

COLUMBIA | ENGINEERING

**NEW DEAN,
BRIGHT FUTURE**

**MARY C. BOYCE
TAKES THE HELM**



Dean of the School
Mary C. Boyce

Executive Director of Communications
Margaret R. Kelly

Editor: Melanie A. Farmer

Writers: Amy Biemiller, Nicole Dyer, Holly Evarts, Janet Haney

Photographers: principal photography by Jeffrey Schiffman;
additional photography by Eileen Barroso, Bruce Hemingway,
Ryan John Lee, Matt Lenz

Design and Art Direction: Columbia Creative

Contributor: David Simpson

Columbia Engineering is published twice a year by:
Columbia University in the City of New York
The Fu Foundation School of Engineering and Applied Science
500 West 120th Street, MC 4714
New York, NY 10027

Comments, suggestions, or address changes may be emailed to:
engineering.mag@columbia.edu or sent to:

Columbia University
The Fu Foundation School of Engineering and Applied Science
Room 510, MC 4714
500 West 120th Street
New York, NY 10027

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Correction, *Columbia Engineering* magazine, Spring 2013 issue:

Because of an editing error, the original version (print and online) of "Making Sense of MOOCs: Columbia Engineering Jumps into the Market of Massive Open Online Courses" misidentified Professor Yannis Tsividis as "among the first professors to conduct video lectures at the University of California at Berkeley." Professor Tsividis has pointed out to us that he was never a professor at UC Berkeley; he conducted video lectures there in the mid-1970s as a lecturer but does not know if he was among the first to do so.

This is an amazing time for Engineering at Columbia and for Engineering globally. I am proud to lead this remarkable institution, The Fu Foundation School of Engineering and Applied Science, on the cusp of our 150th anniversary. The role of engineering in bringing solutions to many of the most pressing challenges and to shape our world for the better has never been more important and it has never been more recognized by society at large.

Indeed, we are entering what I believe is a Renaissance for Engineering—a period of great research, great invention, great innovation, and incredible translation of these innovations to solutions that impact society, cities, the environment, and the world. This Engineering Renaissance is taking place at Columbia, in New York City, across the nation, and across the globe. It is further spurred on by the realization that, at its core, engineering is a highly creative endeavor, and, as a result, there has been a concomitant rebirth of entrepreneurship at all levels. Increasingly, our faculty, alumni, and students are imbued with an entrepreneurial spirit that brings the results of their innovations to fruition as real “products” that influence our lives for the better.

As a School, we are making it a priority to foster entrepreneurship among our current students, nurturing it through many exciting new programs. In fact, I am pleased to report that entrepreneurship is already uppermost in the minds of some of our first-year students. For the second year in a row, at least one of our incoming first-years has already launched a viable start-up while in high school. When you combine the enthusiasm for innovation shown by the newest arrivals to our Columbia community with the extraordinary intellectual capital of our inventive faculty, the promise of incredible, life-changing breakthroughs by our faculty, students, and alumni has never been greater.

As our history shows, faculty entrepreneurs from Michael Pupin and Herman Hollerith to Edwin Armstrong and Elmer Gaden have had a significant impact on society at large and on our daily lives. This issue of *Columbia Engineering* magazine focuses on the most recent advances of our entrepreneurial faculty. Their research in the laboratory forms the framework for start-ups that range from alternative fuel sources to cheap downloadable storage software; from a biotech incubator to a build-it-yourself camera for kids. You will read about their inventions that have the potential to impact health, medicine, energy, and technology, each adding to a better quality of life for us all.

You also will have the opportunity to read about our School’s beginnings in a special article written by Robert McCaughey, professor of history and Janet H. Robb Chair in the Social Sciences at Barnard College. We are pleased that Professor McCaughey, the author of *Stand, Columbia*, the history of the University, among others, is writing a history of our School as part of our 150th anniversary celebration. *A Lever Long Enough: A History of Columbia’s School of Engineering and Applied Science Since 1864* will be published by Columbia University Press in time for our founding day, November 15, 2014.

In addition, the magazine highlights research by current faculty as well as introduces the promising group of scholars who recently joined the School, and whose future contributions will continue our legacy of excellence and impact.



Mary C. Boyce

Dean of Engineering
Morris A. and Alma Schapiro Professor

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H E N E

Engineering Professors Flex Their Research Muscles in the Incredible Field of Graphene

If you are among the legions of gadget hounds hankering for the next best thing—a cooler cell phone, a faster tablet, a jazzier music player—give thanks to Jim Hone, Jeffrey Kysar, and their colleagues at Columbia Engineering. Their team is fast perfecting the thinnest, strongest material in the universe, and the Holy Grail of the electronics industry: a two-dimensional sheet of carbon atoms called graphene. With it comes the possibility of smartphones as thin as paper yet stronger than steel, TV screens that roll up like newspaper, clothing that can charge all your portable devices, and bionic muscles worthy of Steve Austin.

Professor Jeffrey Kysar leads a laboratory to develop novel materials as well as theories to understand and predict their properties.



Ever since University of Manchester Nobel laureates Andrew Geim and Kostya Novoselov isolated graphene in 2004, closely followed by concurrent independent 2005 papers by Columbia Engineering Professor Phillip Kim as well as by Geim and Novoselov on the extraordinary electrical properties of graphene, the world of materials science has been abuzz with its possibilities. Last year, there were 3,000 research papers on graphene's properties and 400 patent applications. The European Union, meanwhile, has announced plans to invest more than \$1 billion into graphene research.

Hone, professor of mechanical engineering at the Engineering School, knows the remarkable potential of graphene just about as well as anyone. In 2008, Hone, Kysar, and colleagues conducted a series of experiments proving for the first time that pristine graphene, nothing more than a single layer of carbon atoms, was the strongest material ever measured. "It would take an elephant, balanced on a pencil, to break through a sheet of graphene the thickness of cling wrap," Hone said. The paper, published in *Science*, has since become one of the top three most cited in graphene research.

Earlier this year, he teamed up again with Kysar, also a professor of mechanical engineering at the School, who studies the strength and elasticity of graphene. Together they published a follow-up paper in *Science* showing that sheets of graphene stitched together like a microscopic quilt are still 200 times as strong as steel, despite earlier studies suggesting that the seams weakened the material.

Their latest finding comes as particularly welcome news to anyone who has ever tried to make a meaningful amount of graphene. Carbon is everywhere. It's the backbone of all life and the sixth most abundant element on the planet. Yet manufacturing graphene out of carbon on a commercial scale is difficult and very expensive. In 2008, a sample of the stuff no bigger than the tip of a pen cost \$1,000.

In theory, graphene is grade-school simple to make. Take a lead pencil and doodle on a piece of paper. The charcoal trail left behind consists of graphite flakes made of layer upon layer of carbon. Each layer, flattened like a two-dimensional honeycomb, is graphene. The tricky part is isolating those layers. Done by hand, it's painstaking and time-consuming work. Even more challenging is the next step of shaping those sheets of graphene into something useful. "Graphene is like a very flexible, two-dimensional sheet of cloth," Kysar says. "The challenge is figuring out how to combine and configure those two-dimensional sheets

"The challenge is figuring out how to combine and configure those two-dimensional sheets in such a way that they span three-dimensional space."

—Jeffrey Kysar

in such a way that they span three-dimensional space. Graphene is fundamentally a 2D material, but we live in a 3D world."

That's where Hone and Kysar come in. Graphene can be "grown" in the lab using an elaborate process called chemical vapor deposition. Materials and techniques vary, but in Hone's lab, researchers pump methane and hydrogen gas into a furnace set to 1,000 degrees Celsius, hot enough to turn rock to lava. Subjected to the heat and hydrogen, the methane gas decomposes and drops carbon atoms onto a thin piece of copper foil just below its melting temperature. When the copper cools, the carbon atoms embedded in the copper rise to the surface like bubbles in a soda, forming an atom-thick sheet of graphene.

It's clever lab work, but unlike pristine graphene, which is exfoliated by hand to form perfect crystal structures, graphene grown chemically nucleates like frost crystals, leaving behind tiny grains. Researchers have previously believed that the boundaries between the grains weaken the graphene, just as a fraying seam or perforated paper respectively weakens clothing or paper. Previous experiments have shown that such defects make graphene 10 times as weak as its ideal strength. "It'd still be stronger than steel but not by much," Hone says.

Brittle graphene would hardly make possible a future of freaky flexible electronics. For manufacturers, such defects represented a discouraging barrier to commercialization. "The atoms in the grain boundaries can be more reactive to chemicals used in processing than atoms within the grains, so that fissures can form much more easily in a grain boundary than within a perfect crystal lattice of graphene," Kysar adds.

In their latest work, however, with postdoc Gwan-Hyoung Lee and PhD candidate Ryan Cooper, the Columbia researchers found that the weakness stems not from inherent flaws in synthesized graphene but rather from a manufacturing flaw, introduced when graphene is ripped off the copper foil. As a solution, the scientists have developed a new way to remove the graphene without damaging the grain boundaries.

In 2008, Hone, Kysar, and colleagues conducted a series of experiments proving for the first time that pristine graphene, nothing more than a single layer of carbon atoms, was the strongest material ever measured.

The Air Force, for one, is taking note. Since 2010, the military branch has awarded Columbia Engineering, the Graduate School of Arts and Sciences at Columbia, and Cornell University's Electronic Materials group \$7.5 million to advance the basic understanding of graphene, with the hope that it will eventually lead to something grand—say, a whole new generation of lighter aircraft or super-light, super-flexible electronics that can lighten the load of its soldiers.

“Between engineering and applied science, and chemistry and physics, Columbia is one of the world's leading centers in graphene research,” Kysar says. “The engineering team has been particularly influential in defining the optical, mechanical, and electronic properties of graphene and using the material to make functional devices.”

One such device is a microscopic wireless tuner that uses a vibrating graphene sheet whose stretch ability allows it to scan a much wider span of the electromagnetic spectrum and pick up signals too fine for conventional tuners. “This device could substantially improve the flexibility, miniaturization, and integration of wireless transceivers, which would make devices such as cell phones smaller, faster, and more energy efficient,” says Sunwoo

“Between engineering and applied science, and chemistry and physics, Columbia is one of the world's leading centers in graphene research.” —Jeffrey Kysar

Lee, one of Hone's graduate students, who earned a \$100,000 fellowship from Qualcomm for his work.

What's next? Graphene—plus a little something extra. Electrons travel through graphene 100 times as fast as they do in silicon. But they cannot be turned “on and off” to make logic circuits. Thus, by itself, the material is a poor candidate for microscopic transistors. So Hone, in collaboration with fellow Columbia Engineering Professors Philip Kim and Kenneth Shepard, among others, are experimenting with ways to combine graphene with other two-dimensional materials like insulating boron nitride and semiconducting molybdenum disulfide—all materials that would complement and enhance the extraordinary properties of graphene, making a kind of twenty-first-century super material.

The field of graphene has never been busier, and Hone says, “Columbia is right in the middle of everything.”





Professor James Hone leads a laboratory focused on novel nanoscale material synthesis and device nanofabrication for electrical, mechanical, biomechanical, and optical applications.



NEW DEAN

**B R I G H T
F U T U R E**

Here, Mary C. Boyce is pictured on a beautiful, clear summer day in July on the 14th floor of the Northwest Corner Building; The Beacon, as it's known around campus, boasts stunning views of the city, from midtown to Manhattanville, through its magnificent walls of windows.



MIT'S MARY C. BOYCE TAKES THE HELM

Mary C. Boyce is joining Columbia Engineering as dean at an exciting juncture for Engineering at Columbia and for Engineering globally.

“We are entering what I believe is a Renaissance period for Engineering—a period of great research, great creativity and invention, great innovation, and incredible translation of these innovations to solutions that impact every aspect of society. Our impacts are scholarly as well as industrially relevant and entrepreneurial,” says Boyce, who also is Morris A. and Alma Schapiro Professor.

Dean Boyce on the 10th floor of the Northwest Corner Building. The space will be home to more state-of-the-art research labs and work spaces for Engineering faculty, students, and researchers.



“Today, the impact of engineering on society is much more apparent and clear to the public at large,” she continues. “The expanding needs for clean water, food, shelter, energy, health care, mobility, and communications for an improved quality of life in all regions of the world have raised the awareness of people everywhere about the role and impact of engineering on our lives. For example, as we strive to enhance the efficiency of agriculture, provide sanitation or electricity to developing regions of the world, it is engineering that is going to have the impact.”

Boyce comes to the Engineering School after a long-standing, impressive career at MIT, where she was Ford Professor of Engineering and, most recently, department head of the Mechanical Engineering Department. At the time of her appointment, Columbia President Lee C. Bollinger said, “Professor Boyce has distinguished herself throughout her academic career not only as a scholar but also as a teacher and mentor driven by an abiding commitment to nurturing the next generation of engineers.”

Boyce considers preparing and mentoring future engineers and leaders with a foundation in engineering to be one of the largest contributions of any faculty member. “It has been a personally very rewarding experience for me to mentor and see a student develop into an independent engineer, investigator, researcher, and leader,” she says.

As dean, she feels she will have a much greater reach and impact on students more broadly. “I fundamentally believe in our mission to educate the next generation of students,” she says. “That’s what my goal has been as a faculty member and I still feel that I’m very much in touch with that role here at Columbia Engineering.”

Boyce is beginning her deanship at the School just in time to celebrate its 150th birthday (November 15, 2014). So, in addition to undertaking the traditional important responsibilities as dean, she also is working on plans to honor the School’s past 150 years while recognizing the promise of the future.

“This is a transformational period for SEAS,” says Boyce. “We’re reflecting on our many contributions in the past, where we are today, and also the incredible opportunities before us in the future.”

One of seven siblings, Boyce grew up in the suburbs of New Jersey but was born in Inwood, a neighborhood just a few miles north of Columbia’s Morningside campus. Her mother was a stay-at-home mom and her father, a businessman. As a child, Boyce thrived in math and science. “I was drawn to engineering primarily because of my total enjoyment of math and physics,” she says, “and the sense that these together had logic and provided mechanisms that let me explain how and why things worked. I think I fully comprehended the impact and power of using that understanding in a concrete way in some of my very first engineering classes.”

Boyce’s research interests include the molecular and nanomechanics of polymers, soft composites, and soft tissues. Her leadership in the field of the mechanics of materials has expanded understanding of the interplay between the micro-level geometrical structure and the inherent physical behavior of a material in achieving mechanical properties and function. Her work focuses primarily on large deformation in either soft,

rubbery-like materials or in geometrically structured materials that have features that bend or buckle. Models and results from her research have the potential to influence a range of fields from polymer processing to composite material design, functional soft materials, tire mechanics, and biological cells and tissues.

Widely recognized for her scholarly achievements, including election as a fellow of the American Society of Mechanical Engineers, the American Academy of Arts and Sciences, and the National Academy of Engineering, Boyce has also been honored for her teaching at MIT, where she was named a MacVicar Faculty Fellow and received the Joseph Henry Keenan Innovation in Undergraduate Education Award.

Boyce left her hometown of Cherry Hill, NJ, in 1976 for Blacksburg, VA, to study engineering science and mechanics at Virginia Tech. After co-oping and completing her bachelor’s degree in 1981, she headed to Colorado to work as an engineer in the aerospace industry. She made the move to Cambridge, MA, to attend MIT, where she earned her master’s degree in 1983 and PhD in 1987. That same year, she joined the MIT faculty and essentially never looked back, until now.

“This is a transformational period for SEAS. We’re reflecting on our many contributions in the past, where we are today, and also the incredible opportunities before us in the future.”

“It has been a personally very rewarding experience for me to mentor and see a student develop into an independent engineer, investigator, researcher, and leader.”

“We are entering what I believe is a Renaissance period for Engineering—a period of great research, great creativity and invention, great innovation, and incredible translation of these innovations to solutions that impact every aspect of society.”

Q: Your first day on the job was July 1. What can you tell us?

A: I feel that I have been very much welcomed into a dynamic and forward-looking community. I'm learning a lot about Columbia, the faculty, and the students. I'm also meeting with the other deans to learn about the other Schools and the University overall. It is an amazing environment!

Q: What were your impressions of the School, even before you considered becoming dean?

A: I did have some very strong impressions about Columbia Engineering—I had observed the very positive trajectory in the School's growth over the last 10 years, and its ability to attract talented students and faculty. The growth combined with the talent has started to bring much more attention to Engineering at Columbia. Talent attracts talent, so it builds on itself and people take notice. It's evident. And, coming here, you see it.

Q: What immediately attracted you to the deanship?

A: There is an ability to have a real impact on engineering more broadly as well as at Columbia. Columbia Engineering is positioned to grow and it's been on such a positive and rapidly enhanced trajectory over the last few years. That trajectory, combined with the ability to grow even bigger with the expansion of Columbia's campus into Manhattanville—with new buildings, new programs, and a larger faculty—is exciting. There are very few schools at this level of excellence that are able to expand at this scale.

This expansion attracted me, combined with two other key ingredients to the future of engineering: the interdisciplinary nature of engineering not only within engineering itself and with science, but also with our intersections with other Schools, whether it's Journalism, Public Health, Medicine, Business, even Law or International and Public Affairs. Access to such pan-disciplinary expertise will produce very fruitful collaborations that help define Engineering, and Engineering is also going to help define these other Schools as we move to the future. These are non-traditional partners and their intersection with engineering is going to grow. The second ingredient is being in New York City. New York City is a global city and this positions us to have incredible reach, not just in New York but beyond. I think New York City has also recognized the transformational role of engineering in the future of cities and of people. This has actually created a hotspot here for engineering, not just for engineering broadly, but also more specifically for innovation in engineering and entrepreneurship.

Q: What are your immediate priorities?

A: Making sure we have the environment and facilities to enable our exceptional faculty and students to be creative, innovative,

and forward-looking in all they do. We are in a period of growth in our faculty numbers and our graduate student numbers, as well as a period defined by an increasingly interdisciplinary nature of research, which demands very different laboratory needs in nearly every field. We need to foster this highly innovative environment and remove any constraints or perceived constraints, whether physical or organizational. Hence, a priority is moving forward quickly on space build-outs and renovations on the Morningside campus together with encouraging and supporting new interdisciplinary, inter-departmental, and inter-school initiatives.

As an example, the new Institute for Data Sciences and Engineering is a wonderful interdisciplinary center that encompasses every one of our nine departments as well as eight of our sister schools. We're designing and building out new space for faculty growth for the Institute. This, of course, will then bring in more graduate students for these fields. So one of my main goals is to provide the right environment for our faculty and our students to succeed.

Q: What type of space expansion should we expect?

A: We are in the process of beginning the renovation of the fourth and fifth floors of Mudd. We also will be building out the tenth and fourteenth floors in the Northwest Corner Building. In total, this will give us an additional 30,000+ square feet of research space for the School. We are also renovating other laboratories within the School. I am also very interested in providing spaces where our students and faculty can pursue independent work designing and prototyping—a “Maker Space”—and look forward to launching such a space.

Q: You spent 30 years at MIT. What would you say you are most proud of with respect to your time at MIT?

A: As a faculty member, I am very proud of my contributions in educating undergraduate and graduate students, in mentoring my graduate students, and the research that I have done in collaboration with my graduate students, postdocs, other faculty, and even undergraduates. The impact you can have on students and the impact your research can have on the field itself and on preparing students for creative and rewarding careers provide real joy to any faculty member and are pleasures that we are fortunate to experience over our entire career. I have been privileged to work with incredibly talented students and faculty in both my research and my education pursuits. I see the same opportunities here at Columbia Engineering.

Q: Will you teach here?

A: I hope at some point that I'll teach, but right now, I have to focus on being the dean! I do hope that, as I get into a more



steady state mode, I will be able to teach first an undergraduate course. I've always enjoyed teaching and do feel that education is at the core of being a faculty member.

Q: Did you always know you wanted to be an engineer?

A: In high school, I really didn't know what engineering was. I'm not from an engineering family. But, I knew always that I loved math. And then, when I took physics, I knew that my direction would be math and physics, and that naturally led me to engineering. As an undergraduate, I then co-oped, spending one quarter each year working in industry—the co-op program helped me learn about different fields of engineering and to find the field that was the perfect fit for me, which was engineering mechanics.

Q: Will you conduct research here?

A: I do plan on starting a research program here. I continue to mentor my graduate students at MIT as they complete their degree programs. I am planning to initiate my research program here at Columbia and was pleased to have joined in a collaborative, interdisciplinary research proposal this summer with Columbia faculty from several different departments.

Q: How will the School celebrate its 150th anniversary next year?

A: I am very excited about the 150th anniversary; it has given me the opportunity to learn about the history and the evolution of the School—the ups and the downs of that history and the great achievements over the past 150 years. This reflection also provides a remarkable foundation for thinking about the present and the future of Engineering at Columbia, especially as we consider expanding into a new building in Manhattanville. As part of honoring our past, we are planning many different celebration events. We'll be doing a launch of our celebration during Engineering Week in February of 2014. We'll also have a series of events over the course of the year, with a gala and final symposium in November. We have a committee comprised of faculty, students, and alumni working on a number of things,

including creating a timeline of the history of the School and the departments within the School. There will also be a book published on the history of SEAS.

Q: What do you do on your down time?

A: Right now, I try to find time to focus a little bit on my research. I also enjoy bike riding and jogging—I have found Riverside Park and Central Park to be fantastic and it is wonderful to see so many families out enjoying these gems of New York City. Finally, although I don't get a lot of time to read, I do read for pleasure when I have the opportunity.

Q: What are you reading now?

A: I'm reading a book called *The Gift*. Over the last couple of years, I've been interested in trying to understand more about people who are creative and innovative and also about what kinds of environments foster creativity. I've recently read the biography on Steve Jobs, a biography on Henry Ford, and the recent book about the innovative years of Bell Labs—*The Idea Factory: Bell Labs and the Great Age of American Innovation*. The book I'm currently reading is in that same vein but from a rather different perspective. It's also about creative people, but from a humanities perspective. The book begins on the history of "gift" giving but then focuses on the creative element of individuals as a gift. Although the focus is on creative people in the arts, I like to think—and I try to encourage our students to think—about the fact that engineers are fundamentally very creative people. We have a gift, and, as faculty, we have a gift that we are sharing with our students, as we educate them, mentor them, and, by our example, we hope to inspire them to use their creativity and their talents to have an impact on others.

By Melanie A. Farmer

Pictured above: Looking ahead. Dean Boyce is pictured on the 14th floor of the Northwest Corner Building, which has an expansive view of Broadway leading uptown to Columbia's Manhattanville campus (marked by the red crane in the background).

P R I V

Columbia Engineering is conducting research in privacy preservation and accountability—including the Software Systems Laboratory’s work on mobile data protection and intrusion detection.

PRIVACY

MATTERS

KEEP IT SECRET, KEEP IT SAFE

Perhaps, up until June of this year, you hardly thought about the information you provide online or by cell phone every day. You probably never gave the National Security Administration (NSA) a second thought, and you certainly never heard of a U.S. government intelligence analyst named Edward Snowden. But then Snowden leaked details about

how the NSA collects data on millions of phone calls and runs an Internet surveillance program targeting foreign nationals via major online corporations.

If those disclosures made you wonder if your right to privacy was being sacrificed in exchange for ambiguous improvement in national safety, you were not alone. A large majority of Americans said the NSA's collection of telephone and Internet data intrudes on citizens' rights without clear improvements in national security, according to a *Washington Post*/ABC News poll in July.

Opinions vary about just how much privacy should be expected—or protected—when data are exchanged on the Internet, especially when talking to commercial sites. “There is a lot of value to privacy and anonymity, and while it’s easy to make a case that one should sacrifice anonymity for the sake of national security, it’s a lot harder to make that case when personal data you provide to one online entity get shared with another without your permission,” says Steve Bellovin, professor of computer science at the Engineering School.



Steve Bellovin



Tal Malkin



Jason Nieh



Roxana Geambasu

“We don’t have to sacrifice privacy for security. I believe it’s possible to ensure Internet privacy and keep the nation safe from real threats.” —Steve Bellovin

Bellovin, recognized as one of the foremost experts on Internet security and privacy, advised the Federal Trade Commission about evolving technology and policy issues in the role of the agency’s chief technologist for the last academic year. In addition, he has been involved with some advisory committees of the Department of Homeland Security. He helped create USENET, a precursor of today’s Internet forums, and wrote the first book on Internet security.

“We don’t have to sacrifice privacy for security. I believe it’s possible to ensure Internet privacy and keep the nation safe from real threats,” he says.

At Columbia Engineering, Bellovin and a number of his colleagues have been examining privacy issues, particularly as they apply to emerging technologies. They have developed privacy tools, systems, and services that allow data to be shared while more fully protecting individual privacy.

Preserving Privacy, Enhancing Accountability

Privacy is about our individual capability to control what we consider to be personal information. Add the Internet to the equation, and privacy management grows to include issues of ethics, law, and politics.

“In the context of human-computer interaction, the issue of privacy becomes more complex as we begin to define how, if, and when information that is considered private becomes public,” Bellovin says. “In the case of the recent NSA surveillance, the problem is not so much what the NSA is doing, as that they’re doing it without oversight, and that leads to abuses.”

Protection of privacy has been a driving force for Bellovin. During more than 20 years of research at Bell Labs and AT&T Labs, Bellovin was one of the first researchers to recognize the importance of firewalls to network security, exploring protocol

failures, discussing routing security, and utilizing password-authenticated key exchange protocols.

“With the increasing scale of computer speed, storage, and sophistication, it is awfully hard to control where your information goes,” Bellovin says. “My research focuses on developing technology that can preserve privacy while achieving other important goals, like accountability.”

Some of Bellovin’s research focuses on a best-of-both-worlds solution to protecting privacy and sharing data in the name of security. For example, suppose one federal intelligence agency has a large collection of data about international commerce, and another has a large data set on international political activity. There could be a legitimate reason for sharing that data and jointly investigating suspected international terrorism, but controls should be in place to protect the privacy of the entities identified in both databases that are not subject to the investigation. How can the two agencies share data only specific to the case without prior knowledge of what data each has?

Bellovin and Tal Malkin, associate professor of computer science at the School, have the answer: encrypted search. Funded by an Intelligence Advanced Research Projects Activity grant, the two researchers are combining mathematical foundations, cryptographic techniques, and systems expertise to enhance privacy and security.

“We are working on technology that will allow us to build an encrypted database, owned by someone else, and send it encrypted queries that are not readable by the database owner—but get back the right answer anyway,” he explains. “We have designed a multi-provider, multi-querier encrypted search scheme based on a novel use of cryptographic primitives that makes authorization controls possible and does not allow any third party to see the queries or results.”

“If an administrator goes rogue, they have the power to cause tremendous harm.”

—Jason Nieh

Malkin explains with a revised scenario about the NSA telephone data surveillance program in which the agency collected and held the phone records of most Americans.

“Let’s say the phone companies kept their data encrypted, and the NSA went to them directly with a search request on the grounds of national security,” she says. “A mechanism could be applied that would have allowed the NSA to execute a search query but which would have protected their reason for searching—suspected terror activities—and would also have kept private all data in that database that did not apply to the search.”

Malkin, who is director of the cryptography lab and chair of the Cybersecurity Center at Columbia’s Institute for Data Sciences and Engineering, is also working on developing cryptographic techniques capturing provable guarantees in practical environments, such as secure computation for big data.

“I think privacy is an important issue that people are just starting to be aware of, but I don’t think people really know how much their privacy is being compromised or what disclosing certain information means,” she says. “I think we should continue to invest in studying the problems, developing solutions, and really understanding what the tradeoffs are.”

Keeping Administrators Honest and Protecting Data

If the Snowden leak proved one thing, it was that system administrators can, and do, access private information on computer systems in the course of their technical duties. Most, but not all, maintain and protect the confidentiality of any information they access.

“If an administrator goes rogue, they have the power to cause tremendous harm,” says Jason Nieh, associate professor of computer science and co-director of the Software Systems Laboratory at the Engineering School. At the 2009 Large Installation Systems Administration conference, he and Bellovin introduced the I See Everything Twice (ISE-T) system, which applies a two-person control rule to system administration.

“ISE-T requires two separate system administrators to perform each administration task. ISE-T then compares the results of the two administrators’ actions for equivalence. ISE-T only applies the results of the actions to the real system if they are equivalent,” Nieh explains. “It is noteworthy that NSA is now taking this approach to address the fallout from the Snowden leak.”

While ISE-T seems to be a good approach to preventing security breaches by system administrators managing government, military, and financial databases, Nieh is also working on ways to further protect personal data stored on mobile devices.

“By giving our mobile devices carte blanche permission to run all kinds of apps, malicious software can often piggyback onto our mobile devices via these downloads and then easily mine for information about our daily activities,” he says.

To address this privacy issue, Nieh is working on lightweight virtualization technology that allows a user to have multiple, isolated personas on the same mobile device.

“Think of a persona as a virtual phone, so you can have multiple, separate virtual phones on the same device,” he explains. “We are working on a model that will enable you to have a protected, private persona and a non-private persona, keeping activities separated and private from tracking.” (See related article on Nieh in this issue, page 30.)

Privacy and Security: A Balancing Act

To many, it may seem that privacy and security are at odds. The same technology that enhances privacy—such as encryption—can also serve to hide terrorist activity.

“We need a more balanced approach to privacy and security,” says Roxana Geambasu, assistant professor of computer science at the Engineering School. “But the huge question is how to find the right balance. Extremes, such as either no privacy or no security, are easy to implement, but undesirable. Anything in the middle raises the question of whether you’re making the right tradeoffs.”

To attempt that balance, Geambasu and her research group have focused on developing techniques to promote user privacy by improving users’ control and transparency over their data, as well as corporate and government data management practices.

“At the highest level, we are trying to build a framework for responsible data management. Sensitive data should be identified, its exposure minimized at any time, and its handling made transparent to users,” she explains.

Her solutions include Vanish, a self-destructing data system that allows users to impose timeouts on their web data, and CleanOS, a new operating system design for responsible sensitive data management.

“Vanish effectively gives users some degree of control over their web data and minimizes its exposure to future attacks,” she explains. “CleanOS maintains a clean environment by monitoring data and automatically encrypting it whenever it is unused for a period of time.”

She and her team are also working on AdWiser, a Firefox plug-in that could improve the transparency of data use by web services by letting users audit what services do with their data.

“If there is anything good that comes from the Snowden leaks, it is that there is now a worldwide focus on Internet privacy,” she says. “This could very well force us to bootstrap solutions that will put us back into balance with more transparency, judicial oversight, and restraint in the accumulation and use of data.”

By Amy Biemiller

PROFESSOR

INNOVATIVE START-UPS BY ENGINEERING FACULTY

“ CEOs ”



Pictured from left to right: Nina Tandon, Samuel Sia, Gordana Vunjak-Novakovic, Shree Nayar, Peter Allen, John Kymissis; facing page: Scott A. Banta, Vishal Misra, Paul Sajda, Alan C. West, Ken Shepard, Dan Rubenstein

Engineers develop their talent within a culture that naturally fuels entrepreneurship. Couple that with brilliant professors, groundbreaking research, and Columbia Engineering—a School that celebrates innovation—and you have a formula for successful start-ups. This light bulb moment of discovery drives many of our faculty as they continue the School’s long tradition of invention and innovation that dates back to one of our most notable inventors, 1913 alumnus Edwin Armstrong, the creator of FM radio.

“It’s natural to connect the dots—engineering solutions make great ideas for start-ups,” says Donna See, director of licensing for Columbia Technology Ventures at the University. “And in recent years, we’ve seen an

increased momentum in entrepreneurial activity from the Engineering School, both on its own and in collaboration with researchers and clinicians from Columbia University Medical Center. From our perspective, these start-ups are an increasingly important vehicle to help bring early-stage ideas to market. And New York City is increasingly becoming a great place to start and grow these businesses.”

Venture capitalists have said the tech start-up scene in New York City is on fire. So to keep pace with this heightened entrepreneurial activity, Columbia Engineering has stepped up support for faculty, students, and alumni with increased programming dedicated to those with an entrepreneurial edge.



NEUROMATTERS

Beginning this year, the School is offering free workspace in New York City's SoHo district to young alumni who need a place to incubate their start-ups. This hub of activity is located on Varick Street in a building shared with Columbia Business School and its alumni entrepreneurs. Engineering alumni will benefit from this established network and also be able to participate in programming designed for start-ups. The workspace will not only serve as a place to confer with one's business partners but also to learn the ins and outs of resourceful pioneering and entrepreneurship.

"We have created the Varick Street space as a nexus where our young alumni entrepreneurs can receive the support and resources they need to launch a successful business," says Mary C. Boyce, dean of the Engineering School and Morris A. and Alma Schapiro Professor. "This new initiative is just one of the ways we promote and encourage our rising entrepreneurs. As an institution that fosters innovation, it's imperative that we share those ideas and bring breakthrough research to market to fully realize its value to society and its impact on the world."

Throughout the academic year, students, faculty, and alumni have many opportunities to promote their start-up ideas. From on-campus business pitching competitions to the more high-stakes venture contest cosponsored with NYCEDC—the NYC Next Idea Global New Venture Competition—the School is steadily giving budding entrepreneurs a chance to take center stage and make their marks in new business. And for faculty, Columbia Engineering's NSF I-Corps Node, an initiative with partners City University of New York (CUNY) and New York University, provides programming to help professors better understand the business process and how to push their groundbreaking ideas out of the lab and into the real world of commerce.

Here, *Columbia Engineering* spotlights a small sampling of the exciting start-ups recently founded by our Engineering faculty. Ranging from a newly opened biotech incubator to a major breakthrough in alternative fuel, these pioneering new business ideas underscore the School's track record in fostering a vibrant culture of innovation that impacts our daily lives.

The School is offering free workspace in New York City's SoHo district to young alumni who need a place to incubate their start-ups.

"As an institution that fosters innovation, it's imperative that we share those ideas and bring breakthrough research to market to fully realize its value to society and its impact on the world."

—Mary C. Boyce



PAUL SAJDA

PROFESSOR OF BIOMEDICAL ENGINEERING, OF ELECTRICAL ENGINEERING, AND OF RADIOLOGY

Imagine walking down a street, admiring a painting in the window, and wondering who the artist was, or seeing a pretty dress on a girl and wondering where to buy it, and then—aha!—your brain receives that information almost instantly. This ability may soon become a reality if Paul Sajda has his way. Sajda, a professor of biomedical engineering, electrical engineering, and radiology, is focused on understanding how we make rapid decisions and what the underlying fundamental neural processes are. He is pioneering brain-computer interface systems that can empower the human brain when faced with complex information processing.

"By decoding the 'aha!' moment, the instant when your brain reacts to an event or something you're seeing," Sajda says, "we'll be able to help people navigate the digital information overload, so that they can find and focus on the information that matters to them."

Sajda, who also directs the Laboratory for Intelligent Imaging and Neural Computing at the Engineering School, has been working with the U.S. Defense Advanced Research Projects Agency (DARPA) for more than seven years, and he developed the idea that led to the agency's Neurotechnology for Intelligence Analysts (NIA) program. NIA's mission, spurred by advancements in satellite imaging technology, is to help analysts manage the exponentially increasing number of images being collected. While humans are very good at analyzing imagery—quickly targeting salient features while ignoring irrelevant ones—it is becoming harder than ever to keep up with the data influx.

"The challenge is to sort through more data in less time than ever before," Sajda observes. "Recent advances in neuroscience, sensors, and machine learning have really improved our ability to decode, model, and detect a range of cognitive states, and this is an exciting time to be working in this field."

Researchers have long known that visual processing of important information can be detected in brain activity. Through the NIA program Sajda's team developed C3Vision (Cortically Coupled Computer Vision), a software system currently being tested by the U.S. National Geospatial-Intelligence Agency. The system offers analysts a way, using the input generated by their brain activity, to increase the number of images they can handle at any given time and to sift through the most "important" data first, finding their target three times faster.

The DARPA collaboration led to Neuromatters, a start-up Sajda founded in 2007 with Lucas Parra, a City College of New York biomedical engineering professor. The company targets a broad range of activities, from remote sensing and multimedia search to neuromarketing, advanced gaming interfaces, and monitoring neurological disorders. Of the original eight companies to compete for DARPA funding, Neuromatters is

"Our vision is to deliver technologies that leverage the unsurpassed recognition, abstraction, and plasticity of the human brain with the data crunching capabilities of computer systems."

one of the top two contenders left, and Sajda is hoping that his system's low cost, portability, and high efficiency will win the day.

"Our vision is to deliver technologies that leverage the unsurpassed recognition, abstraction, and plasticity of the human brain with the data crunching capabilities of computer systems," Sajda notes.

Sajda has ideas for other start-ups related to his research, including one on neural feedback and classifying baseball pitches, and another on monitoring

depression and anxiety. He says the critical thing about start-ups is "having a good team and knowing what you're good at and especially what you're not good at." He's happy to let others run the business side while he continues his research.

And, perhaps down the road, Google Glass could have a cool new partner in C3Vision—the perfect companion for a walk down Fifth Avenue or the Champs Élysées!

By Holly Evarts

Paul Sajda, donning an EEG (electroencephalography) cap, which measures brain signals



BIGSHOT

SHREE NAYAR

T. C. CHANG PROFESSOR
OF COMPUTER SCIENCE

For Shree Nayar, a camera is more than just a device that captures images in time, memories in pixels. Cameras, in all forms, together with the powerful, evocative impact they have on people, have always fascinated him.

“The camera is central to what we do,” says the T. C. Chang Professor of Computer Science, who was inducted into the National Academy of Engineering in 2008 as well as the American Academy of Arts of Sciences in 2011 for his pioneering contributions to computer vision and computer imaging. “It allows us to express ourselves and to communicate with each other in powerful ways—it has evolved into a technology with great social relevance.”

About six years ago, Nayar started thinking about how to leverage the appeal

of the camera to make a broader social impact and embarked on a side project. His tipping point was *Born into Brothels*, a documentary about desperately poor children living in the red light district of Calcutta who were given cameras by one of the directors.

“As they learned photography, they began to look at their world with new eyes,” Nayar observes. “The film reaffirmed my belief that the camera is unique as a technology in its ability to inspire creativity.”

And that was the genesis of Bigshot, a kit that features a build-it-yourself digital camera designed to serve not only as a creative tool but also a medium for education. The camera includes features like a hand-cranked power generator to supplement the rechargeable battery, and a “Swiss Army” lens with a wheel you can rotate to switch between regular, panoramic, and stereo or 3D modes. The kit is accompanied by a website that includes an interactive textbook

with engaging demos of the science and engineering concepts related to the camera—optics, mechanics, electronics, and image processing.

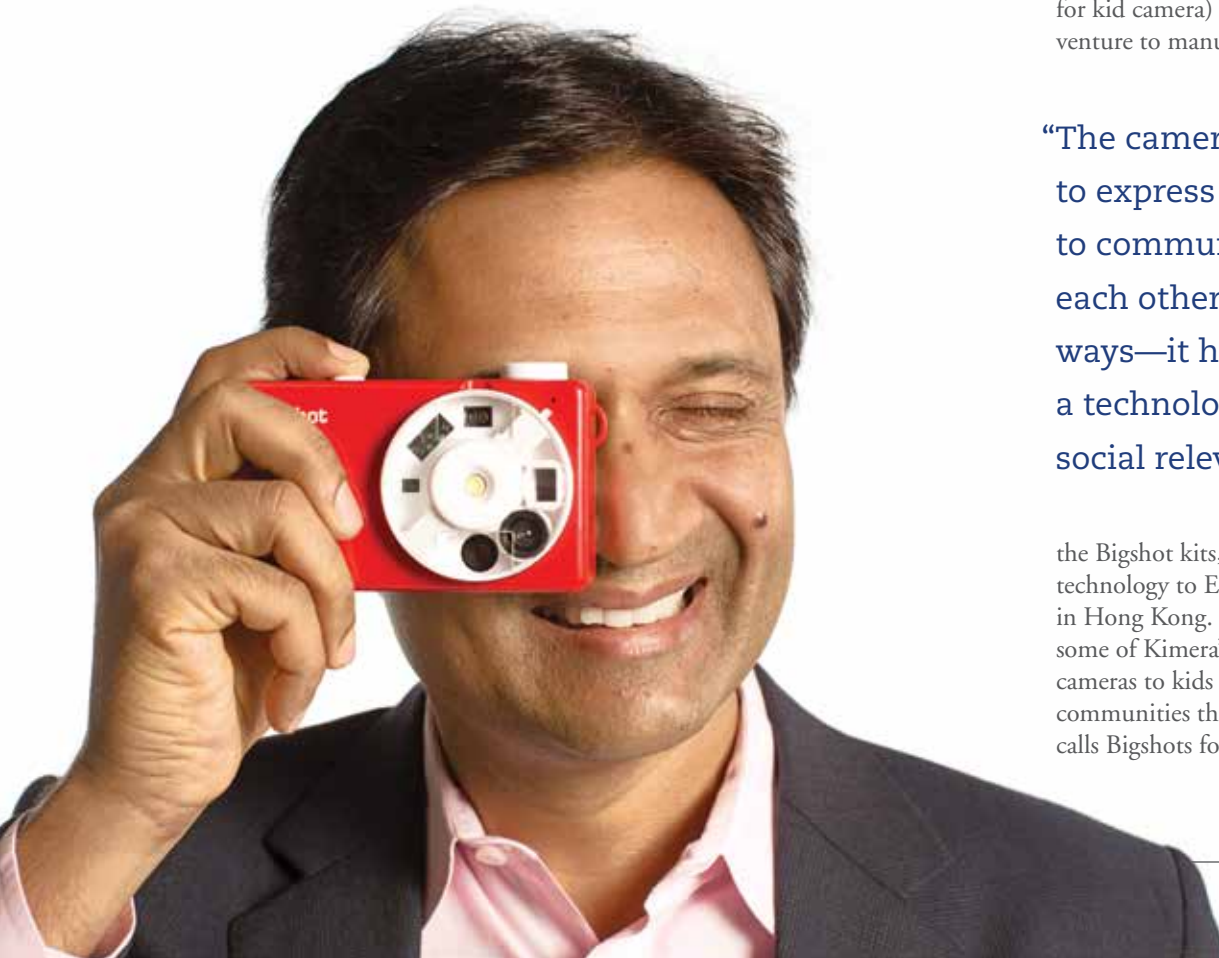
“Building Bigshot component by component exposes kids to a wide range of science concepts, and they learn by doing,” Nayar notes. “Once they have a fully functioning digital camera in their hands, they get to enter the world of photography, storytelling, and documentation. The inherent nature of the camera enables us to juxtapose the sciences and the arts within a single learning experience.”

At Columbia, Nayar worked with independent contractors to build about a dozen prototypes of the camera. He and a team led by graduate students Guru Krishnan and Brian Smith developed the first version of the educational website. They field-tested the prototypes and the website over a six-month period with hundreds of kids in four cities—New York, Bangalore, Vung Tau, and Tokyo. The camera kit was well received.

In 2010, Nayar founded Kimera (short for kid camera) as a for-profit social venture to manufacture and distribute

“The camera allows us to express ourselves and to communicate with each other in powerful ways—it has evolved into a technology with great social relevance.”

the Bigshot kits, licensing the camera technology to EduScience Ltd., based in Hong Kong. Nayar’s goal is to use some of Kimera’s royalties to donate cameras to kids in highly underprivileged communities through a program he calls Bigshots for Good. He is hoping



PIONEERING INTERNET STANDARDS



kids will share their photos online, and on the Bigshot website. And he intends to partner with educational nonprofits and after-school programs, and already has one inked with the Center for Arts Education in New York, to bring Bigshot to under-served students.

Nayar's family is part of the act—his son Akash was six years old when Bigshot was being designed and offered several suggestions. "Some practical and some not!" says Nayar. "The important thing was that he was engaged. As with any technology for education, the challenge is to keep the attention of the student. It was reassuring to know that Akash remained interested during the entire project. He still is!" And Nayar's wife, Kalpana Kanthan, who has worked for educational nonprofits in the past, will lead Bigshots for Good.

"To me, Bigshot is not just a kit, or a digital camera," Nayar says. "It is an experience that I hope will pique curiosity. One kid may be drawn to the science behind it and another may be inspired by the art of photography. Both would be equally good outcomes in my mind."

By Holly Evarts



Henning Schulzrinne

Henning Schulzrinne's research has led to revolutionary advancements to the Internet. The computer scientist is the innovator behind key protocols that enable Voice over Internet Protocol, known widely as VoIP, and other significant multimedia applications, including real-time web streaming. For example, the Session Initiation Protocol (SIP) enables service providers to integrate basic IP telephony services with web, email, and chat services.

If you have called someone via Facetime or viewed a live web cast, it is Schulzrinne's research that has made these multimedia capabilities possible. Schulzrinne, who is currently serving as chief technology officer for the U.S. Federal Communications Commission (FCC), remembers very well the time he spent in the early 1990s as a PhD student working on these novel Internet protocols. Schulzrinne attended his first standards meeting in 1992.

"The topic itself was not new, but until that time, networks and computers weren't really powerful enough to transmit even audio reliably," recalls Schulzrinne, the Julian Clarence Levi Professor of Mathematical Methods and Computer Science at the Engineering School. "Our small group recognized that this would change soon and there would be a need for universal standards to transmit audio and video."

Schulzrinne has since worked on several aspects of technology and communications. He is currently interested in examining how to make heterogeneous wireless networks work better for users, and a research team in his Columbia lab has been building a prototype system that is close to being ready for commercialization.

While he doesn't consider himself a traditional entrepreneur, he is very much a proponent of spreading the wealth, so to speak. "I like to see technology that's useful being deployed and fully developed, and not just remain a research paper."

As CTO for the FCC, Schulzrinne has enjoyed the opportunity to work on a much broader set of research issues, including updating 911 regulations, examining cybersecurity, and creating new technologies for people with disabilities.

Schulzrinne was recently inducted into the Internet Hall of Fame for his pioneering contributions to VoIP and multimedia technologies. Of these achievements he says, "It's been rewarding to see technology progress from early standards and research prototypes to commercial implementations, and now, to widespread use and an ongoing replacement of the technology of the public telephone network. This has been the work of many people over 20 years now—it has been a privilege to be part of the effort."

By Melanie A. Farmer

EPIBONE

GORDANA VUNJAK-NOVAKOVIC

THE MIKATI FOUNDATION
PROFESSOR OF BIOMEDICAL
ENGINEERING

When Gordana Vunjak-Novakovic set out for MIT on a Fulbright scholarship in 1987, leaving her homeland of Serbia with a PhD in chemical engineering, she had never heard of tissue engineering. Few people had. The field was tiny. Only a smattering of scientists at MIT and a few other institutions took seriously the futuristic idea of growing body parts in the lab. “A mentor suggested that I pursue tissue engineering, and I said, “Tissue what?” Vunjak-Novakovic recalls.

But the suggestion intrigued her, so she began experimenting with bone, cartilage, and heart cells, trying to figure out how to keep them alive in a Petri dish. One day she was peering at the heart cells through a microscope, watching them twitch, when someone slammed the lab door and the cells began to beat faster. Vunjak-Novakovic was stunned.

“It looked so real, like a little beating heart,” she says. “At that moment I was struck by the power of both nature and technology. It was overwhelming. I just began to cry.”

From that epiphany sprung the conviction that with smart engineering, cells could grow in the lab as well as they do in the body. “Cells do not know if they are in the body or a dish,” Vunjak-Novakovic says. “They only know the signals they receive from the environment around them.”

Nearly 25 years later, Vunjak-Novakovic, still inspired by that core belief, has become one of the most influential scientists in the now-booming field of tissue engineering. At the Engineering School, Vunjak-Novakovic serves as The Mikati Foundation Professor of Biomedical Engineering, director of the Laboratory for Stem Cells and Tissue Engineering, co-director of

the Craniofacial Regeneration Center, and scientific director of Columbia Stem Cell Core. In 2012, she was elected into the National Academy of Engineering, becoming the first woman at Columbia to ever earn the prestigious distinction.

A pioneer in her field, Vunjak-Novakovic’s work in many ways has only just begun. Her ultimate goal? To push her research out of the lab in order to help millions of people who need tissue grafts every year. That’s the driver behind EpiBone, a start-up for patient-customized bone grafts founded by Vunjak-Novakovic and her Columbia colleagues in 2011 with \$250,000 in seed money.

At the heart of EpiBone is a proprietary bioreactor that mimics the conditions of the body to help people grow their own bone. The technology is still in preclinical testing, but a commercial service would work something like this: Using a scan of

At the heart of EpiBone is a proprietary bioreactor that mimics the conditions of the body to help people grow their own bone.

Pictured from left to right: Sarindr Bhumiratana, Nina Tandon, Gordana Vunjak-Novakovic, Sidney Eisig, and Jonathan Bernhard



INFINIO

the patient as an anatomical guide, scientists would mill a porous scaffold to the exact dimensions of the needed replacement part. In the bioreactor, the scaffold is seeded with stem cells extracted from a small sample of the patient's fat. Then the bioreactor supplies nutrients and oxygen to the cells and applies sheer forces in a way similar to those in the body to help stimulate bone growth. "That's our secret sauce," says EpiBone cofounder Nina Tandon, a postdoctoral researcher in Vunjak-Novakovic's lab. Within a few weeks, the newly formed bone is ready for transplantation.

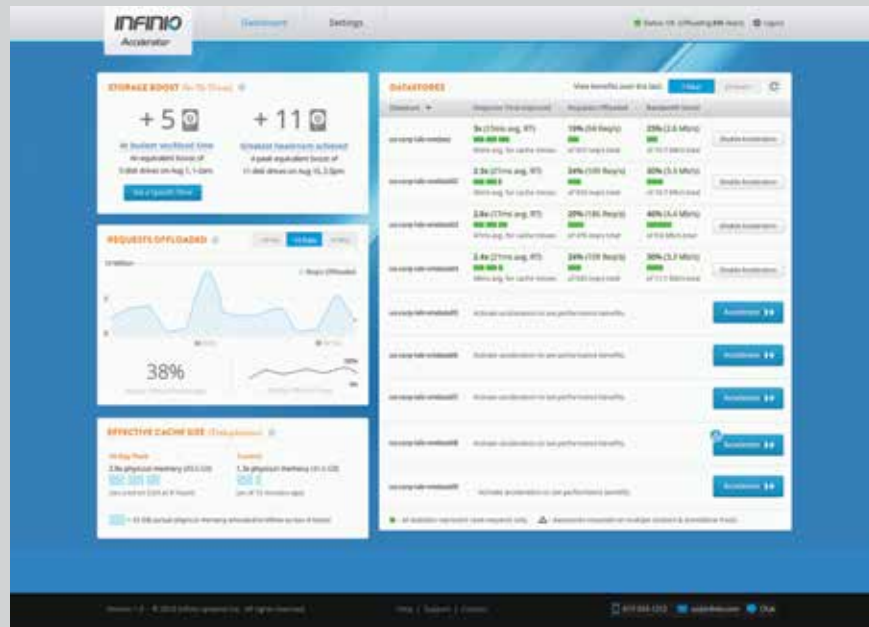
Such technology could make painful bone defects a thing of the past. Today, surgeons harvest bone from the patient's hip or rib, or implant titanium or plastic parts that don't grow or shrink with the body. "But," Vunjak-Novakovic says, "a fixed implant cannot adjust to a changing body. Only living tissue can truly replace what has been lost."

EpiBone has so far attracted more than \$3 million in grants. Such no-strings funding gives its founders the freedom to grow slowly, and on their own terms. Vunjak-Novakovic sees no advantage in rushing to accept investment offers.

"Investors are great, but on the other hand you need to make sure you don't give away the technology for an initial batch of money." For counsel and guidance, she and her colleagues often tap Columbia's deep and able network of experts in entrepreneurship.

Taking things slow is just fine with EpiBone cofounder Sarindr Bhumiratana, a postdoctoral researcher in Vunjak-Novakovic's lab who co-invented the bioreactor. With Vunjak-Novakovic at the helm, he's confident in the future of their company. "Gordana believes in doing what you love," Bhumiratana says. "When you're passionate about your work, you can make anything happen, no matter how difficult."

By Nicole Dyer



VISHAL MISRA

ASSOCIATE PROFESSOR OF
COMPUTER SCIENCE

DAN RUBENSTEIN

ASSOCIATE PROFESSOR OF
COMPUTER SCIENCE

Of all the positives the virtualized computing environment offers, there is one problem: storage bottlenecks that must be resolved by purchasing expensive hardware additions. Vishal Misra and Dan Rubenstein have successfully tackled that problem with a breakthrough, downloadable software solution for businesses.

Misra and Rubenstein, both associate professors of computer science, launched their company, Infinio, in 2011 and have since garnered \$12 million in venture capital support.

"The Infinio Accelerator, our first product, separates the problem of storage performance from the issue of storage capacity. It's a downloadable software solution that installs a virtual appliance on each physical host in a network,"

The Infinio Accelerator dashboard displays performance metrics about your accelerated datastores. (image courtesy of Infinio.com)



Vishal Misra

Dan Rubenstein

Infinio's download-and-go model is elegant and revolutionary, combining user-friendliness and powerful potential to increase storage capacity at a lower cost, with easy performance tracking.

Misra explains. "It takes a little bit of RAM and CPU from each host; those components are combined into a shared, deduped caching and acceleration layer, which enhances performance by retrieving bits closest to the application throughout the network. Moreover, this is done by using the cheapest and most commoditized pieces of hardware found in the data center, RAM, and CPU."

While the company, based in Cambridge, MA, today employs 30 and expects to double that in the next year, the technical foundations of the company were grounded in research done at Columbia.

"This started as an academic exercise, the PhD thesis of our student Joshua Reich, but Vishal realized the potentially seismic impact that this work could

have in industry," Rubenstein says. "Vishal reached out to the start-up world to see if there was any interest, and it turned out there was plenty. The timing was right and we decided to make a go of the company."

Infinio's download-and-go model is elegant and revolutionary, combining user-friendliness and powerful potential to increase storage capacity at a lower cost, with easy performance tracking. Rather than being a cloud storage service, like Dropbox or Google Drive, the Infinio Accelerator speeds up the network attachment storage (NAS), without the investment of additional disks, controllers, or SSDs (Solid-State Drives).

"From the dashboard, users can easily monitor and adjust their system's performance and also track statistics that

show efficiencies, including a running total of how many disks you would have had to purchase if you hadn't installed the Infinio Accelerator," Misra says. "Infinio's product is designed to make the user's experience more efficient, given the limitations of disk speeds. Essentially, our product takes advantage of fast networks and fast processing to reduce the waiting time of slow disks."

Through the development of their research and technological innovations, the goal at Infinio is to build not only a useful product but also a profitable company that can fund its own development.

"The research and development that continues at Infinio is now self-sustaining but started just like our other research that initially requires financial support from government and industry," Rubenstein says. "The core idea of the company emanated from our research, but now the company is supporting further research to build the enterprise."

The founders remain active in planning for Infinio's next move, while at Columbia, there is no apparent limit to Misra and Rubenstein's conceptual prowess. Misra, for example, is focused on economic issues of global connectivity, and Rubenstein is very interested in networking smaller devices.

"New topics and trends are constantly popping up, and as long as we and our students can do some work we think is interesting and possibly significant, we always go after it. Columbia allows us the flexibility to chase all our ideas," Rubenstein says.

"People seem excited about the first product," Misra adds, "and while we are chasing after all these ideas, we also continue to keep our eyes on the long-term vision of Infinio and approach our goal—which is to fundamentally change the way storage is done—one sure-footed step at a time."

By Amy Biemiller

RADIATOR LABS AND CHROMATION

JOHN KYMISSIS

ASSOCIATE PROFESSOR OF ELECTRICAL ENGINEERING

Throughout his career, Ioannis (John) Kymissis has mentored countless students and watched many of them turn their one-of-a-kind research ideas into viable businesses. For his part, Kymissis, associate professor of electrical engineering, has helped his students hone in on their creative research ideas and cultivate their entrepreneurial side. To date, he has been involved in several promising start-ups targeting real-world challenges, including innovations from Radiator Labs and Chromation.

The concept for Radiator Labs stemmed from a common problem for those whose apartments or homes operate on steam heat—the room temperature is frequently too hot. There is generally not an easy or affordable way to adjust the temperature to an individual's preference. After kicking around some ideas with his former graduate student Marshall Cox, the radiator retrofit was born in 2011.

The result is a visually attractive, thermally insulated radiator cover that

helps control the temperature in each room while saving money and energy. As if that wasn't enough to please urban dwellers and homeowners, the unit is easy to install and doesn't require calling an overpriced plumber or a pesky landlord.

"The Radiator Labs system has been deployed on a pilot basis in a number of buildings, and the first-generation commercial unit is in the final stages of design," says Kymissis, cofounder and technical adviser for Radiator Labs. "I expect to see them in a number of buildings this fall and also to announce a consumer version by the end of the year."

The timing of the company's launch could mean a more heat-stable winter for the estimated 14 million homes in the United States that rely on steam and hot water for heat.

For Kymissis, mentoring students is an essential part of being a professor, and he believes entrepreneurship is an extension of research projects.

"In engineering research, our goal is to build systems that extend the state of the art and to solve problems that haven't been solved before," he says. "Once we're done with the academically interesting parts, though, there's often significantly

more work required to get the technology into the marketplace. In many cases this is best done within a company structure."

Cox and several of Kymissis's other students would likely agree, having chosen the start-up path after graduation.

Nadia Pervez, a former postdoctoral student in Kymissis's group, did just that when she cofounded Chromation with Kymissis. Launched in 2010, the start-up develops low-cost spectral sensor modules for color and light measurement. Spectral sensors are used in a wide range of equipment, including water measurement systems, health care diagnostic equipment, color matching systems, and devices that analyze the quality of lighting. The two types of currently available instruments offer varied results. Spectrometers can provide high performance but are costly, while filtered detectors have low performance and are inexpensive. Brooklyn, N.Y.-based Chromation takes a new approach to this situation by using a smaller piece of precision glass that changes the system's form factor and lowers the cost.

"The Chromation system—depending on its features—has a price around \$50, which positions it for inclusion in a new wave of systems as well as a replacement for spectrometers in a number of instruments," says Kymissis, who also serves as Chromation's chief technology officer.

Two other technology companies—Udacomm and Lumiode—have recently spun out of his research group, and Kymissis continues to advise both and is quick to give credit where credit is due.

"While I have been fortunate to be involved with a number of the small companies spinning out of Columbia, the real credit goes to the students and postdocs who have taken the plunge and made this their career," Kymissis points out. "The folks who have done this really serve as the role models to the next generation of student entrepreneurs."

By Janet Haney

For Kymissis, mentoring students is an essential part of being a professor. To date, he has been involved in several promising start-ups targeting real-world challenges.



MULTIPLE SMARTPHONE PLATFORMS, ONE DEVICE

There is no longer a need to juggle multiple smartphones to keep your work life and your personal business separate and confidential. Thanks to a Columbia-built start-up called Cellrox, cross-pollinating the platforms without compromising security is now a reality.

The idea for Cellrox's multi-persona virtualization technology stemmed from studies Jason Nieh conducted several years ago with his research group. Cellrox gives users the ability to carry a single smart mobile device with two or more personalities—work and personal—running side by side. Nieh, associate professor of computer science at the Engineering School, devised this innovative technological approach together with his entrepreneurial-minded students, and one of them started the company on his own after graduation two years ago. Nieh serves as the chief scientist.

"As we move to this post-PC era, people are doing much more business on their smartphones and tablet devices," says Nieh, who also is co-director of the Software Systems Laboratory at Columbia Engineering. "Managing the IT aspects of mobile devices is increasingly important and securing that infrastructure is crucial. Cellrox provides a solution to this problem that secures mobile devices without compromising performance."

Cellrox, headquartered in Tel Aviv, is based on "lightweight virtualization" technology that works at the interface between applications and the operating system, Nieh explains, "so instead of running additional operating system instances, we leverage the device's native operating system instance to support multiple personalities, making it lighter weight."

Nieh often encourages his students to think independently—an important trait for an entrepreneur. This method has worked for those involved with Cellrox—the company has received significant press coverage and is working with partners to bring its virtualization technology to market.

To Nieh, being a professor in many ways is a bit like being an entrepreneur. "As a professor, no one tells you what to work on. You work independently, identify the problems that need to be solved, and come up with the ideas," Nieh says. "You have to come up with the funds to build your team, create research prototypes, and sell these ideas in the marketplace of knowledge. The technology behind Cellrox started this way within the walls of Columbia and is now a successful business endeavor."

By Janet Haney

Pictured: Jason Nieh



PLATFORM IMAGING



Fully insertable in-vivo imaging device

PETER ALLEN
PROFESSOR OF
COMPUTER SCIENCE

DENNIS FOWLER
DIRECTOR OF THE
REEMTSMA CENTER
FOR INNOVATION AND
OUTCOMES RESEARCH,
COLUMBIA UNIVERSITY
MEDICAL CENTER

Going from good to better and then from better to best is often what underpins successful entrepreneurship. In the world of medicine, that mantra can be especially applicable.

Consider the advancement of laparoscopy, or minimally invasive surgery (MIS). Abdominal surgeries that, years ago, required large incisions and resulted in long, painful recoveries for patients, are now performed on an outpatient basis thanks to the laparoscope. This thin, flexible, tube-like surgical tool is often equipped with a video camera and



Peter Allen



Dennis Fowler

“This endeavor is a great example of the impact of a clinician-computer scientist-engineer collaboration.”

—Dennis Fowler

enables surgeons to get full, two-dimensional views inside patients without the need for a large incision.

But is there room to improve the visual acuity and utility of the laparoscope? That’s the question two researchers from Columbia asked and answered.

“The standard laparoscope has not changed substantially since its inception,” says Peter Allen, professor of computer science at the Engineering School, whose research includes real-time computer vision, dexterous robotic hands, 3D modeling, and sensor planning. “We’ve taken its utility to the next level of development.”

Allen, along with Dennis Fowler, MD, director of the Reemtsma Center for Innovation and Outcomes Research (RCIOR) at NewYork-Presbyterian Hospital/Columbia University Medical Center, launched Platform Imaging, a medical device start-up located in New York and created to commercialize intelligent 3D surgical visualization systems for MIS.

“Dr. Fowler, who has more than 40 years of experience in MIS, was unhappy

with the lack of development of new and improved imaging devices,” Allen explains. “He realized that making a small, disposable, and easily controlled camera system that could be fully inserted into the abdominal cavity would be a major breakthrough in MIS.”

Fowler, a pioneer in the field of endoscopic surgery, was the first in the world to complete a sigmoid colectomy laparoscopically. He sought out Allen and his expertise in computer vision and robotics. Together, they have designed and built a number of prototype devices that have been tested successfully in an in vivo environment.

“This endeavor is a great example of the impact of a clinician-computer scientist-engineer collaboration,” Fowler says.

The business partners developed the new technology, which includes 3D perception to enhance the surgeon’s view and lessen the learning curve in training new MIS surgeons, and received an agreement from the University to license the intellectual property behind the innovation. They believe that this

technology will enable the evolution of advanced surgical procedures and reduce the cost currently associated with minimally invasive procedures.

The market opportunity is immense: More than two million MIS procedures are performed annually in the United States alone.

“We are now having conversations with potential investors and other sources of capital, and these initial conversations have been positive,” Fowler says.

The duo is seeking \$2 million in funding to complete the design, manufacture prototypes, and obtain FDA 510K approval. The collaboration has already resulted in related solutions that Columbia has licensed to Titan Medical Inc., which develops robotic surgical technologies.

“The opportunity to produce real devices that can positively affect patients’ lives and outcomes is what really excites us,” Allen says.

By Amy Biemiller

ELECTRICBIO TECHNOLOGIES

SCOTT A. BANTA

ASSOCIATE PROFESSOR OF
CHEMICAL ENGINEERING

ALAN C. WEST

SAMUEL RUBEN-PETER
G. VIELE PROFESSOR OF
ELECTROCHEMISTRY

Move over plant-based biofuels. A new process developed by Alan C. West and Scott A. Banta holds remarkable promise as the alternative to alternative energy.

By developing a new process that directly converts electricity produced by renewable resources, carbon dioxide, and water—rather than plants—into liquid fuels or high-value chemicals, the two entrepreneurs aim to disrupt the energy industry. Their company, ElectricBio Technologies, had its genesis in 2009, when the two scientists responded to an ARPA-E* program's call for a high-risk electro-fuels program.

"The foundation of ElectricBio Technologies is rooted in the development of our initial process, a platform which

can be applied to the production of electrofuels, such as isobutanol, an advanced alcohol that can be blended with gasoline for use in motor vehicles," explains Banta, associate professor of chemical engineering. "The technology is incredibly exciting but fundamentally different from other approaches for renewable energy sources."

ElectricBio Technologies bypasses the typical biofuel process, which is characterized by intensive agriculture and inefficient conversion of energy stored in plant material. Instead, it employs microorganisms that directly use energy from iron ions that can be reused by processing with electricity to produce liquid fuels from carbon dioxide. The innovation is happening at the right place at the right time.

"As renewables become more prevalent, strategies for large-scale energy storage will be very important," Banta says. "Electrofuels allow renewables from all sources to be stored conveniently as a liquid fuel."

To develop the process, the company's founders leveraged their experience

and interests, as well as their collaborative natures.

"We can effectively collaborate because our interests are very orthogonal—Banta's field of expertise is protein engineering, whereas mine is electrochemical engineering," says West, the Samuel Ruben-Peter G. Viele Professor of Electrochemistry. "In our work, these concentrations are complementary; their integration is vital to the research of certain technologies in the sensor and energy arena."

The partners recently competed in the Ultra Light StartUps Future Energy event, a pitch session that connected entrepreneurs, researchers, and private investors in the energy and clean-tech industries interested in developing radical solutions to the world's energy challenges. ElectricBio Technologies took third place and the partners found that they had an audience interested in the potential as well as in the science behind their process.

"While fundamental research is key, the potential of the approach can be difficult to evaluate for those not directly working on electrofuels," Banta says. "Our next

*Scott A. Banta (left),
Alan C. West (right)*



HACKING THE NEW SILICON VALLEY

step is to create a demonstration of the process to help more people understand the commercial potential.”

West and Banta are working through the business aspects of commercially developing ElectricBio Technologies.

“We have multiple patent applications in place concerning the integrated process and media composition,” West says. “Our research tools for genetic modification of these unique organisms are not widely available, so we are ahead of any competition that may be out there. Part of our business strategy is to use our platform to work with customers to make the product in which they are most interested. We possess the advantage of know-how.”

Looking to the future, the possibilities for the company seem infinite and exciting.

“It’s gratifying that our work is directly applicable to industrial interests and also addresses long-term environmental and energy needs,” West says.

By Amy Biemiller

**Advanced Research Projects Agency-Energy*

Banta and West are disrupting the energy industry. They’ve developed a new process that directly converts electricity produced by renewable resources, carbon dioxide, and water—rather than plants—into liquid fuels or high-value chemicals.



Chris Wiggins

The word “start-up” might generate images of tech-savvy college kids developing the next killer app in a Silicon Valley garage. Some 3,000 miles away, New York City, however, continues to boast a significant number of industry-varied start-ups in need of engineering talent.

Chris Wiggins, associate professor of applied mathematics, and his co-organizer, NYU Professor Evan Korth, found a way to bridge the gap between students and local start-ups by

creating hackNY.org more than three years ago.

“New York City start-ups are desperate to hire talented engineers like those from Columbia, but there was simply a lack of information on both sides about how to find each other,” Wiggins says.

The goal of hackNY is twofold: “We’d like to help ensure a sustainable future for New York City as a home to technology start-ups. We also see hackNY as a chance to innovate technical education through experiential learning.”

To this end, hackNY devised a fellows program that pairs a college student with a host start-up. The fellows stay in community-style housing and are introduced to founders and investors from the thriving New York City start-up scene. Additionally, hackNY holds 24-hour hackathons aimed at introducing students to the world of building in code.

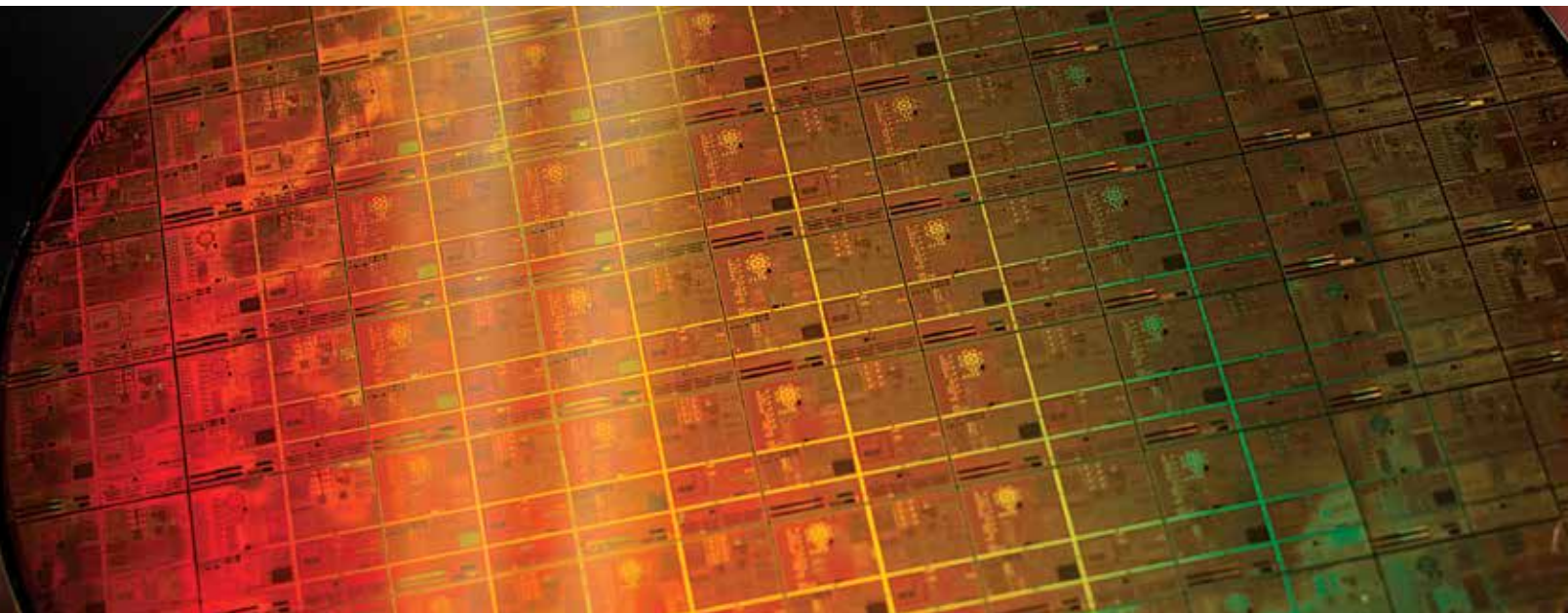
To date, hackNY has hosted more than 100 fellows, and thousands of students have participated in the around-the-clock hackathons, including one held at Columbia Engineering this past spring.

hackNY’s strong entrepreneurial and mentoring style mimics Wiggins’ own life and undergraduate experience at Columbia. He learned early on the value of community and mentors who encourage technically minded students.

“As an alumnus,” says Wiggins, “I think Columbia students are some of the most disruptive—in a good way—and talented in the world, and a career in start-ups is a natural fit for their talents and independent thinking. hackNY offers them another vehicle and set of resources to get started.”

By Janet Haney

“We’d like to help ensure a sustainable future for New York City as a home to technology start-ups. We also see hackNY as a chance to innovate technical education through experiential learning.” —Chris Wiggins



KEN SHEPARD

PROFESSOR OF ELECTRICAL ENGINEERING AND BIOMEDICAL ENGINEERING

The electronics revolution of the last 30 years has been driven by what is known as Moore's Law. Named after Intel founder Gordon Moore, it recognizes the industry trend of scaling the basic transistor of the complementary metal-oxide-semiconductor (CMOS) integrated circuit smaller and smaller, allowing more to be crammed onto chips at lower cost and higher performance. This has allowed smaller, cheaper, and lower-power microprocessors and communications chips that have enabled the plethora of mobile computing devices connecting to powerful cloud servers.

This same scaling, however, has not been possible for the power electronics responsible for providing energy to these devices, hindering progress in the design of these systems. Breaking this barrier with integrated power electronics is what Ferrig Semiconductor Inc. is all about. Founded in 2012 by a team of engineers

and materials scientists out of Columbia University, the company is positioned to enable a paradigm shift in the way power electronics is designed based on exploiting new CMOS technology enhancements pioneered by the company. Key to this is a new inductor technology that allows dense, efficient, on-chip energy storage.

"Ferrig has developed intellectual property in the areas of both basic materials technology and circuit design that enables integrated, high-efficiency power conversion," says Ken Shepard, professor of electrical engineering and of biomedical engineering, and technical adviser and chairman of Ferrig Semiconductor.

"We developed integrated inductors in CMOS technology with precisely engineered laminations of high-permeability magnetic material," he says. "Our custom

process allows the magnetic materials to be deposited as part of normal CMOS fabrication, which drives down the cost of production."

This new class of integrated voltage regulators is expected to provide as much as 20 percent reduction in total power consumption for digital computing platforms, ranging from smart phones to data centers.

"We have recently closed our first round of private financing supplemented by government grants," Shepard says. "We have some strategic manufacturing partnerships in place and some very promising customer engagements. Ferrig has assembled a great team to move things forward." Ferrig's founding team includes CTO Noah Sturcken, who recently earned his PhD at

This new class of integrated voltage regulators is expected to provide as much as 20 percent reduction in total power consumption for digital computing platforms, ranging from smart phones to data centers.



Columbia, and CEO Maurizio Arienzo, an industry veteran.

“This company is benefiting from the enormous technical talent of Noah Sturcken, with whom I was proud to work when he was a PhD student, and now is the driving force behind Ferric’s technology,” says Shepard. “He is an exceptionally talented engineer.”

Technology innovation aside, Shepard feels that one of the most valuable results to come from the company is the example it sets to current Columbia students.

“This company is visible proof that students can ride the risk-reward curve and take things they learn in their PhD programs to the next level,” he says. “It’s so easy for PhD students to just take a job with a company. It’s far more exciting for them to take their ideas into the marketplace with their own ventures.”

Pictured on Opposite Page: Processed silicon wafer showing fabricated inductor structures

HARLEM BIOSPACE



SAMUEL SIA

ASSOCIATE PROFESSOR OF BIOMEDICAL ENGINEERING

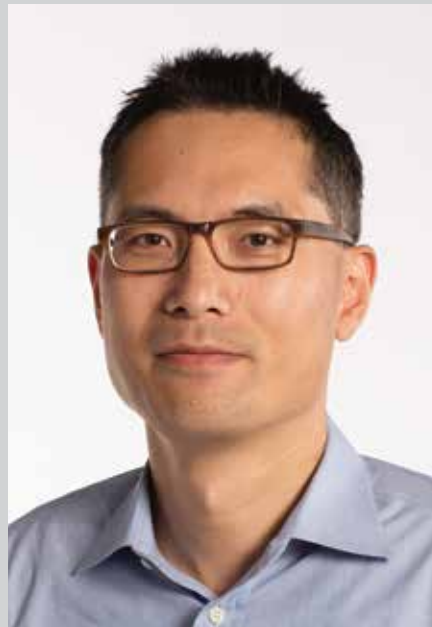
Samuel Sia is giving early-stage biotech start-ups one less thing to worry about: finding lab space at a reasonable rate. Harlem Biospace is a new, innovative biotech incubator in New York City, cofounded by Sia, associate professor of biomedical engineering, and his wife and business partner, Christine Kovich. Biotech entrepreneurs can spend less time on logistics and more time producing solutions to ever-increasing health problems.

Partly backed by the New York City Economic Development Corporation (NYCEDC), Harlem Biospace is opening its doors in November to up to 24 life-science start-up companies, giving them affordable shared wet lab space outfitted with modern biotech equipment, along with entrepreneurial resources and support, including one-on-one guidance with mentors, investors, and other like-minded entrepreneurs.

Harlem Biospace is located just a few blocks north of Columbia in the old Factory District of Harlem in a building formerly used as a laboratory for confectionary research.



Harlem Biospace entrance



Samuel Sia

“There’s a certain sense of creativity and energy in this neighborhood that has an exciting mix of traditional services and newer technology. This sense of innovation reflects the spirit of what we’re trying to do.”

Harlem Biospace is located just a few blocks north of Columbia in the old Factory District of Harlem in a building formerly used as a laboratory for confectionary research.

Sia is thrilled to be in Harlem and thinks the evolving neighborhood vibe aligns perfectly with the idea behind this new biotech incubator model.

“There’s a certain sense of creativity and energy in this neighborhood that has an exciting mix of traditional services and newer technology,” he says. “This sense of innovation reflects the spirit of what we’re trying to do. Our biotech incubator model is promoting a sense of community by encouraging entrepreneurs who have new ideas. This change in Harlem, driven also largely by the Columbia Manhattanville expansion, matches well with what we’re trying to do here.”

Sia has been busy promoting Harlem Biospace, hosting back-to-back open houses and information sessions this past summer, and steadily reviewing applicants. So far, the space has received hundreds of visitors and a significant number of space applications from a diverse

range of biotech start-ups, including those in small molecule drug discovery, medical devices, orthopedic devices, and diagnostics. Members get turnkey access to cell-culture hoods, incubators, benchtop centrifuge, autoclave, chemical fume hood, microscopy, freezers, and refrigerator space. The rent is \$995 per desk per month, with a six-month commitment and an option to renew for up to three years.

“We’ve had a tremendous response. Everybody’s really been asking for such a space from all universities in the New York City area,” Sia says.

A serial entrepreneur, Sia has founded a few of his own biotech companies, including Claros Diagnostics, which was acquired by Opko Health in 2011, and more recently, Junco Labs, an SBIR-funded company spun out of Columbia. His research lab focuses on using microfluidics to improve patient health. Sia plans to sign up for the first seat at Harlem Biospace and will focus on commercializing his work on diagnostics and cell therapy. His groundbreaking mChip technology was recognized with a 2011 Wall Street

Journal Innovation Award. Sia’s fascination with health traces back to his college days and his research has since been devoted to investigating solutions that have a real-world impact on patients’ lives.

Harlem Biospace will aim to make easier the concept-to-commerce process for biotech entrepreneurs. The business end tends to be complicated, and there has been little third-party support to get them off the ground. This new incubator model also is meant to spur a community of health and science start-ups overall.

“Our long-term goal is to bring the same level of innovation that’s so prevalent in the tech space into biotech,” Sia says. “We need more health innovations in this country, and Harlem Biospace is one modest step in that direction. But if we can use this as a platform to continue on that path, we’ll be doing our part in making it easier to pursue innovation in the health sector.”

By Melanie A. Farmer

BIG DATA EDUCATION

COLUMBIA'S INSTITUTE FOR DATA SCIENCES AND ENGINEERING HAS LAUNCHED A NEW CERTIFICATION PROGRAM FOR BUDDING DATA SCIENCE PRACTITIONERS



This fall, Columbia's Institute for Data Sciences and Engineering, housed within SEAS, welcomes its inaugural class of more than 40 graduate students enrolled in the Certification of Professional Achievement in Data Sciences Program. The four new courses being offered, in collaboration with Columbia Engineering and the Graduate School of Arts and Sciences, are Algorithms for Data Science, Probability and Statistics, Machine Learning for Data Science, and Exploratory Data Analysis and Visualization.

The part-time program aims to provide the fundamental skills data scientists need to employ to face the challenges and opportunities of an increasingly growing data environment in today's society.

"The world has changed. We've moved into a time where across all disciplines, across all areas of work, there is an abundance of data, and the ability to make use and exploit that data is important," says Kathleen McKeown, director of the Institute and the Henry and Gertrude Rothschild Professor of Computer Science at the Engineering School. "By bringing together education and data science, we hope to train practitioners so that they can go out and change the world by helping to solve some of society's most challenging problems."

Anticipated for the fall of 2014, the Institute intends to offer an MS program in data sciences that will build upon the certification courses while harnessing the application of data science theory and elective coursework, including a required capstone project course—in essence, bringing innovation and technology to life. The Institute hopes that through the

engagement with faculty and industry, its students will not only develop necessary skills but also have the unique opportunity to apply them to real-world problems.

"We felt that this would be a good way to reach out to professionals who are interested, and they'll come out knowing the state of the art of what data science is about," says Garud Iyengar, chair of the Department of Industrial Engineering and Operations Research at the Engineering School and member of the Institute's education committee and executive committee.

Established in 2012, the Institute strives to be a leader in research and education in the theory and practice of data sciences. Part of its goal is to develop technology to unlock the power of global data to help solve some of our most pressing problems. The Institute will develop the tools and talent to monitor and protect the critical infrastructure we depend upon, improve societal health and patient care, enhance communication and interactions within communities, predict financial failures, and keep personal data safe. Equally important in its mission is supporting and encouraging entrepreneurial ventures emerging from the research it conducts.

The Institute kicked off a string of programming and events in the spring with its inaugural symposium, "From Big Data to Big Ideas." More events are planned for the 2013–2014 academic year, including seminars by leading computer scientists David Blei of Princeton and Michael I. Jordan of UC Berkeley.

*By Jonathan Stark
Director of Operations, Institute for Data Sciences and Engineering*

NEW FACES AT SEAS

A WARM WELCOME TO THE FOLLOWING FACULTY MEMBERS WHO HAVE RECENTLY JOINED THE SCHOOL



SUNIL AGRAWAL

Professor, Mechanical Engineering
PhD, Stanford University, 1990
MS, Ohio State University, 1986
BS, Indian Institute of Technology, Kanpur, 1984

Sunil Agrawal's current and past research has focused on the design of intelligent machines using nonlinear system theoretic principles, computational algorithms for planning and optimization, design of novel rehabilitation machines, and training algorithms for functional rehabilitation of neural impaired adults and children.



MARIA Q. FENG

Renwick Professor of Civil Engineering
PhD, University of Tokyo, 1992
MS, University of Electro-Communications, 1987
BS, Southeast University, 1982

Maria Feng's research is on the forefront of multidisciplinary science and engineering in structural health monitoring, damage/vulnerability assessment, and response control of civil infrastructure, with an emphasis on structural safety and system resiliency. She has pioneered the development of novel sensors, nondestructive evaluation technologies, and system fragility analysis methods for intelligent infrastructure management and hazard mitigation, in addition to her wind/earthquake/blast protective systems.



JINGGUANG CHEN

Thayer Lindsley Professor of
Chemical Engineering
PhD, University of Pittsburgh, 1988
BA, Nanjing University, China, 1982

Jinguang Chen has made pioneering contributions to the understanding and use of novel catalysts, specifically delving into the physical and chemical properties of bimetallic and metal carbide catalysts. His research has inspired fundamental studies in catalytic and fuel cell processes, including the exploration of ways to reduce the use of platinum in the catalysis process to produce hydrogen.

“As a product of the CEEM department at the School myself, I knew it had a great program with a supportive faculty. So I ‘came back’ to SEAS because I was excited to have my former professors become my colleagues and work alongside them to continue to make the department stronger.” —Shiho Kawashima BS’07



CHRISTINE FLEMING

Assistant Professor, Electrical Engineering
PhD, Case Western Reserve University, 2010
MS, Case Western Reserve University, 2007
BS, MIT, 2004

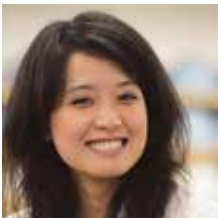
Christine Fleming’s research is concentrated on developing tools for imaging the myocardium, to give cardiac electrophysiologists, cardiologists, and heart surgeons a view of the heart wall to help diagnose disease and guide treatment. Fleming develops image analysis algorithms to extract information from optical coherence tomography (OCT) images and to provide automated tissue classification.



DANIEL HSU

Assistant Professor, Computer Science
PhD, UC San Diego, 2010
MS, UC San Diego, 2007
BS, UC Berkeley, 2004

Daniel Hsu works on algorithmic statistics and machine learning; in particular, he is interested in the algorithmic and statistical aspects of latent variable models, interactive learning, and privacy-preserving data analysis. He was a postdoc at Microsoft Research New England from 2011 to 2013, and at Rutgers University and the University of Pennsylvania from 2010 to 2011.



SHIHO KAWASHIMA

Assistant Professor, Civil Engineering and Engineering Mechanics
PhD, Northwestern University, 2012
MS, Northwestern University, 2009
BS, Columbia Engineering, 2007

Shiho Kawashima’s work is in experimental cement and concrete research, which aims to tie nano-/microstructural behavior to macroscale structural response. She specializes in cement rheology, particularly in the development of innovative characterization techniques to further the understanding of the time- and shear-dependent flow properties of cementitious systems.

“Columbia Engineering is strong in optics and signal processing, has high-quality students, and potential for collaborations with the clinicians at the Medical Center. I knew that Columbia would provide a great environment for interdisciplinary and collaborative research.”

—Christine Fleming



JAVAD LAVAEI

Assistant Professor, Electrical Engineering
PhD, Caltech, 2011
MASc, Concordia University, 2007
BS, Sharif University of Technology, 2003

Javad Lavaei researches various interdisciplinary problems in power systems, networks, communications, distributed computation, and control systems. His current research is focused on the decentralized control of large-scale systems and optimization techniques specialized for nonlinear energy problems.



PIERRE-DAVID LÉTOURNEAU

Chu Assistant Professor of Applied Mathematics
PhD, Stanford University, 2013
MS, Stanford University, 2012
BEng, McGill University, 2008

Pierre-David Létourneau focuses mainly on wave propagation (imaging in random media, seismic imaging) as well as fast algorithms. He also specializes in numerical analysis and mathematical physics.



ALLISON LEWKO

Assistant Professor, Computer Science
PhD, University of Texas at Austin, 2012
MS, University of Cambridge, 2007
BA, Princeton University, 2006

Allison Lewko's research primarily focuses on cryptography, complexity theory, distributed computing, and harmonic analysis. Her work in cryptography centers on developing new techniques to obtain provable security for an expanding domain of applications. She also specializes in creating combinatorial and probabilistic tools for understanding and addressing the core complexity of fundamental problems.



DEBASIS MITRA

Professor, Electrical Engineering
PhD, London University, 1967
BSc, London University, 1964

Debasis Mitra's research work focuses on communication networks, science policies that impact engineers and engineering systems, and on innovations and knowledge creation. To those ends, he is focused on network economics, network neutrality, the sustainability of industrial laboratories, and, in networking, on cooperative inter-networking and traffic engineering. A member of the National Academy of Engineering, Mitra previously served as a vice president at Bell Labs.



MICHAEL J. MASSIMINO

Visiting Professor, Mechanical Engineering
PhD, MIT, 1992; ME, MIT, 1990
MS, Mechanical Engineering, MIT, 1988
MS, Technology and Policy, MIT, 1988
BS, Columbia Engineering, 1984

Michael Massimino's research focuses on human-machine systems, space robotics, and human space flight. A NASA astronaut, he twice fixed the Hubble Space Telescope and is pursuing potential partnerships in space-related research and technology development between NASA and Columbia. He also is developing a new course on human space flight, which he will teach in the spring semester.



JOHN PAISLEY

Assistant Professor, Electrical Engineering
PhD, Duke University, 2010
MS, Duke University, 2007
BSE, Duke University, 2004

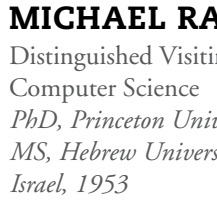
John Paisley's research is on making methodological contributions to statistical machine learning and broadening the reach of its applications. He develops Bayesian models and posterior inference techniques that address the big data problem, in particular for topic modeling, collaborative filtering, and dictionary learning, with applications to data analysis and exploration, recommendation systems, information retrieval, and compressed sensing.



NIMA MESGARANI

Assistant Professor, Electrical Engineering
PhD, University of Maryland, 2008
MS, University of Maryland, 2005
BS, Sharif University of Technology, 1999

Nima Mesgarani researches human-like information processing of acoustic signals at the interface of engineering and neuroscience. His goal is to develop an interdisciplinary research program designed to bridge the gap between these two disciplines by reverse engineering the brain computations involved in robust sound perception which, in turn, motivates novel approaches to emulate human abilities in machines.



MICHAEL RABIN

Distinguished Visiting Professor,
Computer Science
PhD, Princeton University, 1957
MS, Hebrew University, Jerusalem, Israel, 1953

Michael Rabin's fundamental innovations in computer science include: nondeterministic computations; complexity of computations; randomized algorithms, Rabin-Karp string matching algorithms; randomized Byzantine Agreement protocols; Rabin public-key encryption provably as safe as factorization; and practically efficient zero-knowledge proofs with applications to auctions and financial processes.



MICHAEL TIPPETT

Lecturer in Discipline, Applied Physics and Applied Mathematics
PhD, New York University, 1992
MS, New York University, 1990
BS, North Carolina State University, Raleigh, 1987

Michael Tippett’s research focuses on the use and development of mathematical approaches to characterize the variability and predictability of the climate system, from decadal variability of sea surface temperatures to extreme weather (tornadoes!), with emphasis on data-driven methods. He approaches climate science questions from an engineer’s viewpoint, creatively applying sound principles and methods to find practical solutions to real world problems.



NANFANG YU

Assistant Professor of Applied Physics
PhD, Harvard University, 2009
BS, Peking University, Beijing, 2004

Nanfang Yu studies the interaction between light and structured active materials at the nanometer scale and builds novel devices for controlling light with subwavelength spatial resolution and fast speed. He is developing a new class of flat optical components, the thicknesses of which are just one-thousandth of a human hair but can do the jobs of conventional, bulky optical components.



VENKAT VENKATASUBRAMANIAN

Samuel Ruben–Peter G. Viele Professor of Engineering, Chemical Engineering
PhD, Cornell University, 1984
MS, Vanderbilt University, 1979
BS, University of Madras, 1977

Venkat Venkatasubramanian’s work is in the areas of risk management in complex systems, pharmaceutical informatics, molecular products discovery through design, and complex adaptive systems engineering. He is primarily interested in understanding the basic principles that govern self-organization and emergence in complex teleological systems.



CHANGXI ZHENG

Assistant Professor, Computer Science
PhD, Cornell University, 2012
MS, Cornell University, 2009
BS, Shanghai Jiaotong University, 2005

Changxi Zheng works in applied computer science, focusing on computer graphics, scientific computing, and robotics. One of the areas Zheng is working on is synthesizing realistic virtual sounds automatically synchronized with simulated motions. He is also working on building fast, cost-effective algorithms to create realistic virtual environments, both visible and audible.



QI WANG

Assistant Professor, Biomedical Engineering
PhD, McGill University, 2006
PhD, Harbin Institute of Technology, 1998
MS, HIT, 1995; BS, North China University of Electric Power, 1992

Qi Wang’s research focuses on neural coding in the somatosensory pathway of the brain, brain-machine interfaces, and biomedical instrumentation for creating engineered tactile sensations. He utilizes experimental and theoretical approaches to investigate how the brain extracts information about the outside world through the electrical activity of neurons, and how we shape downstream population neural activities, and ultimately perception, through patterned microstimulation.



YUAN ZHONG

Assistant Professor, Industrial Engineering and Operations Research
PhD, MIT, 2012
MA, Caltech, 2008
BA, University of Cambridge, 2006

Yuan Zhong is broadly interested in the modeling and analysis of large-scale stochastic systems, with business and engineering applications in areas such as communication networks, data centers, cloud computing, and health care.



Images of the beating heart could make it easier to detect and treat heart disease.

Christine Fleming is trying to give cardiologists a powerful new tool: high-resolution movies of the living, beating heart, available in real time during cardiac procedures. Such technology might also one day help physicians prevent the source of dangerous irregular heart rhythms without invasive biopsies. It could even help monitor treatment.

Her invention uses optical coherence tomography (OCT), a technique that captures three-dimensional images of biological tissue. A specialized catheter with a laser and small lens near its tip is threaded through the arteries. When the laser light reflects off the heart tissue, it is picked up and analyzed to create an image. OCT has a higher resolution than ultrasound and captures images faster than magnetic resonance imaging or MRI. But today OCT has limited cardiac application—usually to search the arteries for plaques. Fleming, an electrical engineer who joined the faculty at Columbia University this year, has designed a new type of catheter capable of imaging heart muscle.

325,000

Number of cardiac catheterizations performed in the U.S.

**35
Innovators
Under 35
2013**

Introduction
Inventors
Entrepreneurs
Volunteers
Panelists
Past Winners

35

CHRISTINE FLEMING, TOP INNOVATOR

Image courtesy of
MIT Technology Review

MIT TECHNOLOGY REVIEW RECENTLY REVEALED ITS PRESTIGIOUS ANNUAL LIST OF 35 TOP YOUNG INNOVATORS, AND IT INCLUDED ELECTRICAL ENGINEERING ASSISTANT PROFESSOR CHRISTINE FLEMING.

Selected from hundreds of nominations, Christine Fleming is being honored as an outstanding inventor on the list for her work in the field of biotechnology and medicine.

“I am thrilled to receive such a notable recognition of my work,” said Fleming, whose research is focused on developing optical imaging and spectroscopy instruments for applications in cardiac electrophysiology and interventional cardiology. “I hope this will draw attention to cardiovascular disease, which is the leading cause of mortality in the United States—it’s critical that we continue to develop technologies to detect abnormalities at early stages and develop effective therapies to treat this pervasive illness.”

Fleming, 30, is working on giving cardiologists a powerful new tool: high-resolution films of the living heart, available in real time during cardiac procedures. To do this, she is using optical coherence tomography (OCT), a noninvasive imaging technique that provides depth-resolved, high-resolution images of tissue microstructure in real time, and designing flexible catheter probes to image various parts of the body, including the heart chambers.

“You can think of OCT as ‘optical ultrasound,’” she said. “It provides imaging reflections from within tissue to provide cross-sectional images, at a much higher resolution than other imaging techniques such as MRI or ultrasound.”

Fleming hopes her technology will help doctors find the source of irregular heart rhythms, develop more effective therapies without invasive biopsies, improve early diagnosis, and even monitor treatment.

Fleming joined the Engineering School in 2012 after completing her doctoral work at Case Western Reserve University and post-doctoral work at Harvard Medical School. As a postdoctoral fellow at Harvard, Fleming developed signal and image processing algorithms to identify cholesterol deposits within OCT images of coronary arteries.

For more than a decade, *MIT Technology Review’s* Annual Innovators Under 35 list has recognized exceptionally talented technologists whose work has great potential to transform the world. “Over the years, we’ve had success in choosing women and men whose innovations and companies have been profoundly influential on the direction of human affairs,” said Jason Pontin, editor in chief and publisher. “Previous winners include Larry Page and Sergey Brin, the cofounders of Google; Mark Zuckerberg, the cofounder of Facebook; Jonathan Ive, the chief designer of Apple; and David Karp, the creator of Tumblr. We’re proud of our selections and the variety of achievements they celebrate, and we’re proud to add Christine to this prestigious list.”

The honorees have been featured online at technologyreview.com and in the September/October print magazine, which hit newsstands worldwide on September 3. They were also honored in person at the EmTech MIT conference October 9 to 11 in Cambridge, MA.

By Holly Evarts

CAMPUS



CONGRATULATIONS GRADUATES

CLASS DAY AND COMMENCEMENT 2013, MARKING AN END AND NEW BEGINNINGS

FACULTY AWARDS WERE PRESENTED AS FOLLOWS:

Columbia University Presidential Teaching Award

Rocco Servedio, associate professor of computer science
David Vallancourt, senior lecturer in electrical engineering

CEAA Distinguished Faculty Teaching Awards

Martin Haugh, lecturer in industrial engineering and operations research
David Vallancourt, senior lecturer in electrical engineering

Rodriguez Family Junior Faculty Development Award

Martha Kim, assistant professor of computer science

Janette And Armen Avanesians Diversity Award

Tal Malkin, associate professor of computer science

Edward and Carole Kim Award for Faculty Involvement

Kristin Myers, assistant professor of mechanical engineering

“At this very significant, celebratory moment in your education and lives, congratulations on having achieved a uniquely broad education across the broad spectrum of human knowledge, and please help the rest of us develop a course in the Core Curriculum on engineering and technology.”

—University President Lee C. Bollinger
at SEAS Class Day 2013

1 Robert Bakish BS'85, '89BUS, president and CEO of Viacom International Media Networks, was this year's Class Day speaker.

2 David Vallancourt (left) and Martin Haugh were honored for exceptional teaching by Columbia Engineering Alumni Association.



FOUNDERS FOUR

THE BIOGRAPHICAL BEGINNINGS OF SEAS



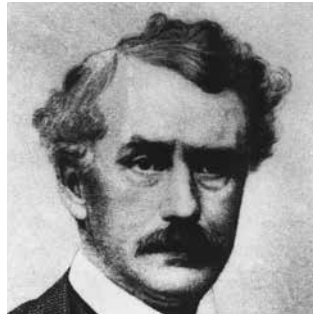
Four individuals share the credit for bringing Columbia's School of Engineering and Applied Science into being 150 years ago and then seeing it through its first quarter-century. To Thomas Egleston Jr. goes credit for the idea of attaching "a school of mining and metallurgy" to the century-old classics-oriented Columbia College, where "science" since 1820 was whatever the put-upon and over-extended Professor of Chemistry and Experimental Philosophy James Renwick taught. His exacted retirement in 1853 produced a succession of appointments that still left Columbia, as the Boston-based *Christian Examiner* wrote in 1854: "Good in classics, weak in science." The possibility for real change came in the summer of 1863, when Egleston persuaded Columbia Trustee George Templeton Strong to present his idea for a School of Mines to fellow Trustees. Egleston later

became the first appointment to the School of Mines as professor of metallurgy, where he remained until retiring in 1892.

To Strong goes credit for being the School's most reliable backer on the Columbia College Board of Trustees, which his diary detailed, during his two decades of membership, as having its share of "anti-science ... fogeys." It was Strong who, after the School opened in November 1864 and attracted large numbers of serious-minded students, persuaded the risk-averse board to assume full financial responsibility for the School. "Work on the new School of Mines building is in active progress," he wrote in one of his last diary entries. "Who would have thought that the little egg that was laid in this very room 12 years ago could hatch out so big a bird?"



Thomas Egleston Jr.



George Templeton Strong



Frederick A. P. Barnard



Charles Frederick Chandler

Strong's staunchest ally on the board was Frederick A. P. Barnard, who arrived as the 10th President of Columbia in the fall of 1864, just as the School of Mines opened. He promptly enrolled his two sons, a gesture unsettling to College loyalists. Attempts in the 1870s to restrict the growth of Mines by Trustees, worried that it "overshadowed" the School of Arts or its instructional costs, were met by Barnard with statistically laced arguments to the contrary. The implementation of a graduate program in Mines that permitted Columbia to award its first PhD degree in 1875 is an instance of effective presidential advocacy. Only after Strong's death in 1875, and more decisively, Barnard's taking up the cause of bringing coeducation to Columbia in 1879, did his effectiveness with the board as the School's champion diminish. In 1882, the board rejected a proposal to change the name to "the School of Applied Science," which better reflected the School's curricular reach beyond its initial focus on mining, largely because it came from the President.

As with Egleston, Charles Frederick Chandler accepted his appointment as professor of analytic and applied chemistry before the Trustees had assumed responsibility for his salary. Yet New York City represented a professional venue and financial opportunity that no academic of his generation more successfully exploited. His election as the first dean of Mines was by consensus. Neither Egleston nor Francis Vinton, professor of mining engineering, were interested in the administrative post or the \$1,000 stipend; 30-year-old Chandler was. During his first dozen years at Columbia he secured three other salaried professorships (at Physicians and Surgeons, at the School of Pharmacy, and, in 1877, as professor of chemistry in the College), developed a lucrative consulting business advising companies on technical and legal matters, and became an active club member. Even as he became one of the best-known chemists in the country, positions of civic responsibility made him the most visible scientist in New York City. Administratively adept, trusted by Barnard, a popular teacher and easy grader, Chandler was protective of his faculty and supportive of his graduates. He was also a formidable fundraiser. The donors of Havemeyer Hall, the chemistry buildings on the new Morningside campus, were friends and regular employers of Chandler's services. During 32 years as dean, until Barnard's presidential successor Seth Low clipped his wings in 1897, and thereafter in a diminished way until his retirement in 1910, he remained the public face of both Columbia engineering and Columbia science.

The beginnings of the School of Mines constituted an experiment undertaken by four outsiders. While rejection remained a possibility, Columbia's engineers had come to stay.

All four were Columbia "outsiders." Egleston was a New Yorker but attended Yale and the *École des Mines*; Chandler, a New Englander, attended the Lawrence Scientific School at Harvard for a year before going to Gottingen; Barnard was another New Englander and a Yale graduate who taught at the Universities of Alabama and Mississippi for a quarter-century before being elected sight unseen to the Columbia presidency. Strong was a Columbia graduate (his father had attended Yale) but resisted the narrow Knickerbocker provincialism and religious sectarianism of some Columbia Trustees, and saw his School of Mines as "proof that physical science can be taught under church influence."

And all were men of science. Though Strong's professional credentials were those of a lawyer, he was a lifelong believer in the efficacy of scientific discovery and technological innovation. The others were card-carrying scientists, with Barnard and Chandler members of the National Academy of Sciences and Egleston one of the country's leading metallurgists. Barnard remains one of only two of Columbia's 19 Presidents (William McGill was the other) with an academic background in science. Thus the beginnings of the School of Mines, today's School of Engineering and Applied Science, constituted an experiment undertaken by four outsiders testing the tolerance of an old school for a new organ, applied science. While rejection remained a possibility, Columbia's engineers had come to stay.

*By Robert A. McCaughey
Professor of History, Barnard College
Columbia University*

Adapted from the forthcoming book *A Lever Long Enough: A History of Columbia's School of Engineering and Applied Science Since 1864* (New York: Columbia University Press, 2014)

Images courtesy of Columbia University Archives

DEPARTMENTS

LETTER FROM THE ALUMNI ASSOCIATION PRESIDENTS

Dear Fellow Columbia Engineers,

It's hard to believe, but another academic year is well under way. This fall, Columbia Engineering not only welcomes a new undergraduate Class of 2017 and a new crop of graduate students but also a new dean, Mary C. Boyce. We are excited to work with her to support Columbia Engineering's tradition of excellence.

It's truly an exciting time at Columbia Engineering. Whether it's the growth of the new Institute for Data Sciences and Engineering or the interdisciplinary collaborations under way at the Northwest Corner Building, every day sees new and remarkable happenings at the School. Our alumni community has never been more vibrant—alumni from around the globe are reconnecting with the School and with each other through events and programs organized by CEAA, CEYA, and our partners in the Columbia Alumni Association. If you haven't yet become involved with the School, now's the time. Regardless of your location, you can access the global Columbia network to make new connections, reconnect with classmates, or support the School.

As you may know, 2014 will mark the 150th anniversary of the School's founding as the Columbia School of Mines. Dean Boyce and the faculty are working on developing commemoration activities—both on and off campus—to mark the anniversary. You'll learn more about 150th plans in the months ahead. In the meantime, please update your contact information in the alumni directory (engineering.columbia.edu/alumni-directory) so you will receive these and other communications.

But you don't need to wait to get involved. The School already has alumni events planned, both in New York and around the globe, for this year. We'll be there, and we hope you will, too.



HITOSHI TANAKA

BS'63, MS'65, EngScD'76

President
Columbia Engineering
Alumni Association



WHITNEY GREEN

BS'10, '13TC

President
Columbia Engineering
Young Alumni



COLUMBIA | ENGINEERING
Alumni Association



COLUMBIA | ENGINEERING
YOUNG ALUMNI

CLASS NOTES: UNDERGRADUATE ALUMNI

1943

Frank Brandt writes, "This engineering class graduated six months early because it continued studies through the summer of 1942. It shared the campus with hundreds of U.S. Navy cadets preparing to fight WWII. The graduation ceremony was held in Earl Hall because it was a small group. That was 70 years ago! There are few January '43 survivors now. **Floyd Hasselriis** and myself are all I know of. I wish other survivors would write in and identify themselves, email engineering.mag@columbia.edu."

1945

Class Correspondent:
Gloria Reinish
reinish@verizon.net

1946

Harry Levey (V-12) writes, "I am retired, following the passing of my wife of 53-plus years. I just returned from the wedding of my last unattached grandson; all three are now happily married and have produced (so far) a great granddaughter who will celebrate her third birthday in August. My daughter and her husband are both also retired. She was an educator for some 38 years in Danville, IL, and now devotes her time to CASA, a wonderful organization assisting needy children. My son, father of the three aforementioned grandchildren, is a member of the management team of a steel mill in Gallatin County, KY. Details of my career at Columbia and thereafter appeared in the alumni notes section of the Spring 2009 issue of *Columbia Engineering*. My email is

Hairyroger1@aol.com. I would appreciate hearing from any V-12 classmates.” *Editor’s note: V-12 was a U.S. Navy and Marine college program for training future officers.*

1948

Joe Mislán writes, “Rather than the usual stuff, I thought it would be interesting to list the electronic devices that are part of my routine and other things that define us. Devices define us. Here they are: MacBook laptop, HP Officejet printer, Samsung cell phone, IBM desktop computer, Canoscan scanner, Canon Camera PowerShot SX200 IS, Kindle Fire, and my watch, a Casio WaveCepter. Watches define us. I do email and eBooks. I am on Facebook and post my movies to YouTube, sell and buy stuff on eBay and Amazon. I am not a social network freak, but I go to Facebook for who and what is new. Cars also define us. Mine is a Toyota Scion with a stick shift. I learned to drive on a manual drive. I like the zip in shifting. I read the *New York Times* seven days a week.”

1950

Class Correspondent:
Joe Alvarado
alvarado@behlman.com

1951

Class Correspondent:
Ted Borri
tjb63@columbia.edu

Ted Borri writes, “I would like to thank **Elna Loscher** for submitting information of a recent trip to Israel that she and her family have taken. It would be most appreciated if others of our class would also contribute some interesting news. In early May **Fred Kant**, **Herman Bieber**, **Sam Rock**, **Elna Loscher**, and myself got together for lunch and laughs. We are lucky that we live relatively close together.

The following is news from Elna. She writes, “My husband Murray and I did go on a long-planned family trip to Israel, after various obstacles were overcome. We had decided to get as much of the family together as we could and go to Israel. Since the older grandchildren are about to go off on their own, we decided to go during winter vacation when all the grandchildren were off from school. It was probably the last chance to have them together. Along with some close family friends and their children, our group included: two of my daughters and their husbands, some other parents, six of our seven grandchildren, and a few other kids. The young folks ranged from 11 to 22. The four high school girls provided a lot of giggling and occasional songs on the bus.

“The main problem we encountered was Murray. He managed to injure a disk in his back before Thanksgiving, and then he herniated it about two weeks before we were supposed to leave. He was really incapacitated—he could barely walk, and then only for a few feet at a time. A shot into the disk helped some with the pain, but it still looked grim. (And the shot was also an issue, because Murray had to come off of some medication in order to take the shot.)

“My daughters came to the rescue. They arranged for a wheelchair at Newark Airport, and at Ben-Gurion Airport, and then another one for the tour, and then back again. And every one insisted that he go. So he went. And everyone pushed his chair. (He greatly enjoyed two granddaughters fighting over who would push Grandpa.) He managed to see about 80 percent of the sights, but mostly enjoyed watching the kids have a good time. And a good time was had by all.

“The trip had been more or less designed to address our interests. In addition to the usual tourist sites such as Caesarea, Acre, Banias, Western Wall, and Masada, we saw a little more archeology in the field and in museums, and some more history, especially modern Israeli history. We went to the tank museum and then on to the underground bullet factory, which operated under the noses of the British Army prior to the establishment of the state of Israel in 1948. A good website for the factory is http://www.jewishvirtuallibrary.org/jsources/Society_&_Culture/ayalon.html. We participated in an on-going archeological dig, which was uncovering an Edomite house from around 2,200 years ago, more or less the time of the Maccabees. My older grandson made a major find—an Edomite idol. The supervising archeologists were very excited. Our days were very busy from a few days before Christmas to New Year’s Day.

“The weather was wonderful. We escaped the snows of New Jersey and the subsequent eight inches of snow in Jerusalem. And it did not rain on us during the rainy season!”

Ken Jagel writes, “Milly and I are in the process of selling our farm and moving to a retirement community, Meadowood, in Montgomery County, PA. It’s nearer to our children and their families, all of whom live nearby. It’s also near Milly’s alma mater, Ursinus College.”

1952

Class Correspondent:
Peter Mauzey
p.mauzey@ieee.org

1953

Class Correspondent:
Don Ross
rossd@jbb.com

1955

Class Correspondent:
Leo Cirino
lc550@columbia.edu

1956

Class Correspondent:
Lou Hemmerdinger
LHemmer@aol.com

1957

Bernard J. Lechner is a leading expert on television and display systems. He writes that he has been extensively involved in technical research on advanced television and display systems and in the development of standards for High Definition Television (HDTV). Bernard has consulted for government and industry on all aspects of television and display systems. His clients have included many Fortune 500 corporations, including almost all of the major television receiver manufacturers and network broadcasters, as well as start-ups.

Formerly staff vice president, Advanced Video Systems at RCA Laboratories, Bernard’s 30-year career at RCA covered all aspects of television and display research, from early work on home video tape recorders in the late 1950s, extensive development of flat-panel matrix displays in the 1960s, including pioneering efforts on active-matrix liquid crystal displays, advanced two-way cable TV systems, and pay-TV systems in the early 1970s, electronic tuning systems and CCD comb-filters for TV receivers in the mid-1970s, automated broadcast cameras and CCD broadcast cameras in the late 1970s and early 1980s, to HDTV in the mid-1980s. The National Academy of

CLASS NOTES

Television Arts and Sciences awarded an Emmy to two of the broadcast camera projects for which Bernard led the research team. He has also received two RCA Laboratories Outstanding Achievement Awards and a David Sarnoff Team Award in Science.

He was chairman of the Teletext Committee of the Electronic Industries Association from 1980 to 1986 and was a member of the National Cable Telecommunications Association Engineering Committee from 1977 to 2002. He served for 15 years as chairman of the Advisory Commission for Electrical Engineering at Mercer County Community College and was a member of the board of directors of Palisades Institute for Research Services from 1981 to 2002.

Bernard is an expert witness on matters relating to television and display systems, especially with regard to patents. Over the last 25 years he has prepared numerous expert reports, declarations, and certifications on behalf of his clients. He is a life fellow of the IEEE, SMPTE, and the Society for Information Display (SID). In 1971, SID named him the first recipient of the Frances Rice Darne Award for his outstanding contributions to matrix displays. In 1972, he was elected to the SID board of directors and subsequently served as treasurer, secretary, vice president, and president (1978–1980) of SID. In 1983, he was named the first recipient of the Beatrice Winner Award for his contributions to SID.

In 1996, Bernard was awarded the David Sarnoff Gold Medal by SMPTE for his many contributions to the technologies essential to today's television systems. He has been honored with numerous awards throughout his career, including the

ATSC Outstanding Contributor Award, the SMPTE Progress Medal Award, and the National Association of Broadcasters (NAB) Television Engineering Achievement Award.

In 2011, the IEEE presented Bernard with the Jun-ichi Nishizawa Medal for his pioneering contributions to early work on liquid-crystal display technology for television pictures, which set the stage for the proliferation of today's flat-screen televisions, monitors, and mobile phones.

Bernard has done graduate work at Princeton University and the Harvard School of Business. He holds 10 U.S. patents and is widely published in the areas of displays and television systems.

1958

Robert F. Drucker writes that he is “fortunate to return to Hawaii this year after recovery from Hurricane Sandy. One highlight was a visit to the Doris Duke Mansion on the residential side of Diamond Head. The site is maintained by the Honolulu Museum of Art. It is in the Islamic motif and probably contains more intact art pieces than exist in Syria today. Doris Duke was ‘the Poor Little Rich Girl’ who was a millionaire-plus in her early 20s due to marriage and inheritance. She built a small harbor for her yacht et al. in the late '30s, which could not be done now due to environmental restrictions. The original location was desolate when first built but is now surrounded by typical average homes.

“Honolulu, however, is not a paradise as it has the usual big city problems of congestion and traffic. The H1 Expressway is worse than the L.I.E. during rush hour. There is also a significant but somewhat hidden homeless problem. The major economic thrust for the state is tourism and real estate development; sugar

cane fields have been replaced by housing developments and condos. A lot more space exists in the other islands but that is also dwindling. For those interested, Oahu can be reached from New York by a direct 11-hour flight; Europe and the Caribbean are more readily accessible and possibilities for later this year. Other news—grandson, **Brian Albert BS'10**, continues graduate work at MIT working on development of high-efficiency photovoltaic devices. Granddaughter, Jacqueline Albert, received a BS in environmental sciences from Cornell in May. Sister Mariah enters her junior year at Boston University and plans to do a semester in Sydney, Australia.”

1959

Class Correspondent:
Betsey Altman
bmeca@comcast.net

Lou Shrier and his wife, Diane, are enjoying the scheduling flexibility of Lou's current academic career, which allows them to spend time with their eight grandchildren and on leisure travel. During the past academic year they spent four weeks visiting Laos and Burma/Myanmar, and for 2013–2014 they are preparing for a month-long Antarctic trip. Lou is completing his first decade as an adjunct professor at Columbia's School of International and Public Affairs (SIPA), where his courses on the geopolitics of energy—drawing heavily on personal experience—have been popular with SIPA students. He has also welcomed cross-registrants from Columbia's other schools and looks forward to attracting his first SEAS student. During the past academic year Lou was a visiting professor at China's main university for training the country's diplomats.

For several years, he has been helping with international efforts to design international policies for economic and political development of the Arctic, as global warming stimulates resource extraction and maritime commerce in the region. Lou looks forward to reminiscing with SEAS classmates at the 55th Reunion next May!

1962

Class Correspondent:
Marshal (Mickey) Greenblatt
mg840@columbia.edu

1963

Class Correspondents:
Chuck Cole
ccole6250@att.net
Mark Herman
mnh18@columbia.edu

From **Mark Herman: Harry Squasoni** writes that he went to work for Westinghouse Electric as a sales engineer after graduating Columbia and then obtained his MBA from New York University. He was then a product manager for Dove and Lux soaps at Lever Brothers and marketed Tetley Teas at Squibb Beechnut. PepsiCo recruited him for marketing and sales and after 12 years he became vice president of marketing. As such, he was in charge of new product development/marketing research and trade sales via new distribution channels such as drug chains, mass merchandisers, and convenience stores. Later, he started a promotional ad agency with former Pepsi colleagues, working with Coke, DuPont, Holiday Inn, and other clients. Currently, he has his own consulting firm for selected clients, advising on marketing communications and sales efforts across many consumer and industrial product lines.

Joe Feig (jmf@janascorp.com) regrets that business commitments

precluded his coming to the Reunion but hopes to make it to New York later this year. He and his wife Marsha recently celebrated their 50th anniversary. Joe writes: “The winter of 1978–79 convinced me that Horace Greeley’s words should be heeded. From western Massachusetts, we traveled west, all the way to California, and have remained here since. After Columbia Engineering, I started working as a chemical engineer in Cambridge, MA. Subsequently I obtained an MBA from Boston University and have traveled the financial operating and consulting path ever since. Along the way, have been CFO of two VC-funded start-ups, one successfully taken public, the second sold to HP when the market window closed. My wife has been successful as well, first as a teacher, then as owner of a personnel agency.”

Entrepreneurship obviously runs in Joe’s family. He continues: “Our son is cofounding partner of a Beverly Hills, CA, entertainment industry law firm; his wife has owned a website development company for over 15 years. Our daughter was key owner of a women’s day-to-night apparel company, co-owned by my wife and I, now doing some specialty work in that area plus real estate sales; son-in-law has a commercial and residential sound-system installation company. Basically, our various occupations manage to keep us pretty busy,” [Busy!?! It’s exhausting just reading this!] “but never conflicting with attending grandchildren’s events or celebrating special occasions and important holidays together. Our daughter-in-law’s dad is 85 years old, built a successful steel pipe company, and retired at 65, and her mom stays part-time occupied by assisting their son’s two online businesses. Our son-in-law’s dad was one of the

founders of the Chicago Commodity Exchange, and his wife is a successful real estate agent. They split their time between homes in the Chicago area and Florida. Am very fortunate that both of our children and their families live within 8–20 miles. Except for about 5 years, Marsha and I lived too far from our parents for our kids to regularly experience the mutually wonderful relationship with grandparents. We have four grandchildren ranging in ages 9–13 and recently celebrated the oldest boy’s Bar Mitzvah.”

And finally, music to Mark Herman’s ears: “We have been opera enthusiasts and had season orchestra seats to the Los Angeles Opera for many years.”

Speaking of music and theater, one of the more unexpected awards won by a Columbia Engineering graduate is an Obie, New York’s Off-Broadway Theater Award. Musicals Tonight, founded in 1997 by **Mel Miller** (musicalstonight@aol.com) has produced staged concert versions of some 75 musicals, going all the way back to Victor Herbert’s *Naughty Marietta* (1910) and in 2004 received an Obie for its entire body of work. The current venue is the 88-seat Lion Theatre, 410 West 42nd Street, New York, NY, and productions planned for the end of 2013 and the beginning of 2014 include Cole Porter’s *Mexican Hayride*, Marvin Hamlisch’s *Smile*, Will Holt’s *Come Summer*, The Gershwin’s *For Goodness Sake*, and Rodgers & Hart’s *America’s Sweetheart*. For performance dates and ticket information go to www.musicalstonight.org.

The transition from chemical engineer to Off-Broadway producer may seem strange, especially since, as Mel states, as a child he “had no experience with the arts, let alone theater,” and did not see his “first

Broadway show until he graduated.” However, he did listen to radio, including the rapidly disappearing drama shows and Saturday afternoon recordings of Broadway shows on CBS. Later, he watched dramas on Public Television and, at Columbia, took Eric Bentley’s course on the Theater of the Absurd and, after graduation, additional literature courses. These courses “put a smile on my face and a gleam in my eye. Solving differential equations never did that for me.”

His first, and only, job as a chemical engineer was with Proctor & Gamble in Cincinnati (coincidentally where Mark Herman was also working at the time, for the Public Health Service, and where the two met occasionally). Later, Mel’s “interest in theater really blossomed,” and, after several intervening jobs and many trips to London to see shows, he founded Musicals Tonight. As of now, more than 80,000 people have seen the revivals performed by Musicals Tonight. According to Miller, “Few of these shows have ever been seen by present-day audiences. Ten of our productions have never been seen by a New York audience and nine have never been seen by a North American audience. Our alums now star in several Broadway shows.” To which one can only say, “Bravo!”

1964 50th Reunion

To take an active role in your Class Reunion activities, please contact Nick Mider at nm2613@columbia.edu or 212-851-0734.

Class Correspondent:
Tom Magnani
tm421@columbia.edu

Carl Gurtman MS’65 writes that he can hardly believe he’s

been over 10 years retired as the assistant nuclear engineering and planning manager at the Portsmouth Naval shipyard (Kittery, ME). After 37 years at the shipyard, and some time as a consultant in the field, he and Linda, his wife of 43 years, are enjoying their retirement with their three adult children, Sarah, Nathan, and Daniel, and their very, very, active four young grandsons, Isaac (5), Benjamin (5), Aaron (4), and Henry (3), in beautiful York, ME. Carl remembers in ’64 the graduates from 50 years earlier who attended and is in awe that next year he’ll be in a similar situation. Fondly remembering Columbia, as if yesterday, he invites all his classmates to contact him at cgurtman@maine.rr.com.

1969 45th Reunion

To take an active role in your Class Reunion activities, please contact Nick Mider at nm2613@columbia.edu or 212-851-0734.

Class Correspondent:
Ron Mangione
Ronaldm@archeng.com

1970
Chester Lee writes, “I’m a first-time grandfather! My oldest son, Michael, and his wife, Grace, are the proud parents of Connor Xavier Lee, born on January 17, 2013. My second son, Douglas, Connor’s uncle, is another SEAS graduate, but of the Class of 2006.”

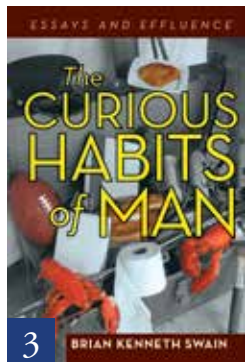
Don Sutaria is founder and president of CareerQuest, located in New York and New Jersey. Also known as Career Doctor Don, he is a consultant to individuals and corporations offering executive coaching and career management services. He is the author of *Career and Life Counseling from the Heart (Your Career is a Pathway to Your Soul!)*



1



2



3



4

1 **Carl Gurtman BS'64, MS'65** has four active young grandsons (page 49).

2 **Daniel Tai BS'72**

3 **Brian Kenneth Swain BS'85** published his fifth book.

4 **Alan Press BS'82, MS'83**, pictured center left, with **Frank Cariello MS'85, PhD'89**, far left

and has been quoted in numerous publications, including the *Wall Street Journal*, *New York Times*, *Working Smart*, and *Fortune*. He is also a member of Columbia Career Coaches Network. His areas of expertise are career assessment, job search strategies, changing careers, résumés and cover letters, salary negotiation, executive coaching, reentering the workforce, work/life balance, self-employment, and age issues. Prior to starting CareerQuest in 2001, Don served for 35 years in the pharmaceutical, fine chemical, food, beverage, and brewing industries at companies such as Pfizer, Hoffmann-La Roche, CPC International, and Schaefer Brewing. He also worked internationally in engineering, design, construction, and consulting firms.

1972

Daniel Tai writes, “In addition to my ‘day job,’ I’m a squash instructor and avid competitive player. Most recently, I won my division in both the 2012 Hyder Cup and the 2012 Grand Open squash tournaments here in New York City.”

1974

40th Reunion

To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

1978

Class Correspondents:

Larry Chung
lpc34@columbia.edu
Peter Luccarelli
peter.luccarelli@plioplaw.com

1978

Ralph Izzo MS'79, PhD'81, chairman and CEO of the Public Service Enterprise Group Inc. (PSEG), was awarded an honorary degree at Rutgers

University’s 247th anniversary commencement ceremonies in May. He has held executive positions within the PSEG family of companies since 1992, including as president and chief operating officer of Public Service Electric and Gas Co. (PSE&G). In 2009, New Jersey Gov. Jon Corzine appointed Ralph to the Rutgers governing board as a Public Governor, and he became chair the following year. During his term, Ralph guided the university through a period of challenging economic times while also helping Rutgers achieve historic milestones. Among his accomplishments, he provided oversight of the presidential search committee that resulted in President Barchi’s appointment in April 2012. Under his leadership, the Board of Governors approved the integration of the University of Medicine and Dentistry of New Jersey into Rutgers and also the university’s entry into the Big Ten.

1979

35th Reunion

To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

Class Correspondent:

Stewart Levy
srlevy@att.net

Alexander Sarrigeorgiou MS'80

is the CEO and managing director of Eurolife ERB Insurance Group and chairman of the board of directors of the Hellenic Association of Insurance Companies. He also is a member of the board of directors and chairman of the audit committee of S&B Industrial Minerals S.A. and of the advisory board of directors of A.M. Nomikos Transworld Maritime Agencies S.A. Alexander is married to Juliana Paparizou and father of

two adult daughters, Alexandra and Roxanne.

1980

Adam Nicolopoulos is the CEO of ADN, a firm that offers financial advisory services in the United States, developed markets as well as the emerging markets, specializing in the transportation, power generation, and renewable sectors. Adam has led the successful structuring, negotiation, and implementation for some of the most innovative and complex financing structures for a diverse clientele, including developers, investors, contractors, and governmental entities. Prior to ADN, Adam spent over 17 years with UBS Investment Banking (Corporate Finance and Project Advisory teams in London, Zurich, New York, and San Francisco), where he focused on the structuring of equity and debt funding for infrastructure assets including roads, airports, ports and mass transit systems, energy and power generation projects. In 2003, he brought the first-ever rated project bond to the market (*Best Deal Award*) for a road infrastructure project in Croatia (Bina Istra). Past domestic projects include the Indiana Toll Road and Northwest Parkway, the Chicago Skyway, and the development of two container port terminals in the Gulf of Mexico. Adam holds an MBA from Stern School of Business at NYU (graduated with honors), an MSc in mechanical engineering from UC Berkeley (honors), and a BSc in the same field from Columbia University. From 2007 to 2011, Adam acted as a visiting scholar at Stanford University.

1981

Class Correspondent:
James Reda
jfreda@jfreda.com

1982

Class Correspondent:
Dan Libby
kdl26@columbia.edu

Louis Minion and his wife, Stella, have recently relocated to St. Thomas in the U.S. Virgin Islands. Lou was appointed corporate group controller of the Innovative Companies, the local, long-distance, internet and wireless provider in the USVI and the cable television provider in the USVI, British Virgin Islands, and St. Maarten. Lou and Stella are enjoying the beaches and exploring the Caribbean. Look him up if you go for a visit.

Alan Press MS'83 celebrated his 30th service anniversary at AT&T Labs in early July at the West Orange Manor in New Jersey with colleagues, including **Frank Cariello MS'85, PhD'89**.

1983

Greg Morea writes, "Time passes far too quickly! It seems as if we were graduating yesterday, and I'm now out in the world for 30 years. Wow! I'm still at Electric Boat in Groton, CT, where I'm an IT supervisor. My wife, Barbara, and I celebrated our 30th wedding anniversary this year, but the big news belongs to the next generation. Our son, Joseph, is an engineer at Electric Boat, and he is engaged to the lovely Alicia with a 2014 wedding planned. Our daughter, Rebecca, graduated from RPI, as did her brother, and is now also an engineer at Electric Boat. To keep it all in the family, Barbara works for a local attorney who handles worker's compensation for, you guessed it, Electric Boat."

1984

30th Reunion
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@

columbia.edu or 212-851-2402. In March, **Dan Smith** joined the Outsell LLC executive team as vice president, product. Outsell is a digital marketing software-as-a-service (SaaS) company that is transforming the way automotive brands engage with consumers.

1985

Brian Kenneth Swain writes, "I am pleased to report that I have just published my fifth book, entitled *The Curious Habits of Man*. It is my first essay collection, and the topics cover a broad range, from food/diet and sports to politics and social issues. I encourage all of my fellow alumni to check it out on Amazon and other book retailing sites."

1988

Class Correspondents:
Caryn Frick
carynfrick@gmail.com
Elaine Loumbas
ElaineZL@aol.com
David Shofi
dshofi@atmi.com

Elaine Zacharakis Loumbas lives in suburban Chicago in Wilmette, IL, with her husband and two children. She is an attorney specializing in health care law and technology matters. She also is an adjunct professor at the Beazley Institute for Health Law & Policy at Loyola Law School and at the Center for Information Technology & Privacy Law at the John Marshall Law School.

1989

25th Reunion
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

Class Correspondent:
Shreosee Roy
Shre.roy@att.net

1990

Class Correspondent:
Laura Cordani Christopher
zchristophers@gmail.com

1991

Class Correspondent:
Radhi Majmudar
radhi@majmudar.org

1992

Class Correspondent:
Janneth Ignacio Marcelo
jannethmarcelo@gmail.com

1993

Class Correspondent:
Herbert Kreyszig
Hek7000@gmail.com

Herbert Kreyszig writes, "I am in the process of working on the second volume of the *Student Solutions Manual* for my *Advanced Engineering Mathematics* book, 10th Edition, John Wiley & Sons."

1994

20th Reunion
To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

Christopher Tso MS'96 is husband to a Columbia College graduate and is a proud father to two beautiful little girls. When he is not busy at work, Chris serves as a Girl Scout troop leader for his older daughter. Chris is a founding principal of CRC Engineering, a professional engineering consulting firm headquartered in New York City. CRC Engineering specializes in central cooling, heating, and cogeneration plant planning and design. The firm has worked on many high-profile projects for clients such as the Port Authority, the New York Power Authority (NYPA), NewYork-Presbyterian Hospital, St. Lukes-Roosevelt

CLASS NOTES

Hospital, and others. CRC Engineering is currently working with NYPA and the NYC Parks Department on the planning and design of a biomass energy plant to serve the Aquatic Center in Flushing Meadows Park in Queens. This cogeneration plant will burn wood chips to generate heat and power for the Aquatic Center and will be the first of its kind in the NYC area. In business for over five years, CRC Engineering continues to grow.

1996

Class Correspondent:
Enrico Marini Fichera
em75@columbia.edu

Tom Pinit recently joined the Conservation Fund in Portland, OR, as conservation ventures associate. The Fund is a leading national land and water nonprofit, the only of its kind with a dual mission of environmental conservation and economic development. Tom is working on issues related to sustainable forestry, green business lending, habitat mitigation, and carbon financing. Prior to joining the Fund, Tom spent a month with a Chinese environmental NGO in Beijing, China, through CRCC Asia's internship program. He enjoyed exploring China before traveling with his wife, Kirstin, and their two boys, Casey and Griffin, to Thailand and Australia.

1997

Class Correspondent:
Kelly Lenz
kal23@columbia.edu

1998

Alex Shender MS'00 writes, "Little brother, Daniel Reuben Shender, joined our family on June 27, 2013. Big brother, Noah (2.5), is already showing him the ropes and the whole family is well!"

1999

15th Reunion

To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

2000

Class Correspondent:
Daisy Chow
daisy@caa.columbia.edu

Vikas Mittal recently completed his cancer treatment. He is appreciative of all of the support of his fellow Columbia classmates!

Daisy Chow married Joshua Glaser on June 8, 2013, at Nature's Classroom in Charlton, MA.

2001

Swati Patel married Sanjay Gupta on November 10, 2012, at the Westminster Hotel in Livingston, NJ. They were excited to have Swati's Columbia friends there for their special day. Columbia College alumni in attendance include Jean Yang Lesko, Molly Lederer, Candida Aguilar Salim, and Valaine Hewitt. After the wedding, Swati and Sanjay visited Maldives, Myanmar, and Thailand on their honeymoon. They currently live in New York City.

Kevin Tung writes, "**Ya Yu Tung** and I are expecting our first baby in October. We both still work and live in New York City."

Daniel Ginat MS'06 has recently published *Atlas of Postsurgical Neuroradiology*. The book contains numerous images and to-the-point case descriptions and is a comprehensive yet concise reference guide to postsurgical neuroradiology. It will enable readers to identify the type of surgery performed and the hardware implanted. Topics reviewed include trauma, tumors, vascular disorders, and infections of the head, neck,

and spine; cerebrospinal fluid abnormalities; and degenerative diseases of the spine. This book will serve as a unique and convenient resource for both neuroradiologists and neurosurgeons.

2002

Class Correspondent:
John Morris
jpm53@columbia.edu

Suman Srinivasa is currently pursuing fellowship training in neuroendocrinology at Massachusetts General Hospital/Harvard Medical School and has been awarded a Pilot Feasibility Grant from the Harvard Nutrition and Obesity Center to conduct clinical research investigating novel hormones responsible for the browning of white adipose tissue.

2003

Class Correspondent:
Amar Doshi
abd19@columbia.edu

Vincent Piau and his wife, Constance '02BC, welcomed their first child, Adam Jeffrey, on April 3, 2013.

2004

10th Reunion

To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

Class Correspondent:
Eric Rhee
eric.rhee@gmail.com

Eric Rhee writes, "Hello, Class of 2004! It's time to officially count down to our 10-year class Reunion that will be taking place on campus from May 29, 2014, to June 1, 2014. Please email me with any ideas or suggestions for our Reunion Weekend and I will be happy to pass them

along to the planning committee. To start, it's been quite a year for me personally and professionally. I married my beautiful wife, Michelle, on August 16 in New York. Together we opened up a pop-up coffee and tea shop called Cold Process inside of a freight container located at Pier 57 in New York. **Andy Jun** was my best man and gave an amazing speech! He is living in Hoboken and working as an AVP at Deutsche Bank.

The rest of our class has been making big changes in their lives as well. **Scott Linthorst** recently left New York for San Francisco to be with his fiancé, Angie, and to join a health care start-up called Practice iQ as their CFO.

Jenn Chu and her fiancé, Mike, will be getting married this October in San Diego. Jenn also recently moved jobs and is now working as a buyer at Rag & Bone in New York.

Last but not least, thanks to **Paul Salama**, who is working as an urban planner at WXY Studio in New York, we found out **Jake Porway** is the host of a TV show called "The Numbers Game," which can be seen on the National Geographic Channel. Jake also started an amazing nonprofit called DataKind that brings together scientists and visionaries to help other nonprofit organizations solve problems."

2005

Class Correspondent:
Devang Doshi
devang.doshi@gmail.com

Brandon Basso writes, "I graduated from UC Berkeley with a PhD in mechanical engineering in December 2012. I'm now working at a start-up aerospace company in the Bay Area, 3D Robotics."

Whitney Booker writes, "I graduated from medical school in 2012 from the University of

Illinois in Chicago, and I am currently a second-year ob/gyn resident at Mount Sinai and living on the Upper East Side.”

Andrew Saxton writes, “I was recently promoted from product manager, Airborne ISR/Targeting Systems, to director of Airport Security with FLIR Systems Inc. I graduated SEAS with a BS in mechanical engineering and now live in Portland, OR, with my wife Taya. I have also received my MBA from the University of Washington.”

2006

Class Correspondent:

Nick Jennings

nfj2003@caa.columbia.edu

Matthew Berry recently received an award from one of the leading publications in the financial services industry. *Institutional Investor* awarded Matt its 2013 “Rising Star” of the fund industry, given annually to up-and-coming finance professionals who have substantially impacted the industry after working in it for less than 10 years. Together with Columbia Business School Professor Michael Johannes, Matt led the creation of a fixed income factor model service. This service, which U.S. mutual funds requires for regulatory compliance, is the first of its kind. Matt more recently began a consulting service, Bedrock Valuation Advisors, which helps fund managers and auditors to more effectively navigate the valuation of complex financial instruments. Matt will receive the award at a ceremony hosted by CNBC’s Tyler Mathisen in April at the Mandarin Oriental in New York.

Shyam Kadakia wed Sonali Shah on May 12, 2013, in Pune, India. The wedding was attended by a few fellow Columbia classmates.



1 *Alex Shender BS’98, MS’00 and family*

2 *Back row, left to right: Jessica Ko Beck ’00BC; Yen Hua ’00BC; Deborah Haight BS’00; Aizan Radzi BS’00; Kate Bittinger Eikel ’99BC; Stephen Specht BS’00; and Dana Weir ’00CC; front row, left to right: Matthew Baker BS’00; the groom and bride, Joshua Glaser and Daisy Chow BS’00; and Andrew Weir BS’00*

3 *Swati Patel BS’01 and Sanjay Gupta on their wedding day*

4 *Adam Jeffrey was born on April 3 to Vincent Piau BS’03 and his wife, Constance ’02BC.*

5 *Eric Rhee BS’04 (center) with wife, Michelle, and their wedding party*

6 *Brandon Basso BS’05 (right) at work*

7 *Shyam Kadakia BS’06 and wife, Sonali, on their wedding day*

8 *Eric Ruben BS’07 and wife, Rafaela (page 54)*

2007

Class Correspondent:
Tamsin Davies
tamsin.davies@gmail.com

Tamsin Davies writes, “Greetings Class of 2007. Can you believe it has been over six years since we graduated? **Eric Ruben** (IEOR) recently joined Freddie Mac in risk management, started a MBA program in Georgetown, and married his lovely wife, Rafaela, in Brazil. **Ronald Cheng** and **Lingfeng Tang** got married in May 2012. Both lived in John Jay their freshman year (their story is at www.lingandronnie.com) and have now relocated to the Bay Area. Ronnie worked as a software engineer at Facebook for four years and recently switched to Samasource, a nonprofit giving digital work to women, youth, and refugees living in poverty (particularly in developing countries). Lingfeng works with data and research as a senior business analyst at Simply Hired, a job search aggregator. **Mark Tabry** married his beautiful wife, Briana, at Rebar in Brooklyn in April 2012 with many fellow Columbians in attendance. Since their nuptials, Mark and Briana moved from the East Village to San Francisco.

After graduating from Villanova Law School, **Chris Kalck** moved to Arizona to work for Ping. **Sarah Clarke** has been pursuing graduate degrees at MIT.

Finally, as for me, I recently completed my master’s degree at Columbia and celebrated six years at J.P. Morgan. I am constantly traveling back and forth between London and New York. In my spare time, I serve as the fund chair for Columbia Engineering Young Alumni, volunteering as chapter adviser for the AXO Chapter at Columbia, training for my second marathon, and learning about the amazing accomplishments of my fellow classmates!”

Juan Camilo Dorado is excited to report that he is working with a foundation called “We Make a Difference” on a project called “case for a cause.” The project involves selling leather accessories for smartphones and donating a portion of the profits to fund children’s education and nutrition programs in developing countries. He writes that he is collaborating with Dean Jeannette Takamura from the Columbia University School of Social Work and he encourages other members of the Columbia alumni community to

get involved in the foundation’s work. Feel free to contact him at me-too@we-mad.org.

2008

Class Correspondent:
Amy Lin
seas2008.engineeringnews@gmail.com

2009

5th Reunion
To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

Class Correspondent:
Ramy Pratiwadi
ramyap@gmail.com

2010

Class Correspondent:
Michelle Madejski
michelle.madejski@gmail.com

2011

Class Correspondent:
Justin Merced
jmm2238@columbia.edu

Carl Jeanbart MS’12 writes, “I’m working at Zilliant in London as a pricing scientist. I also produce music videos with a friend, Alex Lewis ’12CC. You can find our latest one here:

<http://www.youtube.com/watch?v=tMT4zoV2iJk>. I am excited to announce that we finally got our first deal to make corporate videos.”

2012

Class Correspondents:
Rebecca Frauzem
rfrauzem@sbcglobal.net
Hannah Cui
hannah.cui@gmail.com

Rebecca Frauzem writes, “Hey, Class of 2012! Can you believe it has already been more than a year since graduation?! Time has really passed so quickly. We are all up to wonderful and amazing things, traveling the world, working and/or studying. I always enjoy seeing people when I manage to make it back to campus or in Germany. Keep being incredible!”

Jason Strauss has recently graduated from Harvard University with a master’s in education.

Save the Date!
Reunion:
May 29–June 1, 2014
Dean’s Day:
May 31, 2014



Where’s That Old Trumpet?

Are you a lapsed musician whose old trumpet is sitting in the back of a closet? Got a no-longer-used saxophone or flute? A tuba? A sarrusophone? The Columbia University Band Alumni Association (CUBAA) has just launched a drive to help the CU Marching Band beef up its store of instruments for student musicians. If you’re ready to admit that you won’t be playing the old horn any more, or have a spare, CUBAA would love to have it for the Band. The alumni group also hopes to fund repairs for some of the Band’s limping instrument inventory and buy some needed instruments as well as band supplies.

CUBAA, organized to provide financial and other support to the Band, is a 501(c)(3) charitable organization and can provide a tax letter for all donations. For more information about the group’s activities, including its instrument drive, visit www.columbiabandalumni.org or contact Samantha Rowan at columbia.band.alumni@gmail.com.

CORRECTION:

The following correction was received from Neil Marmor, Class of BSEE64, MSEE67, EE69 and was omitted from the print edition of the Spring 2013 issue of *Columbia Engineering*.

"I always look forward to the Class Notes section of *Columbia Engineering*. It's fun to catch up with classmates and also see how other alumni are faring. But when I opened the last issue, I was mortified to see that someone had erroneously awarded me a PhD. I've spent a lifetime establishing a reputation for honor and integrity. All of a sudden, the editors of Class Notes have made me look like just another sleazy businessman or lying politician.

"I apologize for the misrepresentation, though it was no fault of my own. I would urge the editors of Class Notes in the future to be meticulously careful when taking submissions for Class Notes and preparing them for publication."

Columbia Engineering regrets the editing error. The original, unedited submission by Neil Marmor for the Fall 2012 issue is printed below in its entirety:

"A brief update for: Neil Marmor, 64E

I stopped working fulltime for pay about 6 years ago. It was my choice. It took a year or so to get used to living [more frugally] off my accumulated capital. It also gave me the opportunity to decide what I wanted to do with what remains of my life. I quickly decided there wasn't enough time left to simply spend it. If I really wanted to do something, I would, instead, invest my time. Having been trained as an engineer several eons ago, I decided to develop a project plan. I knew I didn't want to wake up in a year's time and wonder where 12 months of my life had gone.

The word retirement had connotations from my folks' generation: Sit on the beach, read the New York Times, get sand in my shorts, and accumulate skin cancer. Not for me! Instead, I do some consulting for pay but invest more of my time doing pro bono work for arts and education organizations. Modern dance lessons in my 60s convinced me that a career in dance was not to be, at least in this lifetime. But I could apply my marketing and finance skills at the local ballet company, with an arts-in-education non-profit, reading to kids, and teaching financial literacy to visually impaired teens as well as to adults living in shelters. My theory is that education can solve most of the problems in the world, and it's best to start with young kids.

I also have had the good fortune to continue to enjoy theater and dance, the library, jogging, the company of several good friends, red wine, and occasional travel to places requiring a passport and inoculations to avoid dread diseases. I often thank my late parents for giving me a generous helping from the deep end of the gene pool. For a kid whose grandparents came over on the boat, in steerage, I've been incredibly fortunate. The education I received at Columbia was part of that good fortune.

Life is good, and the beat goes on.

neil

san diego, ca"

PROGRAM NOTES: GRADUATE ALUMNI

APPLIED PHYSICS AND APPLIED MATHEMATICS

Ryan Bonaparte MS'10 writes, "In April, I released my first book, *Crazy Enough To Try*, in hopes of helping people our age find what they are passionate about and go after it."

John Doorish MS'85, president and founder of Doorish Ophthalmic Technologies, has recently opened the Doorish Research in Science and Technology Institute and the Annunciata Doorish Foundation for Animal Welfare. Doorish Ophthalmic Technologies uses the Artificial Retinal epiProsthesis to restore sight to blind humans and animals. The Research Institute aims to investigate different applications of this technology, both in medical and nonmedical fields. The Annunciata Foundation is being established as a private, nonprofit animal welfare organization dedicated to the health and well-being of all animals, especially the millions of homeless pets that have been lost or abandoned. The foundation seeks to provide rescue, adoption, medical care, and population control services, as well as stand as a leader and supporter for other organizations developing similar animal rescue programs. In the long term, Annunciata would like to create education programs that will help people take better care of the animals in their lives.

Brian Grierson MS'05, PhD'09 is a staff research physicist at the Princeton Plasma Physics Laboratory. He works at the DIII-D National Fusion Facility located at General Atomics in La Jolla, CA.

Katerina Kaouri MS'99

writes, "After leaving Columbia, I pursued a DPhil in applied mathematics at the University of Oxford, UK (graduated in 2005). Three years ago I returned to Cyprus, my home country, and I have been working as an academic there, teaching mathematics to students from various disciplines while continuing to do my own research in applied math. During my PhD years, I discovered a passion for communicating science to the public, and since then I have been giving public lectures about the role mathematics plays in our lives. In March 2013 I delivered a talk at TEDxNicosia on rethinking mathematics. I talked about how math is everywhere around us. We find it in unexpected places, from the destruction caused by meteorites and the way we make decisions, to how we fall in love and what we find beautiful! It was received very well. The YouTube link for my talk is <http://www.youtube.com/watch?v=N6KcC6gxJhI>."

Emily Slutsky MS'09

graduated this past spring from University College Cork School of Medicine in Cork, Ireland.

BIOMEDICAL ENGINEERING

Amin Katouzian PhD'11

writes, "Studying at Columbia University, collaborating with top-notch researchers as well as scientists and living in the bustle of Manhattan are unique experiences and enable CU graduates to become extraordinary. I am indeed lucky to be one of them. Currently, I work as senior research scientist at both Heffner Biomedical Imaging Lab (HBIL) at Columbia University and as the chair for Computer Aided Medical Procedures (CAMP), led by Dr. Nassir Navab, in Technical University of Munich on a collaborative research



1



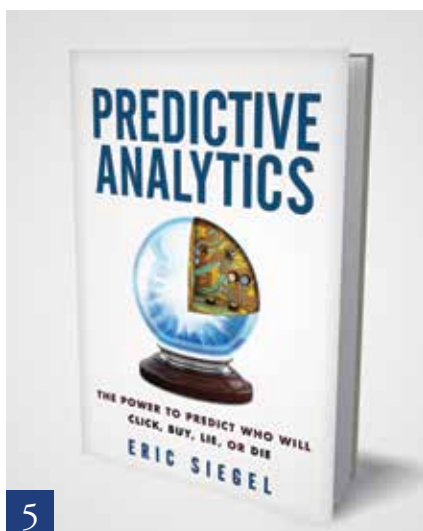
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3



4



5



6



7

1 **Amin Katouzian PhD'11** (page 55)

2 **Sonal Bhatnagar MS'13** (far right) with friends

3 **Subhen Mukhopadhyay MS'78, PhD'85** (far left) is pictured with his former professor, Edward Leonard, professor of chemical engineering, on a visit to the Columbia campus with wife, Trina in March.

4 **Enrica Oliva MS'07** (left), pictured with her brother and mother

5 **Eric Siegel MS'93, PhD'98** released his new book in February.

6 **Alicia Abella MS'93, MPhil'94, PhD'95** with former professor and mentor, Computer Science Professor John Kender, following University Commencement. Alicia was honored this year with the University Medal for Excellence.

7 Recognized for his dedication to Columbia, University Trustee **Armen Avanesians MS'83** (center) was awarded an alumni medal at this year's Commencement. Armen currently chairs the Columbia Campaign for Engineering.

project, resulting in several scientific publications, patent applications, and technology transfers. For the past year, I have also been trying to fund my own start-up, i2Sense, which focuses on online monitoring of chronic diseases such as atherosclerosis through implantable micro-electro-mechanical sensing systems and wireless technologies. As a soon to be CEO, I am so up for this adventure and very excited to work with brilliant people onboard, including my PhD supervisor, Dr. Andrew Laine. The i2Sense will start off with an initial investment round of 600,000 euro in the near future, provided by a German seed funding institution. As an Iranian immigrant, I am so grateful for what I was offered in the United States, which was truly exceptional, and for all the people who believed in me, especially my parents and my beautiful wife, Tannaz. At the end of the day, I hope to reciprocate appropriately to humankind beyond any borders."

Andre Levchenko MS'95, EngScD'99 was appointed the inaugural director of Yale Systems Biology Institute and the John C. Malone Professor of Biomedical Engineering at Yale. Andre is joining Yale after 12 years of being on the faculty of the biomedical engineering department at Johns Hopkins University.

CHEMICAL ENGINEERING

As a graduate student at SEAS, **Sonal Bhatnagar MS'13** conducted research in the area of nanotechnology, where she developed Nano Organic Hybrid Materials (NOHMs) for carbon capture applications. She recently published a paper on this topic in the *Journal of Colloid and Interface Science*. She currently works as a specialist engineer at Merck in New Jersey, support-

ing the manufacturing and commercialization of the latest cutting-edge drugs and formulations. In addition, Sonali is involved with the company's various strategic initiatives and volunteer activities.

CIVIL ENGINEERING AND ENGINEERING MECHANICS

Nora Immoor MS'98 is working in Northern California for Anderson Pacific Engineering Construction. She has two children, ages six and five.

Ahmed M. Jaddi MS'61 writes, "After completing my MS program I studied urban planning at the School of Architecture. I also taught Urdu language at the School of General Studies for two years, 1962–64. I worked on the design of the Madison Square Garden cable-supported roof, U.S. Pavilion at the 1963 World's Fair and Jefferson Monument, and the Gateway Arch in St. Louis, MO. I also supervised the fabrication of the Arch sections in Warren, PA, during 1963–65. I moved to Seattle in 1967. Although I am retired now, I occasionally participate in structural design projects in Washington and Arizona. I am married to Ellanora, a retired grade school teacher with 31 years of teaching academically gifted students, English language learners, and students with disabilities. We have five children, four sons and one daughter, as well as 11 grandchildren. Our oldest granddaughter, Hanna, is a high school senior. She came to see us this summer and we took her to the University of Washington and University of British Columbia campuses. Her dad is a Notre Dame graduate, but she is interested in UC Berkeley! Ellanora and I traveled to India in January. On the way back we stopped in New York for a couple of days. We split our

time between Camano Island, WA, and Phoenix, AZ."

Enrica Oliva MS'07 updates, "I am writing to you the day before my summer vacation... I am very excited for this time off, during which I will have the opportunity to visit my family in Cassino (my hometown in Italy) as well as friends and former classmates. I love traveling. It is my number one favorite thing to do, but unfortunately it takes away time from my family; for this reason, the next two weeks will entirely be dedicated to them (I have a very large family). There will be plenty of family get-togethers and just a lot of quality time. It will be great!

"Work here at Thornton Tomasetti (I am a senior engineer) is good, very busy, and very exciting. I am currently involved in the construction administration phase of a couple of projects, including the Wishard Pavilion in Indianapolis, IN, a Congregation Center for Soka Gakkai International in Brooklyn, NY, as well as the West 57th Street "Pyramid," a very challenging building that will help "reshape" the West Side of Manhattan. I am in the process of getting my green card (currently in the final stages!). After seven and a half years in New York, I will soon be able to skip the long line at JFK airport!"

Catherine T. Sheridan MS'07 was recently named the deputy chief engineer for the New York State Thruway Authority and New York State Canal Corporation.

Abba Tor MS'53 has recently published another article in the Swiss Architectural Journal, *Archithese*. He has also traveled with colleagues in Europe, specifically, Switzerland and Germany, and the Midwest, in Chicago, Indianapolis, Columbus, and St. Louis looking for examples

of modern architecture and its structural expressions.

COMPUTER ENGINEERING

Thibaut Crenn MS'11 writes, "After graduating in spring 2011, I joined a start-up called Freshplanet, specialized in social gaming. I worked as a software developer in a team of five people developing social games for Facebook. Last year, I became the lead developer on our biggest game so far, SongPop. I developed both the mobile and web versions from scratch. The game has done quite well—more than 80 million users have played the game. My team won a BAFTA for best browser game, and SongPop was voted best game of 2012 by Facebook users.

COMPUTER SCIENCE

Apoorv Agarwal MS'09 has received an IBM PhD Fellowship for 2013 to 2014. He has interned at IBM twice, in the summer of 2011 and fall of 2012. In his first internship, Apoorv worked with the team that built Watson, adding new features to it that significantly improved its statistical performance. He spent his second IBM internship publishing results from his first internship experience and worked on adapting Watson to the medical domain.

Eric Siegel MS'93, PhD'98, a former professor of computer science at the Engineering School, is the author of *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die*, published in February by John Wiley & Sons. The book reveals the power and perils of predictive analytics, showing how predicting human behavior combats financial risk, fortifies health care, conquers spam, toughens crime fighting, and boosts sales. Eric is the founding conference chair of Predictive Analytics World and Text Analytics

World, as well as the president of Prediction Impact Inc., a company that provides analytics services to businesses. He has published more than 20 papers and articles in data mining research and computer science education and has served on 10 conference program committees.

Last May, **Nikhil Wason MS'09** took on the responsibility of club leader for the New Delhi Chapter of the Columbia Alumni Association of India. He writes, "It's been a pretty exciting journey, as I have seen the Columbia community in Delhi and the rest of India grow pretty rapidly in terms of participation. We've started organizing a number of events for alumni as well as incoming students on a regular basis, and the alumni office on campus has been very supportive. Apart from that, I also moved on to a new day job—I recently started a company called Cardback, where we are building a product that helps people make better use of their credit, debit, and loyalty cards. We currently have an Android app that shows people offers that they can avail on their cards at various places in their city. The app can be downloaded from bit.ly/cardback-play-store but works only in India for now."

Samreen Zafer MS'12 is a data analyst at the Columbia Genome Center. Samreen has been married since 2008 and has one son four and a half years old.

ELECTRICAL ENGINEERING

Lai-Tee Cheok MS'98, PhD'06 is an assistant professor at the School of Information Systems (Practice), Singapore Management University (SMU). Her research focus is on data analytics, multimedia content analysis and search, object recognition, and mobile multimedia. Some of her past research work also includes

CONSTANTINESCUS MAKE BEQUEST TO ENGINEERING SCHOOL AND COLLEGE OF DENTAL MEDICINE

Serban MS'77 and Dr. Victoria '82DM Constantinescu have made a bequest of \$500,000 to the University. The planned gift, which is provided through the couple's estate planning, will be divided evenly between The Fu Foundation School of Engineering and Applied Science and the College of Dental Medicine.

The couple made the bequest in "deep gratitude" for Columbia's "flexibility and open mindedness" while they were students. When the Constantinescus emigrated from Romania to the United States in the 1970s, they each held graduate degrees: physics for Mr. Constantinescu and dentistry for Dr. Constantinescu. Mr. Constantinescu wanted to shift from physics to engineering, so he came to Columbia, where he earned his master's degree in mechanical engineering in 1977.

After the couple settled in Ohio, Dr. Constantinescu discovered that she needed an American degree to take the state's dental license examination, and the Ohio universities that she contacted insisted that she would need to retake all four years of dental school before they could grant her a degree. When she approached Columbia's College of Dental Medicine (then the School of Dental and Oral Surgery), the College worked out a custom curriculum that allowed her to apply much of her European training toward a Columbia degree, significantly shortening the process.

Dr. Constantinescu credits Columbia's flexibility with helping her enjoy a successful general dentistry practice in Cleveland, OH, for 25 years. Mr. Constantinescu was a practicing engineer licensed in Ohio, Indiana, and Virginia for 35 years. Most recently, he was manager of corporate engineering at PSC Metals Inc., a national processor of recycled ferrous and nonferrous metals.

The couple, who recently retired, believes that without Columbia's willingness to make academic accommodations, they could not have realized their professional success or such a happy life in their adopted country. Through this generous bequest to Columbia Engineering and the College of Dental Medicine, they hope to "contribute a little to Columbia's good deeds" and remind fellow alumni how much they owe to the University.

"It is not about me," Mr. Constantinescu says, "it is about Columbia, which helped me at a moment when I needed it."



optimization. Prior to joining SMU, she worked as a manager and researcher at Samsung R&D Labs in the United States and a start-up that specializes in video surveillance. Her family is happy to have her back in Singapore. One of her sisters, who graduated from the University of Oxford, has also returned to join the family. Lai-Tee is looking forward to moving to her new place come December this year. She certainly hopes to visit New York City next year to see friends, watch Broadway shows, and visit some of her favorite places, including the Columbia campus.

Richard Gitlin MS'65, EngScD'69 is a distinguished University Professor of Engineering at the University of South Florida. In December of 2012, he was named a Charter Fellow of the National Academy of Inventors. Election to NAI fellow status is a professional distinction accorded to academic inventors who have demonstrated a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and social welfare.

Hideki Kinoshita MS'06 completed a sub-4 marathon in all 50 states and DC in the span of 2 years, 3 months by finishing the Vermont City Marathon (Burlington, VT) in 3:28:09. He became the 50sub4 Marathon Club's 38th official finisher.

INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH

Jin-Young Chung MS'97 writes, "After Columbia, I joined Daewoo Securities, a leading finance firm in Korea, and shortly thereafter moved to PwC Consulting in late 1997. The Korean financial crisis sent me back to school, this time to get a master's degree in economics

at NYU. I received a full scholarship offer from the University of Washington (UW) and completed my PhD in economics in 2010. Since 2010, I have been working for Samsung Economic Research Institute, a leading think tank in Korea. I evaluate economic policies and forecast future economic and business environments. I married So-Young Lee, a professional cellist, in Seoul in 1999. We have a son, Yeon-Tae Chung—13 years old and entering 8th grade—and a 4-year-old daughter, Christy Yeon-Ah Chung. My wife received her doctoral degree in cello performance from UW. Currently, she performs with orchestras and trios as well as teaches private music lessons. Yeon-Tae enjoys sports and playing the cello and clarinet. Christy Yeon-Ah has started learning English and loves to sketch and color."

Tudor Pascu MS'03 writes, "I have been living with my wife, Monica Yang '03CC, in Taiwan for five years and on April 23rd, we had our first babies—twins! Having studied industrial engineering and optimization, we optimized this to the maximum; this is why we had twins: Emilie and Stefan!"

Andrea Umana MS'08 writes, "Since I graduated I returned to Colombia, my home country. Two years ago I started my own consulting company, XSS Management, on Process Optimization through Operations Research and LEAN. It's been a tough journey and very rewarding. I now work with the health care and financial services sectors and am hoping to expand into manufacturing soon!"

MECHANICAL ENGINEERING

On March 30, 2013, three Columbians following very

different career paths converged briefly in Paktika Province, Afghanistan. Major **Jonathan Belmont MS'09** writes that “Dr. Ashraf Ghani Ahmadzai ’82GSAS, the head of the Afghanistan Transition Process and senior adviser to President Hamid Karzai, visited Paktika’s capital of Sharana to assess the progress of Afghan-led security efforts and the status of several Coalition Force bases being transferred to Afghan control. Two other Columbia graduates were involved in the visit as well—Mr. Karl Olson ’82CC, a State Department foreign service officer serving as the senior civilian representative on the Paktika Provincial Reconstruction Team and myself, an active duty

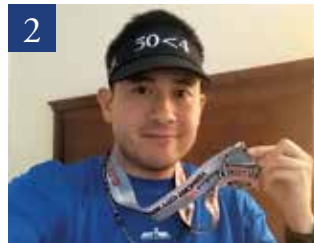
Army officer deployed with the 10th Mountain Division as the team chief for a small group of combat advisers working with the Operations Coordination Center-Paktika (OCC-P). Since January, my team and I have been advising, assisting, and assessing the Afghan Army, police, intelligence, and border patrol personnel that work in the OCC-P.”

Jasmine Bridges MS'10, a manufacturing engineer at Boeing, was recently awarded the Outstanding Young Manufacturer of the Year Award from the Society of Manufacturing Engineers at the North American Manufacturing Research Conference in Madison, WI. This award is given annually to engineers under the age of

35 who have made outstanding contributions to the manufacturing industry. Jasmine is one of seven engineers to receive this award and only the third to win from Boeing in the last 20 years. Currently, she works in the final assembly stage for P-8 airplanes in Renton, WA.

Matt Ham MS'11 is engaged to Peggy Vogt. The couple moved to Tallahassee, FL, where Peggy has begun medical school at Florida State University. Leaving city life behind, Matt decided to apply his technical skills to the electronics repair industry, beginning his professional career by launching his first business, Computer Repair Doctor, a computer and iPhone repair shop in downtown Tallahassee.

In addition to his technical background in engineering and the computer industry, Matt frequently attended Columbia’s Small Business Development Center (SBDC) events. These events and guest lectures by various entrepreneurs, such as Steve Blank, helped prepare Matt for the business end of launching his own company. He is hoping that his technical skills combined with his business training will make him well suited to be successful in his first endeavor.



- 1 **Richard Gitlin MS'65, EngScD'69**
- 2 **Hideki Kinoshita MS'06**
- 3 **Jin-Young Chung MS'97** with his family
- 4 **Tudor Pascu MS'03** has twins, born April 23, 2013.



- 5 From left to right: Paktika Provincial Governor Mohebullah Samim, Maj. **Jonathan Belmont MS'09**, Ashraf Ghani Ahmadzai, and Karl Olson. Jonathan writes, “The picture was taken shortly after a loud and thunderous cry of ‘Go Lions!’ echoed throughout the Provincial Capitol Complex!”
- 6 **Jasmine Bridges MS'10**
- 7 **Matt Ham MS'11** (far right) launches start-up with fiancée, Peggy (center), and business partner, Chris Newman.



1



2



3

1 *Saul Ricklin BS'39*

2 *Arthur Graham BS'42, MS'50*

3 *Mary Elizabeth Michel, widow of Henry L. Michel BS'49 (page 63)*

IN MEMORIAM

ALUMNI

1939

Saul Ricklin passed away on July 29, 2013. He was 93. Saul worked as a process engineer at Metal and Thermit Corp. from 1940 to 1946. There, he worked on development of incendiary and tracer ammunition with awards from the Naval Bureau of Ordnance and the OSRD. He served in the U.S. Army from 1946 to 1947, and later served as a professor at Brown University's chemistry department (1947–1954). He was the owner of Ricklin Research Associates (consultant to industry) from 1954 to 1959. Then he joined Dixon Corp. as director of R&D and retired as chair and CEO of Dixon Industries and as managing director of NTN Rulon in Japan and Dixon Italia in 1981.

Saul also previously worked as a director of Entwistle Corp., EFD Company, and ACS Industries. He served on the board of Trinity Rep. and on advisory boards at Connecticut College and Roger Williams University. In Bristol, he was on the Civic Industries Commission, a high school building committee, and a financial controls committee, and was a board member at Rogers Free Library, the YMCA, Historic and Preservation Society, Tree Society, and was chairman of the Bristol County Foundation of the Arts.

Saul cofounded the RI Society for Chemical Engineers and served as chairman of the Fluorocarbons Division for the Society of Plastics Industries. He and his wife, Lois, were world travelers with visits to almost 100 countries. He was an avid reader, book collector, and

with his wife, an art collector. He authored many technical articles on the industrial applications of Teflon and lectured on the subject. In his retirement years, he wrote travel and history articles, book reviews, Op Ed pieces, and more than 400 Letters to the Editor at newspapers and magazines. With weekly poems in the Bristol Phoenix, he was called the Poet Laureate of Bristol.

Saul is son of Isaac and Rose (Brodozky), husband for 65 years of the predeceased Lois (Webster), brother of Lillian (deceased) and Joseph (deceased). He leaves behind children Donald and wife, Leona; Leslie and husband, Jeff Wells; Ethan and wife, Susan; and Roger and wife, Donna; grandchildren Ruby Wells and husband, Jeff Schneider; Isaac Wells and wife, Jamie; Sam, Julia, and Alana; and great grandchildren, Zeppelynne and Benjamin.

1942

Arthur Graham MS'50, dear friend and fellow alumnus to many of us, has passed away. Arthur passed at the age of 92 after a long engineering career and a life of service to our Engineering School as well to a number of community organizations in Westchester where he lived.

Arthur was an active alumnus until the very last day of his life. He served as the class correspondent for *Columbia Engineering* magazine and recently returned to campus for Reunion this summer. On June 1, he attended the Society of Columbia Graduates celebratory luncheon at which it presents the Great Teacher Awards to honor undergraduate teaching in Columbia College and the Engineering School. Arthur served with great energy and distinction on the Society's board for many years, the last several as vice president.

He was a founding member of the Westchester Chapter of the Columbia University Alumni Association and was its long-standing president at the time of his death. Edward Pressman, the secretary of the Chapter, and Anthony Napolitano, a board director, summarized well Arthur's dedication to the Chapter in the following: "A dedicated alumnus and loyal friend, Arthur has touched the lives of many Columbians within the area and beyond the borders of Westchester County. Those who knew Arthur knew he lived and breathed Columbia. He will be deeply missed."

In addition, Arthur served as president of the Engineering School Alumni Association from 1990 to 1992 and previously served as chair of a number of its committees.

To the very last day, Arthur was an athlete and world traveler. He and his wife, Ruth, had just returned from London and Paris celebrating their 65th wedding anniversary. As an athlete, he was a skilled scuba diver, swimmer, golfer, and skier. In later years, he reduced his activity to swimming, golf, and nautilus training, all of which he had enjoyed in the several days before he passed away, including swimming that morning!

Arthur had served as an Air Force officer in World War II in India between his bachelor's and master's education. He was part of the famous Hump operation, which flew military transports from India to China over the Himalayas to supply the free China Forces and the U.S. Air Force groups based in China. In his subsequent engineering career, he served as vice president for A.T. Kearney, the management consulting firm, and was responsible for all East Coast logistics, after having served in a

number of international assignments for that corporation.

A devoted father, grandfather, and community leader, Arthur served the Westchester community in which he lived with the same enthusiasm he had as a Columbia alumni leader. For his many leadership roles, he was inducted into the Westchester Senior Citizens Hall of Fame.

On a more personal note, I had a long friendship with Arthur. To me, he seemed eternally young! I can say with certainty that he was a most upstanding and dedicated alumnus, of sterling character, an alumnus of whom the Engineering School and the University as a whole can be most proud.

—**Anna Kazanjian Longobardo**
BS'49, MS'52

1946

Edward A. Frieman, former director of Scripps Institution of Oceanography at UC San Diego, and a prominent national adviser to the government on issues of vital importance to defense, energy, and science policy, died in La Jolla, CA, on April 11, 2013. He was 87 years old.

Edward was appointed eighth director of Scripps Institution of Oceanography, UC San Diego vice chancellor of marine sciences, and dean of the Graduate School of Marine Sciences in July 1986. He became director emeritus upon his retirement from his administrative post in 1996. He was a member of the National Academy of Sciences and served as Assistant Secretary of the U.S. Department of Energy from 1979 to 1981.

A plasma physicist, Edward had extensive research interests that extended into other physical science fields, including hydro-magnetics, hydrodynamics, and astrophysics. He was a professor at Princeton University for more

than 25 years, after which he was employed by the federal government, academia, and the private sector.

Born in New York City, Edward received his bachelor's degree in engineering in 1946 from Columbia Engineering, his master's degree in physics in 1948, and a PhD in physics in 1952 from Polytechnic Institute of Brooklyn, NY. During World War II, he served with the U.S. Navy as a deep-sea diving officer. He was trained as a naval hardhat diver in the Hudson River, was commissioned an ensign, and participated in the atomic bomb tests at Bikini Atoll shortly after the end of the war.

Starting in 1952, Edward worked at Princeton University on Project Matterhorn, a classified program studying nuclear fusion, with John A. Wheeler and Lyman Spitzer; in 1954, he became head of the project's theoretical division. During his years at Princeton, he met many prominent physicists including Enrico Fermi, John von Neumann, J. Robert Oppenheimer, and Edward Teller. He also met Albert Einstein and attended his seminars at Princeton. In 1961, he joined the Princeton faculty as professor of astrophysical science and served as associate director of the Princeton Plasma Physics Laboratory from 1964 to 1979.

Edward was a fellow of the American Physical Society, the American Philosophical Society, the American Association for the Advancement of Science, the Astronomical Society, Sigma Xi, and the New York Academy of Sciences. He was the chairman of the National Academy of Sciences/National Research Council (NAS/NRC) Supercollider Site Evaluation Committee and on the Board of Governors for the U.S. Department of

State, U.S.-Israel Binational Science Foundation.

In 1970, he held a John Simon Guggenheim Fellowship and has received many honors and awards throughout his career, including a Department of Energy Distinguished Service Medal in 1980 and Department of the Navy's Superior Public Service Award in 1996.

Edward is survived by his wife, Joy, sons Michael (Judy) of Denver, Josh of Chicago, and Jonathan (Moirra) of San Rafael, and daughters Wendy Frieman (Dave Johnson) of Washington, DC, and Linda Holiner (Tim) of the Boston area, plus six grandchildren and a great-granddaughter.

Zachary Rosenfield, 87, died June 22, 2013, in Blue Hill, ME, of acute leukemia. He was the beloved husband of Marydel Coolidge of Bangor, ME. They have been coming to Deer Isle summers since 1972 and became year-round residents in 2007. Zachary was an avid sailor, sailing in Maine in summers and bareboat chartering in the Caribbean with friends in the winter.

He was born in New York City on December 24, 1925. He graduated from the Ethical Culture Fieldston School in Riverdale, NY, in 1943 at the height of World War II. He was tapped to join the U.S. Navy's V-12 program designed to rush potential officers through college before granting them commissions. After receiving his engineering degree from the School, he earned his master's degree in architecture from MIT in 1950.

Zachary joined his father's architectural firm specializing in the design and planning of hospitals and health care facilities, including nursing homes. In 1970, his father retired and Zachary headed the Rosenfield Partnership until 1990, when he

IN MEMORIAM

sold the firm to NBBJ and went to work for them until 1995.

In addition to his wife of 65 years, he is survived by his three children, two grandchildren, a sister, and three nieces. He will be remembered for his gentle wit, his generosity, his wise counsel, and his love of biking, gardening, and cooking.

1951

Edward Bezkor of Manhasset, NY, passed away peacefully on April 1, 2013, in Chattanooga. He was born in the Bronx to Albina and Theodore Bezkor. He earned a master's degree in engineering from Columbia Engineering and was honored with the Tau Beta Pi National Award for distinguished scholarship and exemplary character. Edward served in the Army Corps of Engineers as part of the post-World War II peacetime force. He was employed as a civil engineer by Parsons Brinckerhoff and was then hired by Gibbs & Hill as project manager for the Comanche Peak Nuclear Power Plant. While living in Manhasset, Edward was a member of the American Legion Post 304, Knights of Columbus, and a communicant at St. Mary's Church. He was also a member of the American Society of Civil Engineers. An avid outdoorsman, he enjoyed camping, fishing, canoeing, hiking, and snow skiing. Family camping trips were a time that he could share life lessons like the importance of planning and preparedness, respect for nature, and his love for the outdoors. He will be dearly missed by his wife of 45 years, Doris; son, Bob; daughter-in-law, Bonnie; and grandson, Barrett; and son, Eddie.

1960

Robert Greenberg "Grandpa Bob" (MS, Mechanical Engineering) of South Hadley,

MA, died peacefully at home on January 6, 2013, surrounded by his loving family. Bob was born in Brooklyn, NY, where he spent his childhood. At Cornell University he earned a bachelor's in mechanical engineering in 1949 and went on to Columbia Engineering to earn a Master of Science. Between 1949 and 1986, he worked for the National Equipment/Union Standard Corp., a family-owned business, as vice president in charge of design and production of machinery for candy and bakery production. His patents include machines for the manufacture of Chocolate Chips, Reese's Peanut Butter Cups, Nestlé's \$100,000 Bars, Mike n' Ike's, Dots, Red Hot Dollars, and many, many more.

Bob took a leave of absence from college to serve in the U.S. Army Air Force during WWII and was stationed in Germany. He told a story of creating a Passover Seder in a barn for a group of Jewish survivors coming out of the concentration camps. After college Bob married Sondra Schilling and moved to Englewood, NJ, and raised their three children. Bob was deeply engaged in the politics of the time, working for sweeping changes in racial equality; he changed election outcomes and created ingenious methods of getting voters out to the polls. He was instrumental in starting the young Democratic Club and made sure his children took part in many political activities.

Between 1972 and 1976 Bob started a teenage hiking group for the Englewood Recreation Dept. aptly named "the Milanos" after a cookie. Bob has climbed Mt. Ranier, WA (14,100'), Mt. Sinai in Israel, backpacked the Cascade Range in Oregon climbing the "3 Sisters," backpacked in Yosemite National Park, CA, climbed the Matterhorn in Switzerland

(14,100'), and trekked for 22 days in Nepal, climbing Gokyo Ri (18,000').

In 1978, he started an outing group for the Flat Brook Nature Center in Englewood, where he continued to lead hikes and adventures for all ages. In 1979, he climbed Mauna Loa, HI, and backpacked the NaPali Coast Trail in Kauai. In 1982, it was Mt. Ruapehu, New Zealand, where he backpacked Milford Track, Routeburn Track, and in 1983, he climbed Kilimanjaro in Tanzania and went on a safari through the Serengeti Plains. He loved Nepal and in 1984, returned to trek for 36 days in Nepal, climbing Kala Patar (18,000').

In 1987, Bob moved from Englewood to South Hadley and was remarried a few years later to Marguerite Davol who predeceased him and together they traveled extensively. He made numerous other hikes, backpacking trips, and climbs including trekking the Inca Trail to Macchu Pichu, climbing Sierra Negra, Volcan Alcedo in Galapagos, touring the Nile Valley in Egypt, and hiking in Switzerland in the Swiss National Park.

In 2000, when his Parkinson's made his legs too weak to trek, he took a trip to the Bugaboos in the Canadian Rockies by helicopter, which dropped him off at the top to do his last hiking.

1969

John A. Bernyi MS'70, '78TC of Westport, CT, passed away March 16, 2013, from complications relating to cancer. He was 65. At Columbia Engineering, he studied industrial engineering and operations research, earning both his undergraduate and graduate degrees in this subject. He was also a Loeb Fellow in advanced environmental studies at Harvard.

John, who was born in Budapest but raised primarily in Queens, NY, spent the majority of his career focused on activities in finance, long-term care facilities, nonprofits, mass transit, and alternative energy. He served as an assistant to Mayor John V. Lindsay of New York and then went on to join Citibank's public finance department. He spent more than 25 years as an investment banker with a focus on environmental finance and in addition to Citibank, worked at HSBC Capital and L. F. Rothschild Unterberg Towbin.

John is survived by his wife, Eileen; three daughters, Jessica, Juliana, and Alicia; and by cousins Vera and Bill Kuhl and Ahuva Peri. As reported in *WestportNow*, "He left a legacy of adventure, entrepreneurship and scholarship, meeting life's challenges with joy and humor."

1993

Wuzhen Zhang (MS'93, PhD'97, Civil Engineering and Engineering Mechanics), 44, passed away on May 26, 2013, at his home in Hong Kong. Wuzhen was born on October 8, 1968, in Fujian Province, China. He attended South China University of Technology in Guangzhou, China, and received a bachelor's degree in 1990. He continued his education in the Department of Civil Engineering and Engineering Mechanics at Columbia. Under the guidance of Professor Rene Testa, he did basic research with experiments on the detection of cracks in steel structures. "Wuzhen was the student and researcher one dreams of: intelligent, knowledgeable, and super-industrious," Testa said. "His thesis required meticulous work in the Carleton Laboratory and great theoretical insight, both of which he provided fully. Moreover, he was always

ready with a smile. His loss is felt personally and professionally.”

After graduating from Columbia, Wuzhen started his career as a bridge engineer with Amman & Whitney in New York City. In 2007, Wuzhen was employed as a senior engineer by Weidlinger Associates, New York City, a leading structural engineering firm that specializes in building, bridge design, and applied science research. In 2010, he moved to Hong Kong joining AECOM Asia as a principal engineer in the Long Span and Specialty Bridge Group. This year he finished writing a technical paper, “High-speed Rail Tunnel Design Using Finite Element Method in Hong Kong,” providing an innovative approach used for the design of high-speed rail tunnels. He is survived by his parents, Qing Jie Zhang and Yue Ying Lu, wife Xiao Yan, daughter, Yan, and son, Yang.

FRIENDS

Mary Elizabeth Michel, an informed and enthusiastic advocate for the engineering profession, died on March 28, 2013. Her late husband, **Henry Michel BS’48**, was a globe-trotting, innovative civil engineer much recognized in his profession and by his alma mater for his many contributions to the field. Henry, CEO emeritus and chairman emeritus of Parsons Brinckerhoff, won the University’s Alumni Federation Medal and Columbia Engineering’s Egleston Medal. He also was a past president of the Columbia Engineering School Alumni Association (now the Columbia Engineering Alumni Association). To inspire and assist engineering students and to build on Henry’s good work, in 2005, Mary Elizabeth initiated the Henry L. Michel Scholarship Fund, which supports undergraduate scholarships for civil engineering

students at the School. The Michel Family looks forward to continuing this legacy and welcomes contributions to support the Fund. Mary Elizabeth is survived by her daughters, Eve Musette Michel and Ann Elizabeth Michel, granddaughter Ava Elizabeth Milanese, and four sisters. Donations in her memory may be made to the Henry Michel Scholarship Fund at Columbia Engineering. Contact Jacqueline Morton at jm3784@columbia.edu for information.

William A. Selke, whose research and publications were in the fields of ion exchange kinetics, thermodynamics, and heat transfer, passed away February 25, 2013, in Pittsfield, MA. William served as manager of the Heat Transfer Research Facility at Columbia, which was established by the U.S. Atomic Energy Commission in 1951. In 1955, William moved to the Berkshires to establish a research and development department for Peter J. Schweitzer Inc., manufacturer of specialized technical papers. The work that he did there resulted in a number of U.S. and foreign patents on specialized papers and novel applications of the papermaking process. Kimberly-Clark Corp. bought the company in 1982. After the sale, William moved to Atlanta to be vice president of the Corporate Science and Technology Group. He retired in 1986 and moved to Stockbridge, MA.

William, who was born in Newburgh, NY, attended MIT where he earned his undergraduate degree in chemical engineering in 1943. He was in the U.S. Naval Reserve after graduation and returned to MIT for a master’s degree in 1947 and later received a doctorate in engineering from Yale in 1949. Following his retirement from Corporate

Science and Technology Group, William remained active as a consultant to major companies, worked as a professor of environmental engineering at the Lenox Institute for Research, and served on various boards and committees, primarily in education and music, including the Massachusetts Board of Education, the Stockbridge Housing Authority, the Council of Tanglewood Friends, and on the boards of the Boston Symphony Orchestra and the Atlanta Symphony Orchestra. He had a lifelong love of classical music and jazz. He is survived by his wife of 60 years, Martha, their three sons, and a granddaughter.

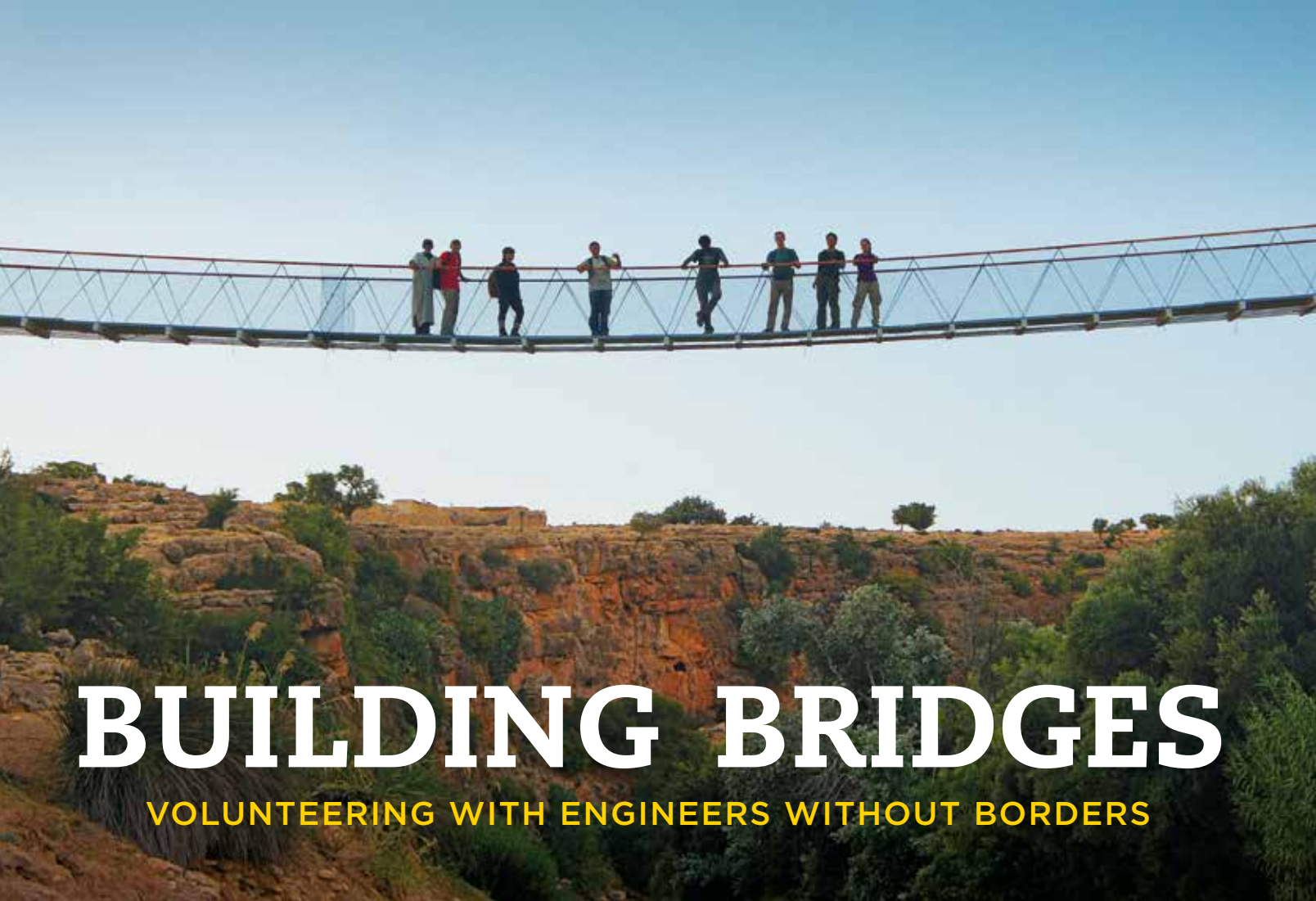
OTHER DEATHS REPORTED

We also have learned of the passing of the following alumni, faculty, and friends of the School:

Dimitry S. Neustroeff MS’33
Edwin W. Bright BS’42
Johnny H. Johnson BS’43,
EngScD’47
Herman Weck BS’43
Norman Lindsay BS’45
Robert J. Buegler BS’46
Herbert Stover BS’46
Thomas Rickenback BS’47
John S. Sieger MS’47
William T. Brophy BS’48
Roy D. Fisher BS’48
John E. Gaus MS’48
Charles A. Kiorpes BS’48
Sidney S. Charschan BS’49
Elliott S. Guttman MS’49
Leo Lacombe MS’49
Weston Maughan MS’49
John E. Melanson BS’49
Albert D. Winquist MA’50
Kay Broughton MS’51
Herbert Stolzer MS’51
Richard Borghi BS’52,
MS’54, ’51CC
Robert Revenko MS’52
Tetsu Yasuda BS’52
James F. Dempsey BS’53, ’52CC

Daniel P. Ross MS’53
Raimonds V. Dzelzalns MS’55
Ronald Corn BS’56, ’55CC
Norman Stoloff MS’56, PhD’61
Donald Desy EngScD’57
Jerome L. Wolf BS’57, ’74 PH
Michael Aiello MS’58
Leon Mir BS’59, ’58CC
Elie J. Boubli PhD’60
Robert O’Lear MS’61
Ramkrishna Agarwal MS’63
John S. Whedbee MS’65,
’59GSAS
Harry Theodos BS’69
Apostolos Kambouroglou MS’70
Julius Bede EngScD’72
Suryakant Berde MS’73
Allan Gluck MPhil’73, ’77PH

Judith Ignall Snyder, friend



BUILDING BRIDGES

VOLUNTEERING WITH ENGINEERS WITHOUT BORDERS

Photo credit: Lee Allen/Courtesy of EWB at Columbia

A team of engineering students from Columbia's Chapter of Engineers Without Borders (EWB) spent their summer completing this suspended footbridge in Ait Bayoud, a rural community of about 5,000 in the southern region of Morocco. Spanning 210 feet across the Tagawowt River, the footbridge finally gives community members a consistent way to get to fresh food, medicine, schools, and markets during the annual three-month rainy season that produces excessive flooding and often prevents access to the other side of the river.

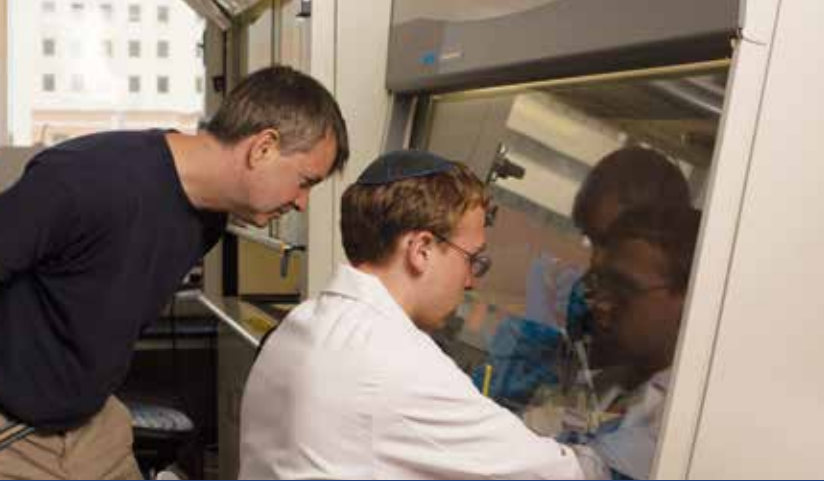
"This type of volunteer work speaks directly to the true calling of engineering," said Andrew Sumner, a senior chemical

engineering major. "Engineering isn't necessarily just about the frontier of technology; it's about improving the quality of life for everyone."

Columbia's EWB Chapter also has volunteer teams currently working in Ghana and Uganda. The Ghana program centers its efforts on developing solutions for water management and sanitation in the rural community of Obodan, located in the eastern region of the country. In Uganda, EWB student volunteers have designed and implemented three rainwater-harvesting systems.

For more, visit morocco.cuewb.org.

"This type of volunteer work speaks directly to the true calling of engineering. Engineering isn't necessarily just about the frontier of technology; it's about improving the quality of life for everyone." —Andrew Sumner, SEAS senior



Student opportunities. Discoveries.
Championship athletics. Global
programs reaching new heights.
This October, what will **YOU** do?



Change Lives and Change The World

On October 23, join Columbians around the globe for 24 hours of giving back, connecting, live events, and chances to win matching funds for your favorite school or program.

Join us!

givingday.columbia.edu/2013

#ColumbiaGivingDay   

Mark your calendar. Spread the word.
Rally your classmates. Pay the
Columbia opportunity forward.
Columbia Giving Day 2013.





500 West 120th Street, Mail Code 4714
New York, NY 10027