SPRING 2016

THE GEORGE WASHINGTON UNIVERSITY

# SYNERGY

SCHOOL OF ENGINEERING & APPLIED SCIENCE

ZACH MARYKEWU

THE GW SCIENCE & ENGINEERING HALL

# CHANGING THE WAY WE WORK


## Room with a View

The south side of the Science and Engineering Hall offers light-filled, two-story spaces for study and research discussions. **Story page 8.**

ZACH MARING/GWU

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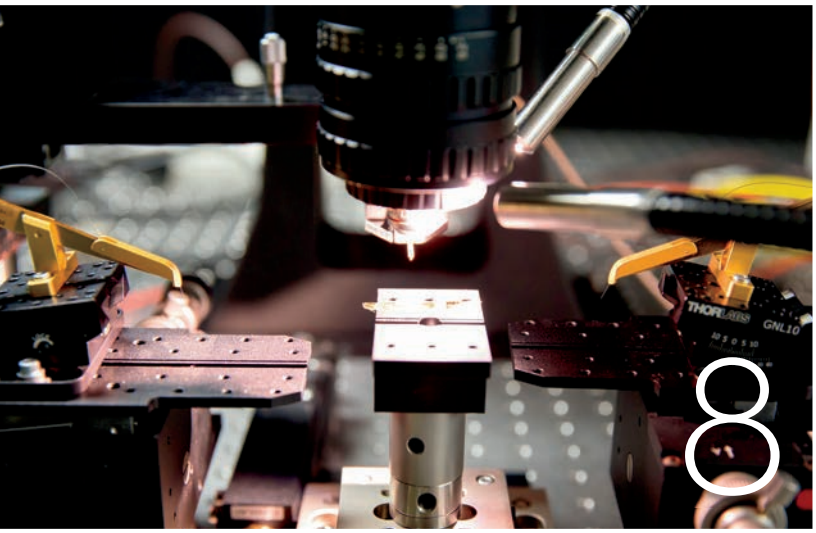




## SYNERGY

**SPRING 2016**

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Michael W. Plesniak, Chair

Biomedical Engineering

## PROFILE

**Chair:** Igor Efimov
202-994-3740
**www.bme.seas.gwu.edu**
**Full-time faculty:** 9
**Undergraduate students:** 200
**Graduate students:** 29
**Annual research expenditures:**
New department; figures not yet available

## FACULTY

Igor Efimov, **PROFESSOR, HRS, AHA, AND AIMBE FELLOW**
Emilia Entcheva, **PROFESSOR**
Matthew Kay, **ASSOCIATE PROFESSOR**
David Lee, **ASSOCIATE PROFESSOR**
Zhenyu Li, **ASSISTANT PROFESSOR**
Murray Loew, **PROFESSOR, IEEE AND AIMBE FELLOW**
Chung Hyuk Park, **ASSISTANT PROFESSOR**
Jason Zara, **ASSOCIATE PROFESSOR**
Vesna Zderic, **ASSISTANT PROFESSOR**

## RESEARCH AREAS

**CARDIAC ENGINEERING**
Efimov, Entcheva, Kay

**MEDICAL IMAGING**
Loew, Zara

**MEDICAL INSTRUMENTATION**
Loew, Zara

**THERAPEUTIC ULTRASOUND/DRUG DELIVERY**
Zderic

**MICROFLUIDICS**
Li

**ROBOTICS**
Park

# The Heart of the Matter

Since 1958, average life expectancy in the US has increased by 10 years. According to Igor Efimov, the inaugural chair of GW's Department of Biomedical Engineering and the Alisann and Terry Collins Professor of Biomedical Engineering, the 68 percent reduction in the mortality rate from heart disease during the same period is a huge contributor to this remarkable gain in life expectancy.

That said, heart disease still remains the country's number one killer, and Dr. Efimov has dedicated his life's work to better understanding and developing devices to treat it.

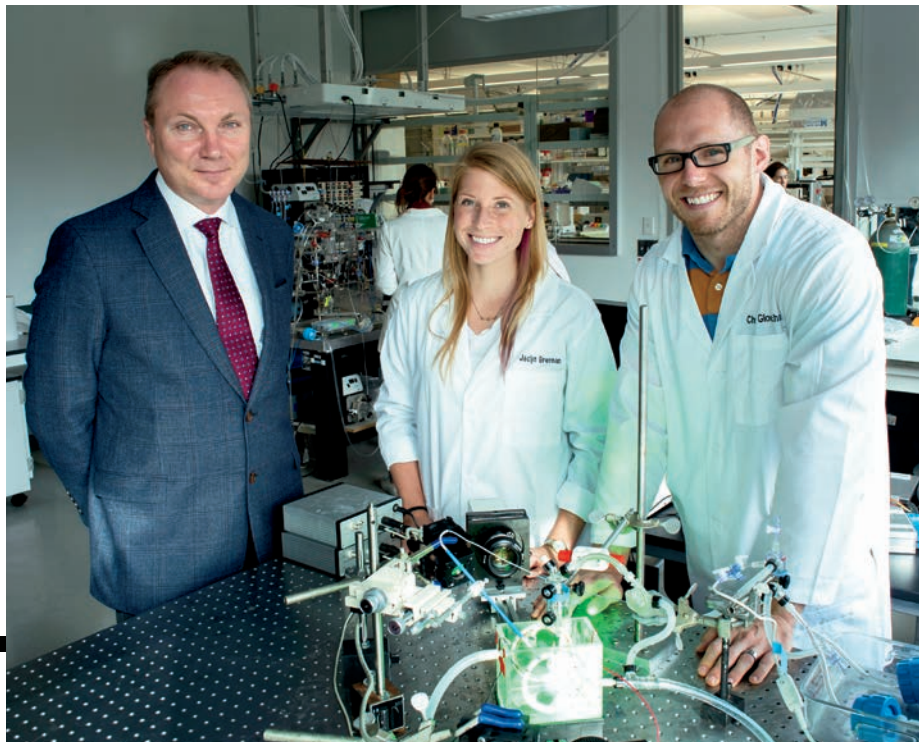
Historically, much of the fundamental cardiovascular research has been conducted through experiments on animals, with scientists and engineers hoping to translate what they learn about the physiology and functioning of the various animals' hearts to the human heart. But there are inherent limits in studying animal hearts. Frustrated by these limits, Dr. Efimov developed a program at his previous university (Washington University in St. Louis) to procure human hearts during transplantation to study them in the lab.

"This was exciting, because for the first time we were able to test many physiological mechanisms of disease in humans," Dr. Efimov recalls. "Essentially we found that many ideas that worked in animals also work in humans, but many do not. Unfortunately, the translational value from many of these [animal] studies is rather limited and has had a relatively small impact on human health."

Medical devices, on the other hand, have had a large and extremely beneficial impact on treatment of heart disease, with pacemakers and defibrillators helping millions of patients. But no medical devices exist yet to treat atrial fibrillation, a form of arrhythmia (or irregular heartbeat) that can cause dangerously rapid heart rates and stroke. The only current treatment is ablation, which burns and kills the tissue in the heart that is causing the arrhythmia.

Dr. Efimov, however, sees a potential treatment in a particularly novel technology developed by Dr. John Rogers of University of Illinois at Urbana-Champaign, and the two are working together to develop new devices based on this technology. Dr. Rogers and other materials scientists have developed flexible, membrane-like electronics devices that will wrap around an organ and monitor its functions. Seeing applications of this for treatment of heart disease, Dr. Efimov began collaborating with Dr. Rogers to develop an implantable, custom-fit device that wraps around a patient's heart.

"It conducts 24/7 monitoring of the function of the organ and, if needed, you can terminate dangerous states such as atrial or ventricular fibrillation," says Dr. Efimov. "This is what I want to continue doing at GW."



# Driven by Safety Concerns

Those of us who commute to work via I-495, I-66, or any of America's other congested highways know the frustration of sitting—just sitting—for minutes at a time. Imagine if we were able to commute on accident-free, congestion-free highways.

Although this still is a dream, it's not as far off as some may think, thanks to the work of researchers like Samer Hamdar. Dr. Hamdar and his team are working on several transportation engineering projects with the goals of increasing driver safety and decreasing congestion.

With funding from a National Science Foundation (NSF) Faculty Early CAREER Award—the most prestigious grants that the NSF awards to junior faculty—he and his research group are working to develop models of teenage driving behavior that can be incorporated into automobile safety systems.

"We collect trajectory data on teenage drivers through driving simulators, so we can understand the behaviors that might lead to collisions," Dr. Hamdar explains. "Then we confirm this data with data we obtain from an instrumented vehicle, and we can model it and propose different active or passive control systems to avoid such unsafe behavior."

Dr. Hamdar's team will look specifically at car-following and lane changing behaviors and will develop control algorithms from the data they collect. The control systems they will then propose could range from simply presenting warnings to the driver to developing mechanisms that take over control of the car.

According to Dr. Hamdar, his team's research goes beyond other similar research in two respects. All other similar research uses only statistics and the probability models they derive from data they get in the field, while his team models collisions from actual driver behavior. Their model also incorporates data on the vehicle's post-collision movement to try to further reduce any negative impacts of an accident.

"We believe we will have a connected system that's tailored to each driver's needs and the errors that he might make," says Dr. Hamdar. "By tailoring the system to the driver, we will encourage the driver's responsiveness to the system and trust in it, which is particularly important as we move to semi-autonomous driving systems."

Dr. Hamdar is working on a separate semi-autonomous driving system project with Dr. Adam Wickenheiser of the Department of Mechanical and Aerospace Engineering. As society moves toward such systems, the assumption is that the automation will remove human error, producing smoother traffic interactions and reducing congestion. But those assumptions need to be tested. Drs. Hamdar and Wickenheiser are working on a pilot project that does just that. By using robo-cars equipped with small personal computers and cameras and allowing them to interact with each other, they plan to test the impact, on both safety and congestion, of vehicle-to-vehicle interaction in a semi-autonomous driving environment.

## PROFILE

**Chair:** Majid Manzari
202-994-4901
**www.cee.seas.gwu.edu**
**Full-time faculty:** 11
**Undergraduate students:** 86
**Graduate students:** 38
**Annual research expenditures:** $662,200

## FACULTY

Sameh Badie, **PROFESSOR**
Kennerly Digges, **RESEARCH PROFESSOR**
Leila Farhadi, **ASSISTANT PROFESSOR**
Samer Hamdar, **ASSISTANT PROFESSOR**
Muhammad Haque, **PROFESSOR**
Tianshu Li, **ASSISTANT PROFESSOR**
Majid Manzari, **PROFESSOR**
Rumana Riffat, **PROFESSOR**
Kim Roddis, **PROFESSOR**
Danmeng Shuai, **ASSISTANT PROFESSOR**
Pedro Silva, **ASSOCIATE PROFESSOR**

## RESEARCH AREAS

**ENVIRONMENTAL AND WATER RESOURCES ENGINEERING**
Farhadi, Riffat, Shuai

**MATERIALS**
Li, Manzari

**STRUCTURAL/GEOTECHNICAL/EARTHQUAKE ENGINEERING**
Badie, Manzari, Roddis, Silva

**TRANSPORTATION SAFETY ENGINEERING**
Digges, Hamdar

Computer Science

## PROFILE

**Chair:** Roger Lang (Interim)
202-994-7181
**www.cs.seas.gwu.edu**
**Full-time faculty:** 17
**Undergraduate students:** 160
**Graduate students:** 400
**Annual research expenditures:** $3.5 million

## FACULTY

Simon Berkovich, **PROFESSOR EMERITUS**
Xiuzhen "Susan" Cheng, **PROFESSOR**
Hyeong-Ah Choi, **PROFESSOR**
Mona Diab, **ASSOCIATE PROFESSOR**
Evan Drumwright, **ASSISTANT PROFESSOR**
James Hahn, **PROFESSOR**
Rachelle Heller, **PROFESSOR**
Lance Hoffman, **DISTINGUISHED RESEARCH PROFESSOR AND ACM FELLOW**
Claire Monteleoni, **ASSISTANT PROFESSOR**
Bhagirath Narahari, **PROFESSOR**
Gabriel Parmer, **ASSOCIATE PROFESSOR**
Shmuel Rotenstreich, **ASSOCIATE PROFESSOR**
Rahul Simha, **PROFESSOR**
Poorvi Vora, **PROFESSOR**
Timothy Wood, **ASSISTANT PROFESSOR**
Abdou Youssef, **PROFESSOR**
Nan Zhang, **ASSOCIATE PROFESSOR**

## RESEARCH AREAS

**ALGORITHMS AND THEORY**
Cheng, Choi, Youssef, Zhang

**ARTIFICIAL INTELLIGENCE AND ROBOTICS**
Cheng, Diab, Drumwright, Monteleoni, Zhang

**BIOINFORMATICS AND BIOMEDICAL COMPUTING**
Cheng, Hahn, Rotenstreich, Simha

**COMPUTER SECURITY AND INFORMATION ASSURANCE**
Cheng, Choi, Hoffman, Narahari, Simha, Vora, Zhang

**DIGITAL MEDIA**
Hahn, Heller, Vora, Youssef

**NETWORKING AND MOBILE COMPUTING**
Cheng, Choi, Narahari, Rotenstreich, Simha

**PERVASIVE COMPUTING AND EMBEDDED SYSTEMS**
Cheng, Narahari, Simha

**SEARCH AND DATA MINING**
Youssef, Zhang

**SOFTWARE ENGINEERING AND SYSTEMS**
Narahari, Parmer, Rotenstreich, Wood

# A Composite View

What if one of the 50-plus small computers contained in today's average car failed, and it was the computer that controls the car's braking system? Or what if one of the computers that help manage a city's water control plant failed? Or maybe just a computer contained within your smart phone.

The consequences of the failure could range from the merely annoying to disastrous, but as computers become increasingly woven into our lives, the need to develop better and more predictable operating systems becomes more urgent.

This is precisely what Gabriel Parmer attempts to do, as he investigates methods to make computer operating systems essentially self-repairing, able to recover from faults and to resume predictable operation. He does this by considering the problem from three perspectives: reliability, security from outside attacks, and parallelism (or, in simple terms, designing the software to work well with the multiple cores that most computers now contain).

"The underlying theme for all three pushes is the notion of predictability," Dr. Parmer says. "We need to know that a certain computation will be completed at a certain time that the real world requires."

To learn more about predictability, Dr. Parmer and his research students have built from scratch an operating system called Composite, on which they all work, innovating on one of the three perspectives of predictability. The general idea behind Composite is to rethink the way code is developed for embedded systems. Generally the code is "put together in one monolithic blob, and the impact of that is that if any one line of code goes wrong, it can impact anything else in the software," according to Dr. Parmer. Instead, he conceptualizes breaking the code into separate compartments that are specialized like cells, so if a hacker takes over one cell, the attack doesn't impact the other cells around it or break the system.

This is the concept he has been developing under his 2012 National Science Foundation (NSF) Faculty Early CAREER Award. These are the most prestigious grants the NSF awards to junior faculty, and Dr. Parmer is grateful for its support. He says that he initially considered his idea a risky way to look at reliability and embedded systems, but the results so far have proven it to be very useful, even more useful than he originally thought it would be.

The CAREER award is a validation of the potential of his idea. And so is the grant he currently has with the Office of Naval Research. It works with the same infrastructure and "attempts to do something that's pretty off the beaten path with it," Dr. Parmer muses. And it, too, is beginning to show good results.

Dr. Parmer is proud of his research results, but he's also very proud of the "results" his students have shown, noting that "seeing them progress as researchers is a huge milestone." His dedication to his students' growth is obvious as he talks, but also borne out by the three teaching awards he has received from both the students and his peers since joining the SEAS faculty in 2010.

# Maximizing Potential

Think of him as the brains behind "the brains." Guru Venkataramani of the Department of Electrical and Computer Engineering studies computer architecture, unceasingly searching for ways to improve the performance, power, and security of computer processors, which he describes as the "brains behind computing systems."

"My area is a very practical field," he says. "We're involved in the design of processors that go into everything from cell phones, to laptops, to super computers, to data centers."

Dr. Venkataramani finds no shortage of interesting challenges in his field. One area in which he's been particularly successful is performance debugging in multi-core processors, or finding the bottlenecks in an application in order to take full advantage of a processor's resources and maximize its speed and performance.

"The question I'm trying to answer is, 'Am I maximizing the potential and taking full advantage of the resources I have, or if not, where is the gap in my application?' I want my four-core processor to run four times as fast as a one-core processor," he declares.

Dr. Venkataramani explains that a number of hardware features usually are insufficiently utilized by software applications that run on top of them. This eventually contributes to the performance gap, but programmers who don't understand what is happening inside the processor's cores often won't be able to figure out what the problem is. So he is developing an integrated hardware-software approach to overcome the bottlenecks in performance when more cores are added to a system. His approach shows enough promise that the National Science Foundation selected him to receive a 2012 Faculty Early CAREER Award, the most prestigious grant it awards to junior faculty.

On the security side, Dr. Venkataramani is developing a novel approach to hardware covert timing channel detection. Traditionally, researchers look at the problem in the context of networks or software structures, but Dr. Venkataramani's group explores the problem from the hardware dimension.

"Our approach was the first in the field to address the detection of covert timing channels that can be prevented on shared hardware," he says. "The proof that it's exciting and novel work is that it was published in the MICRO conference, one of the top two conferences in our field. Many of the papers that are published in this conference eventually become features in real-world processors, and our work already is generating some interest."

Last year, he also started working on a new challenge in collaboration with his colleague, Dr. Tian Lan. Their project, sponsored by the Office of Naval Research, aims to detect sensitive information leakage in user programs. The detection techniques that others have found involve a trade-off between speed and preciseness, but Dr. Venkataramani is hoping to find a synergistic approach that meets both requirements.

## PROFILE

**Chair:** Ahmed Louri
202-994-6083
**www.ece.seas.gwu.edu**
**Full-time faculty:** 20
**Undergraduate students:** 79
**Graduate students:** 208
**Annual research expenditures:** $2.1 million

## FACULTY

Lawrence Bennett, **RESEARCH PROFESSOR AND APS FELLOW**
Robert Carroll, **PROFESSOR**
Edward Della Torre, **PROFESSOR, IEEE AND APS FELLOW**
Milos Doroslovacki, **ASSOCIATE PROFESSOR**
Tarek El-Ghazawi, **PROFESSOR AND IEEE FELLOW**
Kie-Bum Eom, **PROFESSOR**
Amir Etemadi, **ASSISTANT PROFESSOR**
Robert Harrington, **PROFESSOR AND IEEE FELLOW**
Hermann Helgert, **PROFESSOR**
Howie Huang, **ASSOCIATE PROFESSOR**
Can Korman, **PROFESSOR**
Nicholas Kyriakopoulos, **PROFESSOR**
Tian Lan, **ASSISTANT PROFESSOR**
Roger Lang, **PROFESSOR AND IEEE FELLOW**
Ahmed Louri, **PROFESSOR AND IEEE FELLOW**
Ergun Simsek, **ASSISTANT PROFESSOR**
Volker Sorger, **ASSISTANT PROFESSOR**
Suresh Subramaniam, **PROFESSOR**
Guru Venkataramani, **ASSOCIATE PROFESSOR**
Mona Zaghloul, **PROFESSOR AND IEEE FELLOW**

## RESEARCH AREAS

**COMMUNICATIONS AND NETWORKS**
Doroslovacki, Helgert, Lan, Louri, Subramaniam

**COMPUTER ARCHITECTURE AND HIGH-PERFORMANCE COMPUTING**
El-Ghazawi, Huang, Louri, Venkataramani

**ELECTRIC POWER AND ENERGY**
Etemadi, Harrington

**APPLIED ELECTROMAGNETICS**
Bennett, Della Torre, Korman, Lang, Simsek, Sorger

**MEMS/NEMS, ELECTRONICS, AND PHOTONICS**
Ahmadi, Korman, Louri, Nagel, Simsek, Sorger, Zaghloul

**SIGNAL AND IMAGE PROCESSING, SYSTEMS, AND CONTROLS**
Carroll, Doroslovacki, Eom, Harrington, Kyriakopoulos

## PROFILE

**Chair:** Thomas Mazzuchi
202-994-2353
**www.emse.seas.gwu.edu**
**Full-time faculty:** 14
**Undergraduate students:** 127
**Graduate students:** 188
**Annual research expenditures:** $594,000

## FACULTY

Hernan Abeledo, **ASSOCIATE PROFESSOR**
Joseph Barbera, **ASSOCIATE PROFESSOR**
David Broniatowski, **ASSISTANT PROFESSOR**
Jonathan Deason, **PROFESSOR**
Michael Duffey, **ASSOCIATE PROFESSOR**
Royce Francis, **ASSISTANT PROFESSOR**
Erica Gralla, **ASSISTANT PROFESSOR**
Thomas Mazzuchi, **PROFESSOR**
Julie J. C. H. Ryan, **ASSOCIATE PROFESSOR**
Joost Reyes Santos, **ASSOCIATE PROFESSOR**
Shahram Sarkani, **PROFESSOR**
Ekundayo Shittu, **ASSISTANT PROFESSOR**
Zoe Szajnfarber, **ASSISTANT PROFESSOR**
J. Rene van Dorp, **PROFESSOR**

## RESEARCH AREAS

**CRISIS, EMERGENCY, AND RISK MANAGEMENT**
Barbera, Broniatowski, Gralla, Santos, van Dorp

**ECONOMICS, FINANCE, AND COST ENGINEERING**
Duffey, Santos, Shittu, van Dorp

**ENGINEERING AND TECHNOLOGY MANAGEMENT**
Deason, Duffey, Sarkani, Shittu, Szajnfarber

**ENVIRONMENTAL AND ENERGY MANAGEMENT**
Deason, Francis, Shittu

**KNOWLEDGE AND INFORMATION MANAGEMENT**
Broniatowski, Ryan

**OPERATIONS RESEARCH**
Abeledo, Gralla, Mazzuchi, Sarkani, Shittu, van Dorp

**SYSTEMS ENGINEERING**
Broniatowski, Duffey, Gralla, Mazzuchi, Ryan, Santos, Sarkani, Shittu, Szajnfarber, van Dorp

# How Perception Drives Decisions

David Broniatowski's research investigates decision making under risk, big data and health, systems architecture, and computational analysis of group decision-making. What all of these research areas have in common is a drive to understand how information flows within technical and social systems, impacting decision-making and design.

"A lot of our models are built on eighteenth century *assumptions* about how people make decisions," he says. "I work with experimental psychologists to understand how people *actually* make decisions."

For example, Dr. Broniatowski recently co-authored a study, which found that patients are likely to expect antibiotics for viral infections, even though they are aware that antibiotics probably will not cure them. They do this because they compare the status quo—being sick—to the very unlikely possibility of getting better from antibiotics, while assuming that side effects of antibiotics are negligible.

In a related study, Dr. Broniatowski determined that people's perceptions about vaccines also will drive their vaccination behaviors, and that these perceptions can be tracked on social media. In fact, the National Institutes of General Medical Sciences in the National Institutes of Health recently awarded Dr. Broniatowski a $1.5 million R01 grant to continue his study of how people use social media to share their rationales for vaccinating or refusing to vaccinate.

His work on social media builds on previous successful research that used Twitter to track the flu. Although several researchers are trying to use social media to track the flu, Dr. Broniatowski and his colleagues at Johns Hopkins University have had more success than others. Their algorithm can tell the difference, on both the local and national levels, between tweets indicating the person actually has the flu and those expressing only awareness of flu. Their technique was 93 percent accurate when compared to actual national influenza-like-illness data collected by the Centers for Disease Control and Prevention (CDC) during multiple flu seasons.

"Because the CDC's data collection from hospitals and physicians involves a time lag, a system that uses Twitter might be able to reveal a spike in flu cases more quickly," explains Dr. Broniatowski. "Data collected from Twitter may allow cities to do better surge planning for the flu or other epidemics because it can be gathered in real time."

The scientific community has recognized the success of his technique through a letter in the prestigious journal *Science*. But Dr. Broniatowski also works to keep his research relevant to the public, and his studies have received a good deal of media attention, including reports in the *Washington Post*, *National Journal*, *Men's Health*, and other media outlets.

# Adding It All Up

As a doctoral student at Stanford University, Saniya LeBlanc was given a simulation exercise that tasked her with designing an energy portfolio to meet the human population's demand for energy. With that exercise, Dr. LeBlanc found her field of study.

"Seeing the link between this global need and the technologies that we can work on to meet that need, I just never looked back after that," she says.

Now an assistant professor in the Department of Mechanical and Aerospace Engineering, Dr. LeBlanc works to develop technologies that address the growing demand for energy, as well as to improve the energy efficiency of technologies that provide our energy services.

Some of her lab's current projects use additive manufacturing (3D printing) methods to create energy conversion devices based on semiconductor nanomaterials. Using 3D printing, researchers are able to make multiscale—from nano to macro—geometries that traditional manufacturing techniques can't achieve. These tunable geometries allow Dr. LeBlanc and her students to design energy devices that optimize energy conversion, turning unused heat into electricity, for example. She has been particularly interested in studying how to convert unused heat from thermoelectric generators into electricity.

"Thermoelectric generators convert heat to electricity through solid state, that is, the material itself converts heat into electricity," explains Dr. LeBlanc. "It turns out that you can nanostructure a material to make it do that conversion more effectively. But what I also learned by studying thermoelectric generators is that the systems integration problems were actually limiting performance. It's not just the material; it's how the material is integrated into the overall system that can affect the performance and how much electricity you will actually get out of it."

In a separate project, Dr. LeBlanc and her collaborator, Dr. Shannon Yee of Georgia Tech, are working to understand the link between the technical performance of specific energy materials and systems, and the economic requirements for the technologies to make it out of the lab and into the market. They were the first researchers to do a comprehensive techno-economic analysis for thermoelectric technology.

"We wanted to develop an analysis to figure out what the key problems are," says Dr. LeBlanc. "We're now cited as the leaders in this area for having developed the framework for how to think about this problem."

## PROFILE

**Chair:** Michael Plesniak
202-994-6749
**www.mae.seas.gwu.edu**
**Full-time faculty:** 22
**Undergraduate students:** 204
**Graduate students:** 150
**Annual research expenditures:** $3.5 million

## FACULTY

Elias Balaras, **PROFESSOR**
Lorena Barba, **ASSOCIATE PROFESSOR**
Philippe Bardet, **ASSISTANT PROFESSOR**
Kartik Bulusu, **ASSISTANT RESEARCH PROFESSOR**
Andrew Cutler, **PROFESSOR**
David Dolling, **PROFESSOR, AIAA AND ROYAL AERONAUTICAL SOCIETY (UK) FELLOW**
Charles Garris, **PROFESSOR AND ASME FELLOW**
Stephen Hsu, **PROFESSOR AND ASME FELLOW**
Michael Keidar, **PROFESSOR AND APS FELLOW**
Saniya LeBlanc, **ASSISTANT PROFESSOR**
James Lee, **PROFESSOR AND ASME FELLOW**
Taeyoung Lee, **ASSOCIATE PROFESSOR**
Megan Leftwich, **ASSISTANT PROFESSOR**
Yongsheng Leng, **ASSOCIATE PROFESSOR**
Chunlei Liang, **ASSISTANT PROFESSOR**
Michael Plesniak, **PROFESSOR AND FELLOW OF ASME, AIAA, AAAS, AIMBE AND APS**
Kausik Sarkar, **PROFESSOR AND FELLOW OF ASME, ASA, AIMBE AND APS**
Yin-Lin Shen, **PROFESSOR**
Murray Snyder, **PROFESSOR**
Santiago Solares, **ASSOCIATE PROFESSOR**
Adam Wickenheiser, **ASSISTANT PROFESSOR**
Lijie Grace Zhang, **ASSOCIATE PROFESSOR**

## RESEARCH AREAS

**AEROSPACE ENGINEERING**
Cutler, Dolling, Garris, Keidar, T. Lee, Plesniak, Wickenheiser

**BIOMEDICAL ENGINEERING**
Balaras, Bulusu, Friedman, Keidar, J. Lee, Leftwich, Liang, Plesniak, Sarkar, Silver, Zhang

**DESIGN AND MANUFACTURING OF MECHANICAL AND AEROSPACE SYSTEMS**
Garris, Leng, Shen

**FLUID MECHANICS, THERMAL SCIENCE, AND ENERGY**
Balaras, Barba, Bardet, Bulusu, Cutler, Dolling, Garris, Hsu, Keidar, LeBlanc, Leftwich, Liang, Plesniak, Sarkar, Snyder, Wickenheiser

**MECHATRONICS, ROBOTICS, AND CONTROLS**
J. Lee, T. Lee, Wickenheiser

**SOLID MECHANICS AND MATERIALS SCIENCE**
Chong, Hsu, LeBlanc, J. Lee, Leng, Silver, Solares, Zhang

**COVER STORY:**

# Science and Engineering Hall: Changing the Way We Work

by Dean David S. Dolling

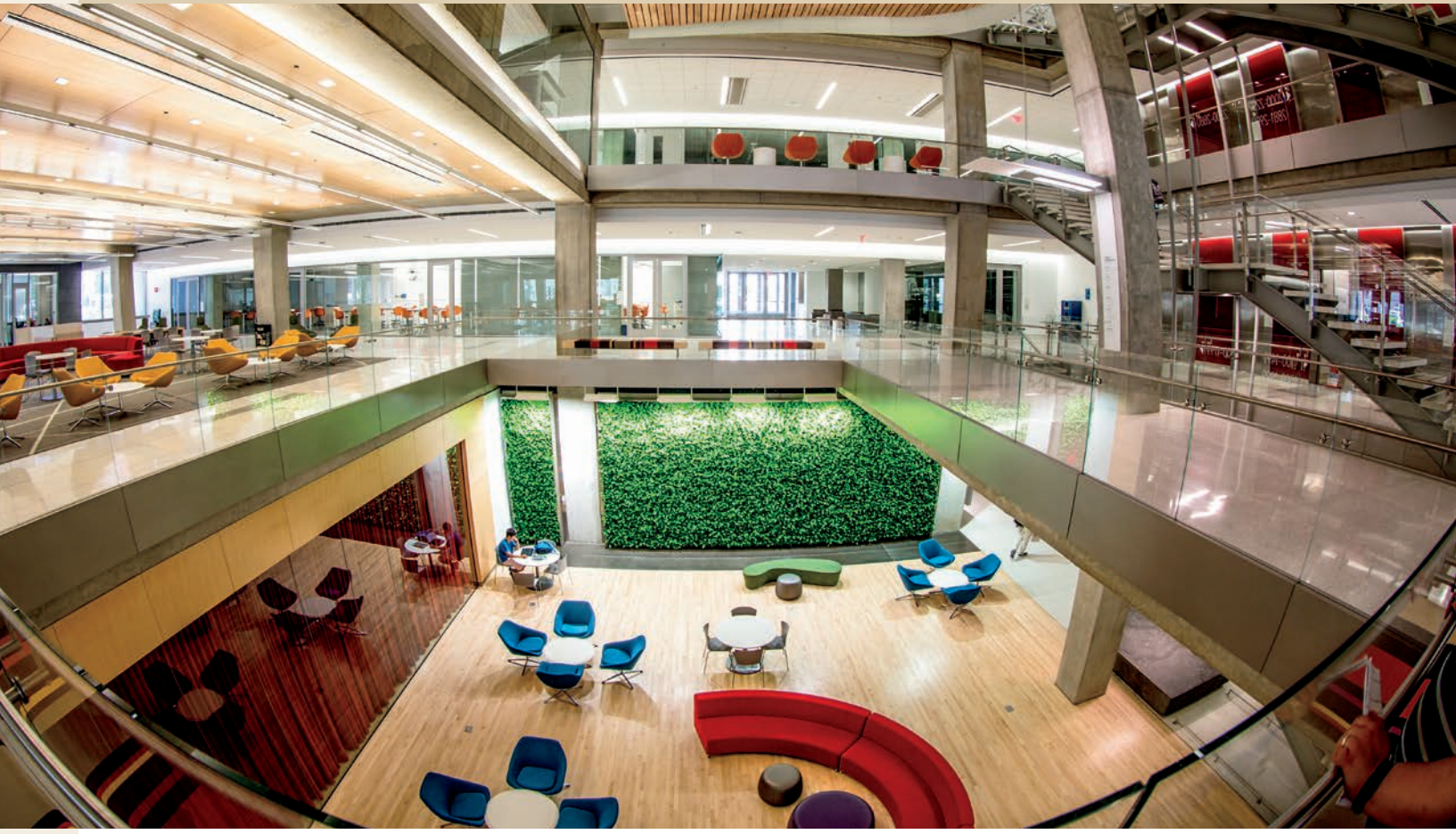


PHOTO ABOVE: WILLIAM ATKINS/GWU

First-time visitors to GW's new Science and Engineering Hall (SEH) push open the doors at any one of its entrances and are immediately struck by the light-filled and open commons spaces. And when they glance down to the atrium below—which they always do—they can't help but notice the vibrant display of its green wall, one of the building's three. And then, as they start to make their way through the building, they usually do a double-take at the glass walls, designed to be written on and covered with equations, lines of computer code, or simple lists of processes and tasks.

What most impresses them, however, are the labs and the classrooms—the spaces where SEAS students and faculty teach and learn, discover and invent. These are the spaces where we work, and the new SEH is changing the way we do that. In the process, it is proving to be exactly what we expected it to be: the enabler of our ambitions.

# Research:

## Thriving in our new home

Some say that "seeing is believing." And it's true that being able to see the gleaming, new, state-of-the-art, eight-story building standing at the intersection of 22nd and H Streets certainly helps one understand the myriad new research possibilities that the SEH creates for SEAS faculty. No one sees the possibilities more clearly than the researchers themselves and the aspiring faculty candidates we meet each semester who are competing for a chance to teach and research in the SEH.

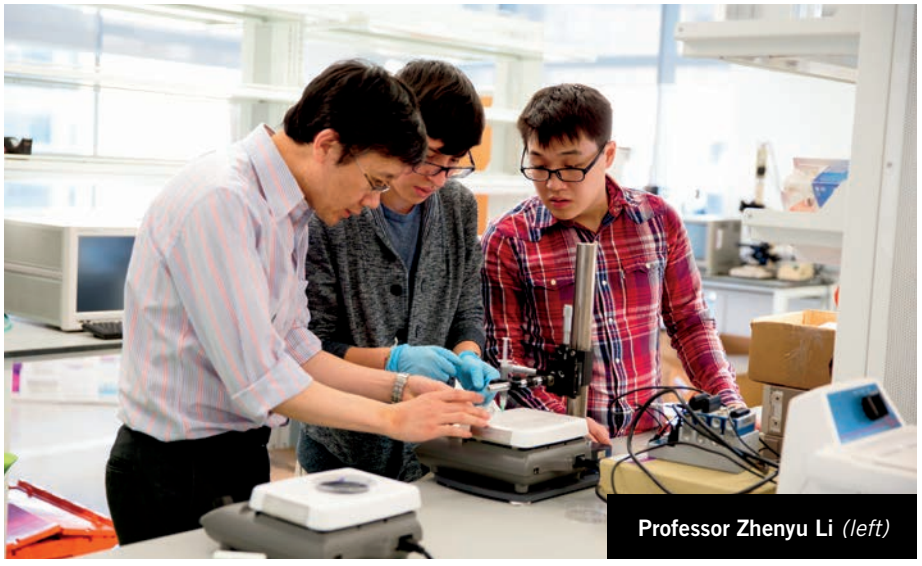
Even during the building's planning and construction phases, the SEH was a powerful magnet, drawing in the talented and dedicated faculty SEAS has recruited recently. These are assistant, associate, and full professors who saw the possibilities for their research to flourish at GW and chose to start their careers here, or leave very well established labs at other universities, to work alongside new colleagues in the SEH.

With access to the state-of-the-art core facilities—the high bay, nanofabrication lab, and microscopy suite—and a host of other labs, these recently recruited faculty are building thriving research programs and driving record research success for SEAS.

Assistant Professor Zhenyu Li, a member of the new Department of Biomedical Engineering faculty, received a four-year, $2 million National Institutes of Health research grant this past fall to develop ambulatory sensor arrays to monitor children with asthma. He will work on this highly innovative project with colleagues in the Department of Electrical and Computer Engineering and the Children's National Medical Center. Using the building's ultraclean nanofabrication lab, Dr. Li will be able to design, build, and test these and other sensors on site, something previously impossible for GW researchers. Less time (and frustration) spent working at outside facilities means more time and faster turnaround for Dr. Li's research.

WILLIAM ATKINS/GWU


**SEH Nanofabrication Lab**



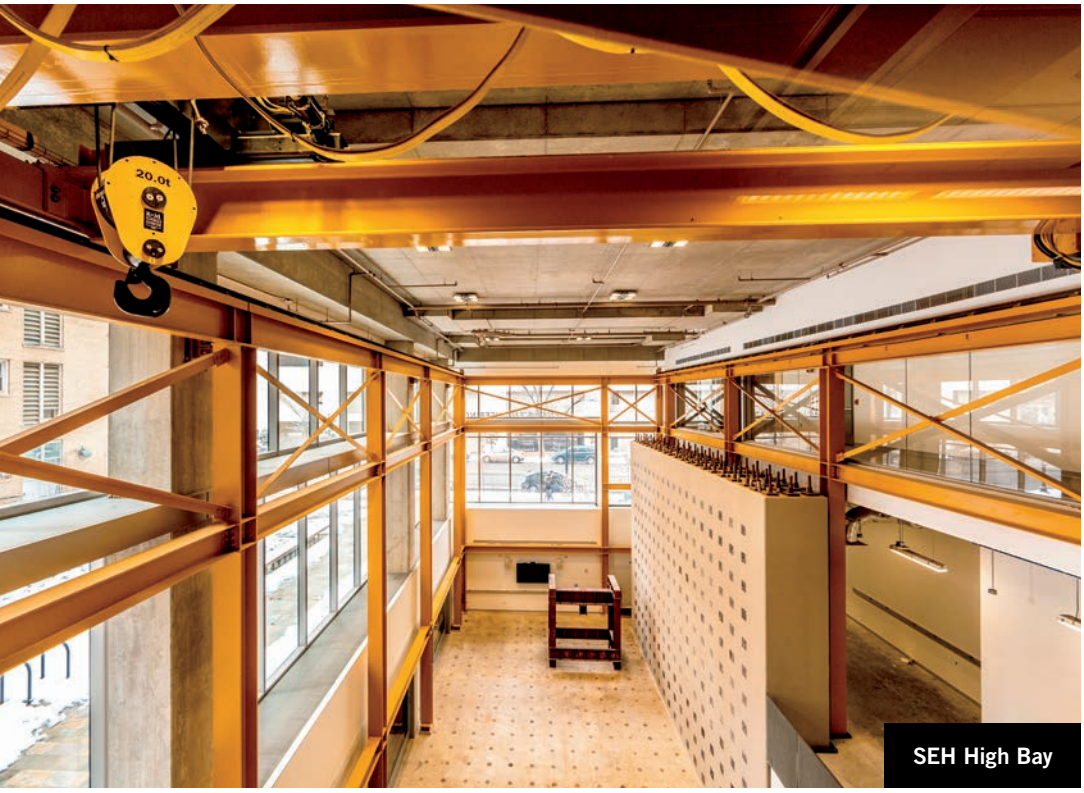
WILLIAM ATKINS/GWU

**Professor Zhenyu Li** *(left)*

Like Dr. Li, Assistant Professor Volker Sorger of the Department of Electrical and Computer Engineering also is prospering in the SEH nanofabrication lab. Dr. Sorger studies photonics, which is optics integrated on a chip, to create the nanoscale chips necessary to develop computers that will operate on light rather than electronics.

As a doctoral student, he was part of a University of California-Berkley team that used a technique called plasmonics to create the world's smallest semiconductor laser, and he is continuing that research here at SEAS. His efforts have been very fruitful. In just over 16 months, he has won three Air Force Office of Scientific Research grants—including a prestigious Young Investigator Program award—and a National Science Foundation (NSF) grant. Together, these grants total more than $2 million.

Associate Professor Lijie Grace Zhang studies novel 3D bioprinting techniques to help advance the development of tissue and organ replacements. Being able to regenerate complex tissues, such as vascularized bone, cartilage, and muscle, is one of the current obstacles researchers face to creating human organs using 3D printers. This is where Dr. Zhang's highly innovative research is making its mark: in 2014 she received a five-year, $2.2 million Director's New Innovator Award from the National Institutes




WILLIAM ATKINS/GWU

SEH High Bay

of Health (NIH). The NIH awards these very prestigious grants to support unusually creative researchers early in their careers.

Dr. Zhang's colleague in the Department of Mechanical and Aerospace Engineering, Dr. Kausik Sarkar, stands to benefit greatly from the SEH microscopy, or imaging, suite. A full professor, he conducts research on ultrasound imaging, drug delivery and therapy, and high-fidelity simulation of blood rheology. In addition to his existing grants from the NSF and NIH, Dr. Sarkar won a four-year, $1.2 million R01 grant last fall from the NIH. He and his colleagues will study ultrasound imaging and the delivery of anticancer drugs to prostate cancer tissues.

A number of other recently recruited SEAS faculty do not conduct their research in the SEH core lab facilities but profit from the building's other lab spaces or simply from being able to collaborate more easily with their SEAS colleagues, now that the school's six departments are housed under one roof.

Instead of a six-block walk across campus to visit SEAS faculty from other departments, the faculty of the Department of Engineering Management and Systems Engineering now take the stairs or elevators to collaborate with them. The accomplishments of two of the department's more recent hires, Assistant Professor David Broniatowski and Assistant Professor Zoe Szajnfarber, also demonstrate the record research success that SEAS is enjoying in the new SEH. Dr. Broniatowski recently received a $1.5 million R01 grant from the NIH's National Institutes of General Medical Sciences for his survey research on attitudes about getting vaccinated, and Dr. Szajnfarber was most recently awarded a nearly $1 million INSPIRE grant from NSF. INSPIRE is a special grant that supports highly interdisciplinary research that has unusual transformative potential.

# Enrollment:

## Setting new records

New faculty are not alone in understanding the benefits the SEH brings to engineering at GW. Prospective students seem to understand it, too.

Undergraduate enrollment has risen 50 percent over the past six years. As of fall 2015, it stood at 880 students, with particularly strong growth in our computer science, biomedical engineering, and mechanical engineering programs. And we are particularly proud that 38 percent of our undergraduate students are female, almost twice the national average for engineering schools.

Systems engineering, the school's newest undergraduate program, also has shown remarkable growth, increasing from approximately 20 to 120 students in just five years. With the large number of engineering consulting firms in the Washington, DC-Metro area, job prospects for these students is proving to be excellent.

At the graduate level, enrollment is also very strong and will continue to grow as we add new online degrees in our professional engineering program. The first of these, a doctor of engineering degree in engineering management, was initiated in August 2015; by summer 2016 we anticipate an enrollment of 100 working professionals. To meet the strong need, particularly in the US, for biomedical engineering professionals who understand the regulatory process and can advance medical device and imaging diagnostics and therapies to market,

Professor Ahmed Louri

DAVE SCAVONE/FOR GW TODAY

we have created a second new program, a master of engineering in regulatory biomedical engineering. This program—which draws on faculty in SEAS and in GW's medical, public health, and law schools—started in spring 2016 and already is off to a good start. It is a truly interdisciplinary degree program with enormous potential, not just locally, but nationally and internationally.

# Fundraising:

## Attracting new investments

If success, in fact, breeds success, then the SEH also should help attract new investment in SEAS. The numbers suggest that this already is happening, that the SEH is acting as a beacon to do just that.

SEAS has achieved record fundraising levels in the last six years, the period after the university's announcement of its commitment to build the SEH. Funds raised by the school in fiscal year 2015 were more than quadruple those raised in fiscal year 2010, and the trend shows a steady increase throughout the six-year period. The school also far surpassed what it achieved in the previous six-year period, fiscal years 2004 through 2009. Compared to that period, SEAS nearly tripled its fundraising during the current six-year period.

The new funds make possible a whole range of investment by the school—investments in new faculty, student scholarships and activities, research equipment, new academic programs, and more.

Endowed professorships are a particularly important investment, because they play a crucial role in attracting leaders who can build nationally recognized education and research programs. Through the generosity of our donors, SEAS was fortunate enough to establish two endowed professorships in 2014 and 2015, and recruit internationally recognized scholars to the faculty.

In January 2015, Dr. Igor Efimov joined SEAS as the Alisann and Terry Collins Professor and chair of the new Department of Biomedical Engineering. In September 2015, the new chair of the Department of Electrical and Computer Engineering, Dr. Ahmed Louri, was installed as the David and Marilyn Karlgaard Professor.

The combination of an endowed professorship and the research facilities of the SEH creates a powerful set of incentives to be able to offer faculty candidates, and they give SEAS the chance to compete with the very best universities in recruiting the very best faculty.

# Success:

## Realizing our ambitions

The SEH is not the crowning achievement of our work here at SEAS. It's really more of a launch pad of sorts, an engineering achievement in its own right that enables us to reach heights we otherwise couldn't reach. Or maybe it's better conceived of as a command module—the control center and living quarters—for intrepid engineers and computer scientists on a voyage of discovery. Either way, it changes the way we work and opens the door for a stunning number of discoveries along the way. And for that, we celebrate our new, amazing, versatile SEH, the enabler of our ambitions.

ZACH MARIN/GWU

# Nicholas Asarese

## Turning Challenges **INTO OPPORTUNITIES**

Nicholas Asarese has quite a challenge in front of him, but he's well prepared for it. He graduated last May with a degree in mechanical engineering, focusing over the course of his four years at SEAS on developing his character, forming strong study habits and a work ethic, and even devoting time to physical conditioning. Those were wise choices, because he'll need to draw on those habits and strengths as he enters flight school in Pensacola, FL, this spring to become a Marine Corps pilot.

Nicholas has known since middle school that he wants to be a Marine Corps pilot, and he had his heart set on reaching his goal via the US Naval Academy.

"I thought it would be such an honor to be part of the Marine Corps. So I worked really hard to try to get a scholarship, to try to get into the Naval Academy; I didn't get either," he recalls.

Instead, he took a chance and made the choice to enroll at GW and in its ROTC program, but without the ROTC scholarship.

"I participated in ROTC as a volunteer my freshman year, which was a big risk, because my family only had enough money for the first year of school, even with everything GW had done to help us," says Nicholas. "I was competing to pick up a scholarship. That's one of the reasons I worked so hard: there was a lot on the line. I didn't want to let my family down, because they had to sacrifice so much just for me to be here."

Nicholas recounts how he and his best friend Casey—also vying for an ROTC scholarship—would wake up sometimes at 4:00 am to work out before the 5:00 am ROTC workout. It paid off. Only 10 scholarships were awarded nationally at the end of their freshman year, and he and Casey each received one.

And as so often happens in life, another surprise awaited Nicholas at the same time. He was accepted to the Naval Academy as a transfer student at the end of his freshman year—and then he had a choice to make, to remain at GW or transfer to the Naval Academy.

With the promise of an ROTC scholarship at GW and the scholarship he had just been awarded from GW's Clark Engineering Scholars program, Nicholas decided to stay at SEAS. As he looks back on the decision now, he credits the Clark scholarship program as a key factor in his decision to stay.

"The fact that they provide study abroad, research opportunities, and the events and meetings throughout the year made GW seem like a more inclusive package because I'd be getting everything," he explains.

And he did get a little bit of everything. Through the Clark Scholars program he had his first research experience that summer, working in the National Crash Analysis Center. The following two summers the program sponsored his research at Rochester Institute of Technology. The experience he probably will remember the most, however, was his semester abroad—another requirement of the Clark Scholars program—which he took in Dublin, Ireland.

"I didn't have any plans to do a study abroad," says Nicholas. "I wouldn't have made that choice on my own, but I'm absolutely glad I went abroad. It was incredibly challenging, but it's definitely one of the best experiences you can have in college."

Making choices seems to be a refrain for Nicholas as he reflects on his college career. And although some of the choices were made for him, he made the most of all of them. And those are four years well lived.

# Jay Kaplan

## Doing **WHAT COMES NATURALLY**

Some people just seem to know from a very early age what they "want to be" when they grow up. Meet Jay Kaplan, a born entrepreneur.

The prologue to the story of Jay's entrepreneurial success begins—as it does for many engineers and computer scientists—with a childhood fascination with technology. "At a very young age, I found myself figuring out how to break computers and put them back together," Jay recalls. "I was always the on-call help desk."

By age 13, Jay did what was natural to him: he combined his fascination with technology and computers with his interest in entrepreneurship, and he started his first company, focusing on website development and shared web hosting.

"I had hands on every aspect of the business and ended up growing the client-base to over 1,000 customers. I automated as many functions as possible so I could concentrate on school, trying to balance the value of an academic foundation with firsthand business experience. I sold the company my freshman year at GW," he recounts.

At SEAS, Jay concentrated on learning the fundamentals of computer science and cybersecurity. He was accepted to several colleges but chose SEAS, because it was one of a handful of schools across the US that had been designated by the National Security Agency (NSA) as a Center of Academic Excellence in Cybersecurity. GW also participated in the Information Assurance Scholarship Program funded by the Department of Defense and the National Science Foundation. He received a scholarship to study under GW's Cybercorps program in exchange for an agreement to work for the federal government in a cybersecurity capacity for three years upon graduation.

Although eager to start his own business, Jay began working for the NSA following graduation in 2009. He didn't see his three-year obligation to the government as a delay, however. In fact, he says, "It was an entry point into some of the most fulfilling, challenging, and intellectually stimulating, work of my life—and a place where my work helped save a countless number of lives."

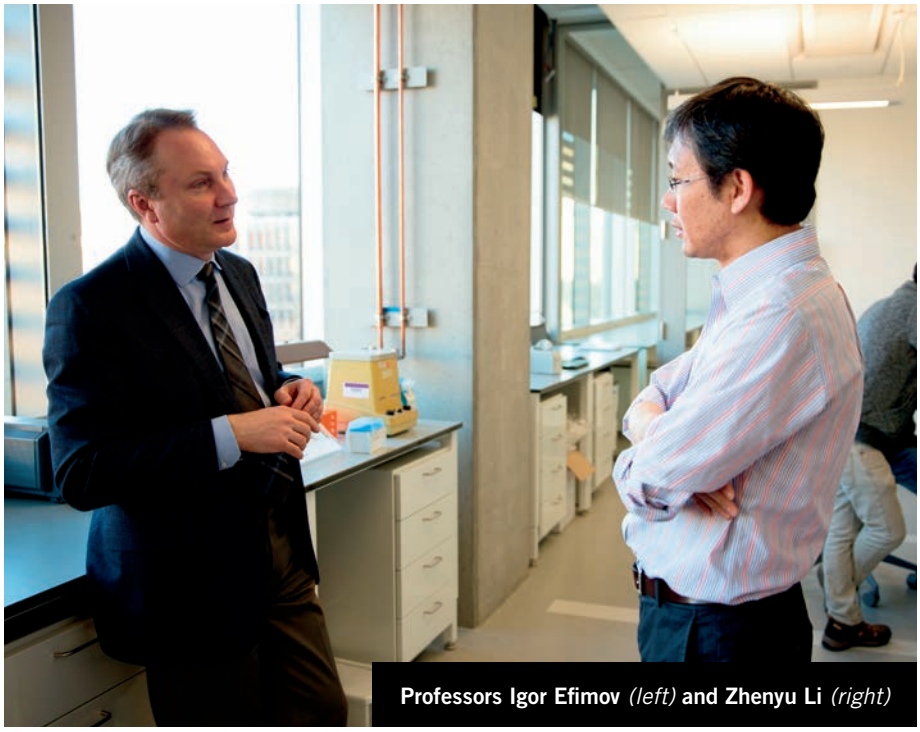
At the NSA, he met Mark Kuhr and the two began laying the foundations over late night coffee runs and weekend meet-ups for their start-up company, Synack. In 2013, they left the NSA to move to Boston after being accepted into an extremely competitive startup accelerator program. Their innovative model to bring NSA expertise to the commercial sector immediately began attracting some of the most renowned Silicon Valley investors and eventually prompted another move for them, this time to the West Coast. And there, in a small incubator office at Kleiner Perkins Caufield Byers (KPCB), Synack was born.

"We give our customers, which are primarily Fortune 500 enterprises, a much better understanding of what they look like to an adversary trying to break into the organization," Jay explains. "The way that we do this is by harnessing a global network of top white hat hackers and centralizing them on a technology platform to enable them to safely engage with our customer base. We do this continuously, giving our customers a constant set of eyes on their technology elements, so they know what the problems are before they eventually become breached."

With Jay as the CEO and Mark as the CTO, Synack has grown to more than 75 employees and several hundred independent contractors around the world, and it has "gained the trust of very large enterprises as clients who are concerned about the ripple effects of a breach," says Jay. It also has grabbed the attention of venture capitalists and investors, who have poured more than $34 million into it in two years—firms such as Google Ventures, KPCB, GGV Capital, and Icon Ventures.

On top of all of this, CNBC named Synack one of the top 50 most disruptive companies in the US, and *Forbes* magazine named Jay to its "30 Under 30" list for 2015. It seems he really is a born entrepreneur.

# News



WILLIAM ATKINS/GWU

**Professors Igor Efimov** *(left)* **and Zhenyu Li** *(right)*

## SEAS Forms a Department of Biomedical Engineering

The average length of time for premarket approval of a new medical device in Europe is 11 months. In the US, it's 54 months. But that may change if Igor Efimov's assessment of the future is correct. Dr. Efimov believes that GW is poised to create a one-of-a-kind biomedical engineering program that can help break that regulatory bottleneck in the US.

Dr. Efimov is the chair of the school's new Department of Biomedical Engineering and the Alisann and Terry Collins Professor of Biomedical Engineering. To him the task falls of guiding the department's growth and positioning it to capitalize on its unique advantages, and he's quite optimistic about the new department's potential.

"I saw the opportunity here right away to develop a biomedical engineering department that can offer several important components missing in most BME [biomedical engineering] departments," Dr. Efimov explained.

Specifically, he saw the potential to build a regulatory biomedical engineering program and to develop innovation and entrepreneurship components in the curriculum, all of which he insists are natural products deriving from GW's location in Washington, DC.

Within walking distance of many patent law firms on K Street, and only a Metro ride from the US Patent and Trademark Office and the FDA, the department can benefit tremendously from its location. By building relationships with practitioners in these organizations, faculty and students will make innovation and entrepreneurship a more integral part of biomedical engineering at GW.

"Many people in these organizations are interested in being mentors to our students," Dr. Efimov said.

But while innovation and entrepreneurship clearly are important to creating and developing new medical devices and technologies, product approval is key ultimately to getting the technologies into the market, where they actually can improve healthcare and save lives.

"There's a deficiency in some BME departments in that students graduate with strong engineering backgrounds, but they don't understand how scientific engineering developments can be translated to the bedside," contended Dr. Efimov. "Our proximity to the FDA and the NIH and to the IP [intellectual property] firms gives us the opportunity to develop a one-of-a-kind regulatory engineering program. And that background in regulatory engineering will offer numerous job opportunities for our students in industry and federal agencies."

The BME department has launched its regulatory BME program, but Dr. Efimov also is building local partnerships and finding creative paths toward his goals for the department. The American Institute for Medical and Biological Engineering (AIMBE) runs its own regulatory fellowship program at the FDA, and Dr. Efimov offered it classroom space in the new Science and Engineering Hall while the GW program still was being developed; in return, AIMBE allowed the GW biomedical engineering students to take its classes free of charge.

Dr. Efimov is realistic about what needs to be accomplished to establish strong academic and research programs in a newly-created department and to build the department's reputation outside the university. And he has clear ideas of how to get there.

"We can't compete for reputation at this point, because we're brand new, but we can compete on numbers, particularly on the research funding that our faculty receive," he stated.

Dr. Efimov sees his job as "setting the stage" for the department's growth, and he plans to achieve this growth by focusing on strategic hiring, curriculum development, and state-of-the-art equipment purchases. The department was established in late 2014 with five faculty, and Dr. Efimov has an ambitious plan to grow it to 10 by the end of this fiscal year. He is very optimistic about the prospects and, in fact, the department already has completed its recruitment of three new faculty members: Drs. Emilia Entcheva, Chung Hyuk Park, and David Lee.

## An Innovation Celebration

Barely one month after moving into the new Science and Engineering Hall (SEH) last winter, SEAS celebrated its annual Student Research and Development Showcase there, in a manner worthy of the size and promise of its new venue.

Building on the momentum created by a substantially larger number of student participants than in previous years, the school expanded the traditional one-day showcase to include two days of poster competition and display, tours of the new SEH, a cybersecurity panel discussion among top corporate and government cybersecurity experts, and a keynote address by Dr. Arati Prabhakar, director of the Defense Advanced Research Projects Agency (DARPA).

With assistance from its National Advisory Council members and donors, SEAS was able to increase the competition categories and prize money, giving the 120 student participants the chance to compete for a total of $35,000 in prize money spread across four categories: undergraduate research, graduate experimental research, graduate theoretical research, and entrepreneurship.

Matthew Kay, the competition's lead judge, attributed the growth of the showcase to Dean David Dolling's recent faculty hires and the school's burgeoning research profile.

"Dean Dolling has done an excellent job promoting research and hiring faculty who are the best in their fields," Dr. Kay said. "More SEAS professors are receiving grants, and we're recruiting better graduate students. And research programs developed five or six years ago are really beginning to mature."

In the experimental category, graduate students Nathan Castro, Allan Guan, and Margaret Nowicki tied for first place and each received $4,000. Nathan and Margaret, Ph.D. students in the Department of Mechanical and Aerospace Engineering, both presented projects related to 3-D bioprinting techniques to regenerate complex bone tissue. Allan, a Ph.D. student in the Department of Biomedical Engineering, created a microfluidic device that manipulates and controls small volumes of liquid in order to trap single cells at 100 percent efficiency. This new design method could aid scientists in studying single cells to investigate disease.

Chris Cox, a Ph.D. student in the Department of Mechanical and Aerospace Engineering, won first place in the theoretical category. He received $5,000 for developing a fast algorithm for solving viscous flow in air, water, or blood. The flow solver could, for example, help doctors decide whether to medically intervene in patients who have stenosis, an abnormal narrowing in a blood vessel.

Maryam Yammahi, a Ph.D. student in the Department of Computer Science, was awarded the $2,000 entrepreneurship prize for developing a new technology that addresses "Big Data" challenges. Her intelligent "Software-Defined-Storage" model enables users to more quickly and efficiently store and process data.

Akhil Chandra, a junior majoring in biomedical engineering, won the $2,000 prize for undergraduate research. Working with Dr. Kay and Nikki Posnack, a researcher in the School of Medicine and Health Sciences, Akhil investigated how exposure to Bisphenol A (BPA), found in many consumer products, can significantly reduce heart rate and the heart's ability to pump blood.

Several SEAS National Advisory Council (NAC) members donated key support to the showcase. Dr. Gulu Gambhir (MS '92, D.Sc. '98), the CTO of Leidos, organized his company's sponsorship of the event through the SEAS Industry Partners program. Leidos provided primary sponsorship of the showcase. *(See the article on page 29.)*

NAC member Mr. Naeem Hussain (MS '99) initiated and coordinated the cybersecurity panel, "Assessing America's Cybersecurity Preparedness," bringing with him panelists from NASA, HP Enterprise Services, the World Bank Group, and Leidos. And Dr. Randy Graves (D.Sc. '78) helped lead planning efforts for the event, as he has done every year since its founding in 2007.

SEAS thanks Dr. Gambhir, Mr. Hussain, Dr. Graves and the showcase sponsors: Leidos, LGS Innovations, Capital Construction Consultants, iCES, Dr. Sassan Kimiavi and Mrs. Gazelle Hashemian Kimiavi, Dovel Technologies, Raith Nanofabrication, and OpenConcept.

**EDITOR'S NOTE:** Portions of this article are excerpted, with permission, from the *GW Today* article "2015 SEAS Research and Development Showcase Spurs Innovation."


## A 'Virtual Heart'

Though Shakespeare would be pleased to know that lovers' hearts do indeed beat in sync, the truth is that no two are exactly alike. And in the case of dangerous arrhythmias—irregular heartbeats that can cause sudden cardiac death—electrical tornadoes spiral across each patient's heart in unique and mysterious patterns.

Dr. Natalia Trayanova, the Johns Hopkins University's Murray B. Sachs Professor of Biomedical Engineering, is developing a new kind of personalized medicine for heart patients that could help doctors better identify and stop those violent storms in their tracks. She described her research at the 2015 Frank Howard Distinguished Lecture, hosted last April by SEAS.

Using computer models to simulate hearts' electrophysiological functions with incredible accuracy, Dr. Trayanova and her team are working to create a "virtual heart." She hopes that one day the medical records of all patients with heart conditions will include their own heart models.

"We want to have a virtual heart for each patient," Dr. Trayanova said. "A patient is admitted to the clinic, a heart is built from the MRI scan, and then with that model, a physician can determine the best treatment in a very rigorous way."

The current method for treating ventricular arrhythmias—particularly in patients whose hearts have patches of scar tissue—is invasive, time consuming, and often unsuccessful.

To fix an irregular heartbeat, doctors first must locate the critical spot where a patient's arrhythmia originates. They do this by inserting a catheter into the patient's leg and guiding it through a vein into the heart. They then navigate the catheter throughout the heart, trying to pinpoint the source of the problem. Once that spot is found, the physicians will burn it away (or ablate, in clinical terms) in order to restore a regular rhythm.

"They go around blindly and poke. At every point, they will report electrical activity, or voltage, in that place in the heart," said Dr. Trayanova, showing an image of a heart filled with catheter-induced burns. "In an attempt to terminate the arrhythmia, a large part of the heart is made non-functional."

The painstaking and risky procedure has only a 51 percent success rate and can take four to 12 hours to complete.

Dr. Trayanova's lab has a radically different proposal for treatment: using a patient's MRI or CT scans, specialists use image-processing tools to locate the heart's chambers and map its scar tissue. With that information, they can construct a 3-D model of the patient's organ and segment out the healthy tissue from scar tissue. Finally, the doctors use another program to estimate the orientation of the heart's muscle fibers, which help the heart contract. Putting all those images together, the doctors will be able to create a unique, geometrical model of the individual patient's heart.

Unlike the traditional method for terminating arrhythmias, Dr. Trayanova's method is non-invasive. Doctors can prod and investigate the computerized heart instead of poking around a patient's fragile organ. The computerized model, she explained, is analogous to a Google Earth map: you can view the whole heart from above, or zoom in all the way to the molecular level.

The model ensures doctors can find the exact place to burn the arrhythmia, while causing the least amount of damage.

Dr. Trayanova's lab also is investigating ways that doctors can use these patient-specific models to determine a person's risk of developing an arrhythmia. In her lab's first study using this approach, she and her team created heart models for 41 patients who had received defibrillators and determined which would develop arrhythmias five years after the implantation surgery.

Analyzing the simulations, the researchers were able to predict the patients who would have arrhythmias with 74 percent accuracy. While Dr. Trayanova's new therapy is still in its experimental stages, she believes that upcoming clinical trials will pave the way for virtual hearts to be a routine part of cardiac care.

"I hope I'm alive to see that happen," she said. "To take something that is basic science and translate it to the clinic is a fundamental leap toward something new. I think computational modeling is going to usher in a plethora of new medical approaches."

**EDITOR'S NOTE:** This article is an edited version of the *GW Today* article "This Engineer Can Design Your Virtual Heart."

## Taking Home the Pelton Award

SEAS hosted its annual Pelton Senior Project Award competition last spring just as it has each year since 2009—but with a little additional buzz. Thanks to the formation last year of the school's new Department of Biomedical Engineering and the opening of the Science and Engineering Hall, SEAS had a new venue and a larger field of competitors for the event.

Each of the school's six departments selected one team of graduating seniors to represent it in the school-wide competition. Teams made presentations to a panel of judges and fielded their questions, and later made presentations to the larger public audience.

Lucas Chaufournier of the Department of Computer Science took home the first place prize for his project, "Jaberwocky: An Educational IDE." An Integrated Development Environment (IDE) is a tool a student can use to learn to program; however, IDEs often are too complicated to help beginning programmers and actually can hamper their progress. Lucas' educational IDE, Jaberwocky, is an editor that evolves with the student as he progresses through his curriculum.

The team from the Department of Electrical and Computer Engineering—Amir Hussain, William Gottschalk, and Leo Parsons—was awarded the second place prize for "Techtiles: A Physiological Measurements System in Clothing." Techtiles is a wearable system that allows users to record their physiological readings, in an attempt to monitor their physical well-being. The system wirelessly monitors the user's heart rate, respiratory rate, steps taken, distance traveled, and energy expended.

Rachael Bevill, Kerry Huntzberry, and Kyle Panzer of the Department of Biomedical Engineering received the third place prize for "Assistive Communication Device for Mentally or Physically Impaired Patients." Their project is a system designed to allow disabled patients to communicate with others. They proposed to develop it as a more affordable alternative to currently available augmentative and alternative communication devices.

Also competing were Eric Prokop, Thomas Steckel, and Adam Sulier of the Department of Civil and Environmental Engineering; Zackary Humayun and Joseph Paleologos of the Department of Mechanical and Aerospace Engineering; and Jean-Max Buteau, Michael Kanter, Ian Morgan, and Liam Nealon of the Department of Engineering Management and Systems Engineering.

The Pelton Award was established in 2009 by former SEAS faculty member Dr. Joseph Pelton to honor his family's tradition of invention.

**2015 Pelton Award winners with Dean Dolling** *(center left)* **and Dr. Joseph Pelton** *(center)*

# New Faculty

### Dr. Emilia Entcheva

Emilia Entcheva joined the new Department of Biomedical Engineering in January 2016 as a full professor. She previously was a tenured faculty member at Stony Brook University, where she served for 14 years. She is recognized for pioneering cardiac optogenetics, the genetically mediated light sensitization of heart cells and tissue to allow optical stimulation, imaging, and control of their electrical activity. Her research group develops high-throughput, all-optical electrophysiology platforms to improve drug testing, human stem cell research, and gene therapies for the treatment of cardiac arrhythmias. Dr. Entcheva completed postdoctoral training at Johns Hopkins University and earned her Ph.D. in biomedical engineering at the University of Memphis.

### Dr. Chung Hyuk Park

Chung Hyuk Park is an assistant professor in the Department of Biomedical Engineering. He previously served as an assistant professor at the New York Institute of Technology and a postdoctoral research fellow at the Georgia Institute of Technology. His research interests include assistive robotics, biomedical systems, machine learning, haptics, and multi-modal human-robot interaction. Dr. Park received his Ph.D. in electrical and computer engineering from the Georgia Institute of Technology.

### Ahmed Louri Joins SEAS as ECE Department Chair

SEAS welcomes Ahmed Louri, the new chair of its Department of Electrical and Computer Engineering (ECE) and the David and Marilyn Karlgaard Professor. He is the first faculty member to hold the newly-established endowed professorship.

Dr. Louri joined SEAS at the start of the academic year, after 28 years as a member of the faculty at the University of Arizona. During his time at the university, he served as the director of the High Performance Computing Architectures and Technologies Laboratory, and from 2000 to 2006, as chair of his department's computer engineering program.

He also has held various visiting scientist positions in both France and Japan over the course of his career, and he served as a program director in the National Science Foundation's Directorate for Computer and Information Science and Engineering, with an annual research portfolio of $800 million.

Dr. Louri, whose own area of research is computer architecture, is a proud advocate of the broader fields of electrical and computer engineering. "The achievements of these fields are inextricably woven into our everyday lives," he stated. "Our world increasingly relies on digital systems to record, support, and shape most aspects of human activity, from commerce to transportation, from health to social networks, from experimental sciences to numerical engineering, from manufacturing to knowledge production. The future of our entire society is directly dependent on the progress in electrical and computer engineering."

Likewise, he's a champion for the role the department has played at SEAS and can continue to play in the future. "This department is a driving force for SEAS," he contended. "One measure of success in companies is that when they become big and successful, they spin off another company. Well, ECE in this school has already spun off two departments: computer science and biomedical engineering. So you can see, it really is an incubator of innovative ideas and programs, and it provides a platform for many, many other collaborations across the GW eco-system."

That said, Dr. Louri has no intention of resting on the department's past achievements—or of allowing anyone else in the department to do so either. He has ambitious goals to grow the faculty pool, dramatically increase the department's external research funding and enrollment, and improve its national ranking.

"My hope," he said, "is that the ECE department will become the destination of choice for undergraduate and graduate students, excellent faculty, employers, and funding agencies from around the world."

# In Memoriam

**Professor Emeritus James Feir** passed away on March 10, 2015. He joined SEAS in 1970 as a member of the Department of Civil and Environmental Engineering faculty and as the school's assistant dean. His position later changed to associate dean for academic affairs. He remained as associate dean until 1992, and as a member of the faculty until he retired in 1995.

While working on his Ph.D. in mechanical sciences at Cambridge University, England, Dr. Feir and his advisor, Dr. T. Brooke Benjamin, performed experiments on the disintegration of waves in a wave tank. Their groundbreaking paper continues to be the basis for research in the field of fluid mechanics, and it put the term "Benjamin-Feir Waves" and "Benjamin-Feir Instability" into the lexicon of fluid mechanics.

JON BETZ, SMITHSONIAN DIGITAL STUDIO

## Learning from Sea Lions

Sometimes opportunities can be found in the most surprising places, as Dr. Megan Leftwich discovered during a trip to the Smithsonian National Zoo with her family.

An assistant professor in the Department of Mechanical and Aerospace Engineering, Dr. Leftwich studies fluid dynamics and was fascinated with the swimming technique of sea lions, which she noticed during that visit.

"Sea lions actually swim differently from almost any animal," she noted. "Fish swim back and forth, and mammals up and down. Essentially they swim with their feet, fluke, or tail fins, but sea lions swim with their arms. They use their fore flippers, but they're mammals, so the fore flippers are like arms. They clap them into their body and form a jet, so it's really a very different paradigm of swimming."

That observation led her to investigate the sea lion swimming technique for possible applications to the design of underwater vehicles. Because sea lions are very agile swimmers that produce virtually no wake, their technique could be ideal for vehicles that need to minimize the disturbances they create, such as those used to conduct stealth operations or search for underwater mines.

With the generous cooperation of the American Trail staff at the zoo, Dr. Leftwich and her students were able to film the sea lions swimming. They collected more than 100 hours of high-resolution, high-speed video footage and then digitally mapped a series of points on the sea lion's flipper, so they could track the motion of the flipper across each frame of the video. From this, they were able to construct a digital fore flipper and later a robotic fore flipper that they can use to further study the sea lion's unique swimming motion.

What started as a project with the zoo to study the sea lions ultimately caught the attention of Smithsonian.com and the *New York Times*. Last summer, Smithsonian.com produced a video of the research Leftwich and her students are conducting, and the *New York Times* followed up with the article "The Sea Lion's Smooth Moves."

## SEAS Faculty Award Winners

SEAS congratulates our five recipients of the 2015 Faculty Research and Teaching Awards:

**SEAS Distinguished Researcher:**
Dr. Tarek El-Ghazawi (Department of Electrical and Computer Engineering)

**SEAS Distinguished Teacher:**
Dr. Poorvi Vora (Department of Computer Science)

**SEAS Outstanding Junior Researcher:**
Dr. Lijie Grace Zhang (Department of Mechanical and Aerospace Engineering)

**SEAS Outstanding Junior Teacher:**
the 2015 award was shared between Dr. Joost Santos (Department of Engineering Management and Systems Engineering) and Dr. Adam Wickenheiser (Department of Mechanical and Aerospace Engineering).

*Left to right:* **Professors Adam Wickenheiser, Lijie Grace Zhang, Dean David Dolling, Poorvi Vora, Tarek El-Ghazawi, and Joost Santos**

# Achievement

Anna Gabriela Porras Santolamazza

## It's More than a Game

Anna Gabriela Porras Santolamazza can't imagine her life without the game of squash. She started playing when she was 10, and it became such an important part of her life that she chose to leave Colombia and come to the US for college so she could play it at the college level. Now a senior and a member of the GW women's squash team, Anna also is an All-American athlete, currently ranked thirteenth nationally among college squash players.

But collegiate competition alone doesn't fulfill Anna's desire for the game. She also is a member of the Colombian national team and competes in international tournaments as her schedule allows. In 2014, for example, she was able to participate in the World Squash Championship because it occurred in early December and didn't conflict with her finals.

Although squash clearly is Anna's passion, this civil engineering student makes room for other interests, too. She maintains an active interest in research, winning an honorable mention prize in the undergraduate category in last year's SEAS Student Research and Development Showcase for her work with Dr. Tianshu Li on hydrate nucleation.

"I enjoyed the R&D Showcase, because it gave me a chance to showcase and explain what we were doing," Anna recalls. "A lot of students struggle, especially in the sciences, to explain and communicate effectively the work we've done, so the showcase gave me good practice to try to engage the public in our research area."

To complement her research experience and round out her college education, Anna also proactively seeks internships. After her freshman year, she served as a summer intern with the Mayoralty of Cundinamarca in Colombia, where, as it turns out, she proposed a waste management plan based on something she had seen on campus. "I actually got the idea from Big Belly Solar at GW, a trash compactor which works with solar power. When it's full, the Big Belly sends a signal so it can be collected," she says.

After completing an internship last summer with Clark Construction, Anna is back on campus and in full swing, enjoying her senior year of studies and squash.

## Robots on Ice

Sam Zapolsky came to GW as an undergraduate in 2008 to study international affairs, but along the way he also ended up earning a bachelor's degree in economics, and is now working toward his Ph.D. in computer science.

After taking a number of advanced mathematics courses as an undergraduate, he enrolled in Dr. Evan Drumwright's Autonomous Robots course to find a way to apply what he was learning. What he discovered was an interest in artificial intelligence and robotics—and a field for graduate study.

A fourth-year Ph.D. candidate, Sam works in GW's Positronics Lab, under the guidance of Dr. Drumwright, who is now his advisor. He has built his own robot, built the lab's planning and control software, and published several papers. One of his primary projects is inverse dynamics with friction and contact—or, what he somewhat tongue-in-cheek calls "robots on ice."

As Sam explains, most models of movement for bi-pedal (two feet) or quadra-pedal (four feet) robots assume that the robot will have solid, "sticky" contact with the ground. In fact, that's rarely the case in the real world. Since that assumption is not realistic—and neither is the goal of preventing slipping in the first place—Sam instead is trying to account for how robots actually do move and to create a more versatile control system that will make the robot more adaptable to the real world. He published his work at a conference in 2014 and is able to run it on an actual robot in addition to running it in simulation.

Sam also is working on PACER, a program he's developing to control a robot without having to change any software at all. Currently, roboticists often need to develop many different software modules just to be able to develop and integrate the aspect of the robot they are interested in building. Sam believes this is beyond the scope of any one person's education.

"The communication and sharing of control systems is practically non-existent in robotics," he maintains. "Ideally you should be able to say, 'These guys made a good vision system and I would like to plug that into my system,' but you can't. With my PACER system, you can plug all those modules in and you don't need to reprogram the existing system."

With his creative mindset and enthusiasm for robotics, Sam has a bright future in the field. And the future is where he keeps his focus. "I think one of the reasons I like robotics so much is that it's at the cusp of the future," he says.

Sam Zapolsky


Eric Prokop

## A Great Decision

Eric Prokop took an indirect route to graduating with an engineering degree. After beginning college as an undeclared major, he selected geography as his major and enjoyed it greatly. But as he began thinking about his career prospects, he considered engineering and decided that civil engineering would be a good fit for him.

"I thought it would be cool to be a part of the team that designs the built environments that we live in," he says.

Switching into engineering at the end of his sophomore year meant that Eric had a number of requirements to make up, and it meant delaying graduation by a year. But that didn't dissuade him.

"I feel great about my decision," Eric announces with a smile. "If I could do it all over again, I might even do it the same way, because I got more of a diverse education, with two years of liberal arts, than the typical engineering student."

And the extra work didn't prove too much for him either. In fact, Eric did so well academically and integrated so well into the SEAS community that he was selected at the end of his senior year as the 2015 SEAS Distinguished Scholar.

At SEAS, Eric was able to explore many of the same interests he previously wanted to explore, such as travel and Spanish. One of the highlights for him was being able to participate in an Engineers Without Borders service trip to El Salvador his junior year and to lead the trip his senior year. "It was the perfect mix of the opportunity to travel, work on engineering, and improve my Spanish," he claims.

As Eric prepared for graduation last spring and began thinking forward to the master's program in structural engineering that he would begin in the fall at Stanford University, he also reflected on what he has learned about engineering and the advice he would give to incoming students.

"The people you meet and the relationships you establish are just as important as what you can do with a pencil and a calculator as an engineer. Engineers can sometimes overlook that fact. Don't get lost in the world of numbers," he cautions.

## A Grateful Sojourner

Some people would call Andrea Lehn's path at SEAS fate, but she knows that it had more to do with people than chance. Professors, mentors, and donors all played important roles in the journey that took her from an undeclared freshman to a graduating senior with a biomedical engineering degree and onto a doctoral program in mechanical engineering, which she began last fall at MIT.

According to Andrea, the Clark Engineering Scholars program, established by the late Mr. A. James Clark, opened doors for her extraordinary undergraduate experiences through research, study abroad, and even participation in conferences. Without the program, she believes she probably would not have ended up in Dr. Megan Leftwich's lab in June 2012.

"I wouldn't have started working for Professor Leftwich that first summer had it not been for the [Clark Scholars] program," claims Andrea. "It also supported my travel to conferences to present my work. The chair of my session at a recent conference saw my talk and congratulated my efforts. She will now be my graduate advisor at MIT. So, the Clark scholarship had a tremendous impact. I'm incredibly thankful for it."

Undergraduate research was a key element in Andrea's education at SEAS, taking her to interesting places along the way, most notably to Dr. George Lauder's laboratory at Harvard University and to the University of Melbourne in Australia, where she spent a semester abroad. Her research project with Dr. Leftwich was a study of the fluid dynamics of human birth that aims to develop ways to avoid Cesarean section births and enable more natural deliveries. As the project progressed, she was able to develop it into her senior design project.

Andrea obviously loves studying engineering, but it's not her only academic interest. In fact, she took a minor in philosophy because she wanted to explore the question of what it means to live a meaningful life. "I got to dedicate time to thinking about that," she explains, "and I ended up with a philosophy minor kind of by accident. I'm so grateful for the opportunity to do that, because I think it made my engineering education so much richer."


Andrea Lehn

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Support from you—our alumni, parents, corporate partners, foundations, students, faculty, staff, friends, and others—is vitally important to the SEAS transformation. The support that you provide to the school helps make a difference in how far and how fast that transformation advances. It can help us enhance scholarships and fellowships for students, sustain important faculty research, and build new learning initiatives. In short, your generosity strengthens the building blocks of the SEAS transformation: our students and faculty.

Sincerely,

David S. Dolling
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Karla Villamizar MS '12
Sujatha Viswanathan MS '05
William F. Vogelzang DSc '77
Oscar von Bredow MS '82 and Pamela Bredow
Surendra S. Vyas BS '04
Robert L. Walker MS '81
Miriam D. Wallace MS '12
Yating Wang CERT '14, MS '14
Jianhua Wang MS '13
Zibing Wang MS '11
Xianqiao Wang PhD '11
Hsing-Yu Wang MS '79
Briana M. Warschun BS '15
Alexander D. Washofsky BA '12
Lee J. Waxman MS '70
Daria D. Webb BS '83
Jocelyn L. Weinberg MS '83+
Mark D. Weinhold CERT '08, MS '09
Clarence H. Weissenstein MS '71 and Donna Kaltaler+
Ulysses Weldon MS '74+
Alex B. Weller BS '12
Prem B. Wells BS '15
Lawrence A. White MS '80
Melvin S. Whitt MS '95
Richard J. Wiegand MS '76 and Louise Sartorelli
Quentin W. Wiest BS '40+
Erin V. Willett BA '07 and Steven G. Willett
Lakisha P. Williams MS '13
Alvester Williams III MS '14
Chelsea N. Willoughby BS '15
Laura A. Wise BS '15
Robert C. Witham BA '50, BS '56 and Susan Witham
Peter W. Witherell MS '78+
Laurence B. Wohlgemuth BBA '01
Adam I. Wolf MS '89+
Michael K. Wong
Josef A. Wonsever MS '84+
Matthew E. Woolverton MS '14
N. D. Wrinkle MS '65 and Pollyann Wrinkle+
Dengyuan Wu PhD '14
Huizheng Xu CERT '14, MS '14
Sheila S. Xu MS '92
Benjamin B. Yarmis BS '13
Ali Yazdi MS '75 and Kay Yazdi
Richard H. Yee BS '50
Yichao Yu MS '12
Yiming Yuan MS '14
Marsha F. Zaidman MS '74 and Steven Zaidman MS '74
Andrew Y. Zaki BS '15
Felipe D. Zambrano BS '13
Xi Zhang MS '14
Xinyue Zhu MS '15
Jiazhen Zhu MS '14
Mossadeq Zia CERT '03
Glenn T. Zora MS '82+

**Key**
Deceased = *
Five-year consistent donor = +

## SEAS VOLUNTEERS

***SEAS thanks our alumni who donated their time for GW during fiscal year 2014. The following alumni volunteered on campus or throughout the country or world:***

Sana Al-Hajj
Emily Alexander
William Alexander
Gregory Allen
Miguel Alvarez
Farizuddin Aman
George Axiotis
Vinod Bagal
Anasse Bari
Danielle Barsky
Caroline Battey
Sarah Bever
Joseph Blackford
Deborah Butterfly
Jerry Butwid
Jennifer Byrne
Kiren Caldwell
Alicia Chau
Edward Chesnut
Dean Coclin
Gregory Colevas
Terry Collins
Minha Do
Brenton Duffy
Carine Dumit
Pascale Dumit
Priya Edjlali
Hatem Elbidweihy
Paul Elman
Loretta Evans
Charles Faughnan
Emilio Fernandez
Osman Fidanci
Barbara Fleming
Sukhdeep Gambhir
Alpana Gowdar
Sudha Goyal
Randolph Graves
Maliha Haddad
Jon Halpern
Gazelle Hashemian
John Holmblad
Richard Hu
Samantha Hurley
Naeem Hussain
Douglas Jamieson
Santosh Jayaram-Narayan
Jay Kaplan
Pradman Kaul
Kevin Kelly
Patrick Kennedy
Issa Khozeimeh
Jeryn Koritzinsky
Ashley Kowalski
Vikas Kumar
Mischel Kwon
Andrew Lacher
Elizabeth Lacher
Maryline Lamborn
Rebecca Lee
Renee Lewis
Huiling Li
Larry Lu
Andrew Lue
Kathryn Maloney
Joseph Mancuso
Patrick Marolda
Timothy McKenna
Michael McLay
Abdullah Meajil
Leila Meshkat
Erin Mignano
Toebagoes Moetawakkil
Pradeep Mohan
Nazri Mohd Salleh
Matthew Mostafaei
Marjan Nabili
Richard Norman
Molly Olsen
August Pabst
Giovanna Patterson
Jacob Portnoy
Christina Preddice
Robert Proie
George Reynolds
Manny Rivera
Carrie Rollman
Joseph Rubin
Samuel Sherman
Dharapuram Srinath
Lolita Street
Michael Suder
Pattrawoot Suesatayasilp
Natalie Sutherland
Kuanysh Taishibekov
Robert Tamaru
Jing Tao
Aida Tessema
L. Varner
Narayan Venugopal
Indrajeet Viswanathan
Sean Walsh
Alex Weller
Matthew Wilkins
Erin Willett
William Wright
Yijing Zhou
Mary Zikria

# News

DAVE SCAVONE/FOR GW TODAY

## David and Marilyn Karlgaard Endow a SEAS Professorship

SEAS alumnus and university trustee, **David Karlgaard (D.Sc. '74), and his wife, Marilyn,** have established a professorship at SEAS by increasing a family bequest to the university. The newly-endowed professorship complements two gifts the Karlgaards previously made to create scholarships for SEAS students, one in computer science and the other in computer engineering.

The David and Marilyn Karlgaard Professorship is held by Ahmed Louri, the new chair of the Department of Electrical and Computer Engineering, who officially was installed in the professorship at a ceremony in the Science and Engineering Hall on September 9, 2015. He is the first faculty member to hold the title. *(See article on page 18 to learn more about Dr. Louri.)*

Stalwart supporters of SEAS, Dr. and Mrs. Karlgaard have been involved with the school for years. Dr. Karlgaard has played a number of roles at SEAS, as an adjunct member of the faculty, a member of the SEAS National Advisory Council, and more recently, a trustee of the university.

Referring to the combination of their scholarships and professorship as "synergistic in building a world class engineering school," the Karlgaards say they hope their gifts will encourage others to give, as well.

"The national prestige of a university is greatly enhanced by the active support and engagement of its alumni," remarked Dr. Karlgaard. "We hope this gift will help to attract the students and faculty who propel SEAS and the George Washington University on a continuing path to excellence."

Dean David Dolling commended the Karlgaards for their dedicated support of SEAS, saying, "David and Marilyn Karlgaard understand that to accomplish our goal of becoming a world-class center for engineering research, innovation, and learning, SEAS must be able to recruit both top faculty and top students. They've responded very generously, first with gifts for endowed student scholarships and now with a very timely gift for an endowed professorship. By endowing the David and Marilyn Karlgaard Professorship, Dr. and Mrs. Karlgaard are helping SEAS hire faculty to key positions that will guide our future growth and bring SEAS one important step closer to our goal. I'm truly grateful for their long-standing commitment to SEAS."

## Supporting the SEAS Transformation

SEAS thanks our alumni and friends whose generous gifts during the 2014-2015 fiscal year (July 1, 2014 to June 30, 2015) supported new funds or programs that are helping to further the SEAS transformation:

**The AT&T Foundation** made a gift to support SEAS Professor Tian Lian's research on efficient resource utilization to meet storage QoS requirements.

**W. Scott Amey (MS '75) and his wife, Deborah,** made a gift to support scholarships for children of veterans killed in action.

**David Berg (BS '68) and his wife, Diane,** augmented their endowed David W. Berg Scholarship, which provides support for undergraduate civil engineering students at SEAS, with an additional gift of real estate that will come through a bequest in Mr. Berg's will.

**Judy Brady, widow of the late Dirk S. Brady (BS '43),** made a charitable gift annuity designated for the Dirk S. and Judy W. Brady Scholarship at SEAS.

**Gennaro Colabatistto (MS '95) and his wife, Constance,** created a scholarship to support a student who is an active military member or veteran. They also made an additional bequest in support of this fund.

**Dean Coclin (BS '84) and his wife, Antonia,** made a gift toward the Science and Engineering Hall.

**Donald Dinger (MS '64, Applied Scientist '78) and his wife, Ann,** made an additional gift toward the Science and Engineering Hall.

**Aran Hegarty (MS '97) and his wife, Fritz Partlow,** made a gift to reward innovation among SEAS faculty members.

**Todd Hetherington (MS '87) and his wife, Britt,** created a scholarship to support a student who is an active military member or veteran.

**Sang Duck Lee (Parent '18)** made a gift to the SEAS Dean's Fund for Excellence.

**Leidos** made a gift in support of the SEAS Industry Partners Program that provided primary funding for the SEAS Student

Research and Development Showcase and helped fund the SEAS Order of the Engineer Ceremony and several research initiatives. **Gulu Gambhir (MS '92, D.Sc. '98),** the Leidos CTO, coordinated the gift on behalf of the company.

**Beverly Mohl, widow of the late Casper Mohl (BS '55),** made an additional planned gift to support the Mohl Scholarship Fund.

**Frank Moy (BS '65) and his wife, Marcia Mau,** continued their support of the Frank Moy and Marcia Mau Annual Scholarship, which supports students with financial need in mechanical and aerospace engineering.

**Cagatay Ozdogru (MS '91)** funded a new fellowship to support Turkish students.

**Nicholas Paleologos (BS '69) and his wife, Suellen,** made a gift to support equipment purchases in the Science and Engineering Hall.

**The Honorable Clifford B. Stearns (BS '63)** made a gift toward the Science and Engineering Hall.

**Richard Stroupe (MS '01)** made a pledge in honor of his company, Sequoia Holdings, through the SEAS Industry Partners Program. The gift will help support the Science and Engineering Hall and the annual SEAS Student Research and Development Showcase.

**Howard Tischler (MS '80) and his wife, Lorraine,** created the Harriet Green Tischler Endowed Scholarship to provide tuition support to students who leverage technology to improve the lives of older adults.

**Sean Walsh (BS '76)** made a planned gift of unrestricted funds to support the SEAS Dean's Fund for Excellence.

**Charles Watt (MS '73, D.Sc. '86) and his wife, Linda,** made a gift to support the Science and Engineering Hall.

## Partners in Progress

Leidos, a national security, health, and engineering company headquartered in Reston, Virginia, furnished the inaugural gift in 2015 to the new SEAS Industry Partners Program, leading the way in helping SEAS forge a web of partnerships to advance engineering education, research, and innovations. Initiating the support from Leidos was the company's CTO, **Gulu Gambhir (MS '92, D.Sc. '98),** a SEAS National Advisory Council member and adjunct professor of systems engineering.

Through its platinum sponsorship of the program, Leidos provided funding for the SEAS Student Research and Development Showcase, the Order of the Engineer Ceremony, and several research initiatives.

"Our SEAS partnership allows us to collaborate with students and faculty on diverse technical topics like cybersecurity, data analytics and visualization, and health IT research," said Dr. Gambhir. "Through our relationship we are able to enhance the academic experience of SEAS students and engage in collaborative problem-solving with faculty to meet the growing needs of our customers."

Leidos went "all in" for the SEAS Student Research and Development Showcase, donating staff time as well as primary sponsorship of the event. Dr. Michael Zuniga, CTO and vice president of the company's Surveillance and Reconnaissance Group, presented remarks before the showcase's keynote address, and Leidos' Robert Zitz, senior vice president and chief systems architect, participated in the day's cybersecurity panel, "Assessing America's Cybersecurity Preparedness." *(See page 15 for more information on the SEAS Student Research and Development Showcase.)*

The sponsorship provided by Leidos and the showcase's other generous sponsors generated a clear and immediate impact on the success of the event, substantially increasing the prize money available to the showcase winners and significantly boosting the number of undergraduate and graduate participants.

Commenting on the SEAS Industry Partners Program and Leidos' support of it, Dean David Dolling said, "SEAS has a great deal to offer the technology community in the DC Metro area. We graduate talented engineers and computer scientists, produce top-notch research, and provide a place for technology leaders, entrepreneurs, and investors to gather and network. I'm so pleased that Dr. Gambhir and Leidos see the benefits of the SEAS Industry Partners Program, and I'm thankful for their support of SEAS."



## GW Honors SEAS Alumni

During 2015, GW honored four extraordinary SEAS alumni for their accomplishments and service to the university.

**Will Alexander (SEAS BS, '04, GWSB MBA '06),** *(left photo, above)* who is widely known across SEAS from his consistent involvement with the school, received the GW Black Alumni Association 2015 IMPACT award. Mr. Alexander's truly extensive list of activities includes serving on President Knapp's Task Force on Access and Success, participating as a speaker on a range of panels across the university and in SEAS classes, volunteering as a mentor and recruiter of GW students, serving on the SEAS National Advisory Council, and routinely answering a wide variety of calls for his assistance.

**Christyl Johnson (Ph.D. '12)** and **Jay Kaplan (BS '08)** *(middle photo, above)* were recognized at the 2015 Alumni Achievement Awards ceremony with a Distinguished Alumni Achievement Award and the Recent Alumni Achievement Award, respectively.

Dr. Johnson serves as deputy center director for technology and research investments at NASA Goddard Space Flight Center, managing the center's research and development portfolio and formulating its future science and technology goals. She previously served as the executive director of the National Science and Technology Council at the White House Office of Science and Technology Policy. Prior to that, she was the assistant associate administrator of NASA, where she provided the oversight of the agency's technical mission areas and field center operations.

Mr. Kaplan co-founded Synack, a cybersecurity start-up, with his business partner, Mark Kuhr, less than five years after receiving his bachelor's degree. Synack employs top "white hat" hackers to help identify data and technology vulnerabilities for clients. In two years' time, the company has attracted more than $34 million in funding from several top investors and landed Mr. Kaplan on *Forbes* magazine's "30 Under 30" list for 2015. *(Read more on page 13.)*

At the 2015 Alumni Outstanding Service Awards, **Howard Tischler (MS '88)** *(right photo, above)* was recognized for his sustained service to GW and SEAS. Mr. Tischler has been a member of the SEAS National Advisory Council since 2002, and served as its chair from 2010 to 2012. He has been an active supporter of SEAS entrepreneurship programs and the GW Business Plan Competition, helping as a mentor and judge for the competition.

## 2015 Hall of Fame

Dean David Dolling inducted seven highly accomplished SEAS alumni into the GW Engineering Hall of Fame last October in a ceremony celebrated for the first time in the newly-completed Science and Engineering Hall. SEAS congratulates our 2015 inductees:

**Donald Blount (BS '63)** is the president of Donald L. Blount and Associates, a naval architecture and marine engineering firm. His firm has participated in setting world records and has been involved with the development of some of the most iconic vessels in the world. He recently received the SNAME (Society of Naval Architects and Marine Engineers) David W. Taylor Medal, which is given annually for notable achievement in naval architecture and/or marine engineering.

**Gennaro "Gene" Colabatistto (MS '96)** is group president of CAE's Defence & Security Group and is responsible for the general management of CAE's defense training products and services. He is involved in several professional associations, previously served in the US Marine Corps, and acted as a first responder and volunteer pilot in disaster and humanitarian relief activities for the US Department of Homeland Security.

**Elizabeth D'Andrea (D.Sc. '06)** is the program manager for the Office of Naval Research's Electromagnetic Railgun Program, where she directs the development of this prototype to a mature technology. Over the span of her distinguished career, Dr. D'Andrea has worked for NASA-Langley and the Departments of the Army, Air Force, and Navy, and she has directly supported the Office of the Secretary of Defense and the White House.

**Kevin Kelly (MS '97)** is chief executive officer of LGS Innovations, which works to develop network-based solutions to solve some of the US government's most challenging networking and communications requirements. He is a founding member of the Innovative Technologies Council of INSA (Intelligence and National Security Alliance), and a member of several professional and industry associations.

*Left to right:* **Donald Blount, Gennaro Colabatistto, Elizabeth D'Andrea, Dean David Dolling, Kevin Kelly, Ronald Luman, Patrick Marolda, and Christopher Scolese**

**Ronald Luman (D.Sc. '98)** is chief of staff of the Johns Hopkins University Applied Physics Laboratory. Throughout his career, his leadership roles have spanned undersea and missile guidance systems, ballistic missile defense, and intelligence systems architectures, with special assignments at the US submarine force headquarters in Pearl Harbor, the Office of Naval Research, the Missile Defense Agency, and the National Security Agency.

**Patrick Marolda (MS '86)** is president and chief operating officer of Rolls-Royce's defense division, splitting his time between offices in Virginia and the United Kingdom. He also has been an active supporter of SEAS students over the years.

**Christopher Scolese (MS '82)** is the director of NASA's Goddard Space Flight Center. In a career with NASA that has spanned nearly 30 years, he also has served as NASA's associate administrator, the agency's highest-ranking civil servant position; as acting administrator from January through July of 2009; and as chief engineer, among other positions.

ZAID HAMID

## National Advisory Council Update from Mark Hughes

As current chair of the SEAS National Advisory Council (NAC), I'm happy to update fellow alumni and friends of SEAS on the council's recent activities.

During the spring 2015 meeting, the NAC began conducting the preliminary stages of a strategic planning process that assists Dean Dolling and the SEAS faculty by incorporating the expertise and perspective that many of our council members offer as industry leaders. The school's new strategic plan will be anchored in the university's strategic plan, Vision 2021, and will provide the framework on which to build for the future of SEAS.

In 2015, the NAC also welcomed four new members, whom I am happy to introduce:

**Todd Hetherington** graduated from SEAS in 1987 with a master's degree in engineering administration. He completed active duty military service in 1990, and later founded a residential real estate company that provides relocation support to families at the various military installations in the National Capitol area.

**Alexandra Halvordson** is a naval architect at General Dynamics Electric Boat Corporation. Over the past decade she has been an advocate for growing research and development at SEAS, and has been involved with student recruitment at General Dynamics, as well as professional development opportunities at SEAS. Ms. Halvordson graduated from SEAS in 2008 with a bachelor's degree in mechanical engineering. She has a master's degree from Rensselaer Polytechnic Institute, and is currently pursuing a Ph.D. degree in mechanical engineering from the University of Connecticut.

**George Reynolds** brings to the NAC the experience gained from working for more than 40 years with Westinghouse Electric and Northrop Grumman Corporations. He recently retired as Northrop Grumman's director of industry and university initiatives for engineering and manufacturing. Mr. Reynolds holds a bachelor's degree in mechanical engineering from Howard University and a master's degree in engineering administration from SEAS.

**Bradley Whittington** is director of capabilities and technology for Raytheon's Intelligence, Information and Services (IIS) business. He has held numerous leadership positions at Raytheon since 2000, and previously worked at Lockheed Martin and NASA. Mr. Whittington holds bachelor's degrees in physics and mathematics from Harding University, and a master's degree in engineering from Texas Tech University.

The NAC looks forward to working with our four new members, and to continuing our efforts to help grow new partnerships to enhance engineering education at SEAS.

# Upcoming Alumni Events

Stay connected with SEAS alumni, faculty, and current students by attending our SEAS alumni events listed below.

Events are updated and added often, so be sure to visit the online alumni events calendar at **www.alumni.gwu.edu/calendar** for more detailed information.

**Order of the Engineer**
May 10, 2016
Science and Engineering Hall
800 22nd Street, NW

**Pelton Senior Design Competition**
May 12, 2016
Science and Engineering Hall
800 22nd Street, NW

**SEAS Graduation Celebration**
May 13, 2016
Charles E. Smith Center
600 22nd Street, NW

**GW Commencement**
May 15, 2016
The National Mall

**Engineer Alumni Association Dinner Meeting**
June 7, 2016
6:30 – 8:30 pm
City View Room
1957 E Street, NW

# Happenings

**Johan Aakre, BS '03 (civil engineering),** received the 2015 Structural Engineer's Association of Illinois Outstanding Young Engineer Award last summer. He currently serves as a senior structural engineer at HNTB Corporation in Chicago, where he has been working in the field of bridge design for more than 11 years.

**Rachael Bevill, BS '15 (biomedical engineering)**, represented SEAS as one of two engineers, and GW as one of three GW students, in the Cherry Blossom Princess Program during the 2015 DC Cherry Blossom Festival. She was the New Hampshire Cherry Blossom Princess. Rachael currently is studying for her MS in biomedical engineering at SEAS.

**Gedare Bloom, Ph.D. '13 (computer science),** started as an assistant professor of computer science at Howard University last fall.

**Donald Blount, BS '63 (mechanical engineering),** received the SNAME (Society of Naval Architects and Marine Engineers) David W. Taylor Medal on November 5, 2015. The award is given annually for notable achievement in naval architecture and/or marine engineering.

**Oscar Carrasco, MS '01 (civil engineering),** recently established the Environment & Livelihood Development Foundation (ELDF), in Manila, Philippines, with fellow SEAS alumnus, **Michael John Ong, MS '97 (electrical engineering).** The two SEAS alumni set up ELDF as the corporate social responsibility arm of Industries Development Corporation, which is a privately-held, vertically-integrated, wood-based company headed by Michael John Ong.

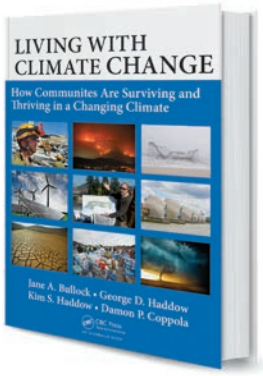
**Andrew Choi, BA '03 (computer science),** recently returned to GW as a cardiology faculty member in the School of Medicine and Health Sciences and at the GW Medical Faculty Associates. His expertise covers expanded integration of a range of novel imaging techniques that assist physicians in a wide spectrum of cardiovascular disorders. Andrew also maintains a voluntary appointment with the NIH.

**Dean Coclin, BS '84 (electrical engineering),** pictured with his sons, hosted a GW summer send-off for incoming freshmen in the Boston area last July. His elder son James graduated from GWSB in 2013 and is working at Tesla Motors in DC. His younger son Chris started at GW's CCAS last fall.

**Sergio Coletta, MS '86 (engineering administration),** has been working in the oil and gas industry since 1986 as a lead civil engineer in engineering and the construction of macro-projects. He has lived in South America, Italy, and the UK, and currently lives in Dubai and works for the Russian company LUKOIL.

**Lori Coombs, MS '14 (systems engineering),** is a Ph.D. student in engineering management at SEAS. Her expected graduation date is May 2019.

**Damon Coppola, BS '95 (CCAS), MS '03 (engineering management),** has published a new professional text *Living with Climate Change: How Communities Are Surviving and Thriving in a Changing Climate* (Auerbach Publications), which was released on October 19, 2015.




**Howard Eisner, D.Sc. '66,** retired as professor emeritus of engineering management at GW but continues to stay involved in the teaching community. Last September he gave a tutorial titled "Four Areas of Special Importance to the Systems Engineer" to INCOSE (International Council on Systems Engineering), and he began teaching an eight-week course.

**Azim Eskandarian, BS '82, D.Sc. '91 (mechanical engineering),** joined Virginia Tech as the department head of mechanical engineering in August 2015. He previously was a member of the faculty at SEAS.

**Lorraine Fleming, MS '81 (civil engineering),** received a Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring and was honored at a White House ceremony in 2015.

**Dennis Gallino, BS '70 (civil engineering),** recently retired from a 45-year civil engineering career. He was honored by the Philadelphia Section of the American Society of Civil Engineers (ASCE) as an ASCE Life Member, and he notes that he began his membership in ASCE in the late 1960s while a student at GW.

**Kenneth Geisinger, MS '70 (operations research),** worked as an operations research analyst at the Federal Aviation Administration, retiring in 2005. He moved to Bradenton, FL soon after and now serves a few hours a day as a volunteer classroom aid at St. Joseph's School, helping in mathematics classes in the 5th and 6th grades.

**Raymond Charles Hardman III, MS '15 (systems engineering),** graduated summa cum laude with a 4.0 GPA. He accepted a promotion to SME II of systems engineering with the management consulting firm eGlobalTech in May 2015, and welcomed his

son Raymond Charles Hardman, IV on June 8, 2015. He presently is leading enterprise restructuring for his firm's client at the Department of Health and Human Services.

**Lawrence Huebner, MS '86 (aeronautics),** has completed 25 years of civil service to NASA. He recently finished leading one of 13 teams that supported the NASA Space Launch System (SLS) Critical Design Review. SLS is NASA's new rocket that will be used for crewed exploration beyond low earth orbit. Now that the review is complete, he is back to supporting a variety of NASA's space technology development projects and serving as chairman of the JANNAF Airbreathing Propulsion Subcommittee.

**Daniel Kane, BS '12 (biomedical engineering),** graduated from The Catholic University of America's Columbus School of Law last May with a concentration in intellectual property law and served as the student speaker at the commencement. He has published an article about 3D printing and international trade titled "Printing a War in Three Dimensions: Expanding 'Article' to Include Electronic Transmissions before the ITC." Daniel also continues to serve as a volunteer assistant coach with GW's cross country and track programs.

**Nahid Khozeimeh, MS '76 (transportation engineering),** recently was appointed by Governor Hogan to serve a third term on the Montgomery County Board of Election, and subsequently was elected to serve as vice-president/vice-chair of the board. During her career, Nahid worked as the special assistant to the SEAS dean for 27 years and after retiring from GW, she became the EVP of Forum International Inc., an engineering/architectural firm in Bethesda, MD. Nahid and her husband Issa, daughters Lili and Nini, and son in-law Brett Holt have earned a total of 10 degrees from GW.

**Elliott Kugel, MS '83 (computer science),** was recognized in the February 23, 2015 issue of *Barron's* magazine as one of "America's Top 1,200 Advisors" and was ranked #20 in the state of NJ. He also was recognized by the *Financial Times* in its FT 400 ranking for 2015 as one of the top 400 advisors in the US. This is his sixth year on the *Barron's* list, and his second year on the *Financial Times* Top 400 list. Elliott is a managing director of investments at Merrill Lynch in Bridgewater, NJ and resides in Skillman, NJ.

**Chung-Shing Lee, D.Sc. '97 (engineering management),** has been invited to serve on the editorial board of the journal *Technological Forecasting & Social Change*, which is ranked among the top journals in technology and innovation management. Chung-Shing's initial appointment will be for a period of three years.

In an August 27, 2015 article, the *Washington Post* profiled the role that **Peter Morrison, MS '95 (structures and dynamics),** played in leading the Navy's "game-changing" LaWS weapons system from its inception to successful completion.

**Greg Passes, MS '99 (telecommunications and computers),** has joined Vector Planning and Service, Inc. as its general manager for the National Capital Area.

**Hugo Reyes, MS '14 (engineering management),** is running to be the next representative for Virginia's 3rd Senate District.

**Perry Saidman, BS '67 (electrical engineering),** is a pioneer in the field of design law, successfully representing clients in groundbreaking cases that have established the enforceability of design patents in court. Today, he is a leading advocate for design patents in the US, and he publishes frequently on design patent law. In 1990, he founded SAIDMAN DesignLaw Group, the first US law firm to specialize in the patenting of designs.

**Muneer Shawareb, MS '85 (engineering administration),** returned to his home country, Jordan, after graduating and served as an officer in the Royal Jordanian Armed Forces. In 2006 he retired from the army at his own request as a colonel and has been working since then in the private sector as a project manager. For the last three years, he has been working at the Queen Alia International Airport, in the Engineering and Maintenance Division. He is married, and he and his wife have two children.

**Michael Suder, MS '98 (engineering management),** joined Bilzin and Sumberg, a commercial law firm in Miami, FL, where he is responsible for overseeing portal collaboration, content management, and process automation initiatives. Michael was a speaker at the 2015 International Legal Technical Association SharePoint Symposium in Baltimore, MD, and his topic included a discussion on Cloud-based, portal solutions.

**Rob Versaw, MS '15 (systems engineering),** recently was promoted to program manager at Vivint in its Innovation Center. Vivint is a smart home automation company located in Provo, UT.

**Weldon Vlasak, Ph.D. '70 (electrical engineering),** has been studying the actions of atoms for the past 25 years and has published five books and several articles on the subject. His technical paper "Computer Analysis of Atomic Forces" was accepted for the 2015 International Conference on Computer Science and Information Engineering.

**Jatuporn Vongmahadlek, MS '01 (engineering management),** currently works as a senior associate consultant at the Electricity Generating Authority of Thailand. She previously was an executive procurement officer at Thai Jurong Engineering Limited.

**Timothy Waire, Jr., BS '91 (electrical engineering),** joined the Cystic Fibrosis Foundation as CIO in January 2015. Prior to joining the foundation, he held executive management positions at Quest Diagnostics and Constellation Energy Group, driving the strategic direction of technology across all lines of businesses and their supporting functions.

**Sean Walsh, BS '76 (mechanical engineering),** has accepted a new position as a senior systems engineer/naval architect with Vencore, Inc, where he provides direct support to the Office of Naval Research, Code 35. He also serves as a volunteer at Our Lady of Lourdes Catholic Church; with Theta Tau Professional Engineering Fraternity; and as the chair of the Lisnyk Senior Ship Design Project Competition for the Society of Naval Architects and Marine Engineers and The American Society of Naval Engineers.

**Charisma Williams, MS '14 (engineering management),** is a senior consultant with Booz Allen Hamilton, supporting a federal client in Washington, DC.

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