

FOR THE FUTURE

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AHEAD

ESM ENGINEERING
SCIENCE AND
MECHANICS

CONNECTIONS

Fall 2013

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Making an Impact

Alumnus George Workman remembers the support of mentors and friends in ESM. One encounter, in particular, changed his course forever and has inspired George to give back.

"George Workman! Is that you?"

George ('64 E MCH, '68 MS), about to walk onto a squash court at Rec Hall, turned to see Lawrence Perez, assistant dean of the College of Engineering calling out to him. It was 1965 and George was a first-year graduate student in engineering mechanics. Surprised that the administrator remembered him, George made his way over to Larry, who said, "I'm so happy to see you back on campus. I am proud that you became a Penn State engineer."



George Workman
La Vie 1964

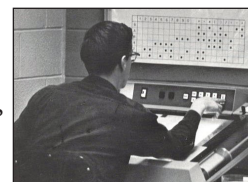
Four years earlier, George had been walking down a hallway in Hammond Building, deep in thought about school, work, and the struggles he was having as a young college student on his own for the first time, when Larry approached him and asked if there was anything wrong. George gained a confidant that day who, after hearing of George's difficulties, urged him to take ownership of his education—to go to every class and focus on his studies. George pledged that he would.

After completing his undergraduate degree and working in hydraulics research for a year, George was invited to return to Penn State on a graduate assistantship. He fondly remembers friends and mentors from that time, including professor and department head Robert Vierck, who encouraged George when he taught his first class in graduate school, statics and dynamics. Some of those people remain a part of George's life today, including Sabih

Hayek, distinguished emeritus professor of ESM.

After earning his master's degree, George worked in vibrations and acoustics for three years and became proficient in using large computers to solve engineering problems.

He then turned his professional focus to technical sales and marketing. After working for Hewlett Packard for five years, George was recognized as top revenue salesman worldwide in 1979. Since the early 1990s, he has been an independent consultant and president of Marketedge, Inc., a company that designs and installs network databases and sales management software.



Graduate student
works on a computer
La Vie 1969



Kathy and George Workman

George has not forgotten that pivotal moment when he made a pledge to Larry Perez and takes seriously the impact that one person can have in another's life. That's why he and his wife Kathy recently established a scholarship through their estate to support students in engineering science. The Matthew George Workman Scholarship, created in memory of the Workman's son, will provide financial support for students with academic and leadership potential.

PENNSTATE



Message from the Chair



With the holidays approaching, there is much to be thankful for!

Engineering Science was one of four Penn State engineering programs ranked in the top ten by U. S. News and World

Report and our student enrollment numbers continue to be strong.

We are proud to recognize two leaders who will retire at the end of the semester. Dean Wormley has served the College for 21 years, pioneering educational innovations that include World Class Engineers, the Learning Factory, and Entrepreneurship, and fostering unprecedented growth in student enrollments and research funding.



Jean Landa Pytel, assistant dean for student services and global programs since 1994 and ESM faculty member since 1979 has been the mainstay of the College's advising center. Never phased by escalating enrollments, Jean invested personally in the success of each student and inspired those with whom she worked to do the same. We congratulate Jean and Dave on all their successes and wish them well in their future ventures.



I thank our dedicated alumni and friends for your unwavering commitments to our students. As leaders and volunteers, you are living proof of the success of an engineering science degree. With your support, the future is indeed very bright for all in ESM!

Judith A. Todd

Judith A. Todd
P. B. Breneman Department Head Chair

Alumni Spotlight

It's an engineer's dream. State-of-the-art plastics and electronics labs; machine, wood and metal-working shops; computers with the latest design software; and loads of collaboration space—all under one roof. Oh, and did we mention the late-night hours and free coffee?



This creative community, known as TechShop, is what inspires Matthew Verlinich ('08 E SC, '10 MS) as he interacts with employees and customers every day at the company's Pittsburgh location. TechShop is an open-access, membership-based fabrication studio, hackerspace, and learning center. Matt is general manager of the facility, overseeing the store's employees, consulting instructors, and managing events and finances.

During his undergraduate and graduate years, Matt worked in Bernhard Tittman's lab, designing and manufacturing novel chemical reactors which used microwaves and high-intensity ultrasound to expedite the production of biodiesel. He then became a mechanical engineer in the Piping Analysis and Fracture Mechanics group in the Nuclear Services Division at Westinghouse Electric Company in 2010.

Today, Matt is living his dream. He continually innovates as a marketer, instructor, businessman, *and* engineer, and he credits his time at Penn State for his ability to be an interdisciplinary leader at TechShop.

Graduate Spotlight

PhD student Beth Bimber ('11 E SC, '13 MS) has received a 2013 Graduate Research Fellowship from the National Science Foundation (NSF).

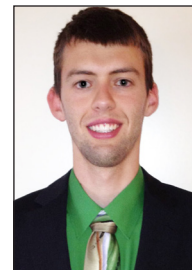


Beth is working with assistant professor Reginald Hamilton's research group to characterize the physical response of shape-memory alloys to thermo-mechanical stimuli. She presented her research on "Development of Novel Laser-Based Digital Direct Manufactured Shape Memory Alloys" at the Materials Science and Technology conference in Montreal on Oct. 30.

Eleven graduate students from the College of Engineering received fellowships. The NSF received more than 13,000 applications for graduate fellowships and made 2,000 award offers.

Undergraduate Spotlight

Senior Kyle Sinding impressed this year's American Society for Nondestructive Testing (ASNT) award committee with his paper, "The Past, Present and Future Contributions of Non-Destructive Evaluation in My Life."



In his paper, Kyle discussed his experiences at Penn State and engineering science and future academic plans. He received the ASNT Undergraduate Award in November at the society's annual conference in Las Vegas.

A Schreyer Honors scholar, Kyle is pursuing degrees in engineering science and mechanical engineering and has a special interest in electro-ceramics. Following graduation, he will begin an integrated undergraduate/graduate program in engineering science at Penn State with a master's completion date of 2015. Kyle plans to pursue a doctorate in materials science.

Yuebing Zheng at UT Austin

Yuebing Zheng ('10 PhD ESMCH) began as assistant professor in the Department of Mechanical Engineering at the University of Texas, Austin, in August. He will also work in the Texas Materials Institute.



Image: UT Austin

Dr. Zheng's research group studies the design, measure and control of novel, optically-active nanomaterials and nanodevices for innovations in photocatalysis, photovoltaics, optical imaging and spectroscopy, drug delivery and point-of-care theranostics.

As a postdoctoral researcher, Dr. Zheng worked in the California NanoSystems Institute at the University of California, Los Angeles. He earned a B.Sc. from Nankai University, China, and M.Sc. from the National University of Singapore.

Albert Segall named Fellow

ESM professor Albert Segall ('82 ME, '85 MS E MCH, '92 PhD ESMCH) received the Society of Tribologists and Lubrication Engineers Fellow Award at the 2013 Annual Meeting and Exhibition in Detroit.



Fellow membership recognizes long-term society members who have made a significant impact on the field of tribology and lubrication engineering.

Dr. Segall is currently investigating the use of dual-beam laser machining methods to improve machining quality.

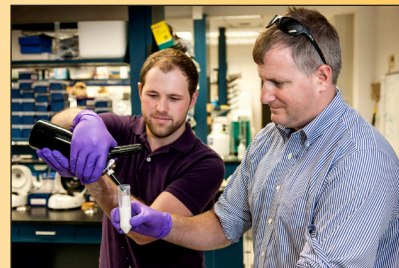
Daniel Hayes receives CAREER Award

Daniel Hayes ('97 SC, '04 MS) assistant professor at Louisiana State University's Department of Biological and Agricultural Engineering, received a National Science Foundation (NSF) Faculty Early Career Development (CAREER) award this past spring.

CAREER is the most prestigious award bestowed upon junior faculty by the NSF, recognizing and supporting the early career-development activities of those teacher-scholars who are most likely to become the academic leaders of the 21st century.

Dr. Hayes will receive \$400,000 over five years for a research project that involves a promising new technique to improve the control of wound healing and tissue repair process through modulation of cell and tissue function with microRNA, which are small non-coding RNA sequences naturally found in animal and plant tissues.

At Penn State, Dr. Hayes worked with Stephen Fonash, Bayard D. Kunkle Professor of Engineering, on nano and microscale devices for biological sensing.



Images: LSU



Save the date for ESM's Golden Decade Reunion, held in conjunction with Penn State's traditional alumni weekend, June 5-6, 2014. All alumni are invited to attend the celebration banquet and half-day program in the ESM department. Find out whether you are a class champion!

For more information and to RSVP visit esm.psu.edu/alumni/reunion

Early Career Recognition Award

The ESM Alumni Society is seeking nominations for the Early Career Recognition Award. This award honors alumni who have distinguished themselves at work and/or in the community, within ten years of graduation.

Please submit recommendations (including self-nominations) by Jan. 15, 2014 at esm.psu.edu/alumni/honorees

We want to hear from you!

Job changes, awards, involvement in your community—we would love to hear about it! Drop us a line at alumnirelations@mail.esm.psu.edu

Cliff Lissenden: international innovator

Cliff Lissenden, professor of engineering science and mechanics, and his research team are featured in the September edition of *International Innovation*, a leading global research publication.



The team is tackling the challenges of structural health monitoring in the United States and making advancements in infrastructure sustainability with use of ultrasonic guided waves.

Visit Dr. Lissenden's research wiki page to view the full article and interview:
www.esm.psu.edu/wiki/research:cjl9:start

Brad Lapsansky named SMART Scholar

Senior Bradford Lapsansky has been awarded a Science, Mathematics, and Research for Transformation (SMART) Scholarship for the academic year.



The SMART Scholarship for Service Program was established by the Department of Defense (DOD) to support undergraduate and graduate students pursuing degrees in science, technology, engineering and mathematics disciplines with the goal of increasing the number of civilian scientists and engineers working at DOD laboratories. Awardees receive a full scholarship and are employed upon degree completion at a DOD research facility.

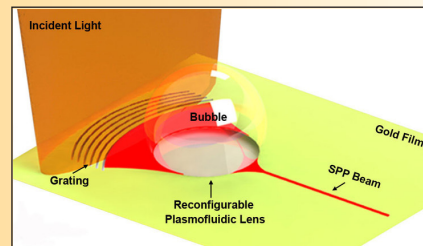
Following graduation, Bradford will work for the U.S. Army Aberdeen Proving Ground's Communications-Electronics Center of the Research, Development and Engineering Command in Maryland.

ESM Research Highlights

Bubbles are the new lenses for nanoscale light beams

According to professor Tony Huang and his team, liquid bubbles may be all that are necessary to bend light beams for use in next-generation, high-speed circuits and displays.

The advantage of a bubble lens is how quickly and easily researchers can reconfigure the bubble's location, size and shape—all of which affect the direction and focus of any light beam passing through it.



To form the bubble lens, researchers used a low-intensity laser to heat water on a gold surface. The tiny bubble's optical behavior remained consistent as long as the laser's power and the environmental temperature were constant. Simply moving the laser or adjusting the laser's power can change how the bubble will deflect a light beam, either as a concentrated beam at a specific target or as a dispersed wave.

Dr. Huang believes that the next step is to find out how a bubble's shape influences the direction of the light beam and the location of its focal point. Fine control of these light beams will enable improvements for on-chip biomedical devices and super-resolution imaging.

Source: *Penn State News* at tinyurl.com/qyjny5d

Brain technology advancements for ALS patients

With support from Zachary Simmons, director of the ALS Clinic at Hershey Medical Center, and Steven Schiff, Brush Chair Professor of Engineering, graduate student Andrew Geronimo is advancing brain technology and its possibilities for people living with ALS and others who have lost voluntary motor control.



Brain Computer Interface (BCI) works with an EEG cap to process information about the brain that has been recorded through the scalp. If successful, users would be able to control computer programs using their mind. Andrew has been working on the BCI project for three years, primarily testing the technology with college students, but has begun a new phase of research involving ALS patients. Andrew is measuring the impact of cognition and genetics, among other factors, on BCI and how the technology can be used for communication and daily living.

Andrew is the recipient of the Dr. Richard E. Llorens Graduate Award in Engineering Science and Mechanics, which recognizes the outstanding academic achievement of a graduate student. This October, Andrew met Rosita Llorens, who created the award in 2009 in memory of her late husband, Richard ('58 MS E MCH, '61 PhD), founding professor of the Penn State King of Prussia Graduate Radnor Center (engineering and mechanical science) and interim dean of the Great Valley Graduate Center.



Nature can make all kinds of things, including nanotubes, polymers and shock-absorbing coils. An international team of researchers, including professor Melik Demirel, are finding ways to mimic structures in nature for use as novel plastic materials.

Alumni who attended the 2013 ESM Golden Decade Alumni Reunion undoubtedly recall professor Melik Demirel's colorfully-titled presentation "Gecko Feet and Butterfly Wings," in which Dr. Demirel described the fascinating qualities from nature that may be used in material production, such as the ability of butterfly wings to shed water, or of gecko feet to scale walls.



Melik Demirel



Dr. Demirel with a squid

Bioelastomers have been an interest for a long time as eco-friendly functional materials, but a recyclable and reusable bioelastomer that has multifunctional properties has not been previously reported because of the complex interplay among a series of physical properties and the difficulties in synthesis.

Ideally, these materials would be engineered using renewable resources and processing strategies

that reflect the "green" chemistry of biological systems.

Reusable bioelastomers have significant impact for the production of bioplastics and in additive manufacturing. Applications in multiple fields include tissue engineering of printable 3D scaffolds as well as 3D printing, where the information can be stored and printed constructs can create novel architectures.

Dr. Demirel and ESM graduate student Abdon Pena-Francesch continue to study the production of biologically-inspired materials and explore methods of imitating these structures simply and inexpensively.

Recent work has discovered unique properties of the grappling, hook-like structures in jumbo squid, known as sucker ring teeth. The teeth show nanotubular structure with strong elastic properties.

One especially exciting discovery finds that the sucker ring teeth can be heated and reshaped without changing their material properties. Biological materials often cannot be reshaped because they do not melt when heated.

One especially exciting discovery was that the sucker ring teeth can be heated and reshaped without changing their material properties.

With this information, Dr. Demirel and his colleagues have found that the bioelastomeric structures in the squid proteins can be used to produce biological thermoplastics.

This means that by extracting the genomic material from squids, understanding its abilities and imitating those properties in material production, the researchers can produce natural plastic.

The elastomeric material can transform from melt to solid, and is therefore forever recyclable.

Manufacturing natural plastic would be a major breakthrough in the world of eco-friendly products. The elastomeric material can transform from melt to solid, and is therefore forever recyclable. The material can also be shaped into almost any object customarily made from plastic.

The research team presented their results in a recent issue of the journal *Nature Biotechnology*. They will continue to explore ways to mimic the structures from nature on a larger scale and do so inexpensively. Making eco-friendly devices for wetting, friction, transport, and consumer products is an important next step in their future research.

The Office of Naval Research funded this research.



Message from Your Alumni Society Chair

Recently, the board members have been discussing the proper role and use of online courses. During our fall meeting, professor Gary Gray presented on his development of an online course.

Dr. Gray taught EMCH 212 (you all remember dynamics!). He explained the technology involved in building the course, gave a brief demonstration of the final product, highlighted challenges, discussed costs and benefits, and shared his teaching experiences. The course content, graphics, and interactive materials were very impressive. EMCH 212 online was offered this past summer for the first time and had 130 enrollees with students from all over the world. Interestingly, Dr. Gray stated that one of the biggest challenges was the need for sharper computer skills on the part of students (no matter the age) to handle homework, discussion sessions and testing. Dr. Gray is currently planning an online version of statics.

The board welcomes Emily Gallagher ('11 Lib) as our new alumni liaison and four new board members: Joe Geddes ('01 E SC, '01 MS), Jim Oliver ('75 E SC), Rich Smith ('73 E MCH) and Gopalaswamy Rajesh ('97 PhD ESMCH).

Finally, I would like to update you on things the board will be working with the department on during the next year. Our LinkedIn community stands at more than 500 members and we are looking to grow. If you are not already connected to the group, please join! This is a great way to share information, do recruiting or job hunting, network, and learn more about what's going on in the department.

We are looking into contributing to the College's blog to better communicate with our alumni and others. Board members will be visiting the Commonwealth Campuses to promote the ESM program to prospective students. Last but not least, we are planning our next Golden Decade Reunion for June 5-6, 2014. Save the date!

Jim Smiley
('60 E MCH, '66 PhD NUC E)

Doing Our Part

Fellow alumni,

In a letter written to his scholarship benefactor this fall, a student said, "I have found my passion in engineering and believe that I can make a difference with a Penn State degree. And, for that, I have you to thank. Without your generous support, the financial burden of going through college would have been overwhelming."

For the future

THE CAMPAIGN FOR PENN STATE STUDENTS

These words are at the heart of the goals of *For the Future: The*

Campaign for Penn State Students. The campaign's top priority is keeping a Penn State degree affordable for students and families. Since the campaign's inception in 2007, ESM has been working toward its own fundraising goals: scholarship, research, and excellence funds, totaling \$6.5 million. And we are almost there. To date, ESM has achieved more than 90 percent of its goal.

As we approach the end of the campaign, remember that gifts of every size—large and small—make a huge difference in the lives of students and faculty in the department. These gifts enable the department to sustain its traditions of academic excellence and honors education, and to seed new innovations in curricular, research and outreach activities.

Thanks so much! Penn State Proud,

Glen F. Chatfield

James A. Miller

Glen Chatfield, Chair
Jim Miller

Development and Alumni Relations Committee

David Farkas

David Farkas

To make a gift, visit secure.ddar.psu.edu/GiveTo/ Designate your gift to the category "other" and write in Engineering Science and Mechanics.



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