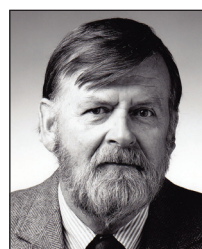
Photo: UC Berkeley



John Longenecker's ('71 E MCH, '73 M.S. E MCH) company, Longenecker & Associates, will support Triad National Security, LLC, which was awarded a five-year management and operating contract for the Los Alamos National Laboratory (LANL) by the Department of Energy's National Nuclear Security Administration. LANL is one of the largest science and technology institutes in the world, with a primary mission of national security responsibilities.

Chin-Jye (Michael) Yu ('91 Ph.D. ESMCH), advanced technology manager for PMA-261 at NAVAIR, was recognized for his leadership and technical achievements at the Society of Asian Scientists and Engineers National Conference in Chicago on October 4. Yu won the Technical/Research/Business Achievement Award for his expertise developing solutions for the CH-53E Super Stallion, MH-53E Sea Dragon, and CH-53K King Stallion helicopters.

In Memoriam



Jaan Kiusalaas, professor emeritus of engineering science and mechanics, passed away suddenly on August 27, 2018, at the age of 87.

Kiusalaas was born in Tartu and raised in Tallinn, Estonia. When the Soviet army marched into Estonia in World War II, he and his mother escaped and made their way across Europe to Augsburg, Germany, where he attended the Estonian Refugee High School. He earned a bachelor of engineering degree at the University of Adelaide in Australia. In 1958, he went to Northwestern University as a Walter P. Murphy Fellow, receiving his master's degree in engineering in 1959 and his Ph.D. in 1962.

Kiusalaas came to Penn State in 1963 as an assistant professor in the Department of Engineering Mechanics, specializing initially in shell theory and structural design. He was named professor in 1974. Kiusalaas spent a sabbatical year at NASA's Marshall Space Flight Center in Huntsville, Alabama, developing computer programs for the optimal design of structures. He received two NASA research achievement awards.

His research was primarily in finite element analysis, methods of structural optimization, the application of numerical methods, and in computer software development. He retired from the University as professor emeritus in 1991 and subsequently published a number of engineering textbooks that remain in print, including *Numerical Methods in Engineering with Python* and *Numerical Methods in Engineering with Matlab*.



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

In Memoriam



Scott R. White ('90 Ph.D. E MCH), 55, passed away on May 28, 2018, after a long battle with ocular melanoma.

White was the Donald B. Willett Professor in Aerospace Engineering at the University of Illinois Urbana-Champaign (UIUC), where he was an innovator of self-healing and self-regulating materials. His research group at the UIUC's Beckman Institute for Advanced Science and Technology developed self-healing plastics, electronics, batteries, and coatings; coatings and materials that indicate when they are damaged or strained; self-destructing devices to reduce electronic waste; and many other innovations to make materials safer and more reliable on both the micro and macro scale.

White was an internationally recognized researcher. He received a Humboldt Research Award in 2013, the American Society for Composites Outstanding Research Award in 2014, and Scientific American magazine's "SciAm 50" award in 2007. He also received multiple teaching and mentorship awards for his work with students at UIUC.

Faculty News/Honors/Awards



Schiff wins prestigious NIH research award

An \$8.1 million National Institutes of Health High-Risk, High-Reward grant will allow **Steven Schiff**, Harvey F. Brush Chair in the College of Engineering, Departments of Neurosurgery, Engineering Science and Mechanics, and Physics, and his team to explore a radically changed approach to predicting, preventing, and treating infectious disease at the individual point-of-care level. This venture provides the researchers an opportunity to explore a new way of addressing critical unmet needs, especially in the developing world. Over the next few years, Schiff and his team will build on both his own previous work and years of existing research on infant infections. They will take a multi-pronged approach involving disciplines as disparate as epidemiology, meteorology, and genomics, and using a variety of tools including machine learning, statistics, and engineering control theory.



Engel named vice provost for Online Education

Renata Engel ('82 E SC), professor of engineering science, was appointed as Penn State's vice provost for Online Education, after having served in that position in an interim capacity since 2017. Engel has served in various faculty and leadership roles at Penn State since 1990.



Researchers develop multi-sensor inspection and robotic systems

Through an integrated research project sponsored by the U.S. Department of Energy Office of Nuclear Energy's Nuclear Energy University Program, researchers at Penn State, led by Professor **Cliff Lissenden**, along with a team of researchers from the University of Michigan, the University of South Carolina, and the University of Illinois Urbana-Champaign, recently developed multi-sensor inspection and robotic systems for dry storage casks that contain spent nuclear fuel. Their newly developed PRINSE system will help evaluate the integrity of casks and extend storage duration of spent fuel until repositories can be built for safe disposal.



Lakhtakia publishes new book on electromagnetism

Akhlesh Lakhtakia, Evan Pugh University Professor and Charles Godfrey Binder Professor in Engineering Science and Mechanics, coauthored a new book with ESM alumnus **Muhammad Faryad** ('12 Ph.D. ESMCH) titled "Infinite-Space Dyadic Green Functions in Electromagnetism." The book provides all previously known, and some new, dyadic Green functions to determine electromagnetic fields in complex materials. Dyadic Green functions are essential for solving scattering and radiation problems.

ESM Frontiers

The Wave of the Future

ESM welcomes new faculty members for 2018-2019

The department is excited to continue its growth with the addition of four new faculty members:

Andrea Arguelles, Christopher Kube, Jacques Rivière, and Parisa Shokouhi.



Arguelles has been hired as an assistant professor and will also hold an affiliate faculty position with the Penn State Graduate Program

in Acoustics. She comes to Penn State from Brimrose Technology Corporation, where she was a lead scientist for nondestructive testing (NDT), developing improved NDT techniques and instrumentation, and cultivating new research programs in NDT.

Arguelles's research focuses on wave propagation in heterogeneous media with applications in materials and microstructural characterization, nondestructive evaluation (NDE), and biomedical ultrasound.

She is a member of the Society of Hispanic Professional Engineers and the American Society of Nondestructive Testing (ASNT).



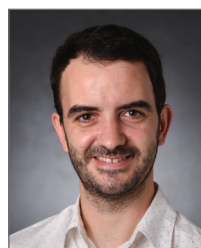
Kube will join Penn State in January 2019 as an assistant professor. Most recently, he was a research engineer with Bennett Aerospace,

Inc. under contract from the U.S. Army Research Laboratory's (ARL) Weapons and Materials Research

Directorate (WMRD). At WMRD, his research focused on ultrasonic NDE and qualification of additively manufactured materials. Prior to WMRD, he was with ARL's Vehicle Technology Directorate, where he served as NDE lead with a focus on developing ultrasonic technology.

Kube, who will also be an affiliate faculty member with the Graduate Program in Acoustics, is an associate editor of the journal *Ultrasonics* and is a member of the Society of Engineering Science, American Physical Society, Acoustical Society of America (ASA), Sigma Xi, and ASNT.

His research revolves around the study of elastodynamic behavior of heterogeneous media with applications in structural health monitoring, NDE, and materials characterization.



Rivière has been hired as an assistant professor following two years as a Marie Skłodowska-Curie Postdoctoral Fellow at Grenoble Alpes University

in Grenoble, France. He will also hold a courtesy faculty position as an assistant professor in the Penn State Department of Geosciences.

In the past, he has worked on projects funded by the U.S. Department of Energy, the National Science Foundation, and Chevron at the Los Alamos National Laboratory and with the geosciences department. He holds professional memberships in the American Geophysical Union and ASA.

Rivière's main research interests include the use and development of novel ultrasonic tools for material characterization and monitoring of rocks in the context of earthquake physics and geophysical applications, concrete and metals for civil and industrial applications, and bone and bone/prosthesis interfaces in the biomedical domain.



Shokouhi joins the department as an associate professor and will also hold an affiliate faculty position with the Graduate Program in

Acoustics. Most recently, she was an associate professor in the Penn State Department of Civil Engineering.

Her research interests involve stress wave propagation in fractured media, nondestructive evaluation (linear and nonlinear ultrasonic testing), structural health monitoring (acoustic emission), machine learning and data analytics, and seismic metamaterials.

Shokouhi has served as the elected vice-chairperson of the Susquehanna Valley Section of ASNT since 2016 and is a member of the Scientific Advisory Committee for the Review of Progress in Quantitative Nondestructive Evaluation, the premier international NDE meeting.

All four faculty members will conduct research in the Penn State Ultrasonics Lab, which focuses on ultrasonic research with diverse applications in industrial, geophysical, and medical fields.



Message from Your Alumni Society Chair

The ESM Alumni Society would like to congratulate **Jonathan Pitt** ('05 M.S. E MCH, '09 Ph.D. ESMCH) as the recipient of the Spring 2019 Early Career Recognition

Award. Jonathan was one of several very qualified candidates considered for the award. Nominations are now open for the Fall 2019 Award. We are looking for alumni who have distinguished themselves in the areas of work, academia, or community involvement. If you know an ESM alum whom you believe is deserving of the award, we encourage you to submit their name for consideration.

We would like to thank Tina Storms, who retired on July 31, for her support as the coordinator for alumni, development, and advancement, and to welcome Lisa Spicer, who was hired to fill that position effective August 20. Lisa has a very distinguished background that includes employment in Japan for 10 years. She spent the

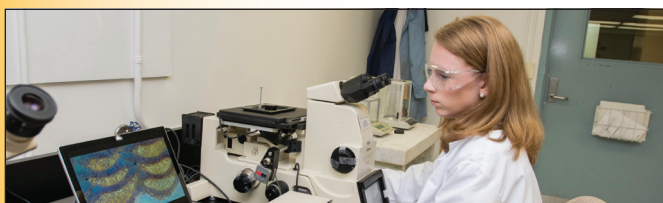
last six years as a development assistant in the College of Agricultural Sciences.

The ESM Alumni Society is comprised of alumni who have a broad range of backgrounds and careers. The purpose of the Society is to foster a connection between ESM alumni and current ESM students and faculty to positively influence the educational experience of students, expose students to the world of the practicing engineer, and assist the ESM department in promoting alumni outreach. If you would like to be a part of the ESM Alumni Society, please contact Lisa at 814-867-1569.

Rich Smith
(73 E MCH)



Jonathan Pitt



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Earn a one-year master's degree from ESM

M.S. in Engineering at the Nano-scale

- Non-thesis program; 30 credits
- Significant hands-on nanofabrication experiences

M.S. in Engineering Science and Mechanics

- Residence-based program; 32 credits

M.Eng. in Engineering Mechanics

- Professional degree program; 30 credits

Master's Degrees in Additive Manufacturing and Design

- M.S.: Resident program; 30 credits
- M.Eng.: Online program; 30 credits



WE ARE...HIRING: Assistant Professor in Advanced Scanning/Transmission Electron Microscopy

The ESM department is currently seeking applicants for a tenure-track faculty position at the rank of assistant professor in the area of advanced scanning/transmission electron microscopy (S/TEM). Tenured academic ranks will also be considered in exceptional cases.

esm.psu.edu/departments/job-opportunities.aspx

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. Please remember ESM this holiday season.

esm.psu.edu/departments/giving-opportunities



Contact ESM and Stay in Touch

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Lisa Spicer	Alumni, Development, and Advancement	814-867-1569	lms8@psu.edu
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