FALL 2013

THE GEORGE WASHINGTON UNIVERSITY

SYNERGY

SCHOOL OF ENGINEERING & APPLIED SCIENCE

A Dynamic Mix

How SEAS is building one of the leading fluid dynamics programs in the country

WILLIAM ATKINS/GWU

FALL 2012

CLARK CONSTRUCTION-SEH CONSTRUCTION CAM

FALL 2013

What a difference a year makes:

Progress continues on the construction of the **Science and Engineering Hall.** This time next year, SEAS will be preparing to move into its new home.

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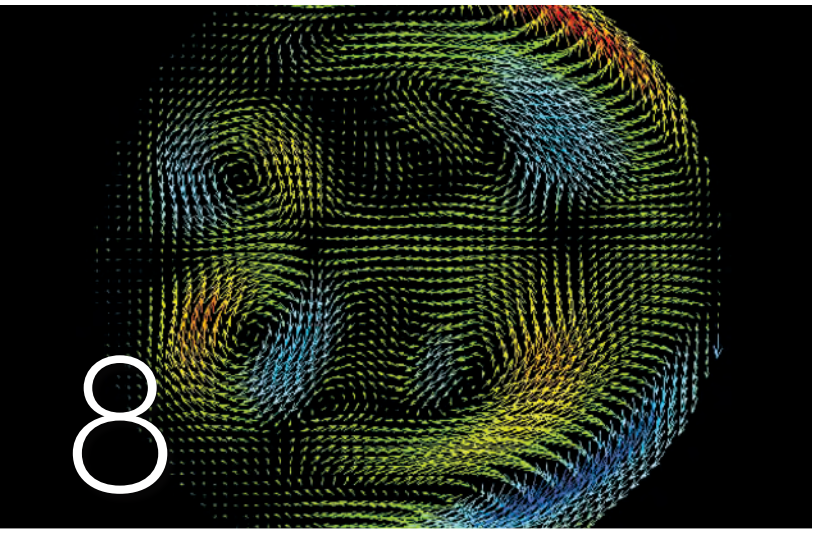

SYNERGY

FALL 2013

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Civil & Environmental Engineering

PROFILE

Chair: Majid T. Manzari
202-994-4901
www.cee.seas.gwu.edu
Full-time faculty: 12
Undergraduate students: 109
Graduate students: 53
Annual research expenditures: $3.6 million

FACULTY

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Azim Eskandarian, **PROFESSOR**
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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, Eskandarian, Hamdar

Putting Things in Context

Professor Kim Roddis wants GW's civil engineering graduates to be known as creative, competent problem solvers. After all, that is what they will need to be able to do if they are to be successful civil engineers. "So how do you teach that?" she asks—rhetorically, it turns out.

In fact, Roddis has found some pretty creative ways of doing this. They involve an array of activities and approaches that all stem from her goal of giving students the skills they will need so they can teach themselves when they encounter a new challenge.

To accomplish this, she gets students actively involved and teaches concepts through examples with which they are already familiar: bending paper clips to demonstrate load and resistance design philosophy, or using wood strips with double-stick tape to teach shear connection location in composite beam design.

What she cannot bring into the classroom, Roddis goes out to find, taking her classes on field trips to the Woodrow Wilson Bridge or the Dulles Metrorail project to provide context for concepts taught in class. She argues, "You need to embed [the concepts] in a much more realistic context. You can make the students crank out moment diagrams all day long, but if you don't give the context, they won't learn how it applies to design."

A big proponent of building a strong learning environment that models typical civil engineering projects and challenges, Roddis also advocates using projects that incorporate the "soft skills" of team building, communications, leadership, and followership.

She is particularly proud of her efforts to get SEAS students involved in the U.S. Department of Energy's 2013 Solar Decathlon competition. The students joined with other students from GW, Catholic University of America, and American University to form Team Capitol DC, which won a spot in the recently concluded competition *(see story on page 19)*. "The decathlon was a problem-based learning situation, and it was really good for the students," Roddis states. "A lot of what they learned is not what some people might traditionally think of as core engineering concepts, but we had three different universities working in three very different areas and everyone was working together."

Roddis' teaching accomplishments have not gone unnoticed. During her nine years at SEAS, students from the Department of Civil and Environmental Engineering (CEE) have selected her three times as the "CEE Professor of the Year," and a committee of her peers honored her with the 2012 SEAS Distinguished Teacher Award. In addition, the American Institute of Steel Construction presented her with a national achievement award in 2002 for her efforts to improve civil engineering curricula.

With the sort of work ethic that she shows, it's not surprising that others recognize her exceptional teaching skills. Referring to a class she has taught more than 30 times over the course of her career, Roddis states, "I still work hard on that class and I still change things and introduce new materials. I don't want to still be teaching the way I was teaching in 1988."

It's All in How You Perceive It

We humans don't usually give much thought to the complicated work our minds carry out every day, helping us to perceive and navigate our physical environment. We see something in our path and, without really being conscious of it in most cases, we move around it.

This is no simple task for a robot, though, as Professor Gabriel Sibley of the Department of Computer Science knows very well. Robots hold the promise of helping humans with everything from exploring other planets to operating warehouses to serving as personal assistants; but before a robot can carry out any of these tasks on its own, without human intervention, it must first be able to perceive its environment correctly, so it can navigate it.

Sibley is a roboticist who studies a number of challenges related to perception in autonomous robots. "My part is to try to teach the machines how to see, how to not get lost, how to know what they're dealing with," says Sibley, "so ultimately they can interact with us."

To help make this a reality, Sibley is studying how to develop a single underlying mathematical model of what the world "looks" like to a robot. At the moment, he is focused on applying this understanding to perception for mobile devices and autonomous driving *(see photo above)*, and he is excited about the prospects for his research because of the unusual combination of strengths he sees in robotics at GW. "There are very, very few teams that have the theoretical background—having developed the idea in the first place—and the technological prowess to build systems that are going to be useful," Sibley states.

Sibley believes his lab's work to build a foundation for robust perception that works in real time is unique. "We're using perception to drive planning and control in ways that we haven't been able to do before," he contends. "The goal here is autonomous operation that doesn't require human intervention over extensive periods of time. My lab and I have built some best-in-class systems and theories that enable a real foundation for long-term autonomy."

In just two years, Sibley already has successfully competed for several grants totaling $2.8 million, including a recent $1.2 million mobile perception grant with Motorola, and he's confident about his lab's research and the future of robotics research in general at GW. "There's something about the potential for success here that is really attractive," he exclaims, citing the new Science and Engineering Hall on the horizon and the 40-plus new faculty hired by the engineering school in the last five years. "Few places have the opportunity or the courage to do that," he adds.

But in the end, Sibley says that the most crucial ingredient of success is building a community of energetic exploration. "It's all about recruiting," he says. "If you can attract people with a passion to build autonomous systems, then you just sort of let it go—give bright students freedom plus a secure environment, and great things will happen."

PROFILE

Chair: Abdou S. Youssef
202-994-7181
www.cs.gwu.edu
Full-time faculty: 20
Undergraduate students: 143
Graduate students: 495
Annual research expenditures: $2.9 million

FACULTY

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

RESEARCH AREAS

ALGORITHMS AND THEORY
Bellaachia, Berkovich, Cheng, Choi, Youssef, Zhang

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

BIOINFORMATICS AND BIOMEDICAL COMPUTING
Bellaachia, Berkovich, Cheng, Hahn, Rotenstreich, Simha

COMPUTER SECURITY AND INFORMATION ASSURANCE
Cheng, Choi, Clarkson, 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
Bellaachia, Berkovich, Youssef, Zhang

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

Electrical & Computer Engineering

PROFILE

Chair: Mona Zaghloul
202-994-6083
www.ece.seas.gwu.edu
Full-time faculty: 28
Undergraduate students: 235
Graduate students: 248
Annual research expenditures: $3.1 million

FACULTY

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Lawrence Bennett, **RESEARCH PROFESSOR AND APS FELLOW**
Robert L. Carroll, **PROFESSOR**
Edward Della Torre, **PROFESSOR, IEEE AND APS FELLOW**
Milos Doroslovacki, **ASSOCIATE PROFESSOR**
Tarek A. El-Ghazawi, **PROFESSOR AND IEEE FELLOW**
Kie-Bum Eom, **PROFESSOR**
Amir Etemadi, **ASSISTANT PROFESSOR**
Robert J. Harrington, **PROFESSOR AND IEEE FELLOW**
Hermann J. Helgert, **PROFESSOR**
Howie Huang, **ASSISTANT PROFESSOR**
Matthew Kay, **ASSOCIATE PROFESSOR**
Can E. Korman, **PROFESSOR**
Nicholas Kyriakopoulos, **PROFESSOR**
Tian Lan, **ASSISTANT PROFESSOR**
Roger H. Lang, **PROFESSOR AND IEEE FELLOW**
Zhenyu Li, **ASSISTANT PROFESSOR**
Murray H. Loew, **PROFESSOR, IEEE AND AIMBE FELLOW**
Thomas J. Manuccia, **PROFESSOR**
Ergun Simsek, **ASSISTANT PROFESSOR**
Volker Sorger, **ASSISTANT PROFESSOR**
Suresh Subramaniam, **PROFESSOR**
Guru P. Venkataramani, **ASSISTANT PROFESSOR**
Branimir R. Vojcic, **PROFESSOR**
Wasyl Wasylkiwskyj, **PROFESSOR AND IEEE FELLOW**
Mona Zaghloul, **PROFESSOR AND IEEE FELLOW**
Jason M. Zara, **ASSOCIATE PROFESSOR**
Vesna Zderic, **ASSISTANT PROFESSOR**

RESEARCH AREAS

COMMUNICATIONS AND NETWORKS
Doroslovacki, Helgert, Lan, Subramaniam, Vojcic

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

ELECTRIC POWER AND ENERGY
Etemadi, Harrington

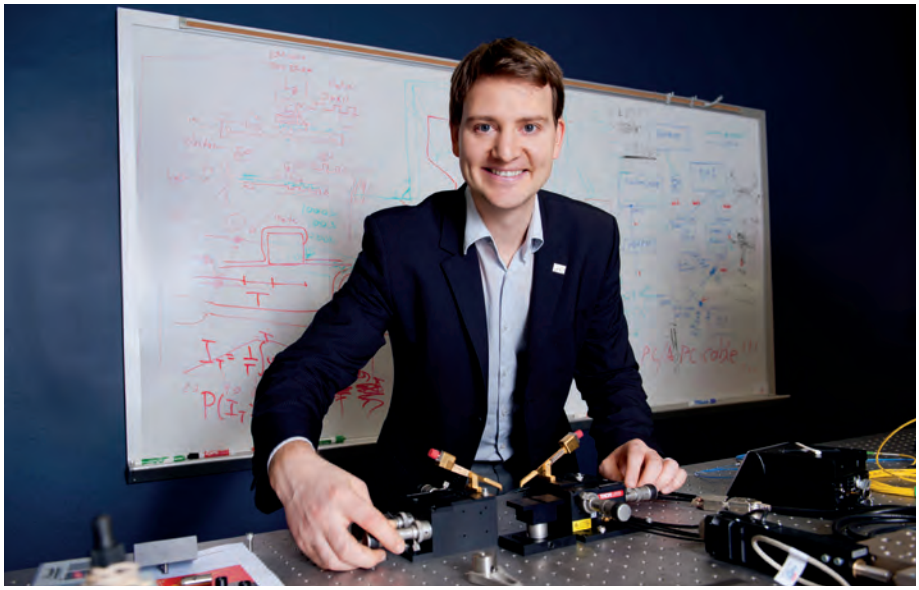
ELECTROMAGNETICS, RADIATION SYSTEMS, AND MICROWAVE ENGINEERING
Bennett, Della Torre, Lang, Simsek, Sorger, Wasylkiwskyj

MEDICAL IMAGING
Loew, Zara, Zderic

MEDICAL INSTRUMENTATION
Kay, Li, Zara, Zderic

MEMS/NEMS, ELECTRONICS, AND PHOTONICS
Ahmadi, Korman, Li, Simsek, Sorger, Zaghloul

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



Working at the Frontier

"The computer of the future will be based on light rather than electronics, and it's projected to be 1,000 times faster than current computers and significantly more energy efficient," claims Professor Volker Sorger of the Department of Electrical and Computer Engineering. "And our research at SEAS will help create this technology."

Current computing technologies work with electricity, which limits the speed of the computer and leaves it vulnerable to losing power. However, researchers such as Sorger hope to plumb the study of photonics—which is optics integrated on a circuit—to create the nanoscale chips necessary to develop photonic computing.

"Physics says we cannot make photonics on the same scale as Intel makes its chips," says Sorger. "My research is addressing this shortcoming. We already have demonstrated that we can create devices at the necessary scale, a few billionths of a meter, and we'll use the clean room in the new Science and Engineering Hall's nanofabrication facility to achieve this. That's why I'm very excited about the clean room."

Sorger has already had some success in his field. As a doctoral student, he was part of the University of California, Berkeley team that created the world's smallest laser, and he is continuing that approach here at SEAS. Sorger believes that the approach he and his SEAS research team use will prove to be a very effective mix of research and development.

He explains, "We are quite unique in that we're rightly aiming to be at the forefront of research in the photonics field, but not 20 to 50 years out in terms of application. Instead, we're looking at the next five to eight years, where we actually see a real path for innovations and entrepreneurship. In fact, I was recently elected to lead the first U.S. effort to develop a roadmap on photonics computing."

Beyond photonics computing, Sorger's research also has potential applications for the development of highly efficient solar cells, chemical or environmental sensors, and biophotonics that are optically triggered (think of a "smart" contact lens).

Although his research targets mid-term commercialization opportunities, Sorger is motivated by the long-term outlook. "Photonics is a key technology for the twenty-first century," he says, referencing the National Research Council's "Harnessing Light 2.0" report, which predicts that those who secure this technology now will be the new dominant players in the IT and medical industries, among other industries. "I believe that those who invest in photonics R&D now will be the big winners for the next 100 years," concludes Sorger. "My group aims to secure key patents for GW and the U.S. We're pushing this frontier beyond classical device limits and collaborating with companies for an accelerated time-to-market."

Enabling Innovation

We've all heard about large-scale, government-funded projects that, when finally completed, are years behind schedule and millions of dollars over budget. Bridges and dams often come to mind. But giant, technologically complex projects such as space missions also can suffer from these problems, and technological surprises are often to blame.

"I study innovation in space agencies and other government agencies that make complex physical products, and I'm interested in understanding how we can invest more effectively in the technologies we need to fly future missions," says Professor Zoe Szajnfarber of the Department of Engineering Management and Systems Engineering.

To better understand technology investment, Szajnfarber and her students are looking at two pieces of the puzzle: the problems associated with predicting and investing in the most appropriate technologies in highly interdependent systems that experience long lags between the time in which the technology investment is made and the time in which new capabilities are deployed; and determining how the structure of the organization influences the architecture of the technology it produces. Szajnfarber explains, "We ask questions about when it makes sense to split work across organizational boundaries and when trades need to be performed by an integrated team."

At first glance, Szajnfarber's work may seem like the kind of innovation management research that business schools conduct, but it's not. Management research, she explains, "largely ignores the underlying technology." Her work integrates the relevant organization theory with concepts from systems architecture and design typically used by engineers. This mixed-methods approach enables a more complete understanding of the innovation process in complex systems.

"I'm one of the very few academics doing space innovation management that considers the pre-project technology development and has a strong organization theory component," states Szajnfarber. "Both halves of my research have very high barriers to entry, and they are in opposite directions. Organizational theorists aren't studying the complex technologies developed for space, because you need a Ph.D. in engineering to get anyone in space agencies to talk to you." On the other hand, she says, "there's a very substantial theoretical base that engineers aren't exposed to at all about how organizations work and how the structure of the organization matters. It's a huge investment to get both pieces, so I'm sort of uniquely positioned to do this kind of research."

Although she has been on the SEAS faculty only two years, Szajnfarber already has funding for her research from NASA, the European Space Agency, and the National Science Foundation, and her results have been used and disseminated by directors at these space agencies.

Asked about the real pay-off of her research, Szajnfarber replies, "We hope that our work will help space agencies make smart investments today in the technologies that will enable the billion dollar missions of tomorrow."

PROFILE

Chair: Thomas A. Mazzuchi
202-994-9187
www.emse.seas.gwu.edu
Full-time faculty: 15
Undergraduate students: 82
Graduate students: 1,095
Annual research expenditures: $3.3 million

FACULTY

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Joseph A. Barbera, **ASSOCIATE PROFESSOR**
David Broniatowski, **ASSISTANT PROFESSOR**
Jonathan P. Deason, **PROFESSOR**
Michael R. Duffey, **ASSOCIATE PROFESSOR**
Royce Francis, **ASSISTANT PROFESSOR**
Erica Gralla, **ASSISTANT PROFESSOR**
Thomas A. Mazzuchi, **PROFESSOR**
Julie J. C. H. Ryan, **ASSOCIATE PROFESSOR**
Joost Reyes Santos, **ASSISTANT PROFESSOR**
Shahram Sarkani, **PROFESSOR**
Gregory L. Shaw, **ASSOCIATE 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, Shaw, van Dorp

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

ENGINEERING AND TECHNOLOGY MANAGEMENT
Deason, Duffey, Sarkani, Shaw, 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

PROFILE

Chair: Michael W. Plesniak
202-994-9803
www.mae.seas.gwu.edu
Full-time faculty: 26
Undergraduate students: 165
Graduate students: 121
Annual research expenditures: $2.6 million

FACULTY

Elias Balaras, **PROFESSOR**
Lorena A. Barba, **ASSOCIATE PROFESSOR**
Philippe Bardet, **ASSISTANT PROFESSOR**
Kartik Bulusu, **ASSISTANT RESEARCH PROFESSOR**
Pinhas Ben-Tzvi, **ASSISTANT PROFESSOR**
Ken P. Chong, **RESEARCH PROFESSOR**
Andrew D. Cutler, **PROFESSOR**
David S. Dolling, **PROFESSOR, AIAA AND ROYAL AERONAUTICAL SOCIETY (UK) FELLOW**
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Stephen M. Hsu, **PROFESSOR AND ASME FELLOW**
Michael Keidar, **PROFESSOR AND APS FELLOW**
Saniya LeBlanc, **ASSISTANT PROFESSOR**
James D. Lee, **PROFESSOR AND ASME FELLOW**
Taeyoung Lee, **ASSISTANT PROFESSOR**
Megan C. Leftwich, **ASSISTANT PROFESSOR**
Yongsheng Leng, **ASSOCIATE PROFESSOR**
Chunlei Liang, **ASSISTANT PROFESSOR**
Michael W. Plesniak, **PROFESSOR AND ASME, AAAS, AND APS FELLOW**
Kausik Sarkar, **PROFESSOR AND ASA FELLOW**
Alex Shashurin, **RESEARCH SCIENTIST**
Yin-Lin Shen, **PROFESSOR**
Jonathan Silver, **RESEARCH PROFESSOR**
Murray R. Snyder, **PROFESSOR**
Adam M. Wickenheiser, **ASSISTANT PROFESSOR**
Lijie "Grace" Zhang, **ASSISTANT PROFESSOR**

RESEARCH AREAS

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

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

DESIGN AND MANUFACTURING OF MECHANICAL AND AEROSPACE SYSTEMS
Ben-Tzvi, 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
Ben-Tzvi, J. Lee, T. Lee, Wickenheiser

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

A Quick Start

Professor Philippe Bardet of the Department of Mechanical and Aerospace Engineering is an experimentalist in the field of fluid dynamics, the study of how liquids and gases behave in motion under the action of internal and external forces.

Bardet studies fluid behaviors to better predict them, so others can apply his insights to improve the design of a myriad of tools and structures on which we depend. For example, with a better understanding of the flow of air or water around airplane wings or ship hulls, engineers can design wings or hulls that result in less drag. Less drag leads to greater fuel efficiency. Or consider nuclear reactors. The water that flows through and cools a nuclear reactor core is critical to the reactor's safe operation. The more we understand the variations in the flows, the better we can design the reactor cooling and safety systems.

These are just two applications to the many projects on which Bardet and his research group are working in their experimental laboratory. Despite the fact that he "got the keys to the lab less than two years ago," Bardet has quickly built several large experimental facilities, and his group's work is already getting the attention of external funding agencies.

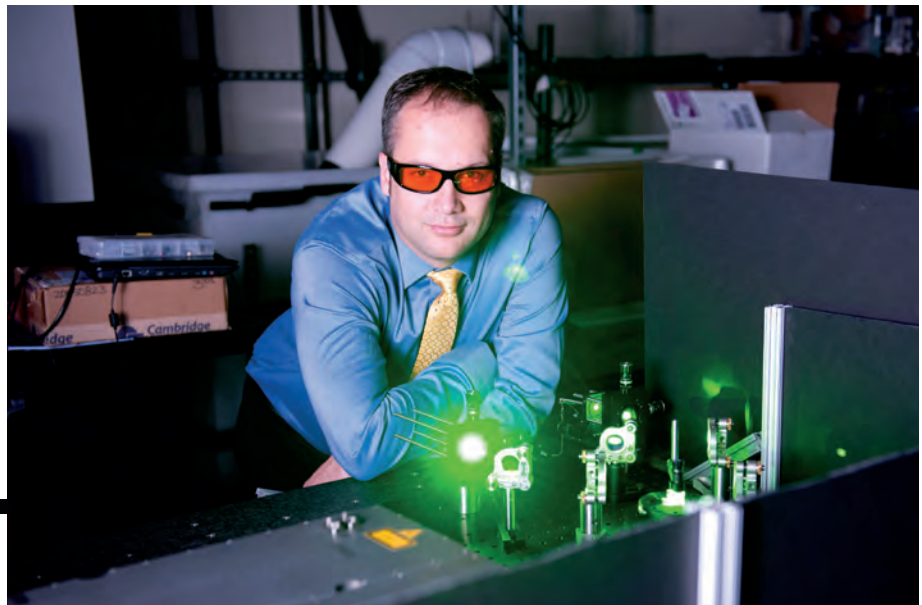
Bardet concentrates on multiphase flows—the interaction of liquids with gases, and the transfer of heat and mass between the two phases—and on the interaction of turbulence and stratified fluid layers. It was his work on multiphase flows that opened the door to his most recent research. "It got the attention of the program managers and they entrusted us with this big project," he recalls.

This "big project" is an $860,000 U.S. Department of Energy (DOE) grant and the opportunity to collaborate with scientists at Argonne National Laboratory and the French Alternative Energies and Atomic Energy Commission. Bardet and his SEAS colleagues, Professors Elias Balaras and Majid Manzari, will use the grant to devise a model to simulate the impact of earthquake-induced fuel rod vibrations inside a nuclear reactor. Why is that important? Bardet explains, "By developing better predictive tools, we can better refine the safety limits of a particular reactor."

To better predict and model these behaviors, Bardet's research group is building a sort of vertical water tunnel on GW's earthquake simulator, or "shake table," and they plan to capture the fluid flow data as the water flows through the tunnel at very high speeds while they shake the whole structure. They will capture the data using instrumentation they have developed that is "customized to the applications and allows measuring phenomena that cannot be captured with commercially available instruments," Bardet asserts.

But the customized instrumentation is just one unique feature of the project. "On fluid-structure interaction, as far as I know, we're the first doing fluid velocity measurements on a shake table," says Bardet. "We're also going to measure the full coupling of the fluid and the structure and how they respond together, which has never been done for this application."

In a related development, Professor Bardet's group also will work under a recently awarded $800,000 DOE grant to develop new laser diagnostics for advanced nuclear reactors.



A Winning Team

Everyone enjoys being part of a winning team. In fact, watching your favorite team when they're on a roll can be pretty exhilarating. This is where SEAS is right now: we're on a roll, too.

If you have had the chance to visit campus this fall, you probably have seen one of the more obvious signs of our progress, the Science and Engineering Hall. It's going up quickly. Soon, the building's shell will be complete, and all eight above-grade floors will be ready for installing utilities and fitting out labs and offices so that in a little over a year, SEAS can move into its new 500,000-square-foot, state-of-the-art home.

On another front, we've had five consecutive years of successful faculty recruiting, and the result is a strong, engaged, energetic faculty. With the addition of 41 new faculty since 2008—most of whom we recruited from top ranked engineering and computer science programs—you could say that SEAS has a very "deep bench" of talent. They are winning research awards and national recognition awards, developing new programs, and teaching and mentoring SEAS students.

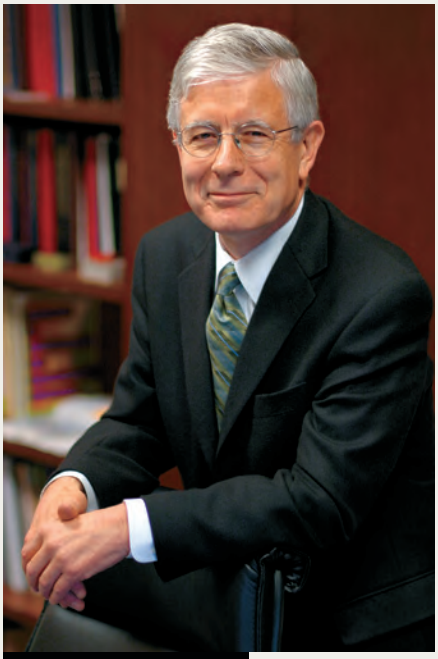
Our enrollment is growing, too—both undergraduate and graduate. Since 2008, undergraduate applications are up about 66 percent and total undergraduate enrollment has increased 33 percent. In the same period, applications to our master's programs have doubled and enrollment has increased 37 percent. But SEAS is not simply admitting more students; in fact, as the number of applications has grown, we have become increasingly selective in admitting students.

The school also is doing especially well in attracting female students. We are enrolling female students at twice the national average and, according to the most recent data available from the Association for Engineering Education, SEAS ranks fifth nationally for the percentage of bachelor's degrees it awards to female undergraduates.

As you read through the pages of this issue of *Synergy*, you'll find many other examples of our successes. All of us can be proud of them, and all of us can be a part of them.

So, to return to the sports analogy, I welcome your participation in the school's successes and ask you to tune in to the SEAS team—or better yet, "suit up" and join us. Get engaged. Everyone gets a spot on the SEAS team…and who doesn't enjoy being a part of a winning team?

DS Dolling



ELLIE KAUFMAN

Dean David S. Dolling

COVER STORY:

A Dynamic Mix

How SEAS Is Building One of the Leading Fluid Dynamics Programs in the Country

It's happening quietly. So quietly, in fact, that very few people in the university even notice it. But these sorts of changes often do happen quietly, at first.

Since 2008, SEAS—and particularly the Department of Mechanical and Aerospace Engineering—have patiently been growing the school's fluid dynamics research program. And the result, a short five years later, is that SEAS has positioned itself as a leading fluid dynamics research program in the United States.

"The size and breadth of our group is a real strength," notes Michael Plesniak, chair of the Department of Mechanical and Aerospace Engineering and one of the architects of the plan to forge the research group at SEAS. "The other strength we have is our blend of experienced researchers and new talent. This is a growing, dynamic group."

Prior to 2008, SEAS already had several faculty members working in fluid dynamics, and from that base Plesniak and Dean David Dolling began to expand the research program. Now, with a vibrant mix of faculty in place whose research covers the entire gamut of fluid dynamics—from theory to experiments to computation—and is focused on both fundamental research and important applied problems, SEAS is being noticed by the fluid dynamics research community.

"People are taking note of the faculty we've hired and their accomplishments," says Plesniak. "I'm involved in several professional organizations in the fluid dynamics community, and when I go to conferences, I hear a lot of praise about the people in our group and growing interest from researchers wanting to join the group. Moreover, a lot of our faculty are getting invitations to speak around the country."

Fluid dynamics 101

So what is fluid dynamics? The simplest explanation is this: it's the study of the motion of fluids—which include liquids, gases, and plasmas—and the forces on them. Aerodynamics (the study of moving air and of the interaction between air and the solid bodies moving through it) and hydrodynamics (the study of liquids in motion) are two examples.

Computational fluid dynamics, or CFD, is a sub-discipline and one of the strengths of the SEAS program. It takes the equations of motion that govern fluid flow and uses computers to simulate the physics associated with those equations. CFD simulations are important because they are quicker and cheaper than building physical experiments. They also unearth data that would be difficult or impossible to measure in experiments.

That said, computations still have limitations and are not always accurate enough, so experimental and computational researchers often collaborate, sharing their approaches and using the computational results to extend what they have measured in the lab.

This synergistic approach is another facet of the SEAS fluid dynamics research program that differentiates it from those at many other universities. "We have a critical mass of experimentalists and computationalists who can attack the fluid dynamics problems with both methods," claims Plesniak. "Most other departments tend to have a focus in one or the other. Given our department's small size, this is particularly impressive."

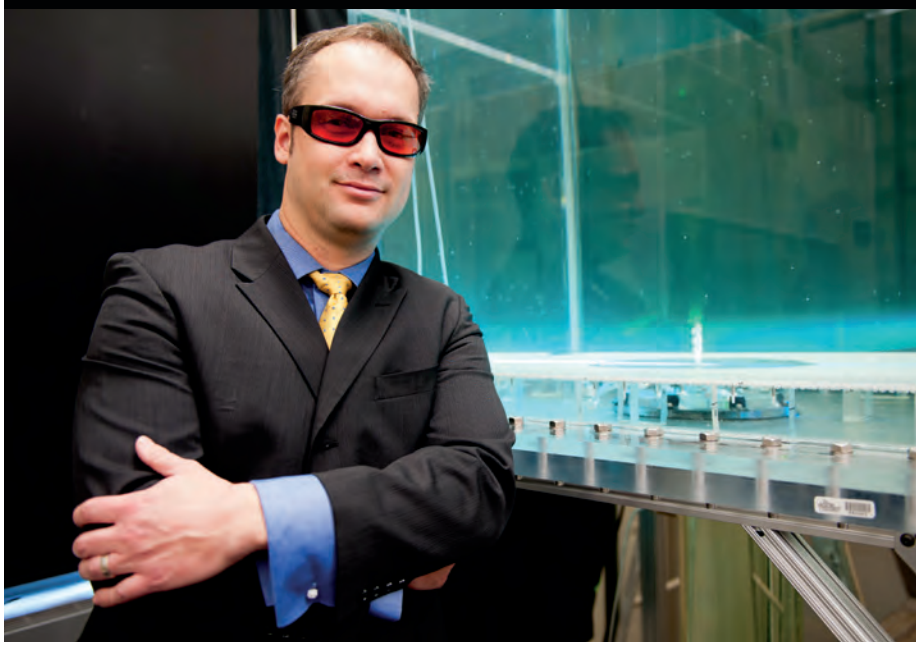
It's ubiquitous

"If you think about it, fluid dynamics is all around us. It's ubiquitous," Plesniak says. Fluid dynamics control a myriad of biological processes, with the flow of blood throughout the body being the obvious example. They control the climate. And they impact transportation, energy, medicine, manufacturing, and many other sectors. So an understanding of fluid dynamics is necessary if we want to better design our vehicles, power plants, and biomedical devices, not to mention improve our weather predictions.

Collectively, the SEAS team of fluid dynamicists covers a surprisingly broad—and in many cases, novel—swath of topics. They examine topics associated with classical fluid dynamics, such as Professor Andrew Cutler's study of supersonic flows and their applications for scram-jet engines, or Professor Murray Snyder's study of ship and aircraft wake interaction, which he does in cooperation with the U.S. Naval Academy using its 108-foot-long dedicated research vessel.

The faculty also investigates a range of topics related to biological processes and biomedical devices. Professor Plesniak's research aims to understand the fluid mechanics of human speech and the effect

Professor Philippe Bardet specializes in developing new laser-based diagnostics for multiphase and fluid-structure interaction flows



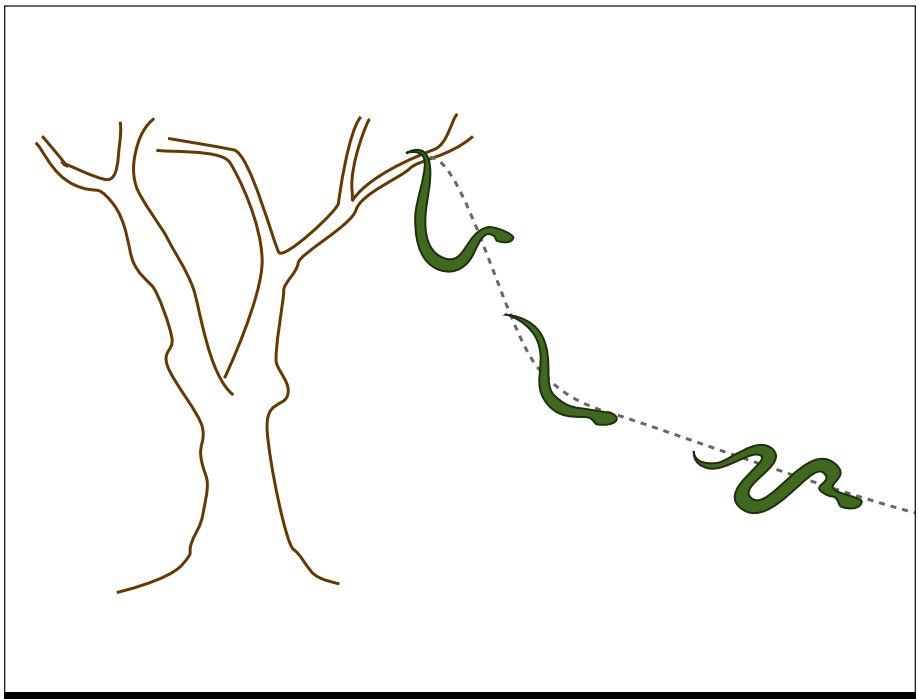
of curvatures in large arteries on blood flow, while Professor Morton Friedman focuses on modeling biological transport processes and the role of mechanical forces in the evolution of vascular disease.

Professor Kausik Sarkar, who studies the fluid mechanics of cell-like soft particles that are used for imaging and drug delivery, simultaneously holds four grants from the National Science Foundation for his research. And Professor Zhenyu Li of the Department of Electrical and Computer Engineering works to develop micro-fluidic devices (often known as "lab-on-a-chip" devices) that can test body fluid samples.

A number of other faculty conduct research related to energy and the environment. Professors Philippe Bardet and Elias Balaras are collaborating with Professor Majid Manzari of the Department of Civil and Environmental Engineering and with scientists at Argonne National Laboratory and the French Alternative Energies and Atomic Energy Commission to devise a model to simulate the impact of seismic-induced vibrations inside a nuclear reactor. The ultimate purpose of the research they are conducting through this $860,000 U.S. Department of Energy grant is to gain knowledge of the variations in the flows inside the reactor so others can use it to better design the reactor cooling systems and predict their responses to earthquakes.

Professor Charles Garris is focused on the fundamental behavior of pressure-exchange and how it can be used for sustainable energy technologies such as air conditioning and refrigeration, fuel cells, and water desalinization. Professor Leila Farhadi of the Department of Civil and Environmental Engineering studies the fluid dynamics of land-atmosphere interaction and other issues related to environmental and water resources engineering.

Plasmas—one of the three forms of fluids—are the specialty of Professor Michael Keidar, who conducts research on plasma medicine, micropropulsion for micro and nanosatellites, and plasma nanoscience and nanotechnology. One of his projects investigates ways to make a plasma "scalpel" that can cut human tissue more efficiently in order to minimize the need for blood transfusions for patients during surgery. He is conducting this research under a $445,000 grant from U.S. Patent Innovations, LLC.



ANUSH KRISHNAN AND LORENA A. BARBA

Flying snakes: after a jumping take-off, followed by a ballistic dive, the snake's body gains speed and then performs a shallow glide

Professor Adam Wickenheiser uses smart materials to develop sensors and actuators for bird-scale aircraft, which are one- to two-foot, unmanned aircraft that may one day be used for monitoring or surveillance missions close to the ground or within cities. Wickenheiser examines the fluids, structure, and electrical circuits together to see how they combine to give an efficient design to the aircraft.

And that's not all.

We're just getting started

More a representative sampling than an exhaustive list, the projects cited above demonstrate the range of SEAS research in fluid dynamics. The professors named above also conduct other fluid dynamics research, whether experimental, theoretical, or computational. And we haven't yet even mentioned some of the more novel projects.

Flying snakes and GPUs:

"It's often the case that solutions in nature surprise us with how clever they are," says Professor Lorena Barba. Her research with what is commonly called the "flying snake" gives Barba reason to think that.

It turns out that flying snakes, which live in rainforest canopies in East Asia, "have a very peculiar method of locomotion: they jump from tree branches, change their body shape, and adopt a posture that allows them to glide," explains Barba.

An internationally recognized leader in computational science and engineering, Barba joined SEAS this fall as an associate professor; she previously had been on the faculty of Boston University. She started this project in Boston and continues her collaboration with Dr. Jake Socha, a biologist at Virginia Tech University, and Dr. Pavlos Vlachos, a fluid dynamics experimentalist at Purdue University. She "bring[s] the tool of computing to this project," she says.

In earlier phases of the project, her colleagues took videos of the snakes and built models of their locomotion, which they then tested in a wind tunnel. In the process, they discovered something surprising: the body of the snake can generate quite a bit of lift, and if the shape it adopts hits the air at just the right angle, it gets another boost.

Barba then built a computer model to study the fluid dynamics of the snake's body, and as the team looked at several configurations of its shape in the air, they found that her

computational results were consistent with the experimental results: "the shape of the snake has a sweet spot where it gets extra lift," she concludes.

Interestingly, Barba did this work using GPUs, a technology that was originally developed for video games. GPUs, or graphical processing units, are a form of parallel processing that uses thousands of processing cores instead of the dual- or quad-core processors that are common in desktop or laptop computers. To be able to do the computations necessary to model the snake's body, Barba and her students wrote software from scratch that uses GPUs. "A bunch of teenagers in basements throughout the world essentially funded this technology that turned out to be very useful for science," she muses, "and now I'm putting snakes on these little graphic cards."

While an immediate goal of projects such as this is to try to understand how we can learn from nature to better design aerodynamic vehicles, the bigger, long term goal for Barba is to learn how to apply engineering to what she calls "these frontier areas."

"The most interesting problems probably are going to be found in the intersection with another discipline. For us, it's biology," she observes. "I like to think of myself as a computational explorer, so as an explorer you want to go to unchartered lands with your team. That's what it's about."

The fluid dynamics of human birth:

Professor Megan Leftwich, who came to SEAS nearly two years ago after finishing her Ph.D. at Princeton and a postdoctoral fellowship at Los Alamos National Lab, is fascinated by the fluid dynamics of human birth.

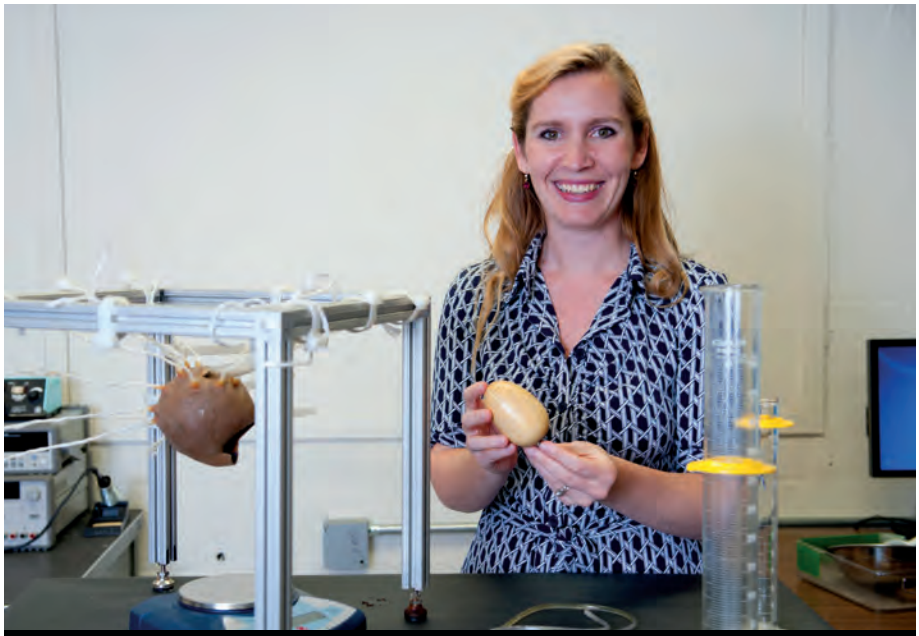
"We know very little about how human birth works from a fundamental physics view," she explains. "It's fundamentally a fluid dynamics process: there's lots of fluid and it has to matter; it has to be doing something. But, we sort of do obstetrics by brute force." She hopes to change that, of course.

Despite what we all may think about the birthing process being completely natural, Leftwich argues, "it's not just something any woman can do." In the U.S., one-third of the babies born are delivered surgically, and in China the percentage is closer to one-half.

The advent of modern medicine has dramatically reduced infant and mother mortality, but Caesarian- or "C-sections" are not the optimal birthing method for either mothers or babies. For mothers, C-sections generally require a longer recovery period than vaginal births, and they are associated with a higher incidence of emotional distress following the birth. For babies, the benefit from passing through the birth canal is two-fold: the canal squeezes the baby and lets out the fluid inside the baby, readying him or her for the air environment, and it transfers to the baby all the good bacteria that live in it. According to Leftwich, the increase in allergies that doctors are seeing in our youngest generation is thought to be linked to C-sections.

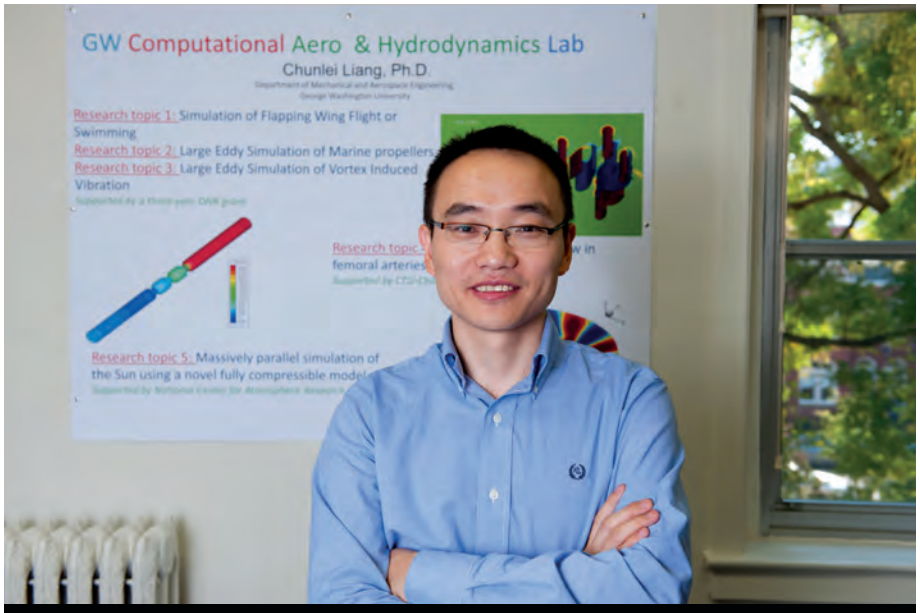
Working closely with clinicians from the School of Medicine and Health Sciences' Department of Obstetrics and Gynecology, Leftwich and her students are studying various issues related to the fluid dynamics of birth. In their lab, they have custom-made a physical model of a uterus that they are using to perform experiments. The model is made of latex and includes an egg-shaped sphere that mimics a fetus.

In one project, they change the angle of the fetus' position and see how those geometric changes affect the forces required to remove the fetus. In another project, they change the properties of the amniotic fluid to see how those changes affect the forces required to remove the fetus. A post-doctoral student coming to her research group will complement these efforts with computer models he will create of the experiments.



Professor Megan Leftwich's team conducts experiments on the fluid dynamics of human birth using a custom-made model of a uterus

"We know very little about how human birth works from a fundamental physics view."



Professor Chunlei Liang specializes in developing numerical methods to solve partial differential equations on unstructured grids that have applications to an array of real-world fluid dynamics problems

> "The sun is doing fluid experiments every day, and my research treats the sun as a lab."

Leftwich points out that her work is in its early stages, but she envisions being able to make recommendations that can be used in developing clinical guidelines in the future to help doctors safely deliver more babies vaginally. For example, by changing the angle of the "fetus" in their model and studying the forces on it at each point, Leftwich and her team plan to model interventions that might occur when the mother is too exhausted to push or the fetus is slightly misaligned. And from this, they hope to help determine the safe limits of intervention. "We can say at what point that force becomes so strong that you risk injuring the baby. We're not nearly there yet," she allows, "but we can move toward clinical guidelines to help in these situations."

Space weather:

Yes, that's right: space weather. Space weather is the term given to the Sun's solar storms (electromagnetic disturbances) that travel through space and affect the Earth. In 1859, when the world experienced the powerful geomagnetic solar storm known as the "Carrington Event," the consequences were, relatively speaking, limited: the storms caused telegraph systems all over Europe and North America to fail. Today, the economic losses caused by a similar solar storm would total billions of dollars, as surges in power grids would cause extensive blackouts and damage to the satellites on which we are increasingly dependent.

If we could better predict space weather, we could mitigate its effects; but as it turns out, that happens to be much more difficult even than forecasting weather here on Earth.

To be able to better predict space weather, we need to build better models of the fluid dynamics of the sun, and this is the goal Professor Chunlei Liang has set for himself. Because the outer one-third of the sun is composed of temperature-stratified gas, it doesn't rotate uniformly as a rigid body does. In fact, the sun's equatorial region rotates faster than its polar regions do, and this differential rotation poses an extremely challenging fluid dynamics problem that is difficult to model. "The sun is doing fluid experiments every day," explains Liang, "and my research treats the sun as a lab."

Liang started studying solar physics as an engineering research associate at Stanford University, and since joining SEAS in 2010, he has extended his research by working closely with the National Center for Atmospheric Research (NCAR) to try to build better models. And he is succeeding.

Liang himself performed research at NCAR during his first three summers at SEAS, and NCAR now funds one of his doctoral students under its prestigious Newkirk Graduate Fellowship. Liang and his student built new software for NCAR that includes a fully compressible model for the convection and rotation of the outer one-third of the sun's radius, and they then built massively parallel computer software to simulate the physics of it. This is an important advance since NCAR's software previously could solve only incompressible partial differential equations, which meant they could not simulate fluid dynamics in the outer five percent of the sun's radius, which is critical for predicting space weather.

Liang, whose expertise is in building software and developing numerical methods for solving partial differential equations, is thrilled with the progress and very optimistic about the possibilities that their research is creating. "The paper we published from our research is creating a new paradigm in this area," he observes.

Developing novel biomedical devices:

"SEAS is one of just a handful of institutions where cutting-edge research in the science of computational engineer-

ing is done," Professor Elias Balaras states softly, but with no hesitance.

Balaras joined SEAS in 2011 as an associate professor. He previously had been on the faculty of the University of Maryland, where he established a research program doing large scale fluid dynamics simulations of multiscale, multiphysics problems in physical and biological systems. Balaras quickly established his Laboratory for Computational Physics and Fluid Mechanics here at SEAS and has been busy with a number of research projects since then.

Balaras summarizes his lab's efforts this way: "We use advanced computational fluid dynamics models and advanced algorithms on high-performance computing platforms to simulate challenging problems in physical and engineered systems. We place particular emphasis on the continuum mechanics side, where we look at fluid-structure problems like the ones you find in cardiovascular circulation."

One of the fluid-structure problems in which he is especially interested is the challenge of modeling the blood interacting with the soft tissue in the heart and the large arteries. According to Balaras, simulations such as these are important for understanding disease and for developing novel biomedical devices.

One of his team's more recent efforts was a project with physicians at the University of Maryland's medical school to develop a novel procedure to assist patients with aortic stenosis, an abnormal narrowing of the heart's aortic valve.

The physicians wanted to implant a tube that they would attach to the apex of the heart on one end and to the descending aorta on the other end. The tube would serve as a conduit for some of the blood flow to provide relief to the heart as it is trying to pump blood through the aortic valve. However, they needed help with optimizing the design of the tube, and that's where Balaras' team came in.

"We performed virtual operations on the computer to simulate the before and after surgery conditions in the heart. And this way, we could select the proper size conduit, the proper type of valve, and where exactly they should connect it so sufficient blood would be pumped through the heart, as well as to the brain."

He adds with some gratification, "The procedure has been very successful and has been implanted on more than 100 patients—to our great satisfaction, too."

The right people

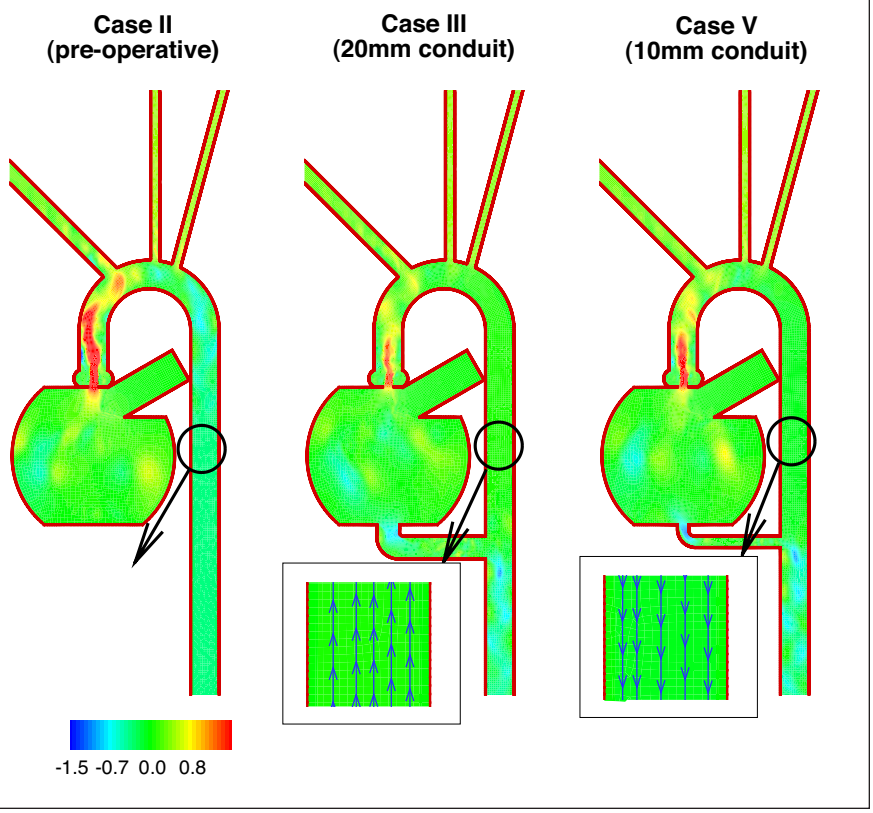
As he looks back over the last five years, Professor Plesniak is justifiably proud of the growth of the SEAS fluid dynamics research program. "We've developed six state-of-the-art research labs at the Foggy Bottom and Virginia Science and Technology campuses, and several of our computationalists have also put together *really* nice computing clusters," he states.

He is most proud, however, of the quality of faculty SEAS has hired into the program. Sure, they graduated from programs at Stanford; University of California, Berkeley; Princeton; California Institute of Technology; Cornell; Johns Hopkins University; and University of London; among other universities—and that means something. But he also recognizes the school's good fortune in being able to recruit several seasoned faculty who had already established strong research programs at other institutions and are widely recognized in the fluid dynamics community.

"It wasn't just happenstance that we developed this balance," Plesniak concludes. "Having a strong core group of faculty in place helped us recruit the outstanding faculty we have. When people see a successful and dynamic group, they want to be a part of it, but we're more successful than we even envisioned because the right people were available."

KS CHA

The diagram below shows a simplified model of the left ventricle and illustrates the effects of the conduit size on the flow of blood towards the brain



Liam Cusack

Exploring **HIS OPTIONS**

Talking to senior Liam Cusack, one gets the sense that he is a naturally curious young man who is eager to try new things and embrace adventure. Of course this is fitting for someone who aspires to be an astronaut.

In fact, Liam has tried a little of everything at GW: music, athletics, service projects, study abroad, and research. For that matter, he even has sampled majors at SEAS, moving through a couple of them before settling on a double major in systems engineering and computer science.

As he tells the story, his odyssey through engineering disciplines included an "a-ha" moment while reading a book assigned in one of his courses. He discovered that he didn't want to start a career in a field that would require him to specialize and narrow his view. Instead, Liam says, "I was more interested in how entire systems work and found out that that is exactly what systems engineering is."

Meanwhile, he has taken full advantage of the chance to explore his interests and the opportunities that SEAS and GW offer. During his freshman year, he applied for and received one of the six scholarships awarded that year through the Clark Engineering Scholars program, which was established in 2011 through a gift from Mr. A. James Clark, chairman of the board and CEO of Clark Enterprises, Inc.

As a Clark Scholar, Liam has had executives from Fortune 500 companies review his resume and has met CEOs, doctors, and yes, even an astronaut. The program also has given him someone he fondly calls a mentor, SEAS alumnus Patrick Marolda. "It is great to get his perspective on everything," says Liam.

Liam believes he benefits as well from the company of the other Clark Scholars. "One of the best things about it is that you're with a small group of people who are doing interesting things, but [those things] are different from what I'm doing," says Liam, "And you tend to reflect the people you're around, so being around people who are doing cool stuff makes me want to do cool stuff."

As part of the scholarship program, Liam even studied in Ireland for a semester during his junior year, sampling everything from life in Dublin to the more rugged landscape of western Ireland. Here on campus, he has been a member of the rowing team since his freshman year; is involved in the SEAS Student Peer Advisory Network; sings with the GW *a capella* group Sons of Pitch (his favorite activity); and worked in Professor Adam Wickenheiser's laboratory on small scale wind energy harvesting using piezo-electric materials. "I learned a lot about using MATLAB," recalls Liam, "and my knowledge using that helped me get my internship at the Johns Hopkins University Applied Physics Laboratory."

Liam says that his favorite part of working at the Applied Physics Laboratory was creating a 3-D visualization tool with mapping capability that is used in analyses and presentations. The team at Johns Hopkins was so impressed with his work the first summer that they called him during the school year and asked him to come back and intern the following summer. In fact, they didn't have a specific internship in mind for Liam and instead offered him the chance to select his own topic. "They just said, 'What do you want to work on?'" recalls Liam.

After he graduates this coming spring, Liam hopes to work in missile or cyber defense until he can submit his application to NASA. "If there was a mission to Mars, I would absolutely sign up for it," he says without any sense of hesitation. In the meantime, he'll continue to explore here on Earth.

Terry Collins

Building on **HIS SUCCESSES**

Terry Collins knows a lot about success. But he also knows about humility and gratitude. And as he talks about his successes, he does so with *both* humility and gratitude.

Terry was the first person in his family to go to college—and at MIT, no less. As a high school student in Kansas City, he had never heard of MIT and didn't know much about applying for college, and as he tells the story, he ended up there "by happenstance."

He attended a college night fair but found that the lines to speak to recruiters from the various local colleges were quite long—so he simply looked for a table with no lines. "There was a guy at a table sitting by himself with a Massachusetts Institute of Technology sign, so I I just walked up to him so he had someone to talk to," he recalls with a chuckle. He concludes the story in a more serious vein, remarking, "Lo and behold, I ended up getting a scholarship to go there."

Terry completed his bachelor's degree in electrical engineering at MIT and then began graduate studies in electrical engineering at the University of Wisconsin. He completed his master's degree in 1969, while simultaneously working in the Electronic Warfare Division at the Naval Research Laboratory (NRL) in Washington, D.C.

In 1971, he enrolled in the electrical engineering doctoral program at GW and continued working at NRL. "I was very impressed by the course material and the quality professors, especially Ray Pickholtz," recalls Terry. After receiving his D.Sc. in 1976, Terry began teaching part-time at SEAS and continued to teach a graduate course each semester until 1979.

In 1979, he was recruited to join Engineering Research Associates (ERA), a start-up company that specialized in signal processing of communications. He became technical director of the company and it grew rapidly. In 1989, ERA was sold to E-Systems, and Terry became a division general manager there. In 1995, Raytheon acquired E-Systems, consolidating all the E-Systems divisions in the Washington area, with Terry at the helm of the new division. "Even though we grew the division and increased profitability," Terry says, "I was not having much fun, so I decided to leave. I didn't have any real plans. I thought about retirement."

Retirement would have to wait, however. Shortly after leaving Raytheon in 1997, he received a call from a program office at the Department of Defense asking him to help with "a high priority program of national importance." The office was familiar with Terry's and his associates' work in telecommunications and signal processing, and the caller asked Terry to consider taking a study contract. Terry and two colleagues, Vic Sellier and Tom Murdock, discussed the opportunity and decided to form Argon Engineering Associates. "I sort of felt that starting the company was an obligation to my country," Terry states, adding, "Frankly, it's flattering to have somebody call from the senior level of DOD and say, 'Can you help me?'"

Terry and his colleagues incorporated Argon Engineering Associates, hired top quality engineers, and started to grow rapidly. In 2004, Argon went public and changed its name to Argon ST, and by 2010 Argon ST had grown to more than $360 million in revenue. The founders agreed to sell in 2010, and Boeing purchased the company in August of that year. Terry agreed to stay on for two years to help integrate Argon ST into Boeing's organization. In April of this year, he retired.

In retirement, he is taking on new interests, getting back into some old interests, and enjoying time with his family, most importantly his wife Alisann. He continues to serve on the SEAS National Advisory Council, and last spring he was elected to the GW Board of Trustees.

When asked what has surprised him the most about his career, Terry answers, "I had no idea I'd be as successful as I've been. Not a clue. I do know, however, that success happens when innovative, talented people work together as a team. I was very lucky to work with such good people."

News

Enrollment Surge in Computer Science Program

GW's Department of Computer Science has a lot to be happy about these days: graduate student enrollment is surging, admissions selectivity is increasing alongside the enrollment growth, and faculty hiring has increased, in part, to keep pace with enrollment growth.

From 2009 to 2013, the department's graduate enrollment climbed 48 percent, while the acceptance rate dropped 30 percentage points during the same period. According to its chairman, Professor Abdou Youssef, the department plans to increase its selectivity by an additional 10 percent this year.

The recent increase in enrollment reflects both the strength of the job market for graduates in computer science programs and the relatively stronger emphasis that SEAS is putting on recruiting international students. The job placement rate for the department's graduates is 100 percent, says Youssef.

During this period, the computer science department has added 20 courses and hired eight new faculty members. It also launched a new master's program in cybersecurity last year, which quickly exceeded enrollment expectations.

Recent university investments in startup packages for new science and engineering professors have helped tremendously, enabling the computer science department and other departments to recruit young faculty from the country's top Ph.D. programs and experienced professors from programs at other universities. The promise of GW's Science and Engineering Hall, scheduled for completion in late 2014, is also helping to draw top faculty and students.

"The University focus on science and engineering is getting noticed," says Youssef. This helps us recruit more students and faculty, and positions us to make significant leaps in education and research when the new Science and Engineering Hall opens."

EDITOR'S NOTE: Portions of this article are excerpted from "Computer science program enrollment surges," published in the *GW Hatchet*.

ELLIE KAUFMAN

A Happy Return

It is not every night that students can attend an event with a NASA astronaut, but that is exactly what SEAS students and others were treated to last February, when SEAS alumna and NASA astronaut Dr. Serena Auñón (BS '97) spoke on campus at the "How Do I Become a NASA Astronaut?" event sponsored by GW's Office of Alumni Programs and SEAS.

During her candid conversation with students, faculty, and community members, Auñón talked about her engineering education and career path, NASA's difficult selection process, and what it is like to work for the space agency. She also answered questions from the audience regarding commercial space travel, the international space station, and the importance of continuing space exploration.

After finishing her bachelor's degree in electrical engineering at GW in 1997, Auñón received a doctorate of medicine from the University of Texas Health Science Center in 2001, among other degrees, and earned board certification in internal and aerospace medicine. She began working for NASA as a flight surgeon in 2006, spent nine months in Russia providing medical support to the crew members of the International Space Station, and served as the deputy crew surgeon for SDS-127. In 2009, she was selected from a pool of more than 3,500 applicants as one of 14 members of NASA's 20th astronaut class. She currently serves as the medical education branch chief for the astronaut office.

According to Auñón, her interest in space goes back to her childhood. "I would sit at home and watch shuttle launches over and over and over. And my father, who was also a GW alum in engineering, sat down next to me one day and said, 'You want to work for NASA? You need to be an engineer.' So it was decided at that point."

Auñón was very complimentary of GW and the role it—and engineering—played in setting her on her career path. "Coming here to GW prepared me to launch into my next career of medicine and certainly ultimately to work for NASA," said Auñón, adding that the SEAS curriculum—particularly the senior design course—taught her how to present rigorous independent work. In a very gracious remark, she stated, "I'm happy to come and give back to the institution that gave so much to me."

A staunch advocate for engineering, Auñón also urged students, particularly those interested in working for NASA, to study one of the engineering disciplines. "Engineering prepares you to go into just about any field," she said. "NASA is engineering. That's how we got to the moon. Engineers are what make NASA run."

But the most important advice Auñón had to offer was, "Do what you love. People ask me, 'Should I do this project or that one—what would NASA like?' It doesn't matter what NASA wants or likes," Auñón argued. "It's what you want or like to do. This is your life's work, and it should be your passion. It's not worth it to you—or to NASA—if you don't love what you're doing."

ELLIE KAUFMAN

Game-Changing Technologies

SEAS had the honor last April of welcoming Rear Admiral Matthew Klunder to campus to present the 2013 Frank Howard Distinguished Lecture. In an informative and inspiring discussion on the role of the Office of Naval Research (ONR) in promoting cutting-edge research, Klunder pitched potential ideas for research collaboration with ONR, shared stories of amazing technologies ONR has developed, and even entertained the audience with a video clip from the movie *Transformers 2* that showed ONR-sponsored electric rail gun technology.

As chief of naval research, Klunder coordinates, executes, and promotes the science and technology programs of the U.S. Navy and Marine Corps, awarding approximately $2 billion in funds annually through ONR. And he continually is on the look-out for "game-changing technologies," as he calls them. Noting that ONR works in "cutting-edge, early, high-risk innovation," Klunder remarked, "We're the high-risk people."

Lest his audience think that the Navy is interested in developing only warfare-related technologies, however, Klunder spoke early and often about the many applications of the research ONR supports. "It's not just about bullets and missiles. There are lots of applications, including lots of medical applications," he argued.

Klunder repeatedly encouraged the SEAS faculty and students to look at research opportunities with ONR, reminding them of the number of ONR labs in the Washington, D.C. area and saying, "We love to do petri dish stuff with universities."

And throughout the discussion, he exhibited the modesty appropriate for an engineer or scientist exploring nature and new technologies. "When we look at technologies, we really look at an uncertain world," Klunder cautioned. "Yes, there's stuff that I know we want to develop, but there's also stuff that I don't even know we want to develop yet."

In the end, however, it comes back to the mission. Said Klunder, "I always invite you to listen, learn, and keep your ears open. You never know what opportunity you're going to bump into in terms of some innovation that can really be a benefit to our country here and our partners around the globe."

Entrepreneurial Engineers

The 2013 GW Business Plan competition, held last April, produced yet more evidence of the culture of entrepreneurship taking hold within SEAS. Three of the eight teams selected to compete in the final round of the competition were SEAS teams.

"The 2013 competition started with 109 entries and included just eight in the final round," explained Dean David Dolling. "We're proud of the fact that three SEAS teams made it all the way to the final round of competition, and of what that says about the quality of their ideas and about the spirit of entrepreneurship that we're actively cultivating within SEAS."

Members of the three teams—Graphene Plasma Technology, Revilex, and The SmartBrush—included SEAS faculty, graduate and undergraduate students, and alumni. Each team was assessed on its company's viability in the marketplace and on its presentation.

Graphene Plasma Technology received the $10,000 second place prize, as well as $5,000 for "Best Sustainable Technology," for its plan to develop a novel graphene-based additive that would dramatically reduce production costs in the reinforced plastics industry. Professor Michael Keidar, research scientist Alexey Shashurin, and undergraduate John Donahue, all of the Department of Mechanical and Aerospace Engineering, joined graduate student Luis Buitrago of the Department of Computer Science and SEAS alumnus Dr. Randy Graves (D.Sc. '78, team mentor) to form Graphene Plasma Technology.

Revilex sought to provide a disaster/emergency management solution for data collection and analysis during hospital surge/mass care. The team comprised graduate student Meg Nash (Department of Engineering Management and Systems Engineering), SEAS graduate Scott Nash (Department of Computer Science), and their mentor, Mr. Allen Herskowitz.

The SmartBrush team won the $3,000 "Audience Choice" prize—a vote calculated through Twitter followers on the day of the event—for its plan to develop an app-connected toothbrush that allows users to brush their teeth through interactive gaming. Team members included graduate students Travis Gonzalez (Department of Engineering Management and Systems Engineering) and Sina Aghli (Department of Mechanical and Aerospace Engineering) and Mr. Genki Kondo.

EDITOR'S NOTE: Portions of this article are excerpted from the *GW Today* article "Business Plan Competition Rewards Student Entrepreneurs."

2013 SEAS Student R&D Showcase Winners

ELLIE KAUFMAN

Innovation on Display

More than 70 students presented their projects and competed for a total of $16,000 in prize money at the seventh annual SEAS Student Research and Development Showcase, held during the 2013 Engineers Week celebration.

Students presented poster boards and brief summaries of their research to panels of SEAS faculty and alumni judges early in the afternoon and to the public afterwards. The day also included a reception and a keynote address by SEAS alumnus Dr. Charles Camarda (MS '80), a NASA astronaut and senior advisor for innovation to NASA's Office of the Chief Engineer.

The first place prize of $5,000 was awarded to Jiaoyan Li, a doctoral student in the Department of Mechanical and Aerospace Engineering (MAE), for her project, "The Foundation of Nanoscience: Multiple Length/Time Scale Modeling of Multi-physics for Nano/Micro Material Systems." Ms. Li's project developed a unified and integrated theoretical framework that solves three representative sample problems for mechanical wave propagation, heat conduction, and electro-magnetic input. Ms. Li is advised by Professor James Lee.

Mohammadreze Ghahremani and Hatem ElBidweihy, both doctoral students in the Department of Electrical and Computer Engineering (ECE), walked away with the second place prize of $4,000 for their exploration of energy efficient and environmentally friendly magnetic refrigeration systems. Mr. Ghahremani and Mr. ElBidweihy are advised by Professors Edward Della Torre and Lawrence Bennett.

Third place, and $3,000, was awarded to doctoral student Anastasia Wengrowski, also from the ECE department. She presented her findings in a new model that will be useful for the study of cardiac arrhythmias (an irregular heartbeat) and beta blocking drugs. Ms. Wengrowski is advised by Professor Matthew Kay.

The recipient of the Entrepreneurship Award was undergraduate Yash Jain. The biomedical engineering student designed a plasma jet that propagates plasma through an endoscopic tube to destroy cancer cells. The jet has the ability to shoot plasma up to 50 centimeters, a far greater distance than those currently on the market. According to Mr. Jain, the added distance means that plasma jets could be used surgically to treat more invasive cancers than current plasma jets can treat. Mr. Jain is advised by MAE Professor Michael Keidar.

Undergraduate mechanical engineering student Elizabeth Hubler studied the airflow through human vocal folds and how polyps or a vocal disorder can affect that airflow. With help from the GW Department of Speech and Hearing, Ms. Hubler, who won the Undergraduate Award of $2,000, created a synthetic self-oscillating model of the vocal folds. She explained that her synthetic model will help other researchers develop medical procedures and prosthetics to help people with vocal disorders. Ms. Hubler is advised by MAE Professor Michael Plesniak.

SEAS thanks RiVidium, the Bruce J. Heim Foundation, Goya Foods, LinQuest Corporation, Hegarty Research, ICES Corporation, Capital Construction Consultants, Turner Construction Company, and Siemens for their generous support and sponsorship of the 2013 Showcase.

Clark Engineering Scholars Program Grows

With the addition last spring of five members of the SEAS freshman class and four incoming students admitted to SEAS as Clark Engineering Scholars, the Clark Engineering Scholarship program now boasts 21 scholars.

The newest scholars are: Dor Hirsh Bar Gai, Adam Gray, Sean Keefer, Elliot Liskin, Gabby Potvin, Joshua Shapiro, Samantha Starr, Katherine Walker, and Ian Wong. They join upperclassmen from the Classes of 2014 and 2015.

The scholarship program was established in January 2011, with an $8 million gift from Mr. A. James Clark, chairman of the board and CEO of Clark Enterprises, Inc. Now in its third year, the program provides annual, merit-based scholarships and leadership training for the school's top undergraduate students.

And the Pelton Award Goes to...

SEAS celebrated its 4th annual Pelton Senior Design Competition last May, awarding first prize to Michelle Cano of the Department of Computer Science. Ms. Cano won the competition for her senior project, Text for All Ages: Mobile Adult Literacy.

Five individual students or teams of students representing the school's five departments competed for the SEAS-wide award, presenting their projects to a panel of faculty and alumni judges and to an audience of faculty, classmates, alumni, and family members. Their projects were selected by the department chairs from

Left to right: **Clark Scholars Elliot Liskin, Ian Wong, Dor Hirsh Bar Gai, Samantha Starr, and Adam Gray**

ELLIE KAUFMAN

2013 Pelton Award Participants

all the senior design projects completed last year.

Second prize was awarded to the Department of Electrical and Computer Engineering (ECE) team for its work on Harvest Home, the solar house that a larger team of students from SEAS and GW, Catholic University of America, and American University built for the U.S. Department of Energy's 2013 Solar Decathlon competition. The ECE team members included: Asmae M'nebhi, Christopher O'Brien, Damon McCullough, Scott Baker, Caroline Litchfield, Jiaxuan Shang, Benjamin Miller, Joshua Rooks, John Gearheart, and Loreto Pantano.

Derek Najdzin and Alisa Tulio of the Department of Mechanical and Aerospace Engineering received the third place prize for their project, which investigated the effects of leading and trailing edge devices on the propulsive efficiency and aerodynamic characteristics of varying camber hydrofoils.

Also competing were Claire Silverstein, Jason Robertson, and Tara Fogarty of the Department of Civil and Environmental Engineering (CEE), and Madeleine Brannon, Eileen Le Guillou, Joshua Klein, Aliya Dossayeva, and Phillip Graeter of the Department of Engineering Management and Systems Engineering (EMSE). The CEE team presented its work on the design of the Belcrest Center Office Building, and the EMSE team presented the volunteer system its members designed to assist senior citizens during power outages.

The Pelton Award was established in 2009 by Dr. Joseph Pelton, a former ECE faculty member, as a school-wide competition to encourage innovation and entrepreneurship among SEAS students.

Team Capitol DC Places 7th in Worldwide Solar Decathlon

"If you build it, they will come" is a popular take on a line from the movie *Field of Dreams,* but evidently it also holds true for the students of Team Capitol DC, whose entry placed 7th in the 2013 U.S. Department of Energy Solar Decathlon and drew 18,000 visitors during the competition, which was held in October in Irvine, CA.

The Solar Decathlon is a biennial competition that challenges collegiate teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive. Preparations for the event began more than two years ago, when students and faculty from GW, Catholic University of America, and American University joined forces to enter the Solar Decathlon as Team Capitol DC.

After winning one of the 20 slots available for this worldwide competition, students from the three universities got busy designing and building the team's entry, the Harvest Home. GW was responsible for all the engineering, interior design, handicap access, and sustainable design issues, while Catholic University students were responsible for the architecture, and American University students handled the media and communications for the team.

"All the teams competing in the solar decathlon were required to design, build, and operate their homes during the competition, and this was all student-led," said Professor Kim Roddis, the lead SEAS professor on the team. "Faculty provided guidance, but this was the students' project."

The concept for the Harvest Home was to create a home that harvests natural resources to power it and help support its future resident. Students constructed it as a 700-square-foot, "net-zero energy" structure, one that is designed to produce as much energy as it consumes. The solar thermal system is responsible for heating the home's water and is a closed loop system that does not require electricity to keep the water heated, as conventional systems do. The Harvest Home's ecologically responsible design also uses storage tanks to collect rainwater and includes gardens on the home's perimeter to supply some food for the homeowner. From the beginning, the Harvest Home was designed to be donated to a wounded American veteran who has returned from the wars in Afghanistan or Iraq. Team Capitol DC worked closely with Wounded Warrior Homes, which selected a veteran to occupy the home. Immediately following the competition, the Harvest Home was transported to San Diego and will soon be moved to its permanent site in Vista, CA.

"One of the things most unique about our house was that it really was a house that was going to be occupied by someone," said Roddis. "It was a more complete home than any of the other houses in the competition, because very few of the others were going to remain a house. We're very proud of the fact that we donated our house to the Wounded Warrior Homes."

In addition to "doing good," the students of Team Capitol DC also "did well." Referring to the team's 7th place finish, Dean David Dolling said, "Bearing in mind that this was our first foray into this intense competition, this was truly an achievement. It was a very tight race at the top. The competition was scored on a possible 1,000 points, and only 30 points separated Team Capitol DC and the winning team. But most importantly, our SEAS students had a unique and extraordinary learning experience."

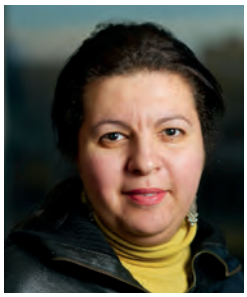
The SEAS students who participated in the project echoed that sentiment. Farah Albani, a junior studying systems engineering, was a member of the team and one of the students who traveled to California for the competition. Responding to a question about the impact on her of the solar home project, Ms. Albani said, "This is something that was of some interest to me earlier, but after this competition I'm so passionate about it. Being a part of something so amazing, I walked away with a different mindset on the future of energy."

JASON FLAKES/US DEPARTMENT OF ENERGY SOLAR DECATHLON

New Faculty

Dr. Lorena Barba

Lorena Barba is an associate professor in the Department of Mechanical and Aerospace Engineering. She received her Ph.D. degree in aeronautics from the California Institute of Technology. Prior to joining SEAS in fall 2013, she was an assistant professor of mechanical engineering at Boston University and a lecturer/senior lecturer of applied mathematics at University of Bristol, UK. Professor Barba's research interests include computational fluid dynamics, fundamental and applied aspects of fluid dynamics, fast algorithms, and scientific computing on GPU architecture. Professor Barba is an internationally recognized leader in computational science and engineering.

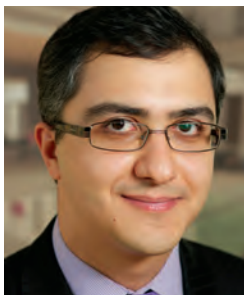


Dr. Mona Diab

Mona Diab joined SEAS in January 2013 as an associate professor in the Department of Computer Science. Prior to joining GW, Professor Diab was a research scientist and adjunct associate professor at Columbia University, a postdoctoral research scholar at Stanford University, and a research associate at the University of Colorado at Boulder. She received her Ph.D. degree in computational linguistics in 2003 from University of Maryland, College Park and her M.S. degree in computer science in 1997 from GW. Professor Diab is a recognized expert in the area of Natural Language Processing (NLP) and one of the foremost scholars in Arabic NLP.

Dr. David Broniatowski

David Broniatowski is an assistant professor in the Department of Engineering Management and Systems Engineering. He received his Ph.D. degree from the Massachusetts Institute of Technology. His research interests include decision-making under risk, group decision-making, system architecture, and behavioral epidemiology. Professor Broniatowski joined SEAS in fall 2013. Prior to that, he was a postdoctoral fellow at the Center for Advanced Modeling in the Social, Behavioral, and Health Sciences at Johns Hopkins University.



Dr. Amir Etemadi

Amir Etemadi joined SEAS in January 2013 as an assistant professor in the Department of Electrical and Computer Engineering. He received his Ph.D. degree from the University of Toronto in 2012. His research interests include integrating distributed energy resources, realizing microgrids, and developing smartgrid technologies. He is particularly interested in the modeling and control of electronically-interfaced renewable resources such as wind and solar power plants. Professor Etemadi is a member of IEEE Power Engineering Society and an active member of the IEEE Taskforce on Microgrid Control.

Dr. Leila Farhadi

Leila Farhadi joined SEAS in January 2013 as an assistant professor in the Department of Civil and Environmental Engineering. She received her Ph.D. degree in civil and environmental engineering from Massachusetts Institute of Technology in 2012, and before coming to GW held a research scientist position at NASA Goddard's Global Modeling and Assimilation Office. The main focus of her research is land-atmosphere interaction and boundary layer processes, as well as optimization techniques and parameter estimation in hydrology.

Dr. Ekundayo Shittu

Ekundayo Shittu is an assistant professor in the Department of Engineering Management and Systems Engineering. He completed his Ph.D. degree in industrial engineering and operations research at the University of Massachusetts Amherst. He conducts research in the economics and management of climate change by focusing on the interplay between public policy and energy technology investments. He also investigates the transaction costs faced by firms dealing with market uncertainties, and how firms can choose from alternatives that mitagate market and institutional hazards. Prior to joining SEAS in fall 2013, Professor Shittu was an assistant professor at the A.B. Freeman School of Business at Tulane University.

Dr. Danmeng Shuai

Danmeng Shuai joined SEAS in fall 2013 as an assistant professor in the Department of Civil and Environmental Engineering. He received his Ph.D. degree in environmental engineering from the University of Illinois at Urbana-Champaign. His research interests include novel materials (such as multifunctional nanomaterials) for water treatment with a reduced energy footprint, renewable energy production, and resource recovery.

SEAS Research Review

Success is its own reward, and SEAS faculty are continuing to have a good deal of it in their bids for research funding.

Vying with faculty across the country for major research grants and awards, SEAS faculty obtained funding in the last academic year from a number of National Science Foundation (NSF) programs, other governmental agencies and laboratories, and corporations.

Building on the school's success the previous year in winning NSF CAREER awards, Professor Timothy Wood of the Department of Computer Science won a CAREER grant for his work on cloud computing. Cloud data centers run web applications that millions of people rely on and use daily. These applications are growing in size and complexity, and Professor Wood's research aims to improve their efficiency and reliability. The CAREER grant under which he is conducting this research is the most prestigious award that the NSF gives to junior faculty.

Professor Gabriel Sibley, also of the Department of Computer Science, studies perception in robots, and he received a $1.2 million grant from Motorola Mobility LLC for the research project "Perception in the Pocket," as well as funding from the CIA to develop perception algorithms that improve the energy-efficiency of ground robot tele-operation.

U.S. Patent Innovations, LLC awarded nearly $445,000 to Professor Michael Keidar of the Department of Mechanical and Aerospace Engineering to study ways to develop a plasma device that will cut human tissue more efficiently, an effort that could minimize the need for blood transfusions and other products for patients during surgery.

A German automotive manufacturer consortium comprised of BMW, Audi, Daimler, VW, and Porsche awarded a $419,000 grant to the

National Crash Analysis Center and Professor Kennerly Digges of the Department of Civil and Environmental Engineering to study particular testing requirements of the U.S. standard on occupant crash protection in frontal crashes.

In the Department of Electrical and Computer Engineering, Professor Tian Lan is conducting research under an NSF grant on per-process energy accounting in mobile systems. Per-process energy accounting is important for software evaluation and optimization, as well as for system energy management and security.

"These grants reflect the range and quality of the research our faculty are conducting, but they are just a sample," said Dean David Dolling. "During the 2012-2013 fiscal year, faculty expenditures on research exceeded $15 million. And we fully expect our research funding to continue to increase."

Faculty Excellence: Building a Tradition

In what has now become a tradition, SEAS celebrated its fifth annual Faculty Research and Teaching Awards Presentation last April, honoring the 2013 recipients of the awards, Professors Michael Plesniak, Yin-Lin Shen, and Pinhas Ben-Tzvi.

During the ceremony to honor the three, Dean David Dolling highlighted their accomplishments and noted the unusual circumstances of the 2013 awards: all three awardees are members of the same department (the Department of Mechanical and Aerospace Engineering), and one of the awardees received both awards in the young faculty category.

Left to right: **Professor Plesniak, Dean Dolling, Professor Ben-Tzvi and Professor Shen**

JESSICA MCCONELL-BURT/GWU

Professor Michael Plesniak, the chair of the department, was named the 2013 SEAS Distinguished Researcher in recognition of his seminal contributions to the field of fluid dynamics. Introducing Professor Plesniak, Dean Dolling remarked, "Over the course of his academic career, Professor Plesniak has built a world-class research program focused on experimental fluid mechanics. He is a particularly respected scholar in the area of complex turbulent flows and bio fluid dynamics and is considered a leading expert in experimental work on modeling the fluid mechanics of human speech."

The 2013 SEAS Distinguished Teacher Award was presented to Professor Yin-Lin Shen for his dedication to both teaching and advising. "Professor Shen has devoted his teaching career to serving his students both in the classroom and outside it," said Dean Dolling. "He brings innovation and the highest standards of professional ethics to the classroom and is a committed advisor and mentor to his students." Dean Dolling also remarked that Professor Shen's efforts have not gone unnoticed by his students, who have selected him to receive the department's annual Professor of the Year Award five times.

In a rare occurrence for the faculty awards, Professor Pinhas Ben-Tzvi received both the 2013 SEAS Outstanding Young Teacher and the 2013 SEAS Outstanding Young Researcher Awards. He was named the Outstanding Young Teacher in recognition of his efforts to develop the robotics program at SEAS through innovative curricula and teaching methods and his STEM-related mentoring and outreach activities to the local community.

He received the Outstanding Young Researcher Award for his exceptional contributions to robotics, mechatronics, mechanism design and integration, systems dynamics and control, and sensing and actuation. Noting that Professor Ben-Tzvi "hit the ground running" when he arrived at SEAS, Dean Dolling said of him, "Professor Ben-Tzvi has quickly established himself as one of the leading researchers in the field of robotics, mechatronics, and controls. He founded the GW Robotics and Mechatronics Research Laboratory and used the lab to help launch the GW robotics program. In less than five years' time, he has won several major research grants and has been able to build a diverse research program that covers theoretical and applied research on mobile field robots, autonomous systems, mechatronics, and controls."

Recent Retirements

SEAS extends its best wishes and appreciation to three faculty members who retired during the past academic year and have become emeriti professors.

Dr. Howard Eisner

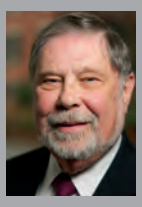
Howard Eisner of the Department of Engineering Management and Systems Engineering retired after 24 years at SEAS *(bottom left)*. Considered the father of systems engineering at GW, Professor Eisner was instrumental in the program's early curriculum development and had the vision to establish off-campus programs that serve industry.

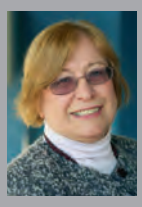
Dr. E. Lile Murphree

E. Lile Murphree, also of the Department of Engineering Management and Systems Engineering (EMSE), retired after 28 years at SEAS *(bottom middle)*. He was chairman of the Department of Engineering Management (the predecessor department of EMSE) from 1991 to 1997, and later served as founding chair of the EMSE department. He also served as the director of the SEAS Virginia Campus programs from 1998 to 2001.

Dr. Martha Pardavi-Horvath

Martha Pardavi-Horvath of the Department of Electrical and Computer Engineering retired after 24 years on the SEAS faculty *(bottom right)*. A distinguished educator and researcher in the field of magnetics, she capped off her career as the associate dean for academic affairs at SEAS from 2006 to 2012.





Notable Accomplishments

Awards, Honors & Patents:

Tarek El-Ghazawi (ECE): was awarded the Humboldt Research Award, a prestigious international research award. The award is granted to academics whose fundamental discoveries, new theories, or insights have had a significant impact on their own discipline and who are expected to continue producing cutting-edge achievements in the future.

Azim Eskandarian (CEE): was elected a Fellow of the American Society of Mechanical Engineers (ASME).

Carl Landwehr (research scientist, Cyber Security Policy and Research Institute): was inducted into the national Cyber Security Hall of Fame. Dr. Landwehr was also named an Institute of Electrical and Electronics Engineers (IEEE) Fellow.

Roger Lang (ECE): was awarded the Institute of Electrical and Electronics Engineers (IEEE) Geoscience and Remote Sensing Society's Distinguished Achievement Award.

Murray Loew (ECE): received a Fulbright Distinguished Chair in Advanced Science and Technology Award for 2013-2014. He will work at the Australian Defence Science Technology Organisation in Adelaide, and his research is expected to have application in defense, medicine, and industry.

Michael Plesniak (MAE): was selected as a 2013 American Institute of Aeronautics and Astronautics (AIAA) Fellow. Each year, one Fellow is selected in this very competitive process for every one thousand voting members of the AIAA.

Kausik Sarkar (MAE): was elected a Fellow of the Acoustical Society of America for his contributions to the modeling of ultrasound microbubbles.

Ergun Simsek (ECE): was selected to participate in the National Academy of Engineering's (NAE) 2013 Frontiers of Engineering Education symposium. The NAE selected 73 of the nation's most innovative, young engineering educators to participate in the symposium.

Mona Zaghloul (ECE): achieved the status of Institute of Electrical and Electronics Engineers (IEEE) Life Fellow in January 2013 in recognition of many years of loyal membership and support of the IEEE activities.

Jason Zara (ECE): and his former collaborators from Duke University and UNC-Charlotte were issued U.S. Patent #8,400,697, "Scanner apparatus having electromagnetic radiation devices coupled to MEMS actuators," on March 19, 2013.

Books:

Howard Eisner (EMSE): is the author of *Topics in Systems*, published by Mercury Learning and Information.

Rumana Riffat (CEE): authored the book *Fundamentals of Wastewater Treatment and Engineering*, published by CRC Press.

Media Mentions:

Joseph Barbera (EMSE): was quoted in the May 10 *Wall Street Journal* article, "Rescued But Medically Still at Risk." Professor Barbera was also interviewed on NewsChannel 8 on September 17 about the response to the Navy Yard shootings the previous day.

Rachelle Heller (CS): authored an op-ed article, "H1-B visa program has a gender gap problem," which was published in *The Hill* on March 28.

Lance Hoffman (CS): was quoted in the April 4 *Bloomberg* article, "Cyberattacks Abound Yet Companies Tell SEC Losses Are Few," and in the August 12 *Washington Post Express* article "Cyber Heroes in Training."

Michael Keidar (MAE): was quoted in the November 29 *Inside Science* article "Leukemia-killing Plasma Beam Could Offer New Cancer Treatments." Professor Keidar also was quoted in the June 6 *Scientific American* article "'Plasma Scalpels' May Make Surgery More Precise and Less Bloody."

Julie Ryan (EMSE): gave an on-air interview about information warfare to the Voice of Russia on April 9.

Branimir Vojcic (ECE): was quoted in the January 25 *Wall Street Journal* article "Picturing Percentages."

Abdou Youssef (CS): was quoted in the March 11 *Computerworld* article "Foreign students now a majority in computer science grad schools."

DEPARTMENT KEY:

- **CEE:** Department of Civil & Environmental Engineering
- **CS:** Department of Computer Science
- **ECE:** Department of Electrical & Computer Engineering
- **EMSE:** Department of Engineering Management & Systems Engineering
- **MAE:** Department of Mechanical & Aerospace Engineering

Achievement


Alyse Stone

An Enterprising Young Woman

Anyone who knows Alyse Stone knows about her passion for design. But how did a young woman with such a strong interest in the fashion and retail industry end up studying mechanical engineering?

The summer after her junior year of high school, Alyse attended the LEAD (Leadership Education and Development) Summer Business Institute, a development program and business plan competition held at Stanford University. While the program focused primarily on promoting entrepreneurship, it helped Alyse recognize her interest in creating practical design solutions and gave her a glimpse into the engineering world.

"I was always so big on finding that million dollar idea, pursuing entrepreneurship and being my own CEO," Alyse remembers, "but I was introduced to engineering through the program, and I realized I could do all of those things and still be an engineer."

At the end of the three-week program, Alyse had the chance to present her idea—a retractable high-heeled shoe. Still excited by the idea several years later, she entered her retractable heel into the Entrepreneurship Pitch Competition Awards sponsored by Dean David Dolling during her sophomore year. And she ended up walking away with the $2,000 first place prize.

While she still plans to continue developing the idea in the future, Alyse temporarily has put the project on the back burner to pursue other interests and opportunities during college. At SEAS, she has been involved with SEASSPAN (the SEAS Student Peer Advisory Network) since the spring of her freshman year, and she also served as the junior representative to the Engineers' Council. She is most proud, however, of leading the effort to plan last year's Engineers' Ball. When asked what is so unique about "E-Ball," Alyse cites a number of special qualities about the ball that "speak volumes to SEAS' family aspect."

Alyse hasn't restricted her activities to SEAS, however. After her sophomore year, she was selected to serve on GW's Colonial Cabinet. The Colonial Cabinet staff help guide incoming freshman through the orientation process, and the selection process for it is very competitive. This year, she will continue her work with the President's Council for Diversity and Inclusion, as well as work with the GW Office of Undergraduate Admissions to help interview prospective students. "I'll do interviews twice a week on campus and then I'll also get to travel to help interview prospective students," she says.

A Jackie Robinson Foundation Scholar, Alyse also has benefitted from the many off-campus experiences the foundation offers its scholars. She has had internships with her corporate sponsor, Northrop Grumman; is assigned mentors who support her personal and professional development; and has attended leadership development conferences. She is grateful to the foundation and her sponsors for the scholarship and particularly for the mentorship, and she credits her mentors with helping her develop both her professional and academic skills. She includes among them her mentor at SEAS, Mr. Howard Davis, the director of the SEAS Undergraduate Services Office, saying simply, "I have awesome mentors."

In the end, this student, soon-to-be businesswomen, and community leader manages her very full plate by following the advice of another mentor, her father: "hard work can get you anything you want."

A Practical Man

Originally from New York City, John Wittrock knew he wanted to attend college in a city he wasn't already accustomed to. After visiting Washington, D.C., John decided that GW was the place for him. D.C. offered unfamiliar territory to explore, and GW had the sort of environment that would allow him to balance his classes with extracurricular activities.

"I think an engineering school isn't complete without a group of students who are actively involved in what they're doing outside the classroom," muses John. "You need to extend what you learn in the classrooms and try it outside the classroom."

And that is exactly what he did. He immediately immersed himself in his computer science classes, began working toward a minor in mathematics, and quickly got involved in projects outside of the classroom. Doing so helped him "get outside of my comfort zone a bit," he says.

He became active in student theater, designing sound and lighting, and designing and building sets, as he had done throughout high school. He also became active in the SEAS student-led GW Tech Collective, presenting workshops for fellow students, as well as serving as the vice-president of the GW chapter of the computer science association ACM. "I really enjoy teaching and helping someone else," John offers. "Being a technical director for theater, you end up doing a lot of teaching. And running workshops, you teach, too."

Because he is someone who "like[s] my engineering with a dose of social relevance," John conducted research during his


John Wittrock

sophomore and junior years on the Scantegrity voter-verifiable voting system with Professor Poorvi Vora. Working on the project, he saw how one can use cryptography and math to try to mitigate attacks on voting systems. "Theoretical things are not very interesting to me if you can't apply them," says John, "so seeing that there was an application for all of this discrete mathematics was really cool, especially when it came to cryptography and being able to apply it to something as crucial as voting."

Following his research with Professor Vora, he began working with Professor Gabriel Parmer on operating systems research, helping him examine composite systems. "Research has been the defining aspect of my time at GW," recounts John. "I would encourage undergraduates to get into doing research with their professors, because I don't think there's anything more interesting and rewarding than being able to do something that's never been done before."

Although he certainly enjoyed his research and other activities outside the classroom, John still kept his priorities in line and took his studies seriously, earning the 2013 SEAS Distinguished Scholar Award. And when he graduated last May, he capped off his undergraduate years with an eloquently delivered Distinguished Scholar address that celebrated not his own successes but those of the classmates in whose company he learned.

The Dynamic Duo

Individually, Emma Fletcher and Adam McCormack have plenty of energy. But when they team up, that energy transforms the two friends into a dynamic duo brimming with enthusiasm and ideas.

Despite their already busy schedules, the two SEAS students decided during their junior year to start hosting workshops on the weekends so they and their peers could learn new things they weren't already learning in the classroom. The idea—which they named the GW Tech Collective—caught fire, and their student-run workshops became a hit among their peers.

When asked about how they decided which events and workshops they wanted to host, Emma replies, "We started holding events *we* would want to go to." For each workshop, they chose a topic, found a student with knowledge about that particular topic, and spread the word to their friends.

Adam McCormack and Emma Fletcher

"It is a great opportunity if you're more knowledgeable about a topic to share that knowledge, lead a group, teach, and get public speaking practice," says Emma about the student-driven GW Tech Collective. The group, which has grown in membership since its inception in 2011, now hosts workshops twice monthly.

"Anything you want to do, we'll help you do that," adds Adam after listing some of the group's most popular events, which have included Arduino workshops, 3-D printing workshops, and the "Minty-fresh Beats" workshop that taught students how to turn an Altoids mint box into a fully functional speaker. Based on demand from SEAS students, the group also branched out to other sorts of activities that have ranged from movie nights to a field trip to Micron Technology's chip factory in Manassas, Virginia.

Emma and Adam graduated last May, but over the course of their four years at SEAS they each were involved in a number of other activities beyond the GW Tech Collective. The Tech Collective, however, is the activity of which they are most proud—or at least it's the activity from which they learned the most. "Everything was a lesson. Everything was a success—even our failures, because we could learn from them," says Adam.

Branching Out

Caroline "Carly" Litchfield knew that GW was the place for her when she visited campus on Admitted Students Day during her senior year of high school. She remembers thinking that "everyone was super upbeat, really excited, and wanted me to be friends with them already." She also recalls comparing the visit to other colleges and thinking that her soon-to-be SEAS classmates "seemed, by far, the most fun and interesting group of engineers I had met."

When she returned to GW in the fall to start college, Carly was ready to dive into campus life. She made friends quickly at SEAS, as she expected, and settled into her coursework. But she soon was ready to branch out.

She decided to join the Panhellenic sorority Sigma Kappa. Not many female engineers are part of "Greek life" on campus, but Carly could not have been happier with her decision, so she consistently encouraged her SEAS sisters to join Greek life, too. "I met so many diverse people through the Greek network, found out about different events, and got integrated with the rest of the school," she says.

Carly eventually became the vice president of finance for her sorority, seeing this as a complement to her SEAS activities. During her four years, she served as the student

Carly Litchfield

representative on the SEAS Undergraduate Curriculum Committee, the senior class representative on Engineers' Council, and the electrical engineering student lead—along with Joshua Rooks—on the Team Capitol DC Solar Decathlon project *(see story on page 19)*. Perhaps Carly's drive to be so active in the community was fueled by her philosophy that "people with the most success do something else interesting."

Carly didn't limit herself to campus—or even the U.S.—as she looked around to do "something else interesting." She decided to study abroad in Ireland and ended up living right in the heart of Dublin. She admits she was hesitant about going at first but is very thankful she pushed herself to go.

After returning from Dublin, she continued her mission to meet new people by going to start-up events in D.C. and networking with entrepreneurs. She says she would love working at a start-up company, because they provide a "work hard, play hard" atmosphere, which is perfect for Carly, who isn't a huge fan of "heels, suits, and formality."

Carly graduated last spring with a bachelor's degree in electrical engineering, finishing her undergraduate education with a strong foundation for her graduate studies and an impressive grade point average. Although ready to start the next phase of life, she left SEAS with a treasure-trove of memories, saying simply, "the SEAS community is unlike any other school."

Non-creative Thinkers Need Not Apply

Deep space exploration is still only a dream for humanity, but one that NASA is working on—and last summer it enlisted the help of some unexpected participants, including SEAS doctoral student Christopher Blower.

At NASA's Innovative Conceptual Engineering Design (ICED) 2013 Innovation Boot Camp, Christopher and approximately 50 others were challenged to think about ways to mine asteroids to harvest the water or metals that humans would need for deep space explorations.

Deep space missions would be tens of years long. Repairs would be needed along the way. Water obviously would be essential, but carrying the necessary amounts of water and the metals used for repairs would be impractical. "But if we could harvest water or metals out of asteroids, we could pick them up along the way and then go on from there. We could repair at a local site rather than come all the way back to Earth," explains Christopher.

Christopher attended the boot camp at the invitation of NASA astronaut Dr. Charles Camarda (MS '80), who is currently the senior advisor for innovation to the Office of the Chief Engineer at NASA. At last year's SEAS Student Research and Development Showcase, which Dr. Camarda attended as the keynote speaker, the two struck up a fairly lengthy conversation about Christopher's research, and Dr. Camarda ultimately invited him to participate in the boot camp.

"Being an international student and being able to do something NASA-related is really cool, considering I've wanted to work at NASA since I was 12," remarked Christopher. "I actually got the chance to work with them."

Dr. Camarda leads the workshop, which is held annually and focuses each time on one "epic" engineering challenge that NASA wants to solve. "NASA is trying to get universities and high schools involved. By making the challenge more open to the public, they might find an advantageous solution other than the one their engineers are focusing on," Christopher explains. "The overall goal is to try to develop a methodology to fail quickly and cheaply. Rather than simply going with 'Option A,' they will advance every subject to the point that they can quickly see which one will be best or if a combination of ideas will be preferable."

The participants in this year's challenge included 22 university students and 30 high school STEM (science, technology, engineering, and math) teachers. Participants spent the week learning about the challenge from an array of subject matter experts, and they then were placed in teams tasked with generating ideas to address the challenge and with developing ways to teach the topic to high school STEM students.

The presenters included experts in orbital mechanics, asteroid capturing techniques, geology, mineralogy, conceptual design development, efficient failure, and other areas. Although Christopher attended as a participant, he also was one of only two university students who were invited to present material. He presented the challenge from his field of study, bio-inspiration in biology and engineering.

Christopher is still engaged with the program and plans to promote it at GW and become an ambassador for it. He has ideas for smaller scale projects he can introduce on campus and is optimistic about the chances of other SEAS students being selected for future innovation boot camps. "Now that we have our foot in the door, we're in a good position," says Christopher with a nod of appreciation to Dr. Camarda.

Christopher Blower

PHOTO COURTESY OF MATTHEW WILKINS

Matthew Wilkins

"Pedal-ing" Solutions

Many of us dabble in our interests on the side, wishing we could find more time to devote to them, while a lucky few find—and make—the opportunity to try to turn their interests into a job or a career. SEAS graduate student Matthew Wilkins is one of those lucky and dedicated few.

The previous issue of *Synergy* reported on Matthew and his teammates' initial success in winning the Clinton Global Initiative University (CGIU) in April 2012 for their project Panda Cycles (now called Pedal Forward), but since then Matthew has continued to develop the project and explore several related activities.

The initial idea for Pedal Forward was to create a business that builds bamboo bikes and donates one bike to a community in the developing world for every bike that it sells commercially in the U.S. Bamboo bikes are cheaper to construct than bikes made from other materials, and they can be built with materials that are grown rather than mined. So, Pedal Forward's goal was to contribute to this lower cost, "green" form of transportation, particularly in the developing world, where bikes are used extensively for transportation.

Following their success at CGIU, Matthew was invited to several GW events that gave him the chance to pitch the Pedal Forward idea and network with others who might be interested in it. During a reception at GW President Steven Knapp's home, Matthew met Cincinnati Mayor Mark Mallory, who was looking into creating a bike share system in Cincinnati and was interested in integrating bamboo bikes into the system. He later flew Matthew and his Pedal Forward partner, Chris Deschenes (GW School of Business, '12), to Cincinnati to have them meet with the city's Department of Transportation director. Although the city ultimately did not decide to use the bamboo bikes, Matthew learned a lot about presenting the project and said, "It was a cool experience nonetheless."

Matthew continued advocating for the project, raising money from students and others in the SEAS and GW community to donate bikes to students in Ngara, Tanzania. Dean David Dolling matched the donations with money from the SEAS Dean's Fund and, in March 2013, Matthew flew to Tanzania to deliver 35 bikes to orphans who live a distance from their schools and will use the bikes to get back and forth to school. "SEAS helped a lot," Matthew recalls. "The support the dean gave me for my trip to Tanzania was amazing."

Matthew subsequently began working with TeamLift Inc. to submit a feasibility study of starting a small bike factory in Malawi, and he and Chris Deschenes have decided to concentrate their energy on this project. "Pedal Forward will manufacture affordable, durable bamboo bicycles in Karonga, Malawi, and local people will manage the manufacturing, because social entrepreneurship is all about empowering others."

Simultaneously, Matthew is working with the SEAS administration to launch a new course, called Makeshift Innovation and Engineering in the Third World, for the fall 2014 semester. Matthew will teach the course and will bring in practitioners from the non-profit organizations with whom he has worked on the Pedal Forward project.

"The course will be offered through the Department of Engineering Management and Systems Engineering, and it will bridge the gap between engineering, public health, and international development," Matthew explains. "It will be offered to both engineering and non-engineering students, with each contributing their specialized knowledge to help solve these problems."

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Charles E. Pinkus
Gabrielle J. Pipp
Robert C. Piwko
Michael J. Podolsky
Robert S. Polster
Meera B. Ponnappa
Michael K. Ponton+
John C. Poulos+
Patricia A. Poulson
William S. Prusch
Andre A. Pugin
Scott B. Pustay
PavanKumar V. Puvvala
Patricia Quistgaard
Ivatury Raju+
Anne H. Ramsey
William D. Randolph+
Harold K. Rappoport+
Maryline M. Rassi
Jeffrey S. Ray
Tassos D. Recachinas
William L. Reed, Jr.
John M. Rhatigan
Robert W. Rhodes
Karen L. Rice+
Karl J. Rickert
Michael A. Rickert
Mariel L. Rico
Sandra J. Riela
John W. Roberts, Jr.+
Jason A. Robertson
Jada J. Robinson
Andrew J. Rolinski
Joshua M. Rooks
Johnathan D. Ross
Franklin D. Rowland, Jr., USA
Joseph E. Russ
Renee M. Russell
Kenneth W. Rutland
Julie J. Ryan
William R. Ryerson
Robert D. Sadler
Elham Sahraei Esfahani
Ehab M. Samuel
Ruben A. Sanchez
Patrick C. Sanford
Ronald J. Sasiela
Martin S. Schletter+
Marlayna L. Schoeneman
Jack H. Schofield
John C. Schuster
William K. Schwan
Michael H. Schwartz+
Jaime Schwartzberg
James E. Sclater
William F. Seigneur
Sethu Sekhar
Jiaxuan Shang
Edward J. Shannon IV
Gregory D. Shapiro
Richard E. Shaw+
Paul V. Shebalin
Zohreh Sheibanifar
Linda J. Sibert
G. W. Singley
Lynwood D. Sinnamon, Jr.
Brian K. Smith
Carleton L. Smith+
Rosanne C. Smith
Alexandros Sofianos
Ornulv Sonsteby+
Bhanu P. Sood
Arthur Southerland, Jr.
Timothy R. Spell
Ned A. Spencer
Ronald Spitalney+
Lena C. Steele
Timothy F. Stephens
Joan E. Sternberg
Alison M. Stlouis
Kevin D. Stone+
Randall R. Stowe
Frank W. Strasburger
Aubrey J. Stringer
Alfred Stroh, Jr.+
Danton D. Stuart
Rajakumari Sudeswaran
Ralph M. Sullivan
Sandra E. Summons
Charles F. Swats+
Nina Sweeney
Eva Szollosi
Richard C. Szymanski+
Meseker Takele
Michael A. Talley
Norma J. Talley
Martin E. Tanenhaus
Nicolas D. Tarver
Beverley E. Taylor
John G. Taylor
Lambert O. Tchaptchet-Ngamga
Stephen M. Tenney
Roy L. Terwilliger
T. R. Thiaga Rajan
Lawrence A. Thomas+
Frank R. Thompson
Ronald J. Thomson+
Kimberly W. Todd+
Robert L. Tomaine
Vera D. Torrence
Susan M. Trakimas
Chase V. Tran
Hung D. Tran
Toan Q. Tran+
Elizabeth H. Trively
Roger S. Trouesdale+
Patrick F. Truitt
Thanh N. Truong
Steven Tsakos
Rachel M. Usdan
Rosario B. Uy
William L. Van Besien
Leonard A. Van Lowe
Andrew C. Vasko
Michael F. Veedock
Philip R. Viars+
Valdo Villalba
Indrajeet Viswanathan
William F. Vogelzang
Oscar von Bredow
Kumar A. Vora
Sakellarios G. Vouvalis+
Kanu R. Vyas
Elizabeth M. Wailes
Daniel E. Wall
Doreen Walters-Brooks
Elizabeth J. Warnick
Mandisa T. Watkins
Donald D. Watson
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Jean Weintraub
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Ulysses Weldon
Robert P. Wenzel
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Nadine M. White
Thomas B. White III
Larry J. Wiese
Quentin W. Wiest
Arlie C. Williams
Donna M. Williams
John B. Williams
Ian S. Wilson
Mark S. Winkler
Patricia Witham+
Robert C. Witham
Peter W. Withere II+
John W. Wittrock
Donald Y. Wong
Josef A. Wonsever+
Barry E. Wood
Franklin B. Woodbury
N. D. Wrinkle
Zhong Xie
Benjamin B. Yarmis
Glenn T. Zora
Francis K. Zugel*

Key
Deceased = *
Five-year consistent donor = +

From the Office of Development & Alumni Relations

The SEAS community is fortunate to benefit from the generosity of alumni like you. More and more of you are stepping forward to volunteer your time, lend your expertise, or support SEAS with financial contributions. Thank you for sharing your time, talent, and treasure.

Because of your generosity, SEAS exceeded its 2013 fundraising goal, raising $4.7 million dollars for the fiscal year. Last year, your gifts to SEAS helped make a difference in the four core funding areas that make the greatest impact:

- **Science and Engineering Hall (SEH):** The construction of the SEH stands as a symbol of GW's commitment to the advancement of engineering and the sciences.
- **SEAS Power and Promise Campaign:** Scholarships and fellowships help to make a SEAS education accessible to qualified students.
- **Faculty Development:** SEAS is recruiting a world-class faculty and positioning itself to be a leader in teaching, discovery, and technology commercialization. Funds to support faculty recruitment and development are necessary to sustain this effort.
- **Dean's Fund:** The Dean's Fund helps Dean Dolling support unbudgeted needs, allowing SEAS to take advantage of opportunities that arise for students to participate in conferences and competitions, as well as to help jump start new faculty and student initiatives.

We are continuing to build on this strong foundation, but for SEAS to realize its full potential, we need even more of you to lend your help. Consider returning to campus for Reunion, attending the Frank Howard Lecture, or participating in the outings of your local alumni club. Join the many alumni who volunteer to serve as mentors to students, conduct mock interviews for seniors, serve as judges at our annual SEAS Student R&D Showcase or the Pelton Senior Design Competition, or present a guest lecture in class.

Lastly, when you think about your philanthropic giving, please consider not only the impact that SEAS has had on you, but also how you can enhance the experience of the students who follow in your footsteps. Whether you support the Dean's Fund, endow a scholarship, or support the SEH, each and every contribution to SEAS makes a difference. Now more than ever, your generosity is essential to sustaining and enhancing engineering education at GW. Thank you for all that you do for SEAS.

Sincerely,

Alexander Dippold
Interim Assistant Vice President
Development and Alumni Relations
dippold@gwu.edu
Tel: 202-994-4051

News

Supporting the SEAS Transformation

In this space, SEAS takes the opportunity to publicly recognize and thank those individuals and organizations who, during the 2012-2013 fiscal year (July 1, 2012 to June 30, 2013), provided gift support for new funds or new programs that are helping to further the SEAS transformation.

SEAS participated in the 2013 U.S. Department of Energy's Solar Decathlon as part of Team Capitol DC, and **Alpha SteelFab, Inc.** made a gift in-kind of steel and steel fabrication to the team for construction of Harvest Home, the solar-powered house it built for the competition.

American Bureau of Shipping (ABS) has pledged support for SEAS Professor Stephen Hsu's research on the application of coatings to the hulls of ships.

Glen Ballowe, BS '49, and his wife Mary made a gift toward the Science and Engineering Hall. Mr. Ballowe, who holds a GW degree in civil engineering, has spent his career in the Washington, D.C. area as a building contractor.

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

Gail Boggs, BS '48 (deceased), made a planned gift in 1996 in support of the Gail E. Boggs Graduate Engineering Fund. The bequest intention was realized this year and a gift was given by the **Estate of Gail Boggs** in support of SEAS programs and activities.

Ali Dilmaghani, BS '82, MS '83, made a formal pledge for the Science and Engineering Hall through the **Dilmaghani Dream Foundation.**

Amr ElSawy, MS '81, made a pledge through the **ElSawy Family Foundation** to create the ElSawy Family Endowed Scholarship. This scholarship will be awarded each year on the basis of merit to a full-time undergraduate student enrolled at SEAS.

GW parents, **Zafar Farooqi, BS '74, MS '78, and his wife Zia,** pledged a gift toward the Science and Engineering Hall.

Mark Hughes, MS '77, and his wife Susan made a gift to the SEAS Dean's Excellence Fund. Mr. Hughes serves on the GW Board of Trustees and the SEAS National Advisory Council.

David Karlgaard, D.Sc. '74, and his wife Marilyn continued their support of SEAS through the Karlgaard Family Foundation. Their gift is designated for the Karlgaard Scholarship Computer Engineering Fund and the Karlgaard Scholarship Fund in Computer Science. Dr. Karlgaard serves on both the GW Board of Trustees at GW and the SEAS National Advisory Council.

Dr. Joong-Keun Lee, parent of a GW alumnus, provided support to fund the Dr. Joong-Keun Lee, George Washington University, and Seoul National University Endowment. This fund will establish a graduate exchange program with Seoul National University. Dr. Lee is the founder and chairman of Booyoung Group.

Patrick Marolda, MS '86, made a gift toward the Science and Engineering Hall through the Ayco Charitable Foundation. Mr. Marolda is a SEAS National Advisory Council member and the parent of a SEAS alumnus.

Michael J. Miller, BS '80, renewed his pledge to the Connie J. Miller Strategic Opportunity Fund. Mr. Miller serves on the Department of Civil and Environmental Engineering Advisory Board at SEAS.

SEAS National Advisory Council member and GW parent, **Nicholas Paleologos, BS '69, and his wife Suellen** made an additional gift to the Nicholas G. Paleologos Scholarship Fund to support undergraduate civil engineering students.

Richard J. Salerno, BS '75, and his wife Paula made a bequest intention in support of programs and activities at SEAS.

The American Chemical Society gave in support of research being conducted in the Department of Civil and Environmental Engineering.

Peter Unanue, MS '92, established the Unanue Annual Scholarship Fund. This fund will provide a need-based scholarship to a junior or senior pursuing an undergraduate degree in the Department of Engineering Management and Systems Engineering.

William Varner, BS '73, made a bequest intention in support of SEAS. Mr. Varner serves as a member of the SEAS National Advisory Council.

Mission Accomplished:

In June, GW President Steven Knapp and Dean David Dolling toasted GW Board of Trustees member and SEAS alumnus **W. Scott Amey, SEAS MS '75, and his wife Deborah** for their recently-concluded $1 million Amey Challenge Match for the Science and Engineering Hall. The challenge began in February 2011 and was successfully completed in February 2013. The challenge fund provided a dollar-for-dollar match for gifts to support the Science and Engineering Hall.

DAVE SCAVONE – SCAVONE PHOTOGRAPHY

Left to right: **Dean David Dolling, W. Scott Amey, and President Steven Knapp**

National Advisory Council Update

As the current chairman of the SEAS National Advisory Council (NAC), I am pleased to welcome four new members to the Council.

Dov and Elma Levy are the co-founders of Dovel Technologies, a McLean, Virginia-based firm that creates software solutions that are low-impact and help customers communicate, access, and store mission critical information. Dov is the president and chief technologist, while Elma is chair of the board and oversees the internal operations needed to run the company. Dov received his master's degree in computer science from GW, and Elma holds a master's degree in health care from Marymount University.

Kevin Kelly is the chief executive officer for LGS Innovations and has more than 20 years of experience in the communications industry. LGS Innovations researches, develops, and deploys networking solutions dedicated to U.S. Government operations around the world. Kevin holds a master's degree in systems engineering from GW.

William Varner is the president and chief operating officer for Mission, Cyber & Intelligence Solutions at ManTech International Corporation. Bill holds a bachelor's degree in electrical engineering from GW and advanced degrees from Purdue University and Virginia Tech.

I'm also pleased to report on the fall 2013 NAC meeting, which was jam packed with updates on current and future SEAS activities. In an overview session, Dean Dolling reviewed the state of the school and reported on the successful recruitment of new faculty and students and on the faculty members' successes in winning research grants and receiving recognition awards.

Dean Dolling also spoke about the real growth of an entrepreneurial culture at SEAS. One of his points particularly stands out for me: in 2013, SEAS overtook other, bigger schools at GW for the first time and became the top participating school in terms of both the number of entries in the GW Business Plan Competition and in terms of the number of teams that made it to the finals of the competition. The NAC and its members were instrumental in supporting the initiation of entrepreneurship activities at SEAS, and this payoff is very gratifying.

I look forward to continuing to work with the NAC members and SEAS leadership as we support and guide another year of progress at SEAS.

NAC Chairman Randy Graves

AMANDA LOMAX

Left to right: **Ashok Jha, Sassan Kimiavi, Gazelle Hashemian Kimiavi, Dean David Dolling, Gurminder Bedi, Peter Unanue, Christopher Wiernicki, and David Mastran**

Hall of Fame: A Time for Reflection

The annual GW Engineering Hall of Fame ceremony is always a wonderful mix of celebration and reflection and the 2013 ceremony, held in October, was no exception. With family, friends, and Dean David Dolling present to honor their achievements, the inductees became philosophical as they contemplated the paths that brought them to that evening's celebration—and more importantly the people who helped them get there.

The seven inductees included a retired executive of one of the "Big 3" automakers, an executive in the maritime and offshore energy sectors, an executive of one of the nation's fastest-growing food companies, and several entrepreneurs who work, or recently retired from working, in the aerospace sector, social welfare programs management, and information technology and telecommunications.

Mr. Gurminder Bedi, BS '69, is a retired executive of the Ford Motor Company, having served until 2001 as vice president of the company's $60 billion worldwide truck enterprise. He also was president of Ford operations in Argentina and Brazil. Throughout his 30-year career with Ford, he set the pace for trucks and SUVs in the industry, and was instrumental in delivering on Ford's series of "Cleaner, Safer, Sooner" pledges by making all pickups and SUVs low emission vehicles.

Mr. Ashok Jha, BS '86, BS '90, MS '92, co-founded ADNET in 1991 to provide engineering and IT solutions to the NASA science community. As chief executive officer of ADNET, he has led the company to an exceptional growth period, expanding its core functions to science, engineering, IT, and education and public outreach to a growing client base. Through Mr. Jha's vision, ADNET today supports more than 40 NASA science missions at five NASA Centers nationwide.

Mrs. Gazelle Hashemian Kimiavi, MS '97, established her credentials as a leader in the telecom community early in her career and then co-founded Paragon Technology Group with her husband, Dr. Sassan Kimiavi. In 2001, she joined Dr. Kimiavi in managing the company and moving it into government contracting. After successfully growing the company, the couple sold it in 2012.

Dr. Sassan Kimiavi, BS '85, MS '87, D.Sc. '98, co-founded Paragon Technology Group with his wife, Mrs. Gazelle Hashemian Kimiavi, in 1997. He managed Paragon and built up its client base, and in 2001, Mrs. Kimiavi joined him in managing the company. After selling the company in 2012, Dr. Kimiavi founded ALTA Development LLC and ALTA Worldwide LLC, which are focused on commercial and residential real estate development.

Dr. David Mastran, D.Sc. '73, founded MAXIMUS in 1975 to provide consulting, social welfare program management, and information technology services to state, local, and federal government. He served as chief executive officer and a member of the board of directors of MAXIMUS until his retirement in 2004. During his tenure, MAXIMUS was selected four years in a row (1999-2002) by *BusinessWeek* magazine as one of the "100 Best Hot Growth Small Companies."

Mr. Peter Unanue, MS '92, is the executive vice president of Goya Foods, a family-owned business, the nation's largest Hispanic-owned food company, and one of the fastest-growing food companies in the U.S. He is responsible for overseeing all logistical operations for Goya's 14 facilities and distribution centers in the U.S., and plays a significant role in the overall management of the company's operations.

Mr. Christopher Wiernicki, MS '83, is an internationally recognized business leader and naval architect in the maritime and offshore energy sectors. He is the chairman and chief executive officer of the American Bureau of Shipping (ABS) and the chairman of ABS Group. Combined, ABS and ABS Group employ 5,500 professionals in 70 countries. Mr. Wiernicki has been a leading voice on a number of issues impacting the marine and offshore industry.

With the addition of this year's inductees, the GW Engineering Hall of Fame now has 47 members.

The SEAS Contribution to Vision 2021

In May of this year, the GW Board of Trustees approved Vision 2021, a new strategic plan that provides a framework for the university's progress over the next decade.

Vision 2021 is built on four themes that jointly aim to create a more unified undergraduate educational experience; enhance research initiatives, especially those with a cross-disciplinary approach; and expand GW's contributions to the local, national, and global community. SEAS already has many initiatives underway that contribute to the strategic plan and its four themes. To familiarize alumni with the strategic plan, Dean David Dolling recently has been explaining the school's contributions to it with a few examples.

Cross-disciplinary collaboration: Engineers and computer scientists at SEAS recognize that great potential for discovery and innovation exists at the intersection of disciplines—such as biology and engineering or chemistry and engineering—and they already routinely work at those intersections with their peers from different departments and schools, as well as with each other. Biomedical engineering is a prime example; it's an inherently cross-disciplinary field and one that is growing rapidly at SEAS.

Globalization: SEAS faculty are answering GW's call to conduct research that focuses on solving both national and global problems. The school's faculty currently have active research grants to investigate solutions to national and global challenges that confront us in sectors that range from communications and cyber security, to health and medicine, transportation and urban infrastructure, and energy and the environment.

Governance and policy: GW naturally looks to build on one of the university's key strategic advantages, its location in Washington, D.C. The Cyber Security Policy and Research Institute, led by faculty from the Department of Computer Science, does this by working with leading cyber security experts and policymakers to advance solutions to the vexing challenges facing our increasingly digital world. Once the Science and Engineering Hall is constructed, SEAS will be even better positioned to capitalize on its location by hosting high-profile policy symposia and conferences.

Citizenship and leadership: GW aims to educate students in citizenship and leadership to effect positive change in the world. For inspiration, students already can look to SEAS graduate student Matthew Wilkins, who won the 2012 Clinton Global Initiative University challenge for his effort to provide low-cost and sustainable bamboo bicycles to communities in the developing world (*see story on page 27*). Matthew's project, which started in the basement of Tompkins Hall, already has made its way to Tanzania—and back, as he makes plans to teach a new course next fall titled Makeshift Innovation and Engineering in the Third World.

ELLIE KAUFMAN

Vicki Gumtow *(left)* **greets students at the Society of Women Engineers conference**

SEAS Hosts Reception at SWE Conference

On October 25, SEAS hosted a reception attended by more than 40 alumnae and students during the annual Society of Women Engineers (SWE) conference, held in Baltimore, MD.

Vicki Gumtow, BS '91, welcomed the group to Baltimore. Gumtow is co-founder, along with her husband **Karl Gumtow, BS '92,** of the Baltimore-based cyber security company CyberPoint International.

When she began her studies at GW, Gumtow was one of a handful of women studying at SEAS. "I remember sitting in the first physics lecture class—there were about 100 of us, because all the students had to take physics," Gumtow reflected. "I remember looking around, and all I saw were boys, and maybe four or five girls. That was really striking to me."

Today, however, according to the most recent data available from the American Society for Engineering Education, SEAS ranks fifth nationally for the percentage of bachelor's degrees awarded to women.

"I just think the school is doing a fantastic job enrolling women," said Gumtow. "Kudos to GW for spending so much time and effort recruiting women!"

SEAS alumna and conference attendee **Carrie O'Quinn, MS '04,** recalled some of the unique benefits of her graduate school career. "The program itself was so amazing and the research that I was able to do was unlike anything I would have gotten at any other university," she explained. "I was able to work with NASA and work on research projects; those experiences were so unique to the program."

Before the event concluded, SEAS Professor Julie Ryan spoke to the group about the support women in engineering are able to offer each other as they move through their careers. Ryan's words clearly resonated with senior Rhiannon Scanlon. "I had a wonderful time and gained so much from the opportunity," Scanlon said. "Seeing SEAS alumnae so eager to give back and help the next generation of emerging engineers was inspiring, and I cannot wait to be one myself."

EDITOR'S NOTE: Major portions of this article are excerpted from "SEAS Women Connect at SWE Conference in Baltimore," written by Buthaina Shukri and published in the November 2013 SEAS Alumni Newsletter.

JESSICA MCCONELL-BURT/GWU

Dean Dolling and Richard Stroupe

Richard Stroupe Receives Alumni Award

SEAS congratulates **T. Richard Stroupe, Jr., MS '01,** on receiving the 2013 Distinguished Entrepreneurial Achievement Award, which was awarded to him last April by the George Washington University Entrepreneurs Round Table (GWERT). GWERT presents the award annually to a successful GW entrepreneur whose accomplishments inspire and motivate aspiring GW entrepreneurs.

Stroupe is a highly accomplished entrepreneur with extensive experience in business startup/growth, board governance, system/software development, education, and technical consulting.

He founded TRS Consulting in 2001 to design and implement IT solutions for Fortune 500 companies, the U.S. intelligence community, and other federal government agencies, and he spent the next eight years growing it from a concept to a company of 60 employees and $14 million in revenues. Under his direction, TRS was recognized as one of the fastest growth companies in the Washington, D.C. area in 2008 and 2009. And in 2009, it was also named #1 "Best Place to Work" for the midsize category by the *Washington Business Journal*. TRS was acquired by NCI Information Systems in 2009, and Stroupe stayed with the company until 2011, serving as its senior vice president and general manager of its national security group.

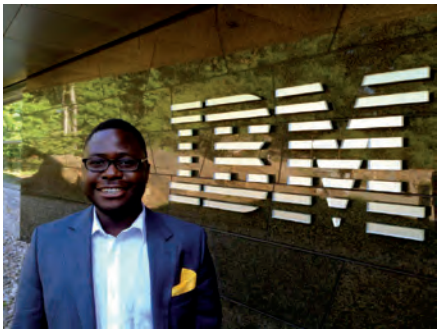
In 2011, he became an investing member in Blu Venture Investors, and the same year founded Crimson Holdings, which is an early stage angel investment and advisory services firm that focuses on start-ups across the healthcare, financial, agriculture, energy, defense, and emerging technology markets. He followed this up in 2012, by co-founding Sequoia Holdings, which provides high-end software development and engineering services to the U.S. intelligence community.

Stroupe also finds time to teach entrepreneurship. This fall he is again teaching SEAS 6200: Launching Technical Ventures, a course he began teaching in fall 2012 to pass along his knowledge of entrepreneurship and to mentor SEAS and GW students who want to start their own businesses or simply learn how new businesses are created.

Happenings

Charles Adkins, MS '63, D.Sc. '69 (mechanical engineering), retired from the Central Intelligence Agency in 2001 as a senior scientist with the grade of SIS-3 (equivalent to Senior Executive Service). Since retirement, he has consulted for government agencies including the National Reconnaissance Office. During his career, Charles worked in the fields of aerodynamics; the design, stability and control of unmanned aerial vehicles (UAV's); acoustics; and digital signal processing. He holds both the Distinguished Intelligence Medal and the Distinguished Career Intelligence Medal awarded by the CIA.

Abdulaziz Alhargan, D.Sc. (computer science) '03, is now CEO at Kentune Consultancy.



Ian Balina, MS (telecommunications engineering) '12, briefly worked at Deloitte as a consultant in 2013 and now works at IBM as an IT specialist.

Sultan Barq, MS '79, resides in Pakistan and conducts business in various sectors, including engineering, agriculture, trade, manufacturing, and telecommunications. He is considering investment options in the U.S. and welcomes suggestions from others.

William Brittle, MEM '75, has retired from a long and successful career at Bechtel Corporation. William continues to share his expertise as the regional governor for the American Society of Civil Engineers. He is a structural engineer with extensive experience in construction, environmental engineering, sustainable design, and transportation.

Holly Clarke Gardner, MEM '05, recently had her second child, James Christopher Clarke Gardner, born on June 15, 2013. Holly lives in Panama City Beach, FL, with her husband Chris and daughter Charlotte. She runs a successful studio specializing in commercial/editorial photography and documentary weddings. She also has been working as an environmental science professor, but is currently taking time off from that to focus on her family and business.

Alessandra DeSarno Kelly, BS (systems engineering) '10, was married on October 19, 2013. She and her husband are building a new house and moving to North Carolina. She currently works at UBS Investment Bank in IT infrastructure services.

Howard Eisner, D.Sc. (communications) '66, had his seventh book, *Topics in Systems*, published in 2013 by Mercury Learning and Information. He also retired in 2013 from GW as professor emeritus of engineering management and distinguished research professor after 24 years in academia and an earlier 30 years as a research engineer and executive in industry. He is a Life Fellow of the IEEE and a Fellow of INCOSE and the New York Academy of Sciences.

Joshua W. Elvove, MS (engineering administration) '90, is serving as the president of the Society of Fire Protection Engineers for 2013. Elvove is a licensed Professional Engineer in four states and a Certified Safety Professional, with more than 32 years of overall fire protection and life safety experience with the federal government and the private sector.

Alex Florescu, BS '10, MS '11 (computer science), has been working at Yahoo in London, UK, since spring of 2013.

Gulu Gambhir, MS (operations research) '92, D.Sc. (systems engineering) '98, has been promoted to chief technology officer of Leidos, a national security, health, and engineering solutions company.

Nuzhat (Nuzi) Haneef, Ph.D. (computer science) '09, is currently working for Dell Services on an IT contract with the National Institutes of Health in Bethesda, MD. Her LinkedIn profile is at **http://www.linkedin.com/in/nuzhathaneef.**

Don Jacobovitz, MS (engineering administration), '88, was recently named to the national Top Ten Public Works Leaders of the Year by the American Public Works

Association (APWA). The APWA annually recognizes ten national leaders to this list. Don is the public works director of Putnam County, FL.

Jay Kaplan, BS (computer science) '08, MEM '09, is the co-founder of Synack, a company that provides vulnerability assessments and penetration testing by utilizing proprietary technology that allows companies to safely engage leading global security researchers to test their systems in highly efficient virtual private testing environments.

Daniel M. Korn, BS (electrical engineering) '91, was recently named the director of training at Credible, Inc. **(www.credibleinc.com).** Credible provides enterprise SaaS solutions for behavioral healthcare providers.

Elliott Kugel, MS (computer science) '83, was named in the February 18, 2013 issue of *Barron's* magazine as one of the "Top 1000 Advisors in America." He also was ranked #15 in the state of New Jersey in the same survey. Elliott is a managing director of investments at Merrill Lynch in Bridgewater, NJ, and resides in Skillman, NJ.

Larry Laubscher, Sr., BS (electrical engineering) '52, JD '55, writes, "I am still enjoying the practice of patent law (on a reduced work load basis, of course) in my satellite office in scenic St. George, UT. Life is good in the Wild West. Little bit of golf and travel! Regards to my remaining engineering school classmates."

Walter (Walt) Mebane, BS '83, MS '91 (mechanical engineering), works at the Naval Sea Systems Command in the Surface Ship Design Group, Combatant and Mine Warfare Ships Division. He has been assigned as the new senior ship design manager for the DDG 51 Flight III program.

Robert Middleton, MEM '95, is a senior federal employee with the Department of Homeland Security. He participated this year in the four-week Leadership for a Democratic Society course at the Federal Executive Institute in Charlottesville, VA.

Marguerite Mudd Walter, BS (civil engineering) '81, received her Master of Divinity from Princeton Theological Seminary in May 2013. The Master of Divinity is a three-year graduate degree that is the basic professional degree for ministry. Princeton Theological Seminary is the largest Presbyterian seminary in the country.

James R. Owens, BS (mechanical engineering) '56, writes, "I'm fully retired and live in downtown Bethesda, with summers at Bethany Beach after a career at RCA, COMSAT, and INTELSAT (in the 1990s). Anne and I keep busy with 19 grandchildren scattered about the country. When in town, I play golf with my really old Sig Ep brothers, followed by happy hour. Life is good."

Sasha Pailet Koff, BS (mechanical engineering) '97, has been promoted to senior director of quality management systems for Johnson & Johnson. **Matthew Koff, BS (mechanical engineering) '97,** is an assistant scientist at the Hospital for Special Surgery in New York, where he uses MRI in the evaluation of musculoskeletal diseases. He recently received an R01 grant from the National Institutes of Health to use MRI as a biomarker for adverse local tissue reaction in individuals with total hip replacements. Sasha and Matthew "continue to reside in NJ with our two children, who both have demonstrated a propensity to take everything and anything apart to examine how it works. We aren't positive, but we think we may have two engineers on our hands!"

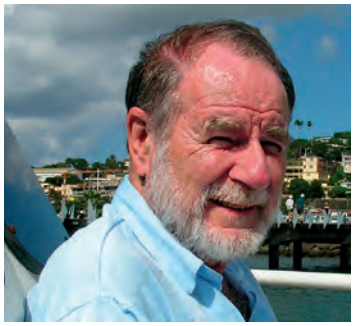
Ronald Sasiela, MEM '00, has been named a Certified Food Specialist by the Institute of Food Technologists, an organization of more than 15,000 professionals. Ronald is one of the first to be awarded this designation. He has worked for more than 45 years in his field, has co-authored industry reference books, and is a co-inventor on patents. He also has served as the research and development director for two large food corporations.

Shyaam Sundhar Rajamadam Srinivasan, MS (computer science) '05, has worked in the computer security field for several years and currently works at the U.S. Department of the Interior. He also is very interested in entrepreneurship.

Sean Walsh, BS (mechanical engineering) '76, has been appointed a member of the Department of Mechanical and Aerospace Engineering's Advisory Board at SEAS. He also is participating in the new GW Athletics Career Mentoring Program as a mentor to a current GW student-athlete.

Christopher Wiernicki, MS (structural engineering) '83, received the Vice Admiral "Jerry" Land Medal for outstanding accomplishment in the marine field in November 2013. It is one of the highest awards that the Society of Naval Architects and Marine Engineers gives.

Several current SEAS students and alumni attended the 2013 Theta Tau Educational Foundation Leadership Academy held at Washington University in Saint Louis, MO, July 25-28, 2013. Pictured left to right are: **Michael Livingston '92, Alex Palson '13, Brittany Brumback '16, Claire Wilhelm '14, Zaid Ibrahim '14, Felipe Zambrano '13, Emma Fletcher '13, Adam McCormack '13, and Sean Walsh '76.** (*Photo courtesy of Sean Walsh*)



E. A. (Bud) Wareham 3rd, BS (electrical engineering) '53, is a consulting engineer with his own firm, E.A. Wareham 3rd, and is licensed to practice electrical engineering system design in the states of Florida, Virginia, and Maryland. He has been the recipient of numerous professional and technical awards including local, regional, and national awards. When he has time to relax he enjoys reading books on his Kindle and walking his Shih Tzu.

Volunteer Opportunities

There are many ways alumni can be involved at SEAS and GW. To learn how, you can:

- complete our SEAS survey at: **go.gwu.edu/eaanetwork**
- contact Buthaina Shukri at **bshukri@gwu.edu** for a complete list of volunteer opportunities,
- or visit us online at **www.alumni.gwu.edu/volunteer.**

We invite you to complete the survey at **go.gwu.edu/eaanetwork** to tell us more about how you would like to connect with fellow alumni or students in any of the following areas:

Competition Judge
Let us know if you would like to participate in high school science fairs or judge GW design or business project competitions.

Career Service Resource
Do you like to review resumes, conduct mock job interviews, or help students learn to network? Would you like to host a site visit for students to your organization? Please tell us how you would like to assist students with their career development.

Recruiter
Employers can find some of their most valuable employees through their alma maters. If you would like to recruit SEAS alumni and students, we can help. Tell us whether you want to hire for internships or full-time positions and whether you want to participate in job fairs or on-campus interviews.

Advocate
Students can benefit immensely from the advice of others already working and developing their careers. Please tell us if you want to take advantage of one of the many ways to help guide students, such as acting as a mentor, hosting a dinner for them, or advising a student club.

Connector
Do you want to connect to GW and to fellow alumni? If so, let us know whether you prefer to do so through our cultural or social programs, our networking events, or our community service and professional development opportunities—or all of the above!

Engineer Alumni Association Network
We are building new and dynamic alumni programming at SEAS, and we need alumni volunteer leaders to help spearhead these efforts. Become an active part of our network, lending your creativity, energy, and talent to support SEAS. If you are interested in participating, please contact:

Buthaina Shukri
Senior Associate Director,
School Alumni Programs
Alumni House @ 1918 F Street, NW
Washington, D.C.
Phone: **(202) 994-2355**
Email: **bshukri@gwu.edu**

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.

SEAS Student Research and Development Showcase
Wednesday, February 19, 2014
3:00 – 6:00 pm
Marvin Center
Grand Ballroom
800 21st Street, NW

Engineering Career Fair
Thursday, February 20, 2014
6:00 – 9:00 pm
Marvin Center
Grand Ballroom
800 21st Street, NW

GW Business Plan Competition Finals and the Distinguished Entrepreneurial Achievement Award Presentation
Friday, April 11, 2014
9:00 am – 6:00 pm
Duquès Hall
2201 G Street, NW

Pelton Senior Design Competition and Senior-Alumni BBQ
Wednesday, May 14, 2014
5:00 pm: Pelton Competition
6:30 pm: Senior-Alumni BBQ
Marvin Center
Grand Ballroom
800 21st Street, NW

Engineer Alumni Association Dinner Meeting
Tuesday, June 3, 2014
6:30 – 8:30 pm
City View Room
1957 E Street, NW

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

School of Engineering & Applied Science
The George Washington University
Tompkins Hall
725 23rd Street, NW
Washington, D.C. 20052

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GW SERVICES

Alumni House
1-800-ALUMNI-7

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SEAS SUPPORT SERVICES

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Development, SEAS
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Emmy Rashid
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SEAS Student Career Services Office
202-994-7892

Howard Davis
Director
Undergraduate Advising and Student
Services
202-994-6158

Adina Lav
Director
Graduate Admissions
202-994-6158

ACADEMIC PROGRAMS

Applied Science & Technology
202-994-7541
www.emse.seas.gwu.edu

Biomedical Engineering
202-994-6083
www.ece.seas.gwu.edu

Civil & Environmental Engineering
202-994-4901
www.cee.seas.gwu.edu

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202-994-6083
www.ece.seas.gwu.edu

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www.cs.gwu.edu

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www.mae.seas.gwu.edu

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www.emse.seas.gwu.edu

Telecommunications & Computers
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www.ece.seas.gwu.edu