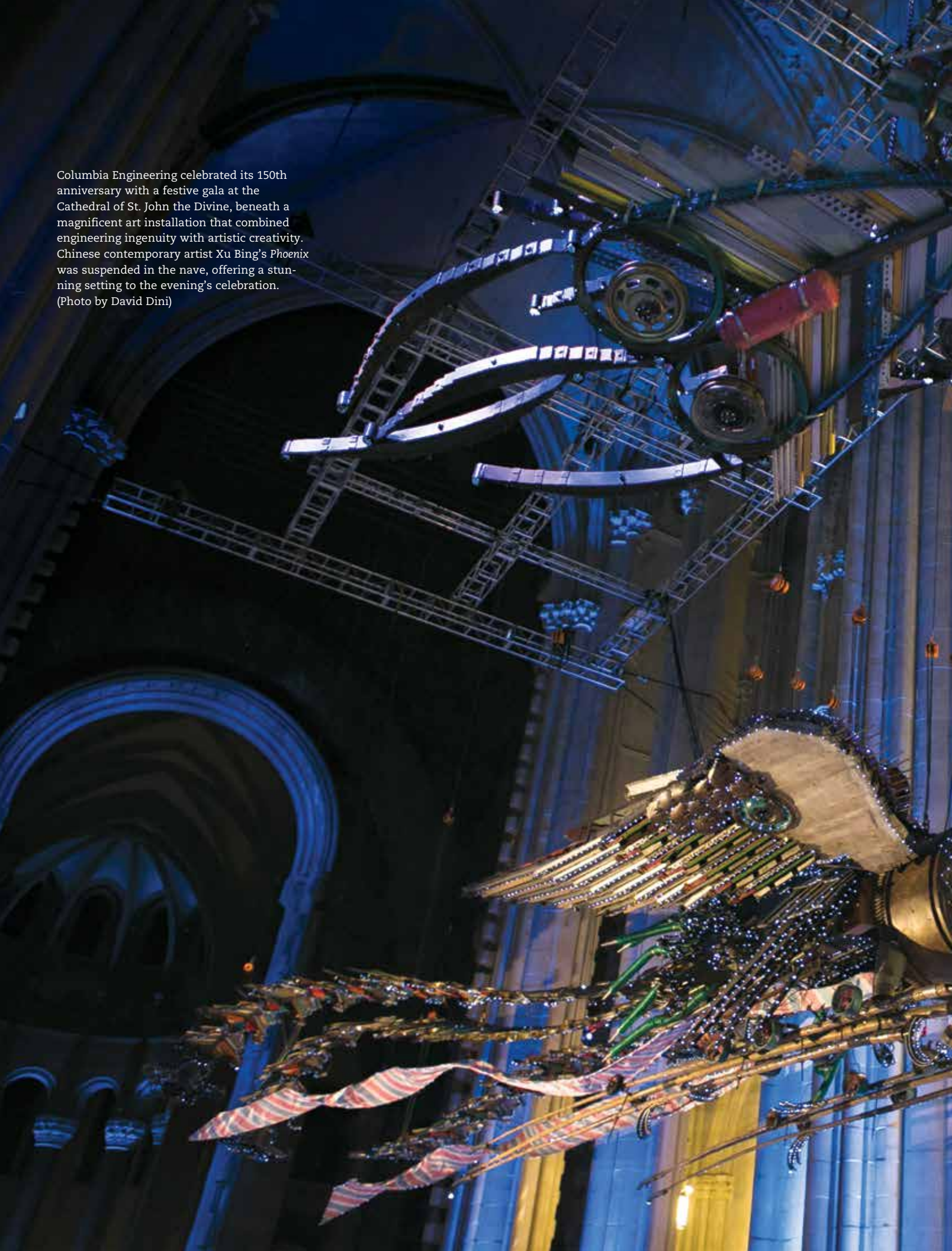
COLUMBIA | ENGINEERING

THE FLIPPED CLASSROOM, COMPUTING FOR NON-TECHIES, AND MORE

FAST, LOW-COST ENGINEERING SOLUTIONS TO COMBAT EBOLA

RES.INC. PROGRAM = 24/7 STUDENT INNOVATION

ULTRASOUND: A NEW WEAPON AGAINST DISEASE



Columbia Engineering celebrated its 150th anniversary with a festive gala at the Cathedral of St. John the Divine, beneath a magnificent art installation that combined engineering ingenuity with artistic creativity. Chinese contemporary artist Xu Bing's *Phoenix* was suspended in the nave, offering a stunning setting to the evening's celebration. (Photo by David Dini)

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For the latest news and updates about Columbia Engineering, visit engineering.columbia.edu.

Opposite page: Dean Mary C. Boyce is pictured in the Northwest Corner Building overlooking campus. (Photo by Jeffrey Schifman)

Cover: Focused ultrasound in combination with microbubbles is used to noninvasively and transiently open the blood-brain barrier in the caudate putamen region. (Image courtesy of Elisa Konofagou)

Our sesquicentennial year gave us the opportunity to reflect on the incredible accomplishments of our faculty, students, and alumni. This period of achievement is the harbinger of a new era for Columbia Engineering, one that leverages the School's strengths with the concomitant energy of the global Engineering Renaissance.

A fundamental hallmark of any Renaissance is creativity. It is the essential, creative nature of engineering and applied science that is now being recognized, and that is the catalyst for today's Engineering Renaissance. In this issue of the magazine, we celebrate our creativity, which manifests itself in myriad ways at the School.

The opening photo shows Chinese artist Xu Bing's art installation, *Phoenix*, at the Cathedral of Saint John the Divine, where our faculty was feted at the culmination of our 150th anniversary year. This sculpture, one of a pair, might be considered symbolic of our profession on many levels. First and foremost, it is creative, born in the mind of the artist seeing a construction site.

The phoenixes are made primarily of construction debris and tools—feathers created from shovels; crowns made of hard hats; heads created from jackhammers; and bodies sculpted from plastic accordion tubing and other construction castoffs. Together they weigh over 12 tons, measure 90 and 100 feet long, and required more than 30 hoists and 140 feet of trussing to raise them to the Cathedral ceiling. So the creativity involved in transporting and safely suspending these two gigantic works of art is a second, direct connection to our profession.

Equally dramatic evidence of creativity is reflected in the stories of our faculty, students, and alumni featured in this magazine. In our Research section, you will read about the creativity of Professors Elisa Konofagou, who is pioneering ultrasonic methods for drug delivery through the blood-brain barrier; Shih-Fu Chang, who is devising ways to extract information from visual data; and Julia Hirschberg, who is developing technology to identify deceptive speech. Similarly, the innovative research of four junior faculty has earned them NSF CAREER Awards this year: Christine Hendon, for optical imaging and spectroscopy to monitor specific treatment of cardiac arrhythmias; Kristin Myers, for exploring biomechanical forces that cause preterm birth; Mingoo Seok, for designing computing chips that can achieve the best level of their own individual computing performance; and Changxi Zheng, for using physics-based simulation to automatically generate computational sound fully synchronized with its associated motion. (See page 41.)

The creativity of our students in Res.Inc., the 24/7 living learning center for budding entrepreneurs, is visible in the ideas for their start-ups. And the recent Ebola challenge sponsored by the School in conjunction with the Mailman School of Public Health spurred remarkably creative solutions to mitigate the spread and effects of the disease. We are proud that one student team has received USAID funding for its project (see page 23).

And creativity is now more than ever an integral part of the education process. As technology has enabled significant learning to move out of the classroom, new pedagogy has emerged that has enhanced student understanding. See some of these new strategies in our story on page 24.

Finally, the creativity of our alumni, which we also celebrated during our anniversary year, is highlighted in our spotlight profiles of Fermi Wang MS'89, PhD'91 and Samantha John BS'09.

I invite you to join us for Dean's Day on Saturday, May 30, to see for yourself how we are capitalizing on our creative thinking to ensure the continued excellence of our education, research, and innovation. And for alumni whose graduation year ends in a 0 or a 5, I hope to see you for all of Reunion Weekend, from Thursday, May 28, to Sunday, May 31!

Mary C. Boyce

Mary Cunningham Boyce
Dean of Engineering
Morris A. and Alma Schapiro Professor

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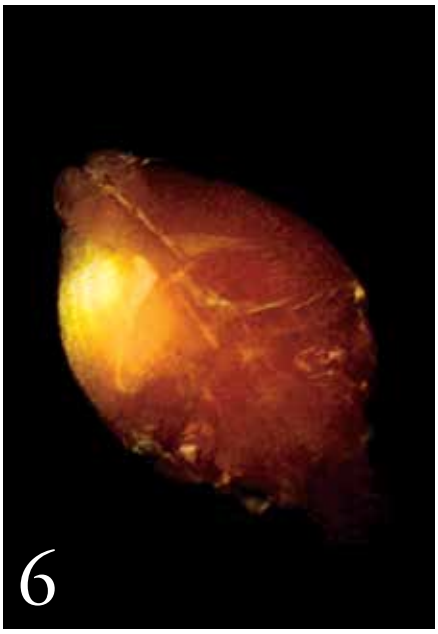
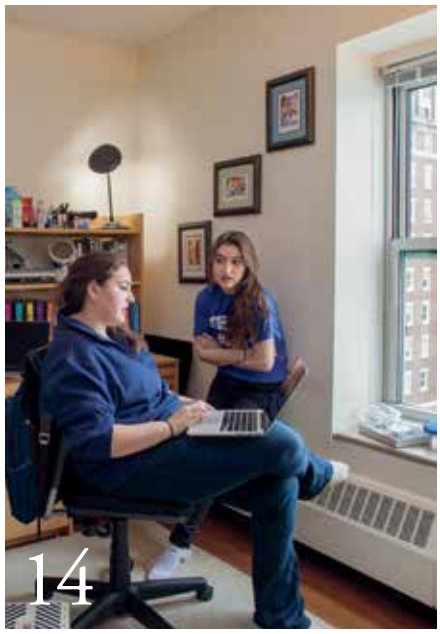




RESEARCH

INNOVATION

EDUCATION

ALUMNI

NEWS

DEPARTMENTS

Elisa Konofagou's Ultrasound Elasticity Imaging Lab works on developing novel, ultrasound-based techniques for both imaging and therapeutic applications. (Photo by Jeffrey Schifman)

ELISA KONOFAGOU

HEADWAY IN HARMONIC HEALTH CARE

Imagine if there were a way to detect early-stage cardiovascular disease or cancer without exposing a patient to potentially harmful radiation. Consider the benefits of a therapeutic application that could destroy tumors without surgery or stimulate motor control in the brain of a patient suffering from Parkinson's disease. Funded by the National Institutes of Health, Elisa Konofagou, professor of biomedical engineering, and her research team are bringing these medical marvels closer to reality using the acoustic energy of ultrasound technology.

Though ultrasound—the use of high-frequency sound waves to produce images—is not itself a new technology, Konofagou and her team have developed novel ways to use it in the detection and treatment of specific medical problems.

"We have pioneered a way to use ultrasound to assess the elasticity of tissues such as the heart, the vessels, and tumors in the breast and pancreas," says Konofagou. "We use the intrinsic movement of the organ, or the movement induced by the acoustic wave, to detect the elasticity."

The method of harmonic motion imaging can effectively identify cancerous tissue—which typically has greater stiffness than normal soft tissues—and can measure mechanical functions of the heart muscle, disruptions in which can indicate disease.

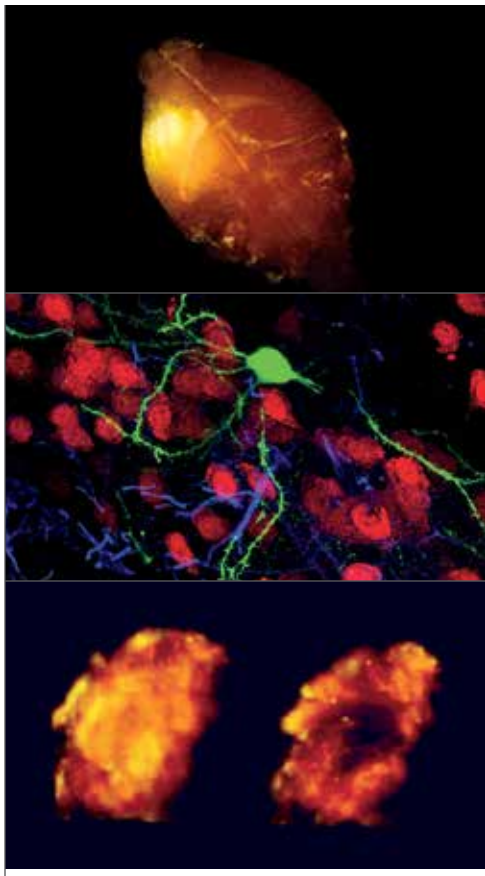
"A radiation-free method is important because it is safely used for children (who are more sensitive to radiation doses), eliminates burn risks, and allows for follow-ups at necessary frequencies without worrying about a build-up of radiation," says Konofagou.

SEEKING A SOUND SOLUTION

These benefits are critical not only in the team's ultrasound imaging studies, but also in the therapeutic use of ultrasound at higher powers to burn tissue locally and selectively.

"This is done outside the body by focusing acoustic waves, similar to what you would see with sun rays through a magnifying glass, to destroy tumors," she says. "We are testing the therapeutic ultrasound's effects and developing methods for real-time monitoring of the treatment on breast and pancreatic cancer and hope to translate this technology to humans within the next couple of years. This could potentially provide a noninvasive and nonsurgical alternative to tumor treatment, especially in the case of benign tumors most common in both young and older women."

Elisa Konofagou and her research team are developing a revolutionary ultrasound technique that, if proven effective, could be essential to the treatment of inoperable cancers in organs like the brain, prostate, pancreas, and kidneys.



Top: Focused ultrasound (FUS) in combination with microbubbles is used to noninvasively and transiently open the blood-brain barrier (BBB) in the caudate putamen region. The BBB opened region is revealed with contrast-enhanced MRI as the highlighted region; *middle*: Adeno-Associated Virus (AAV) carrying green fluorescent protein (GFP) gene was successfully delivered across the blood-brain barrier (BBB) with transcranial FUS, where AAV transduction was observed in neurons (green); *bottom*: Three-dimensional Harmonic Motion Imaging of the human breast before (left) and after (right) thermal ablation. (Images courtesy of Elisa Konofagou)

Using therapeutic ultrasound to treat benign or cancerous tumors without the need for anesthesia would mean a patient could return to his or her standard routine quickly, avoiding the high costs, risk of infection, recovery period, and likelihood of scarring often associated with surgery.

If this precise ultrasound technique proves to be effective, it could be essential to the treatment of inoperable cancers in organs like the brain, prostate, pancreas, and kidneys.

Konofagou's team is also focused on using ultrasound to open the blood-brain barrier in order to deliver drugs directly to brain cells of patients with neurodegenerative diseases like Alzheimer's, as well as to stimulate various parts of the brain to induce motor control.

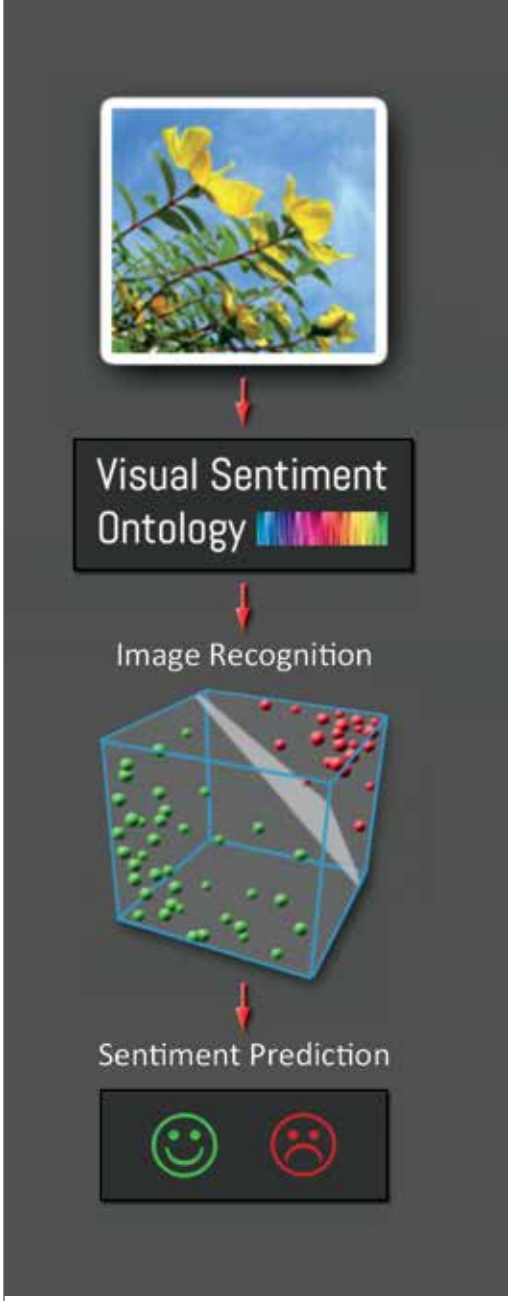
As a biomedical engineer, Konofagou is excited by the potential impact of her team's research and the increasing emphasis on biomedical engineering as a critical component of medicine.

"Biomedical engineering brings together different disciplines—biology, engineering, and medicine—that would not otherwise intersect," she says. "Since a lot of the basics have been uncovered in those disciplines, to advance to more complex understanding, multidisciplinary efforts must be conducted and brought together under the same umbrella. Biomedical engineering facilitates that. For the first time, we can generate the required platforms of expertise to image and manipulate, and therefore ultimately understand why the heart or the brain is wired like it is or what triggers and sustains tumor growth."

By Jessica Driscoll

Watch a video on Elisa Konofagou and her research: *engineering.columbia.edu /web/newsletter/elisa*.

Above: Neuro-protection was achieved via focused ultrasound facilitated noninvasive delivery of Adeno-Associated Virus expressing Glia-Derived Neurotrophic Factor (AAV-GDNF) to the substantia nigra of a living brain. Dopaminergic neurons were stained in brown color and only the left hemisphere received the combination treatment. (Image courtesy of Elisa Konofagou)



Above: The Visual Sentiment Ontology (VSO) concerns semantic concepts that (1) have a link to an emotion, (2) have a strong sentiment, and (3) are frequently used on online platforms like Flickr or YouTube to describe images or videos. Currently the VSO includes more than 3,000 concepts, with each composed of an adjective and noun, e.g., "beautiful sky" or "sad eyes." Advanced image recognition methods are used to detect such concepts and predict the sentiment expressed in the image. (Images courtesy of Shih-Fu Chang)

SHIH-FU CHANG

FINDING A VISUAL NEEDLE IN THE DIGITAL HAYSTACK

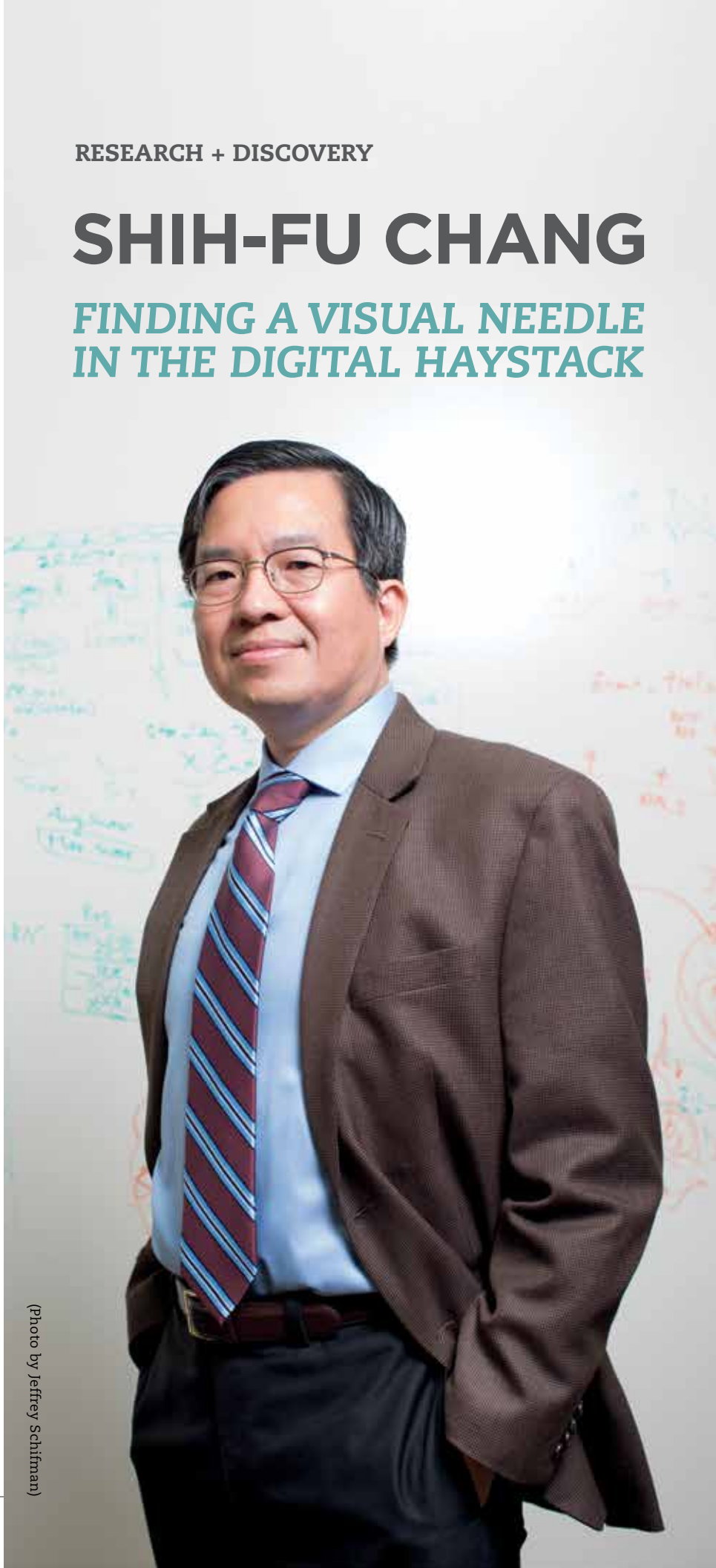
Research indicates that we upload and share as many as 1.8 billion pictures each day on the Internet—everything from photos of our kids, vacations, and meals to important events and natural phenomena. And those are just the tip of the digital image iceberg. Scientists are sharing images too—photos that capture how cells divide, videos of how the most minute particles interact, and satellite images of new planets in different solar systems. Then there are the surveillance and assistive systems around the world that upload photos and videos minute-by-minute every day, and the media networks that release video and photos of breaking news.

The problem with all those images is apparent when you try to search for one. Right now, most image search engines rely on keywords, or descriptive text, that are linked to a photo or video. That's an unreliable method of finding a specific image.

Lucky for the world that Shih-Fu Chang, Richard Dicker Professor of Electrical Engineering, professor of computer science, and director of the Digital Video and Multimedia (DVMM) Lab, thought about that problem more than 20 years ago.

"I have long been fascinated by how images can be used to help people communicate ideas, sense physical environment, or even express personal emotions," explains Chang. "My goal has been to develop intelligent systems that can extract useful information from vast amounts of

"My goal has been to develop intelligent systems that can extract useful information from vast amounts of visual data and use the information in innovative ways to address grand challenges."



(Photo by Jeffrey Schifman)

visual data and use the information in innovative ways to address grand challenges."

Chang, who is ranked by Microsoft Academic Search as the most influential researcher in the field of multimedia, leverages machine learning, computer vision, multimedia analytics, and video processing to develop intelligent visual search solutions for society and industry. His contributions include groundbreaking search paradigm and prototype tools that allow users to find content of similar visual attributes, to search videos by a very large pool of visual concept classifiers, and to summarize the event patterns and anomalies found in a large array of video sources.

But the deeper Chang goes in developing visual search capability, the more opportunities he finds to push the science further. Currently, he is focused on developing practical applications of multimedia information extraction to help machines conduct situation awareness of events portrayed in open source videos. His objective is to enable better decision making in complex, dynamic situations such as international conflict, socioeconomic movement, emergency service, and sociopolitical movement.

"In order to reach these goals, we are leveraging theories and tools culled from many fields including machine learning, computer vision, signal processing, and natural language processing, for which we have been privileged to enjoy very fruitful collaborations across departments and schools at Columbia," he says.

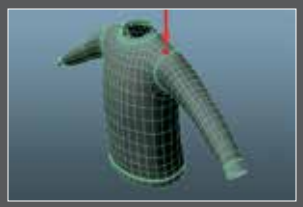
One of those collaborations is with Peter Allen, professor of computer science, to further user-machine interaction and enhance assistive technology.

"Collaboration with Peter Allen's group is a very natural outcome since the intelligent capabilities of visual search emerge not only in the field of information extraction, but also in all other areas dealing with human-machine interaction," he notes.

For their collaboration, Chang and Allen are investigating one of the stickier

Chang is currently focused on developing practical applications of multimedia information extraction to help machines conduct situation awareness of events portrayed in open source videos. The objective? To enable better decision making in situations like international conflict, emergency service, and sociopolitical movement.

Above: A treemap visualization of a part of the VSO associated with the "joy" emotion and the visual concepts related to different adjectives. You can see the popularity, detection accuracy, and sentiment (indicated by color of the cell) of each Adjective Noun Pair (ANP), for example "Beautiful Clouds" shown in the picture. (Images courtesy of Shih-Fu Chang)



Chang is collaborating with Computer Science Professor Peter Allen to develop robotic visual recognition and manipulation for deformable objects like clothing. Here, the computer references a database of models and estimates the grasping point on a shirt being held by a robot. (Images courtesy of Yinxiao Li)

"I have long been fascinated by how images can be used to help people communicate ideas, sense physical environment, or even express personal emotions."

problems in robotic and computer visual recognition: identification and manipulation of deformable objects like clothing or food. Imagine an intelligent assistive robot that can identify a pair of jeans by any shape it may be in—such as hanging on a hanger or part of a pile of clothes—and figure out how to correctly fold it. This will be of tremendous value for improving productivity in the textile manufacturing industry or even in advancing personalized robotic care, which may one day be popular in our rapidly aging society.

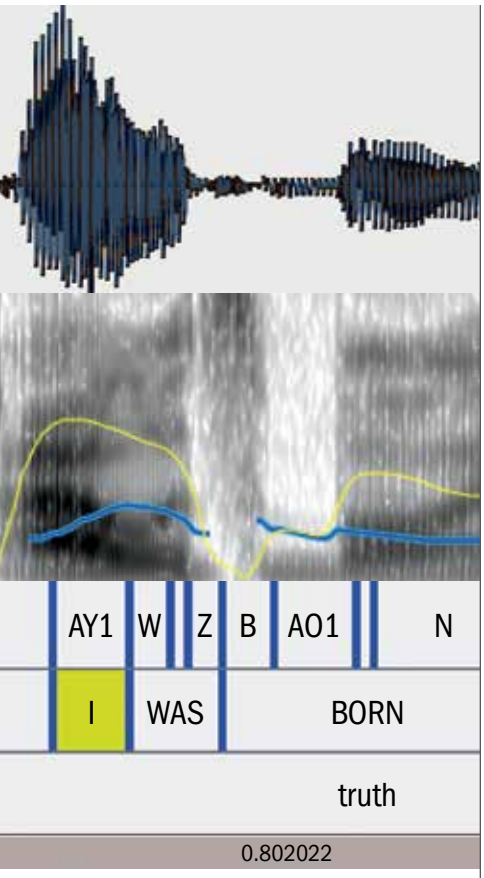
"Together, we are combining the intelligent visual recognition techniques developed by my group with intelligent robotics control and planning systems developed by Professor Allen's group," he adds. "We are working on intelligent machines that can resolve the ambiguity of visual appearance, and enhancing robotic performance with regard to recognition and control tasks."

While a picture may still be worth a thousand words, the possibility of developing breakthroughs in visual information processing across the gamut of scientific and practical domains inspires infinite possibilities for Chang.

"With the broad strength we have in all engineering disciplines and the vibrant collaboration culture at Columbia, I am confident that we will be able to continue leading the way and make fundamental contributions in this space," he says.

By Amy Biemiller

Above: Chang discusses the Visual Sentiment Ontology (VSO) with his students Brendan Jou, Joe Ellis, and Hongzhi Li. (Photo by Jeffrey Schifman)



Above: An example of the waveform of an utterance from the corpus, along with its spectrogram—a visual representation of the power at each frequency—and its phonetic and orthographic transcriptions. The final row shows the truth value of the utterance, as reported by its speaker. (Images courtesy of Sarah Ita Levitan)

Opposite page: Julia Hirschberg in the Speech Lab, where her team performs laboratory studies on human speech production, analyzes speech, and builds speech technologies. Speech data is recorded in this double-walled soundproof booth. (Photo by Jeffrey Schifman)

JULIA HIRSCHBERG

LIES AND LINGUISTICS

MACHINE LEARNING GETS CLOSER TO THE TRUTH

There's an art and a science to spotting deception. Until now, body language, writing style, and biometric measures (as measured by polygraph machines) have been relied upon to indicate whether a person is telling the truth. But these cues have not been shown to be reliable cues to deception.

A key to better detecting the truth could reside in a person's verbal cues, according to Julia Hirschberg, Percy K. and Vida L.W. Hudson Professor and Chair of Computer Science. She bases her research on what science already knows about why deception is detectable: An increase in cognitive load coupled with the fear of detection can lead to behavioral changes. That means that, when lying, one may change one's normal behavior—raising or lowering one's pitch, looking directly at a conversational partner or not, speaking louder or softer. Such differences vary by individual, and heretofore it has been impossible to predict with real accuracy how a given person will act when lying. "Our first work was in American English, where we discovered what practitioners believed anecdotally—that there are significant individual differences in deceptive behavior *within* a single culture. We hypothesized that there must be a way to figure out the reason for these differences," she explains.

Hirschberg and her colleagues at the University of Colorado and SRI International had already shown that scores on a simple, standard personality test correlated with human judges' ability to detect deception. Raters who scored higher on a standard personality test in such traits as openness to experience and agreeableness were significantly better at distinguishing truth from lie. They wondered if the same scores could predict individual differences in individual behavior when lying as well. "We decided to see whether we could use personality scores to help predict variation in acoustic and prosodic features of deceptive versus nondeceptive speech," she says.

This work has already led to the development of machine learning classifiers to make it possible for machines to recognize deceptive speech with reasonable accuracy. "Those algorithms, which we developed for the Department of Homeland Security

"Our first work was in American English, where we discovered what practitioners believed anecdotally—that there are significant individual differences in deceptive behavior *within* a single culture. We hypothesized that there must be a way to figure out the reason for these differences."

and the National Science Foundation, were quite successful, enabling us to identify deceptive speech with 70 percent accuracy," she states. Since human accuracy is below chance (in laboratory experiments, only criminals perform well at this task) this classifier performance was impressive.

Now, Hirschberg is not just helping to further the possibility of developing lie-detection technology that is more accurate than human intuition or the polygraph. She is also discovering cross-cultural differences and similarities in how people deceive. She currently studies how native speakers of English and Chinese compare in deceptive behavior, funded by a grant from the Air Force Office of Scientific Research to study deception in speech across cultures.

Her earlier research resulted in the largest collection of cleanly recorded deceptive/nondeceptive American English speech, which Hirschberg has made available for study by the research community. The corpus she is collecting now is much larger and has produced some interesting results so far. "We are now finding that the ability to detect deception is correlated significantly with the ability to deceive. This makes sense, but no one had demonstrated that before," she says.

While Hirschberg and her colleagues are still analyzing the new data, she feels confident that the new study will provide new insights into how people from different cultural backgrounds deceive and detect deception. In the future, machines that can aid humans in identifying deception could be practically applied in many areas of society, from enhancing law and security and more fairly delivering justice and appropriate social services, to enhancing employee relations and increasing credibility in politics. While Hirschberg and her collaborators are getting closer to that reality, she does not discount the human factor.

"Tools created through artificial intelligence along with human perception could be the most powerful way to get closer to the truth," she says.

EAT, SLEEP, COLLABORATE

RES.INC.

A LIVING LEARNING CENTER FOR BUDDING ENTREPRENEURS

Res.Inc., the immersive Living Learning Center program, is giving Columbia Engineering students a head start on their entrepreneurial careers.

Centered in Wallach Hall, the collaborative, entrepreneurship program was established with the support of Alessandro Piol BS'79, MS'82, and Alexandra Piol BS'79, MS'83, and gives students the mentorship and structures they need to get their start-ups off the ground while balancing a full undergraduate life.

Mr. Piol, cofounder of Vedanta Capital, and Mrs. Piol, managing director at 4C Ventures Management, endowed the Piol Family Entrepreneurship Fund in 2011 to create the Residential Incubator, launched that year with seven students. Today, 29 students from the Engineering School, and now Columbia College, live and collaborate together while learning the tenets of Steve Blank's customer-focused Lean LaunchPad strategy and moving their projects closer to reality.

"I was initially attracted to the program because of the opportunity to learn from like-minded peers about entrepreneurship and technical innovation," Anshul Gupta '17SEAS said. "Coming into college, I was a definite computer science major, but I didn't know where my interest lay between the diverging worlds of research, entrepreneurship, and corporate software development, and the program offered me the opportunity of diving deep into one of the three possibilities."

Opposite page, top: Anshul Gupta (left) discusses his arts education start-up, Chisl, with fellow Res.Inc. students Ruchi Kirtikar (center) and Willie Koomson; *bottom*: The SightSeers team, sister duo Christina Michaels and Stephanie Michaels, considers the molecular structure of the window screen material of their prototype to both let in light and maintain a high-quality image. (Photos by Timothy Lee Photographers)

Above, left: Res.Inc. students often brainstorm and share ideas in the lounge/shared work space in Wallach Hall (Photo by Timothy Lee Photographers); *right*: A screenshot of the initial prototype of Chisl shows a 3D rendering complete with interactive information texts and transformational tools. (Image courtesy of Anshul Gupta '17SEAS)

Gupta and his team created Chisl, an online art education platform that lets users browse interactive 3D models of sculpture and other pieces of art—allowing anyone, he said, to "turn his or her laptop into a museum." The group won a $10,000 Columbia Engineering Ignition Grant this past summer to help bring the program to its target users of art instructors and enthusiasts.

And he gives Res.Inc. credit.

"Be it the random 2:00 a.m. start-up viability conversations we have or the off-site office tours that we went on together, I've had a great experience in my two years in Res.Inc.," he said.

Sisters Christina Michaels '17SEAS and Stephanie Michaels '18SEAS agreed that the unique live/work structure of the program has been a boon to their project, SightSeers, which will let hotels broadcast real-time scenic views over any windows using a mobile projector and clear adhesive screen.

"The whole idea behind this program was to find a way to bring together students with a common interest in entrepreneurship, and to give them the tools to learn how to go from a concept to a business and the space to put their ideas into practice."

—Alessandro Piol BS'79, MS'82, who cofounded Res.Inc.

Above: An early developmental shot of one of the main pieces of concept art for the video game, Spectrum: An Elegy for Piano, developed by Res.Inc. student Rienzi Gokea '16SEAS. (Image courtesy of Gokea)

"What's been really helpful is to have this variety and diversity on the floor—when you're pursuing a project, you don't always know what skills you need at the outset," said Christina Michaels, a chemical engineering major. "I don't know how to code and Steph doesn't know how to code, but you can show up at study break to ask who has time to code something or teach us how, and that's the unique thing about Res.Inc.: you can get that down the hall."

And, Stephanie Michaels added, the mentoring aspect from program leadership—including Engineering administrators Leora Brovman, Scott Helfrich, and Ivy Schultz, and graduate student Boyan Penkov—and others was invaluable. "My sister and I, having the same background and same sort of way of doing things, need to expand, so it's been so helpful talking on the floor, and with leadership, to see that way of looking at things."

Rienzi Gokea '16SEAS, a mechanical engineering major, has worked on two projects this academic year, a puzzle adventure video game based on synesthesia and an electricity-generating scooter. For him, the residential atmosphere keeps motivation high—a huge advantage when classwork, athletics, extracurriculars, and simply the desire to relax sometimes all conspire to make moving forward difficult.

"Being here on a Res.Inc. floor, everyone's really enthusiastic about their ideas—being in this environment where everyone's on the same page, it's really about this whole culture of working and seeing it through, and that's really cool," said Gokea.

The program is already paying dividends. In the last round of Columbia's Fast Pitch in November, two of the top 10 teams came out of Res.Inc.—Gokea and the Michaels sisters. Not bad considering the elevator pitch competition is open to all Columbia students, including grad students, faculty, and recent alumni. But Res.Inc. students say the benefits go far deeper.

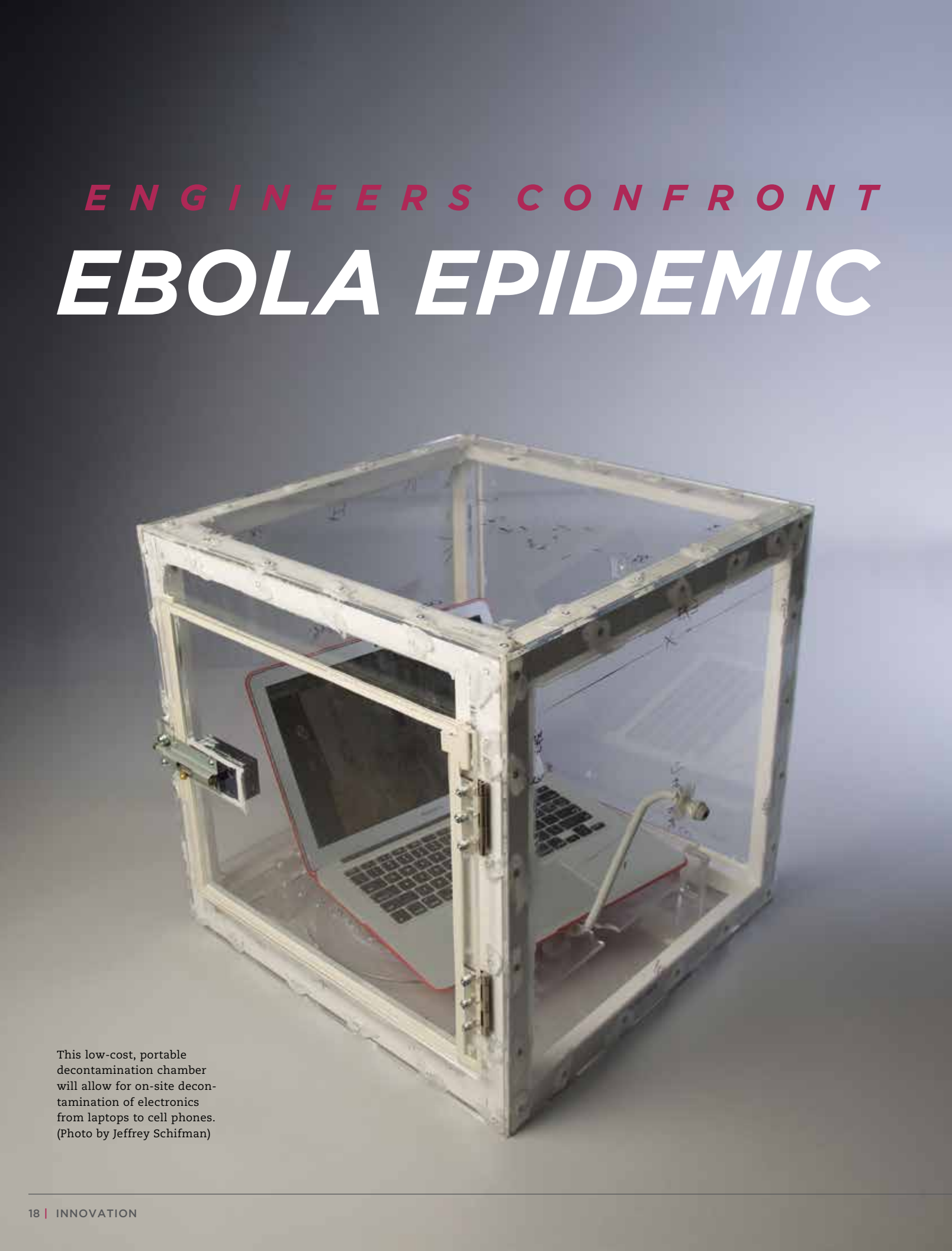
"It gives me the ability and experience so early in my academic career to approach the concepts in my engineering classes with a business outlook, as in 'How can I make this into a product or a process?'" Christina Michaels said. "Being able to think of both with an entrepreneurial mindset, it's shaped my entire experience."

By Jennifer Ernst Beaudry

Top, left: Christina Michaels '17SEAS; *top, right*: Rienzi Gokea '16SEAS discusses his design of an electricity-generating scooter that can also be used to charge a cell phone; *bottom*: Res.Inc. puts students in a collaborative environment, spurring tech innovation and creativity. (Photos by Timothy Lee Photographers)

ENGINEERS CONFRONT

EBOLA EPIDEMIC



This low-cost, portable decontamination chamber will allow for on-site decontamination of electronics from laptops to cell phones. (Photo by Jeffrey Schifman)

Kay Igwe (left), electrical engineering MS student, and Jun Guo, mechanical engineering major, two of the six-member team that designed the portable decontamination unit (opposite page). (Photos by Jeffrey Schifman)

SCHOOL'S FIRST-EVER DESIGN CHALLENGE SPURS REAL-TIME SOLUTIONS TO FIGHT THE SPREAD OF INFECTIOUS DISEASE

The real-life global problem: Ebola outbreak. The challenge: to develop low-cost, technology-driven solutions to meet the tremendous risks posed by the Ebola crisis.

Realizing the urgency to control the outbreak, in October the deans at Columbia Engineering and the Mailman School of Public Health sponsored a rapid-fire design challenge to confront the Ebola crisis. The idea behind the challenge was to not only develop low-cost, real-time solutions, from concept to deployment, but also engage the Columbia community—from all disciplines—to take action and work together on this critical global issue.

"Engineers create solutions that address global challenges," said Dean Mary C. Boyce. "There is an urgent need for innovative, cost-effective solutions to de-escalate this public health crisis, and so we encouraged our students and faculty from across the University to concentrate their creative energies on working on innovations to ameliorate this situation."

Eleven teams of students—undergrads and grads—and faculty from the Engineering School; Mailman; School of International and Public Affairs; Columbia College; and the Graduate School of Architecture, Planning and Preservation; among others—worked on practical designs or rough prototypes to help victims, their families, and health-care workers.

The teams worked 24/7 in brainstorming sessions and, in less than two weeks, developed and presented their proposals to a panel of leading public health specialists and engineers, including Dean Boyce, Mailman Dean Linda Fried, Mechanical Engineering Chair Jeffrey Kysar, and Mailman's W. Ian Lipkin, an authority on epidemiology and outbreak response. The panelists helped shape the concepts, also garnering feedback from infectious disease experts from the World Health Organization, Centers for Disease Control and Prevention, and Médecins Sans Frontières. The goal: to help fund the design of a viable prototype and pursue more support for actual deployment and use.

"What a great partnership this has been," said Boyce during the final presentations held at Mailman in December. "It has been great to be able to light the fire under so many people to come together, to work on different and very creative and innovative solutions so quickly. It's impressive how the constructive feedback we have been giving has been embraced. The designs have gotten better."

Three of the solutions proposed were being considered for funding in the USAID Fighting Ebola Grand Challenge: a low-cost pigmented bleach solution, a decontaminating bleach foam, and a portable decontamination chamber. (The pigmented bleach solution won USAID support. See page 23 for article.) Other participants developed an Ebola-specific protective containment suit and a 3-in-1 cot system.

The design challenge itself made headlines, including in *Fast Company*, *NPR*, *The New Yorker*, and *The Washington Post*. And some of the teams' ideas are already being used or are in the midst of deployment. The Fire Department of the City of New York, after testing the pigmented bleach solution in early December, has incorporated it into its HazMat unit decontamination protocol, spraying surfaces such as ambulance doors and personal protective equipment suits.

Jason Kang '16SEAS, who helped develop the pigmented bleach, said the chance to come up with an engineering solution in real time with real impact is what becoming an engineer is all about.

"There is an urgent need for innovative, cost-effective solutions to de-escalate this public health crisis, and so we encouraged our students and faculty from across the University to concentrate their creative energies on working on innovations to ameliorate this situation."

—Dean Mary C. Boyce

"I was extremely excited when I saw that Columbia was holding this challenge," Kang said. "I believe challenges with real-world applications will greatly improve the culture of innovation and social impact at Columbia."

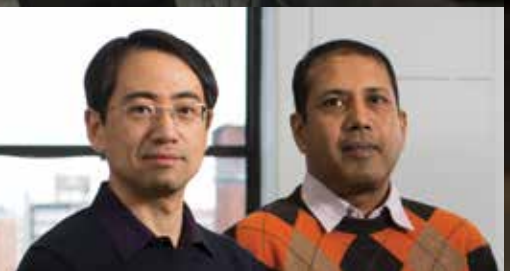
Engineering Professor Ponisseril Somasundaran and his team of postdocs Jun Wu and Partha Patra called the entire experience a "great journey," and are testing and further developing their innovative bleach foam for deployment. The foam decontaminates a larger area, deposits uniformly on different types of surfaces, provides enough contact time to kill the virus, and better adheres to contaminated surfaces.

Collaborating was essential to the team who designed the portable decontamination chamber, a low-cost unit that will allow for on-site decontamination of electronics, from computer monitors to cell phones. According to Kay Igwe, a first-year master's student in electrical engineering, meeting new people from different disciplines was one of the best parts about the design challenge. "It is interesting to see how people think. There are things the electrical engineers do not think of that the biomedical engineers do, or that the mechanical engineers may have considered, but others did not," she said.

SEAS and Mailman advisors agreed on the urgent need for the portable decontamination chamber and are currently helping the team test their prototype, aiming to deploy the unit for use in West African hospitals including Columbia's satellite site in the region.

The challenge fell right in the middle of midterms, but, notes Lipkin, even that did not deter student interest. "They really want to do something," he said. "It's really great." Added Boyce, "I am im-

Above: The Ebola SafeSuit integrates cooling, hydration, ventilation, and sweat regulation systems to provide comfort and protection for medical staff treating patients in rural areas; *opposite page, top left, clockwise*: Four members of the Ebola SafeSuit team: William Joe Smith, Joshua Bazile, Sidney Perkins, and Ritish Patnaik. (Photos by Jeffrey Schifman)



Professor Ponisseril Somasundaran and his team of post-docs are testing and further developing their innovative bleach foam for deployment; *left*: Ponisseril Somasundaran, LaVon Duddleson Krumb Professor of Mineral Engineering; *bottom left*: Post-docs Jun Wu (left) and Partha Patra in Somasundaran's lab. (Photos by Jeffrey Schifman)

pressed with what they have been able to come up with in such a short amount of time."

This first-ever real-time design challenge demonstrated that engineering design and innovation have global impact, and underscored the critical need for engineers. So much so that both deans have stated they intend to sponsor more of these challenges in the future.

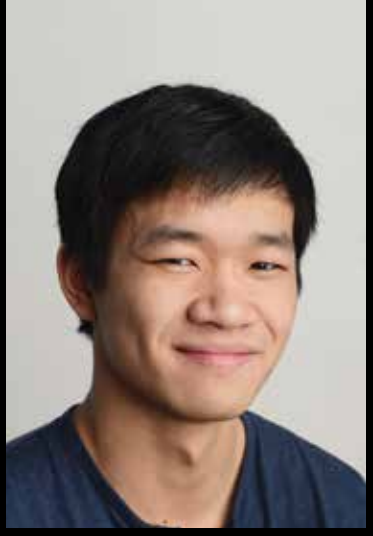
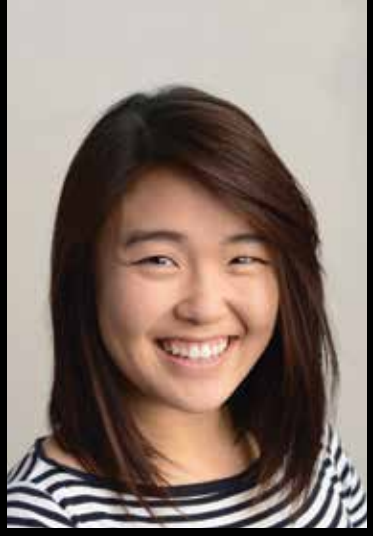
Their rewards and benefits are made evident by student enthusiasm, typified by Ritish Patnaik '16SEAS, who said, "We've definitely challenged each other respectfully to produce the best ideas and methods to make our protective suit a success. I really hope we have more challenges like this in the future."

By Melanie A. Farmer

Top row, clockwise from left: Dr. Chris Aston of Environmental Health & Safety at Columbia University (left) and W. Ian Lipkin of Mailman School of Public Health during design challenge presentations; this team is currently testing their prototype and is aiming to deploy the decontamination unit for use in West African hospitals; Engineering Dean Mary C. Boyce provides feedback and advice to design challenge participants; Engineering students present their design for a low-cost, disposable PPE suit. (Photos by Timothy Lee Photographers)

Bottom row, from left: 3D model of student team's design of a portable cot (Image courtesy of Marisol Rodriguez); students behind the portable cot project, (upper row) Lauren Cardenas, Ankita Gore, and Marisol Rodriguez, and (lower row) Sydney Garay, Mimoun Delmar, and Sigal Winfield (Photos by Jeffrey Schifman); W. Ian Lipkin, a leading authority on epidemiology and outbreak response (Photo by Timothy Lee Photographers)

Opposite page, from left to right: The Fire Department of the City of New York has incorporated Highlight into their decontamination protocol (Photo courtesy of FDNY); Jason Kang, Katherine Jin, and Kevin Tyan (Photos by Eileen Barroso)


USAID HIGHLIGHTS TEAM BEHIND PIGMENTED BLEACH

The student team behind Highlight, a pigmented bleach solution that improves decontamination of infectious diseases, has won the USAID Fighting Ebola Grand Challenge. The trio of students, including biomedical engineering junior Jason Kang and teammates Katherine Jin (Computer Science and Biology, Columbia College) and Kevin Tyan (Biology, Columbia College), is one of just 15 teams selected from more than 1,500 applicants who will receive USAID support and whose product will undergo intensive testing to ensure readiness for production and field deployment.

"This has been such a long journey since October—it's been very tough, but it's also been incredibly rewarding," says Kang. "I can't even begin to count the number of times we met up at night and on weekends testing all the different iterations of our formula, calling up suppliers, writing and submitting proposals, making trips up to the medical campus, and so on. We are really excited and proud to be chosen by USAID to continue our work!"

After attending the information session for last fall's Ebola Design Challenge, Kang asked his teammates if they wanted to collaborate on a solution. Not only were they already friends, says Kang, "we all have particularly strong skill sets in this area. We've each done several years of biomedical research." Jin has worked directly with patients and doctors in hospitals, and Tyan is part of the team that runs CUEMS, Columbia University's volunteer ambulance corps. Kang himself has experience deploying medical devices in resource-poor countries (he also is vice president of engineering for start-up Jibon Health Technologies).

"It just made sense that this would be a team that could tackle a global health issue," he says. And that they did.

Kang, Jin, and Tyan pushed through their classes, homework, tests, and papers, while spending hundreds of hours on their project, refining Highlight, and figuring out how to produce and market it. They quickly formed a company, Kinnos Inc.; advisors include Dean Mary C. Boyce; Samuel Sia, associate professor of biomedical engineering; Aaron Kyle, lecturer in biomedical engineering; and Ian Lipkin, John Snow Professor of Epidemiology at the Mailman School.

Highlight colorizes a standard bleach solution and modifies the solution's liquid properties to provide visualization of sprayed regions, improve coverage and adherence to all surfaces, and increase antiviral potency. It can be added directly to bleach solutions currently used in the field and is compatible with standard-issue contractor sprayers. "It's extremely versatile and highly effective, and can be used to decontaminate any infectious disease, not just Ebola," Jin notes.

While bleach is the most commonly used disinfectant for surfaces contaminated with the Ebola virus, it is transparent and forms droplets when sprayed on waterproof surfaces like personal protective equipment suits. "So it's really difficult to ensure complete topical coverage with bleach during decontamination, and that can leave health care workers susceptible to infection," Tyan explains. Highlight improves the effectiveness of bleach mist decontamination and ensures the safety of health care workers, enabling them to visualize with color exactly what has or has not been decontaminated.

During the Ebola Design Challenge, the students often had to choose between going to class and making their presentations, or going out on the weekend versus staying in to test a new reagent. Says Kang, "Back in November, I decided not to study for my organic chemistry midterm and go to Mt. Sinai Hospital to demo Highlight in front of the FDNY. I got absolutely destroyed on the test, but the FDNY ended up incorporating Highlight into their decontamination protocol, so it was worth it!"

With the newfound USAID support, the team's immediate goal is to see Highlight implemented on the field in West Africa, and, down the road, implemented on an international scale in preparation for future epidemics. This summer, they will work on improving the technology behind Highlight and expanding their market and partnerships.

By Holly Evarts

For more on Highlight, watch the video: *engineering.columbia.edu/web/newsletter/ebola*.

TINKERING WITH COURSE DESIGN

SCHOOL EMBRACES NEW APPROACHES TO TEACHING ENGINEERING

What does it take to make sure students of science, technology, engineering, and math (STEM) not only graduate technologically competent, but also are ready to take active roles in a dynamic workforce?

The answer seems to lie in changing the way courses are taught. At Columbia Engineering, several instructors are exploring innovative methods of teaching that include more hands-on experience, applicable knowledge, and insight into the process of design.

Even the way the classroom operates is fair game for these teaching innovators, one of whom is Michael Collins, Vikram S. Pandit Professor of Computer Science, who has found a "flipped classroom" approach to teaching allows students to better absorb course material.

In a flipped classroom, students are assigned video lectures, which they watch on their own time. Collins splits the class into small groups and meets for an hour a week with each group, giving a brief recap of the week's material, then working through three to four problems with the students. The students have a few minutes to figure out each problem before Collins explains the solutions and answers questions.

"The small group sessions allow us to go much deeper within the material, in a setting that encourages much more interaction between the students and the professor," he says. "It's a great chance for the students to test their understanding of the material and ask questions and for us to have an open discussion about the material."

Collins says the flipped classroom has changed his role dramatically, and that, though recording lectures can be more time consuming, it results in a resource that can be used over many years.

In terms of assignments for the class, a flipped classroom follows the usual format: four homework assignments, each involving analytical questions and programming assignments; a midterm; and a final. But it allows students to digest the material at their own pace and have an additional hour each week to go over problems with the professor.

ENGAGING THEM EARLY

Students might think they want to major in engineering, but some of their first-year courses can seem technical and dry.

"I'm in favor of anything that helps students develop a love for the subject being taught, so they will apply themselves and learn it," says David Vallancourt, senior lecturer in circuits and systems in the Department of Electrical Engineering.

So, in 2011, Vallancourt created a course called the Art of Engineering (AoE) for first-year students.

AoE comprises four components: weekly lectures intended to expose the students to real-world engineering practice in all disciplines; a choice of hands-on projects in a specific engineering field; a class-wide common design project; and instruction in the use of MATLAB.

"Everything but the MATLAB component changes from semester to semester," says Vallancourt. "It's like jazz—I never do the same thing exactly the same way twice. We want to give students a satisfying, hands-on, deep engineering experience that demonstrates how much fun engineering can be."

Chloé Blanchard, an undergraduate TA for AoE, says this is what students need and describes the modern engineering student as versatile and well-rounded because of these new techniques.

"Students are coming out of engineering schools with a wide range of abilities and knowledge," says Blanchard, a junior studying computer science, applied mathematics, and French. "We're very aware of the problems that exist not only in the basic mechanisms of day-to-day life, but within the greater flow of society. Columbia prepares engineers with the mindset that we are working to create a better society. That means we emphasize positive impact and a close and careful learning that demonstrates understanding of how the world works."

In the AoE class, students might engage in physics and math through electric guitar design, learn about mechanical engineering by building a toy robot, or figure out computer science by hacking a calculator.

Vallancourt also invites guest speakers to present work in areas of high visibility to capture young students' attention. Where appropriate, the class encourages speakers to use live physical demonstrations, video, animations, or other attention-grabbers and describe how particular engineering achievements affect society.

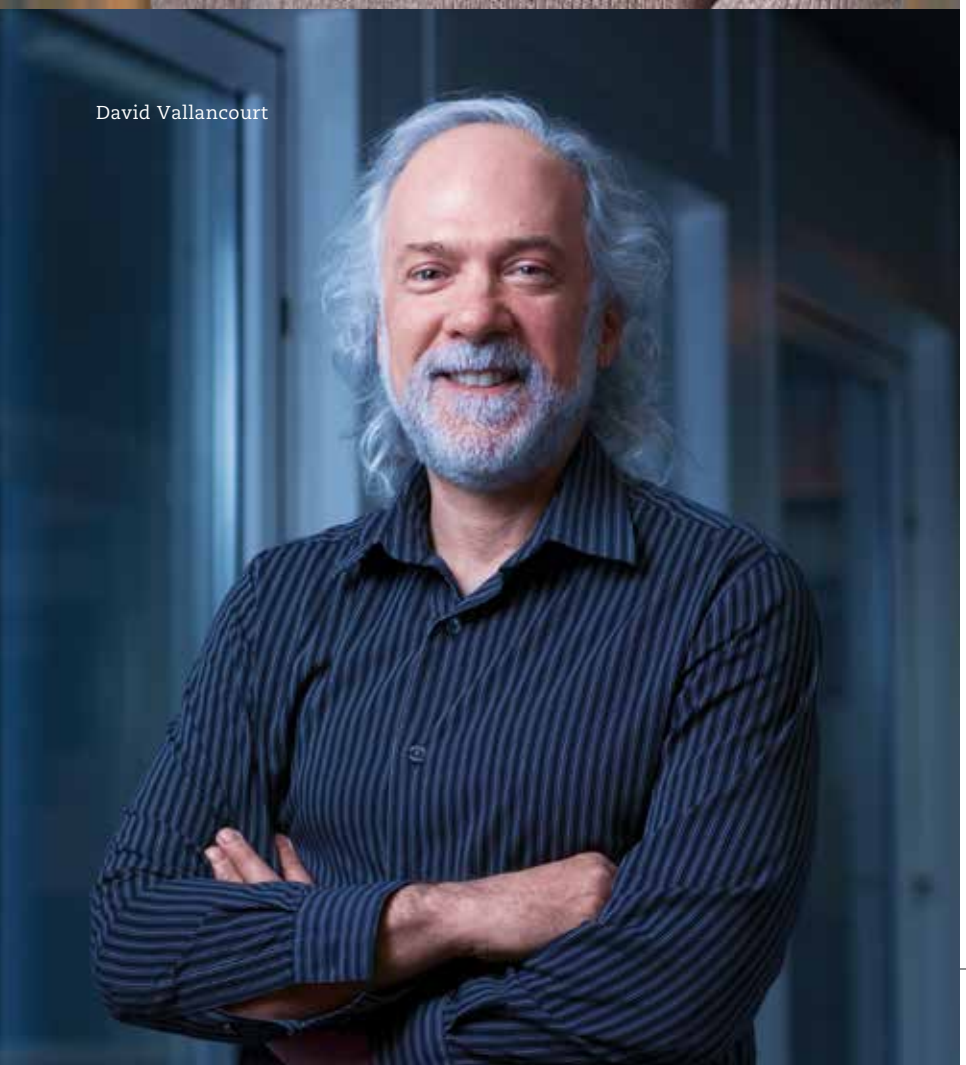
STRETCHING THE SCOPE OF SCIENTIFIC SCHOLARSHIP

Adam Cannon, senior lecturer and associate chair for undergraduate education in the Department of Computer Science (CS), says there is strong student demand and an educational need for computer science courses designed for the liberal arts major.

"While traditional computer science literacy courses for non-computer-science majors exist, they usually provide a broad introduction to the field," says Cannon. "While this is a good thing, I believe students want more. They want real computational skills that they can apply in their own lives and in their own disciplines."

Michael Collins records lectures for his "flipped classroom." Students are assigned video lectures, which they watch on their own time, and then they meet for an hour a week in groups with Collins. (Photo by Jeffrey Schifman)

Adam Cannon



David Vallancourt

The challenge, he says, is that there is no one-size-fits-all solution for a CS education component to a liberal arts degree. His new course—Computing in Context—departs from the traditional CS concepts course structure in an attempt to better serve the wide range of students seeking liberal arts degrees.

The computer science concepts component consists of two lectures a week during the first half of the semester and one lecture a week during the second half of the semester. Topics include algorithmic problem solving, basic computer programming, introduction to the Internet and the World Wide Web, and an introduction to databases.

Domain-specific components consist of one recitation each week during the first half of the semester and one recitation plus one lecture each week during the second half of the semester. The purpose of this component is to apply each week's computer science lessons in a specific context.

"When registering for the course, students also register for a specific track that they will study for the entire semester," says Cannon. "Homework assignments and computing projects will be specific to each context and, ultimately, the variety of contexts offered will be demand- and resource-driven. To start, we are offering digital humanities, computing for the social sciences, and computing for economics and finance."

Working with Cannon currently are full-time faculty from other relevant departments, including Dennis Tenen, assistant professor of English and comparative literature; Matthew Jones, professor of contemporary civilization; and Karl Sigman, professor of industrial engineering and operations research.

"We will be digitizing the context lectures so that in future iterations of the course we can use a flipped classroom approach," says Cannon. "In this way, we will add contexts from year to year, building up an online bank. Ultimately the course, to some degree, will have a choose-your-own-adventure flavor where

students will have a very wide range of context tracks to choose from."

Cannon says, given the current pervasive nature of computation and, more importantly, computational thinking in disciplines across the University, the way computer science is taught to those who do not major in the science is a "unique challenge."

"This course is an experiment," he says. "We're trying something different and we're excited to see the outcome."

EMPHASIZING CONCEPT CREATION IN CONTINUING EDUCATION

Innovative courses and educational tools are just as important in graduate instruction, says Katherine Reuther, lecturer in biomedical engineering (BME).

"While BME undergraduates receive broad, structured training in many aspects of biomedical engineering, BME graduate students come from diverse backgrounds, including research fields, industry, and educational experience in life sciences, mathematics, computer science, and several fields of engineering," says Reuther. "Many are seeking to redefine their career direction, and most master's students are seeking employment in industry after graduation."

To meet those needs, a new course, Graduate Special Topics: Biomedical Design, is providing graduate students with real-world training in biomedical design and innovation to help prepare them for the workforce.

The course explores all elements of the design process, including identifying clinical needs, concept generation, concept selection, and implementation. Students work in teams and apply the design process to a real biomedical engineering project.

"The structure of the course incorporates a hybrid learning strategy with core lectures and collaborative learning experiences," says Reuther. "The core lectures are being delivered through a combination of short videos and visiting experts. Students practice and refine concepts presented in the lecture during in-class workshops, group exercises, case studies, design review meetings, and presentations, and through completion of a team design project."

Reuther explains that, instead of simply replicating the undergraduate design program for graduates, the School wants to provide a rich experience that fills in knowledge gaps and provides an extension into the real world of commercialization.

"Our program capitalizes on the deeper and more diverse training and prior experiences of our graduate students," says Reuther. "We find that graduate students are especially motivated, are genuinely interested in their chosen topic, and are therefore quite likely to have interest in continuing the advancement of their inventions, either independently as entrepreneurs themselves or in collaboration with industrial partners."

Changing the way engineering is taught makes good business and academic sense, according to Vallancourt.

"It's a cliché, but students have changed," he says. "Education is the business of communicating ideas, so one must be able to speak the language and culture of the students."

By Jessica Driscoll

"I'm in favor of anything that helps students develop a love for the subject being taught, so they will apply themselves and learn it." —David Vallancourt

Katherine Reuther, lecturing for her new course, Graduate Special Topics: Biomedical Design. Her students gain real-world training in biomedical design and innovation, and work in teams to apply the design process to a project. (Photos by Jeffrey Schifman)

Opposite page, top: Adam Cannon, Senior Lecturer in Discipline, Department of Computer Science; *bottom*: David Vallancourt, Senior Lecturer in Circuits and Systems, Department of Electrical Engineering. (Photos by Jeffrey Schifman)

STUDENTS

KAITLIN HUBEN

SENIOR, COMPUTER SCIENCE

(Photo courtesy of Kaitlin Huben)

In examining Kaitlin Huben's diverse set of extracurricular activities—teaching assistant, research assistant, campus tour guide, and, even, teacher for Columbia Bartending Agency & School of Mixology—one gets the sense that when she says she was drawn to engineering because it was the application of mathematics and science, she means it. Her zeal for what she describes as the intersection of technology and people compels her to be out in the world experimenting with principles of the field, not behind a desk studying them.

Huben came to Columbia seeking the well-rounded education ensured by the University's famous Core Curriculum requirements. Part of the Engineering School's prestigious Egleston Scholars Program, she entered her first year intent on pursuing a mechanical engineering degree but quickly found herself hooked on computer science. When she began working on homework for her Intro to Java class before any of her other assignments, she realized a passion and switched her focus.

Now a senior, Huben is an accomplished research assistant. Currently working with Computer Science Professors Martha Kim and Stephen Edwards, she has the noble task of teaching children about hardware principles in a research project called FPGAs4Kids. She has found the experience invaluable and grasps the social importance of the project. "While some schools have programming classes," she says, "it's rare that you find classes that discuss the logic and hardware underlying the software."

The ability to share her knowledge is definitely a common thread in Huben's interests; she is enlivened by spreading her passion for science and technology. "So many people are intimidated by the very idea of math or coding. I genuinely enjoy breaking things down in a way that anyone can learn." To simplify a subject to the point of easy comprehension, a person must be able to understand it in totality. Huben's perfect grade point average indicates she possesses this kind of mastery. But beyond a brilliant aptitude for the subject, she is also able to see how her passions fit into the context of society.

"Making tech topics accessible to people with nontechnical backgrounds is something that I not only enjoy but also think is essential in this increasingly technological world," says Huben. "Engineering isn't just about math and science; it's about applying that knowledge in a way that makes the world a better place."

If ever there was a company that embodied Huben's effervescent energy towards tech, it's Google. And upon graduating this spring, Huben will join their team as a software engineer, returning to her native California to code with some of the best technological minds in the world. She remains characteristically unintimidated, and instead is thrilled by the opportunity to grow in a dynamic setting, energized by a seemingly limitless environment.

"Being an engineer today means you can do anything. If you want to try something, even if it seems impossible right now, you can be instrumental in developing the technology to make it happen."

Huben can look forward to a bright future with unbounded potential, and she intends to keep her "eyes, ears, and heart" open for opportunities to keep learning, discovering, and sharing with others—a strategy that has served her well thus far.

By Elaine Rooney

"Engineering isn't just about math and science; it's about applying that knowledge in a way that makes the world a better place."

FENG-MING "FERMI" WANG
MS'89, PHD'91

Wang Fong-Jen (left) and Fermi Wang (right) with their father, Wang Hsing-Pen

DIGITAL VIDEO PIONEER

After earning a bachelor's degree in electrical engineering from National Taiwan University and completing his military service in Taiwan, Feng-Ming "Fermi" Wang had considered attending graduate school in California. His brother, Wang Fong-Jen, was already a student at Columbia Engineering studying mechanical engineering and convinced Fermi to join him, even though Fermi did not have any financial aid.

Despite what he describes as a "huge transition" moving to New York City, Wang thrived. "My brother and sister-in-law took care of me." He even used his brother's computer for his own coursework. Soon, however, Electrical Engineering Professor Dimitris Anastassiou decided to take Wang on as a student, and his career took off. Wang went on to earn both an MS (1989) and PhD (1991) in electrical engineering.

In 1990, Wang and Anastassiou successfully filed a patent for encoding core digital MPEG-2 video. Their technology is essential to video and systems coding standards still used in TVs, DVD players and recorders, personal computers, computer gaming, and cameras.

Since this early success, Wang has become a global authority on video compression technology, a highly respected leader in the semiconductor industry, and a serial entrepreneur, responsible for a set of highly successful products and services.

"The patent definitely changed my life," Wang says. "It helped make me financially independent so that I could take chances at other companies."

After graduation, he joined C-Cube Microsystems, a pioneer in video compression technology and semiconductor integrated circuits. By 1997, he was a vice president and general manager in both engineering and business management roles. In the home media division, he led the DVD, digital video recorder, and digital video business. He launched C-Cube's MPEG codec business, growing it by 200 percent and developing the world's first MPEG codec chip.

In 2000, Wang cofounded Afara Websystems, a start-up that pioneered throughput computing for servers. He was CEO until Afara was acquired by Sun Microsystems in 2002. Afara's multi-core, multi-thread CPU remains a critical technology in Sun's UltraSPARC microprocessor.

In January 2004, Wang cofounded Ambarella Inc., which produces low-power, high-definition, and ultra-high-definition video compression and image processing semiconductors. The company's products are used in cameras and video camera recorders as well as in television broadcasting. Wang is the company's CEO, president, and chairman of the board. The company, which has research centers in Asia and California, went public in 2012.

Last year, Wang endowed the Wang Fong-Jen Professorship in Mechanical Engineering in honor of his brother, who died tragically not long after earning his doctorate in 1990. "I wanted to do something for him and his family," Wang says. "I think of how appropriate this professorship is to remember him and his ties to Columbia." He also hopes "to encourage people to think about innovation and entrepreneurship in college."

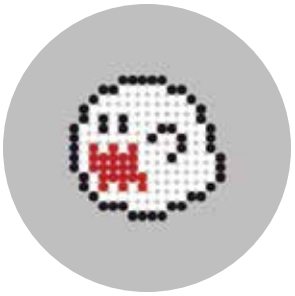
The University's Trustees named James Hone as the inaugural Wang Fong-Jen Professor in October 2014. Wang approves of the choice. Hone "is great," he says. "I'm convinced some of his research will be important for the semiconductor industry."

The Wang Fong-Jen chair is part of the School's "Rising Superstar" faculty initiative, funded by University Trustee Armen Avanessians MS'83, that has supported seven new named professorships so far.

By Timothy P. Cross

SAMANTHA JOHN BS'09

FOUND HER UNEXPECTED CALLING AT COLUMBIA ENGINEERING



Hopscotch user-generated pixel art
(Images courtesy of Samantha John)

PROGRAMMING THE FUTURE

It may not have been her degree, but Samantha John BS'09 found the keys to a whole new career path—and to launching a company that lets her pursue a passion—at Columbia Engineering.

John cofounded Hopscotch, an iPad app aimed at children that lets any of its users create their own game. The app, which she codeveloped in 2011 with Jocelyn Leavitt '07BUS, went live in April 2013. Today, it sees 50,000 projects published each week, with users playing their games more than 3 million times each month. But founding a company and becoming a programmer wasn't in the plan when John enrolled at the Engineering School as an applied mathematics major on a premed track.

"I took a couple of programming courses that were required and made a website for a student club, and I got really into it," she said. "Before that, I hadn't been exposed to programming very much, and I didn't think of it as something I would like or I could do. But I realized between programming and math, I was having more fun with tech stuff than my premed stuff, and decided that it was what I want to be doing."

This late-blooming interest in the programming world was the inspiration for Hopscotch. "All these guys we know had started programming at 11 or 12 because they played video games and they wanted to make mods for them, and we thought, 'We wish we had had a toy that got us into engineering as kids,'" John said. "And then we thought, 'We need to make that toy.'"

Hopscotch is a gender-neutral platform, but making it a welcoming place for girls is a top priority for John and her business partner. And while the data is limited (because the app is designed for children, privacy laws restrict what user information the company can collect), the strategy seems to be working; anecdotally, John said, their audience seems to be 50-50 girls and boys.

"We've been very deliberate in making it feel girl-friendly," she said. "A lot of beginning programming tools skew boyish, even with the example projects they give. We want to make sure we're not shutting out girls."

John credits her Columbia experience for not only exposing her to programming, but also putting her in the mindset of conquering problems.

"I got used to looking at a problem set I'd been assigned and thinking, 'I don't know if I'm smart enough to complete this problem set,'" she said. "And so I got very comfortable with this feeling of, 'This might not happen!' which is how I feel every day as an entrepreneur."

And most critically, she said, her time at Columbia Engineering put her in great company.

"I think my main takeaway was just being around so many great, smart people," she said.

John and Hopscotch cofounder Leavitt were introduced by mutual friend David Alpert BS'09, a cofounder of the programmer retreat Hacker School. Today, three of the seven employees at Hopscotch are Columbia grads, including one of the company's newest hires, a friend of John's from the College who has really "discovered his inner engineer," she said.

Going forward, Hopscotch has big plans. To grow the burgeoning community, the company is looking to add ways for users to easily share and collaborate on projects, as well as adding a video feature to completed projects. Who knows, maybe there will be more alums coming on board in the future to help support that goal.

"I wouldn't mind hiring more Columbia people!" said John with a laugh.

By Jennifer Ernst Beaudry

ALUMNI REUNION WEEKEND 2015

TAKE A TRIP DOWN MEMORY LANE, AND JOIN COLUMBIA ENGINEERING FOR ANOTHER ENGAGING AND FUN ALUMNI REUNION WEEKEND.

The four-day celebration, Thursday, May 28, to Sunday, May 31, offers the chance for alumni and guests to connect with old friends and make new ones, and to rediscover the campus and the city where they spent so much of their time. Celebrating this year will be alumni from class years ending in 5 and 0 (e.g., 1965, 1970, and so on). Reunion events will be held on campus and at venues throughout New York City all four days, and Dean's Day, open to all alumni, will take place on Saturday, May 30.

Reunion 2015 follows the culmination of the School's 150th anniversary celebration and builds on that great momentum. During "Back on Campus" sessions, Columbia's world-renowned faculty and prominent alumni will present their latest thought-provoking research and findings. Additionally, alumni and friends will have a chance to hear from Dean Mary C. Boyce when she provides an update on the School as it continues to have incredible impact on many key sectors, including data science, nanotechnology, sustainability, and health and wellness.

"Reunion is a wonderful time on campus and I am looking forward to greeting a new cohort of celebrants," said Dean Boyce. "It is a great opportunity for alumni and their families to see what remarkable progress our School has made since their graduation. Every department has experienced extraordinary growth in breadth and depth, and I know participants will be fascinated by the current research initiatives of their former professors. We are in an Engineering Renaisssance, and Reunion is a great time to celebrate it!"

For many alumni, Reunion Weekend is an ideal occasion to revisit Morningside and see how much the campus has changed since graduation. It also gives them a chance to relive their days here and have fun in New York City again.

"We had a wonderful gathering of our classmates and families," said Thomas Magnani BS'64, who attended his 50th Reunion last year. "The opportunity to connect with classmates I had not seen or spoken with in 50 years was a real treat."

David Schach BS'99 traveled from the San Francisco Bay Area last year to attend his 15th Reunion. "Reunion was such a success in so many ways," Schach said. "It was like no time had passed. Reminiscing was great, whether walking around campus, sitting on the Low Steps, or dancing on Low Plaza. I reconnected with classmates and even made some new friends that I hadn't been as close with during my time as a student. We all agreed on two things: our class has aged well, and our time at Columbia was both invaluable and essential to bringing each of us to where we are today!"

By Nick Mider

Keep an eye out for Alumni Reunion Weekend e-mails or visit the Reunion website at engineering.columbia.edu/reunion. Join us this spring!

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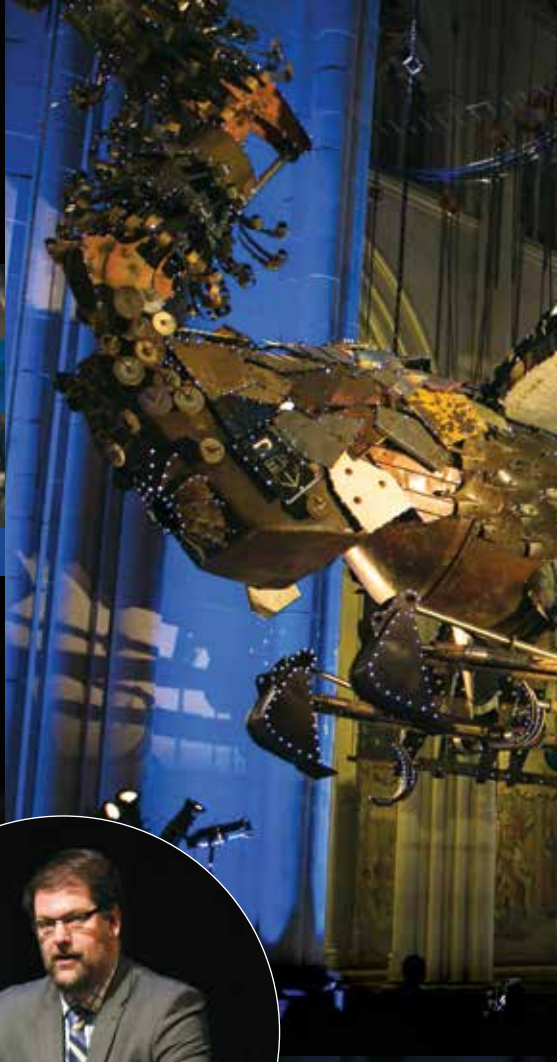

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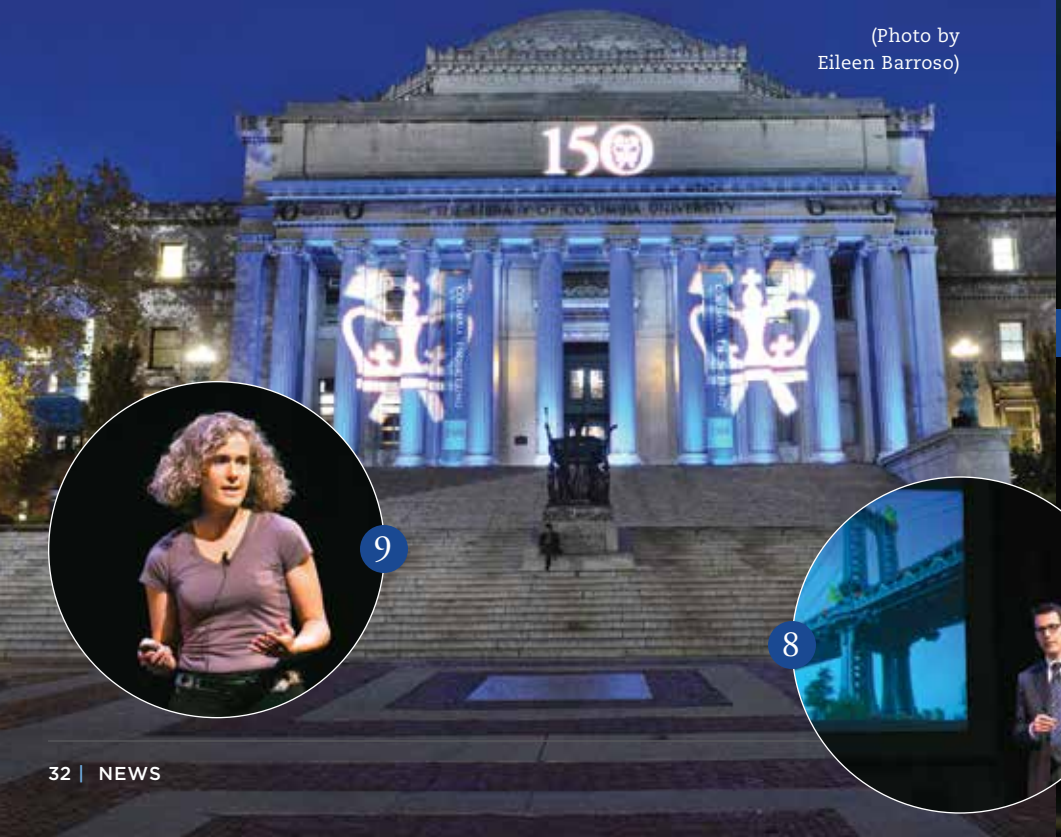
FOUNDATION FOR THE FUTURE

SYMPOSIUM HIGHLIGHTS 150 YEARS OF DISCOVERY + INNOVATION

(Photo by Eileen Barroso)



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FOUNDERS DAY GALA

CELEBRATING THE SCHOOL'S 150TH MILESTONE

(Photos by David Dini)

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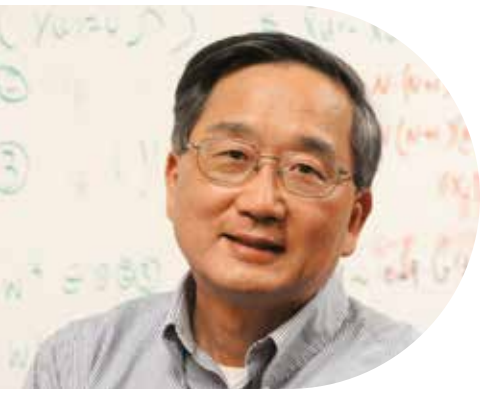
12

1. Nearly 800 guests packed Lerner Auditorium to learn about the School's pioneering research
2. Shih-Fu Chang, Richard Dicker Professor of Electrical Engineering and professor of computer science
3. Elizabeth Hillman, associate professor of biomedical engineering
4. James Hone, Wang Fong-Jen Professor of Mechanical Engineering
5. Chris H. Wiggins, associate professor of applied math
6. Symposium moderator Andreas H. Hielscher, professor of biomedical engineering
7. Low Memorial Library light display
8. Andrew Smyth, professor of civil engineering and engineering mechanics
9. Keren Bergman, Charles Batchelor Professor of Electrical Engineering
10. Ah-Hyung (Alissa) Park, Lenfest Chair in Applied Climate Science of Earth and Environmental Engineering and Chemical Engineering
11. University Trustee Armen Avanessians MS'83
12. Dean Mary C. Boyce welcomes more than 800 guests to the School's celebratory gala
13. University Trustee Emeritus Savio Tung BS'73 with family (from left), Patty Tung, Ya Tung BS'01, and Kevin Tung BS'01
14. University Trustee Vikram Pandit BS'76, MS'77, PhD'86 (left) with Jagdish Rao, who sits on the SEAS Parents Council
15. Upmanu Lall, Silberstein Professor of Earth and Environmental Engineering and professor of civil engineering and engineering mechanics (center) and Tuncel Yegulalp, professor of earth and environmental engineering (right)
16. David Hu BS'13 and Mary Byers BS'13
17. University President Lee C. Bollinger underscored the centrality of engineering to the University as a whole

PROFESSOR DAVID D. YAO ELECTED TO THE NATIONAL ACADEMY OF ENGINEERING



(Photo by Eileen Barroso)

Opposite page, top left: Carleton Lounge and cafeteria are being transformed into the new Carleton Commons and Blue Java Café, set to reopen this spring; *bottom right:* new space for the Data Science Institute (Images courtesy of Payette Architects)

DAVID D. YAO, THE PIYASOMBATKUL FAMILY PROFESSOR OF INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH, HAS BEEN ELECTED TO THE NATIONAL ACADEMY OF ENGINEERING (NAE), ONE OF THE HIGHEST PROFESSIONAL DISTINCTIONS AWARDED TO AN ENGINEER.

Yao was cited for his leading scholarship and research of stochastic systems and their applications in engineering and service operations. Announced on February 5, the NAE has elected 67 new members and 12 foreign members, bringing its total U.S. membership to 2,263 and foreign members to 221.

"I am deeply grateful for the kindness and generosity of many colleagues at Columbia and elsewhere in helping me throughout my career," said Yao. "Much as I feel extremely honored by this election, I am also profoundly humbled by the very thought of being part of an institution of men and women whose monumental achievements and accomplishments—like those of many at Columbia Engineering, current and past—I always look up to in awe."

NAE membership honors those who have made outstanding contributions to engineering research, practice, or education, including significant contributions to the engineering literature, and to the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering or developing/implementing innovative approaches to engineering education.

"I was delighted to learn that David's significant contributions in stochastic systems have been recognized by the National Academy of Engineering," said Dean Mary C. Boyce. "His work in complex networks and optimization has been groundbreaking and widely applied in many industries. This is a well-deserved honor and we are all immensely proud of his achievement."

Yao is a leading researcher and scholar in stochastic systems and applied probability, focusing on resource control and risk management issues in application areas such as health care, financial services, and supply chains. His strength in these areas has enabled him to do extensive research and consulting work in a highly varied range of applications such as aspects of semiconductor fabrication, inventory and distribution planning, and scheduling and resource management in computer operating systems. He is a fellow of the Institute for Operations Research and Management Sciences and of the Institute of Electrical and Electronics Engineers, as well as chair of the Data Science Institute's Center for Financial and Business Analytics. Yao has received multiple awards from IBM, including the Outstanding Technical Achievement Award and IBM Faculty Award.

In 2012, Yao was named the inaugural holder of the Piyasombatkul Family Professorship of Industrial Engineering and Operations Research. A Guggenheim fellow and a recipient of the Presidential Young Investigator Award from the National Science Foundation, Yao joined Columbia Engineering in 1983 after earning his PhD in industrial engineering from the University of Toronto. Shortly thereafter he was appointed an assistant professor at Columbia in the Department of Industrial Engineering and Operations Research. From 1986 to 1988, he served as an associate professor at Harvard and returned to Columbia with tenure and promotion to full professor in 1988. Attesting to his outstanding qualities as a researcher and teacher, the Society of Columbia Graduates, in 2012, awarded Yao with a Great Teachers Award.

Yao joins Dean Boyce and many other Columbia Engineering colleagues who are NAE members; most recently elected, Professors Gordana Vunjak-Novakovic (Biomedical Engineering) in 2012 and Mihalis Yannakakis (Computer Science) in 2011.

By Melanie A. Farmer

RESHAPING THE FUTURE OF COLUMBIA ENGINEERING

MAJOR RENOVATIONS ARE POISED TO RESHAPE COLUMBIA ENGINEERING FOR YEARS TO COME, ENHANCING FACILITIES FOR TEACHING, RESEARCH, AND COLLABORATION.

In Mudd, a flurry of construction is already underway, beginning with the campus-level fourth floor of the building, which is undergoing perhaps the most dramatic change. The old Carleton Lounge and cafeteria are being transformed into the new Carleton Commons and Blue Java Café. Set to reopen in April, the reimagined space will comprise 2,800 square feet with seating for 160 and areas for casual meetings, individual and group work, and quiet study. The new student commons will also be readily reconfigurable for large gatherings.

With the opening of the Science and Engineering Library at the Northwest Corner Building, the former Engineering Library on the fourth floor of Mudd is being transformed to be home to the Columbia Data Science Institute (DSI). The facilities will serve SEAS DSI faculty members and more than 80 graduate students and postdocs, as well as provide communal space for collaborative research and study.

Other floors of Mudd are also getting revamped to better serve departmental needs, including major renovations to laboratory spaces for Biomedical Engineering and Electrical Engineering.

Adjacent to Mudd, in the Schapiro Center for Engineering and Physical Science Research (CEPSR), and at nearby Havemeyer Hall, exciting research enhancements are well on their way. In partnership with Arts & Sciences, Columbia Engineering recently constructed a state-of-the-art Transmission Electron Microscope (TEM) Laboratory on the first floor of Havemeyer, directed by Katayun Barmak, the Philips Electronics Professor of Applied Physics and Applied Mathematics at the Engineering School. The new facility will include two transmission electron microscopes, a precession electron diffraction system for phase and crystal orientation mapping in the TEM, two scanning electron microscopes, and a suite of sample preparation instruments.

The mission of the laboratory, according to Barmak, is to train students and researchers in the theory and practice of scanning and transmission electron microscopy, and to provide research and education services to the University and Greater New York communities. “I am thrilled to introduce a modern microscope on campus that will enable breakthrough research in the physical sciences and engineering,” she says.

Also currently in the works are upgrades and an expansion of the Schapiro CEPSR Clean Room to accommodate interdisciplinary nanotechnology research under the Center for Integrated Science and Engineering, a collaboration among the Departments of Applied Physics and Applied Mathematics, Chemical Engineering, Chemistry, Electrical Engineering, Mechanical Engineering, and Physics. The new TEM facility and Clean Room are expected to be fully operational and completed by the end of the year.

In February, final construction activities were completed on over 10,000 square feet of laboratory space and more than 3,500 square feet of office space on the tenth floor of the Northwest Corner Building, designed as an open lab for experimental research. New faculty moved into the space in January, and by summer, 2,000 more square feet will open on the fourteenth floor of the Northwest Corner Building.

By Jesse Adams

Q&A

(Photo by Jeffrey Schifman)

GORDANA VUNJAK-NOVAKOVIC

THE MIKATI FOUNDATION PROFESSOR OF BIOMEDICAL ENGINEERING

PROFESSOR OF MEDICAL SCIENCES

Gordana Vunjak-Novakovic's research is making it possible to engineer human bone and build parts of the heart and lung. An innovative researcher, Vunjak-Novakovic also has launched two start-ups in the course of two years: EpiBone, a bone reconstruction company that allows patients to "grow their own bone," and TARA Biosystems, which is developing a platform to provide physiologically relevant human heart tissue models for drug testing.

For more than 20 years, Vunjak-Novakovic has made tremendous headway in the emerging field of tissue engineering and regenerative medicine, earning numerous honors along the way. She is a member of the National Academy of Engineering and the Institute of Medicine of the National Academies and a founding fellow of the Tissue Engineering and Regenerative Medicine Society; most recently, she was elected to the American Association for the Advancement of Science (AAAS) and the National Academy of Inventors.

Over winter break, fresh from a trip to Miami to visit her son, Vunjak-Novakovic gave *Columbia Engineering* magazine access to her lab and discussed the start of her tissue engineering career, her love of music, and works of art that she returns to time and again.

Q: You're a chemical engineer turned biomedical engineer. What attracted you to the field of tissue engineering?
A: It was serendipity. I was a Fulbright fellow at MIT, and I was there when tissue engineering just started to develop. At that time there was this idea that if you combine cells and biomaterials and you put them into the body, they will find a way to regenerate tissues. And, what I had done for my PhD coincidentally was actually a basis of culture systems, putting in one more step. I use cells and biomaterials, but I direct them in the lab to start becoming the tissues that you would like them to be—intervening with the shape, with the structure, maturing the tissue—and *then* you put this tissue into the body. The moment I learned about this field, I realized this is what I always, always wanted to do.

Q: You're often referred to as a pioneer in this field.
A: I am, in fact, one of the people who were in the field relatively early, but the problems that we are solving are bigger than one person or one lab. It is really a collective effort. There are many different approaches being pursued, and, collectively, we are making more and more progress every year, so the field is now maturing and it is helping us better understand the physiological functions of the body—how the regeneration helps us model diseases and how it helps us also to grow some quality tissues that can be implanted in patients.

Q: Why is this such an exciting field for you?
A: Growing tissues and organs is really exciting not only for me but also for the whole lab and for many young people who are now starting to pursue careers in biomedical engineering. We're trying to help people live longer and happier lives. The most interesting things in science are happening at the boundaries of disciplines—so to grow a piece of tissue, this really makes you step out of your zone of comfort and work with people who are not bioengineers. We are collectively pursuing this dream that we'll be able to one day have a "body shop" for our tissues and organs.

Q: Who inspires you?
A: I'm very much inspired by humanists and free thinkers. When I was a little girl I was really fascinated with Nikola Tesla, who is my compatriot, and, coincidentally, his family and my father's family come from the same area. I was always fascinated not only by him being a pure genius, but also by his humanitarian side. He showed that you could be an entrepreneur without being self-centered and without caring for money. He was like a patron saint of electricity. Someone once said that if we were to take away his discoveries we would slump into darkness. I'm inspired by people who strive to make a difference in the lives of others.

Q: You're busy in the lab, you teach, you are a founder of two start-ups. What do you do on your down time?
A: Lots of things! [*Laughs.*] My husband and I are big music lovers. We go to the opera all the time and to concerts. We cook dinners for friends and travel a lot. This does go at the expense of sleep, but actually there is life. There *is* life. And, I read a lot.

Q: What are you reading now?
A: The last significant new book was *When Nietzsche Wept*, a fiction about how Josef Breuer, one of the founding fathers of psychoanalysis, met Nietzsche, the most important philosopher of his time. This is a phenomenal book. It's about the fear of aging and the huge questions we all ask ourselves, and it's really about the redemption of a friendship. There's also a book that has been very important for me all my life—*The Alexandria Quartet*. It's about the city of Alexandria and its inhabitants and the things that matter the most. What's unique about the book is that it's almost mathematically constructed in four pieces—one of which giving length, the other depth, the other breadth, and the final one, time. You have this impression that this is a book that's not moving, but it's sort of spinning around its own axis showing different facets of life. This is the book that I have read many times and always go back to for more.

Q: Where are you in your life now?
A: It's a very exciting stage, because professionally we are trying to move some of the discovery into applications. This is not easy but we are hopeful. Personally, I'm in a stable stage. We have a son who is a doctor who just started working. He has been a shining star in our lives. This is a really great stage—seeing him begin his own professional career.

Q: What would your colleagues be surprised to know about you?
A: I have fantastic intuition. I am a good cook. I dream in color.

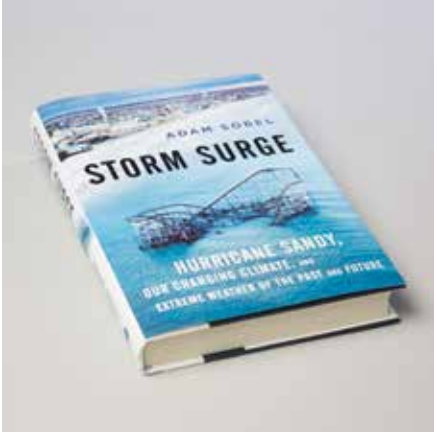
Q: Very important question—What is an engineer?
A: An engineer is a person who's trying to mobilize the resources of this planet to the benefit of people.

Q: Is this your dream job?
A: Absolutely. No question about it. This is the best job in the world.

By Melanie A. Farmer

Watch the behind-the-scenes video:
engineering.columbia.edu/web/newsletter/gordana.

ROUNDUP



FACULTY + RESEARCH HEADLINES

Prof. James Hone (right) and post-doctoral fellow, Lei Wang, have been actively exploring the novel properties of 2D materials like MoS_2 and graphene as they are stretched and compressed. (Photo by Jane Nisselson)

Top, left: Smartphone device can perform a point-of-care HIV and syphilis test from finger prick of whole blood in just 15 minutes (Image courtesy of Samiksha Nayak); *right*: Adam H. Sobel's book, *Storm Surge: Hurricane Sandy, Our Changing Climate, and Extreme Weather of the Past and Future* (Photo by Jeffrey Schifman)

Opposite page, from left to right: Positive and negative polarized charges are squeezed from a single layer of atoms, as it is being stretched (Image courtesy of Lei Wang); *middle*: Elizabeth Hillman (Photo by Eileen Barroso); *right*: Roxana Geambasu (Photo by Eileen Barroso)

DEFT DIAGNOSIS

A team of researchers led by Samuel K. Sia, associate professor of biomedical engineering, has developed a major advance in miniaturized low-power diagnostics hardware for rapid and inexpensive point-of-care diagnosis of diseases including HIV and syphilis.

Sia's innovative dongle, a small device that connects easily to smartphones and computers, can perform a laboratory-quality test that simultaneously detects three infectious disease markers from a finger prick of blood in just 15 minutes. Powered by mechanical action and a phone or computer's standardized audio jack, the accessory performs an enzyme-linked immunosorbent assay (ELISA) on disposable plastic microfluidic cassettes with pre-loaded reagents, and reveals results via a user-friendly app. Sia estimates the dongle will have a manufacturing cost of $34, much lower than the $18,450 at which typical ELISA equipment runs.

The dongle was recently piloted to great success in Rwanda, where health care workers were able to test blood samples from nearly one hundred patients enrolled at clinics and testing centers after just 30 minutes of training. Because the dongle is vastly cheaper than conventional laboratory equipment, Sia hopes it will enable large-scale screening efforts and better care both in the developing world and closer to home.

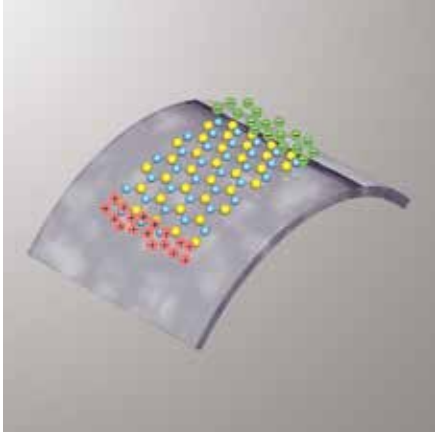
Science Translational Medicine published the research on February 4. The study was funded by a Saving Lives at Birth transitional grant and the Wallace H. Coulter Foundation.

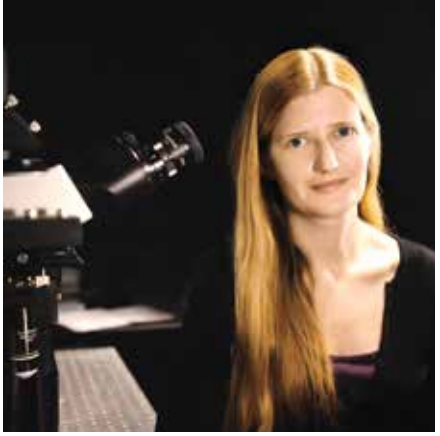
UNDERSTANDING SUPERSTORM SANDY

Professor Adam H. Sobel's new book, *Storm Surge: Hurricane Sandy, Our Changing Climate, and Extreme Weather of the Past and Future*, was released in October to wide acclaim. Published by HarperCollins, the work of popular science explores the climatic conditions that created the catastrophic 2012 "Superstorm" and what scientists expect to occur in the future.

Sobel, professor of applied physics and applied mathematics at Columbia Engineering and of earth and environmental sciences at the Lamont-Doherty Earth Observatory, is a globally renowned atmospheric scientist and leading expert in the study of climate and extreme weather events. During the approach, landfall, and traumatic aftermath of the storm that battered New York City and much of the United States' northeastern coastline, Sobel was a prominent voice in the media on the science behind the disaster.

Drawing on Sobel's expertise as a scientist and New Yorker, *Storm Surge* examines the atmospheric factors that set Sandy on its fateful path, the advances in weather prediction science that empowered meteorologists to accurately forecast the storm, the links between climate change and extreme weather, and what policies might help coastal communities better prepare for storms to come.





THE WORLD'S THINNEST ELECTRIC GENERATOR

Mechanical Engineering Professor James Hone helped lead recent research that developed the world's thinnest electric generator from just a single layer of atoms.

In a paper published in *Nature* in October, researchers from Columbia Engineering and the Georgia Institute of Technology reported the first experimental observation of piezoelectricity—the phenomenon by which stretching or compressing a material generates an electrical voltage—in an atomically thin layer of molybdenum disulfide (MoS_2). Intriguingly, neither thick layers of MoS_2 nor samples with very small even numbers of atomic layers are piezoelectronic, but only material in very small odd numbers of layers.

Hone and his research team, led by postdoctoral fellow Lei Wang, placed flakes of MoS_2 on flexible plastic substrates and patterned metal electrodes onto the flakes, while the Georgia Tech team installed measurement electrodes and measured current flows and outputs as the samples were mechanically deformed. Tony Heinz, a professor of optical communications at Columbia Engineering, also contributed to the research.

The resulting ultralightweight electric generators and mechanosensation devices are optically transparent, extremely pliable, and rich with potential applications. MoS_2 is among an array of two-dimensional semiconducting materials that theoretically share similar piezoelectric properties and could contribute to novel devices like body-powered wearable sensors and self-powered nanosystems capable of harnessing energy from the environment.

REINVENTING 3D MICROSCOPY

A new 3D microscope devised by Professor Elizabeth Hillman is poised to enable significant advances in biomedical and neuroscience research. Known as SCAPE—for swept confocally aligned planar excitation microscopy—the technique can image freely moving living things in real time, up to 100 times faster than conventional methods.

Hillman, associate professor of biomedical engineering at Columbia Engineering and of radiology at Columbia University Medical Center, built a prototype with her students from off-the-shelf materials after envisioning a simple, single-objective imaging geometry that didn't necessitate sample mounting or translation. A novel variation of light-sheet microscopy, SCAPE is fast, easy to use, and surprisingly inexpensive.

Hillman and collaborators, including colleagues from the Mortimer B. Zuckerman Mind Brain Behavior Institute and the Kavli Institute for Brain Science at Columbia, have already utilized SCAPE to closely observe the 3D dynamics of fruit fly larvae, zebrafish hearts, and neurons firing in rodents' brains. The system may soon enable groundbreaking research in microfluidics and flow-cell cytometry systems, while potential clinical applications include video-rate 3D microendoscopy and intrasurgical imaging.

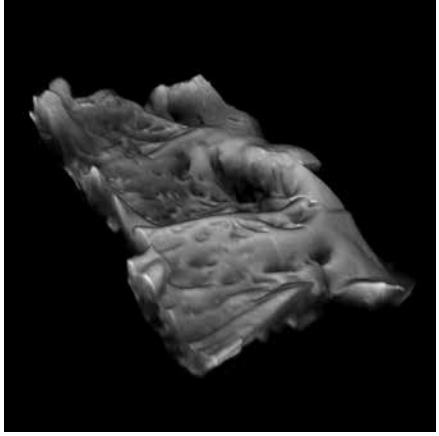
Columbia holds an issued patent on the technique behind SCAPE, and Hillman and her students are continuing to develop the system for commercialization. At press time, the technology was available for licensing from Columbia Technology Ventures.

THE FUTURE OF CYBERSECURITY

Roxana Geambasu, assistant professor of computer science, capped off a remarkable 2014 when *Popular Science* placed her among the Brilliant Ten, the venerable magazine's annual list of the "brightest young minds in science and engineering." Earlier in the year, she also received a prestigious Microsoft Research Faculty Fellowship and a CAREER Award from the National Science Foundation, all for her groundbreaking work in cybersecurity.

Popular Science profiled Geambasu's innovative research advancing privacy and data security in the age of cloud computing, ubiquitous phones and tablets, and web services that harvest users' personal information beyond scrutiny or control. The magazine wrote that Geambasu "exposes how companies use your data" and "allows people to see where the information they upload to the cloud goes," describing programs she's written to make data self-destruct after a set time and to reduce potential data theft from misappropriated mobile devices.

Geambasu collaborates extensively across fields to integrate a broad range of systems research specialties, drawing insights from cryptography, distributed systems, and operating system techniques. She aims toward a future where companies are more transparent about how they use and protect sensitive data.



SEAMLESS INNOVATION

Seamless Devices was cofounded by Jayanth Kupambatti PhD'14 and Electrical Engineering Professor Peter Kinget in December of 2013. The company's core technology, Switched-Mode Signal Processing (SMSP), started as a research project in Kinget's group that attracted seed funding from the National Science Foundation (NSF) Small Business Innovation Research (SBIR) Phase I program and the Columbia SEAS Ignition Fund.

The immense potential of SMSP for next-generation systems attracted the attention of Allied Minds, a Boston-based venture capital firm that specializes in spinning out early-stage technologies from universities and federal labs. With financial and management backing from Allied Minds, Seamless Devices is working on solutions for the semiconductor intellectual property (IP) market, which involves developing and licensing circuit designs that are incorporated into system-on-chip integrated circuits. As a first market application, the company is pursuing analog-to-digital converters (ADC) for telecom applications, meeting an accelerating demand for ADCs that can operate at high bandwidth and high resolution with low power consumption.

Above, left: Peter Kinget (Photo by Eileen Barroso); *middle*: Hendon's multiscaled approach utilizes Optical Coherence Tomography (Photo courtesy of Christine Hendon); *right*: Kathleen McKeown (Photo by Eileen Barroso)

Opposite page: Photos by Eileen Barroso

HOW CAN YOU MEND A BROKEN HEART?

Christine Hendon, assistant professor of electrical engineering and director of Columbia's Structure-Function Imaging Library, received a New Innovator Award from the National Institutes of Health (NIH) in October. She is one of just 50 engineers and scientists selected to receive $1.5 million over the next five years for "proposing highly innovative approaches to major contemporary challenges in biomedical research."

Hendon, whose work concentrates on advancing optical imaging and spectroscopy for interventional cardiology and cardiac electrophysiology, will use the grant to develop instruments that can better image the myocardium, or muscular middle layer of the heart wall. While catheters are the standard tool for guiding heart therapies, high-resolution real-time optical imaging and signal analysis could vastly enhance practitioners' ability to diagnose and treat myocardial diseases and abnormalities.

Hendon's multiscaled approach utilizes Optical Coherence Tomography (OCT) for cellular-level imaging of the myocardium, develops classification algorithms to do the imaging in real time, and prototypes high-resolution catheters for three-dimensional imaging and optical biopsy. Her pioneering research promises to provide important insights into tissue remodeling and become a significant new tool for understanding and treating ailments of the heart.

DISASTER NEWS SUMMARIZED QUICKLY

As the magnitude of Hurricane Sandy became clear, so did the problem of wading through torrents of information about the storm's aftermath. What if computers could be trained to sift through it all to weave a master narrative?

This question led computer scientist Kathleen McKeown to start building a system that could process disaster-news feeds in real time and automatically select and summarize the key points. She highlighted the project in a January 29 talk sponsored by the Data Science Institute, which she heads.

Using natural language processing tools, McKeown, Rothschild Professor of Computer Science, and her colleagues are training computers to sort through text from mainstream news, personal blogs, and social media conversations to extract and summarize the most relevant details. The challenges include teaching the computer to filter out redundant facts in stories covering the same event, and to recognize sub-events such as blackouts and flooding that may not be explicitly flagged as disaster related. McKeown's work on disaster summarization builds on her earlier software project, Newsblaster, which identifies related news stories and sums up their main points.

McKeown said one future application of this research could be the translation of streaming social media in disaster zones. Many relief workers abroad do not speak the native language; the ability to get timely updates would allow responders to act more quickly and effectively.

NSF CAREER AWARD WINNERS

FOUR ENGINEERING FACULTY MEMBERS HAVE RECENTLY WON PRESTIGIOUS NATIONAL SCIENCE FOUNDATION (NSF) CAREER AWARDS FOR THEIR INNOVATIVE RESEARCH.

CHRISTINE HENDON | *ASSISTANT PROFESSOR OF ELECTRICAL ENGINEERING*

Hendon proposes to use optical imaging and spectroscopy as a means to monitor radiofrequency ablation, or RFA, treatment of cardiac arrhythmias. The goal is to directly interrogate the heart for tissue characterization to improve RFA efficacy to terminate atrial fibrillation, the most common arrhythmia. She aims to use optical modalities in combination with functional electrogram analysis to analyze how tissue microstructure influences electrical conduction patterns and provide real-time guidance of RFA energy delivery. Hendon's research interests are in developing optical imaging and spectroscopy instruments for applications in cardiac electrophysiology and interventional cardiology. In 2014, she was awarded an NIH New Innovator Award.

KRISTIN MYERS | *ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING*

Myers's project is focused on exploring the mechanics of the cervix and determining the biomechanical mechanisms that cause preterm birth (PTB). Despite advances in prenatal care, the rate of PTB (birth before 37 weeks of gestation) both in the United States and around the world remains high. Myers is aiming to determine the driving factors that cause premature cervical remodeling and the mechanical dysfunction of the cervix. Her study will measure the mechanical and biochemical property changes of the cervix under various hormonal cues and develop a set of equations that can predict the mechanical function of the cervix during pregnancy. Myers plans to also use her NSF CAREER Award to train the next generation of female engineers interested in improving women's health.

MINGOO SEOK | *ASSISTANT PROFESSOR OF ELECTRICAL ENGINEERING*

With demand increasing for ever-smaller devices to perform at ever-higher levels, it is becoming more difficult to manufacture computing chips that are identical at the nanoscale level. Seok is working to develop a way to make chips monitor variations and dynamically adapt to them. This way, even if each chip is manufactured with its own variation and experiences varying operating conditions, such as temperature, over time, it can still achieve the best level of its own computing performance. Seok's research interests are in low-power digital and mixed-signal design and methodology, and he has devised approaches that deliver record-setting energy efficiency in microcontrollers, embedded memories, power conversion circuits, and DSP accelerators.

CHANGXI ZHENG | *ASSISTANT PROFESSOR OF COMPUTER SCIENCE*

While computer-generated imagery has made tremendous progress in recent years to attain high levels of realism, the same efforts have not yet been applied to computer-generated sound. Zheng is among the first working in the area of dynamic, physics-based computational sound for immersive environments, and his proposal will look to tightly integrate the visual and audio components of simulated environments. It will represent a change from today's practices where digital sound is usually created and recorded separately of the action and then dropped in when appropriate. In Zheng's proposal, computational sound will be automatically generated using physics-based simulation methods and fully synchronized with the associated motion. —Linda Crane

FACULTY APPOINTMENTS & PROMOTIONS

NEW FACULTY

JOSHUA JACOBS

Assistant Professor
Biomedical Engineering
PhD, University of Pennsylvania, 2008
MEng, MIT, 2002
SB, MIT, 2001

Joshua Jacobs studies how the human brain supports spatial navigation and memory. Jacobs performs this work by studying brain recordings from neurosurgical patients who have electrodes surgically implanted in deep brain structures. He plans on teaching courses in neural data analysis and bioengineering research methods.

"I could not be more excited to join Columbia Engineering, not only for the School's world-renowned expertise in engineering research and education, but also for our broader links to Columbia's strong clinical and basic research communities." —Joshua Jacobs

APPOINTMENTS TO ENDOWED PROFESSORSHIPS

STEVEN M. BELLOVIN

Percy K. and Vida L. W. Hudson Professor of Computer Science

Steven M. Bellovin is one of the world's leading researchers in computer networks, cybersecurity, and privacy. The Hudson Chair was established by Mr. Hudson, a descendent of Henry Hudson, who graduated from Columbia School of Mines in 1899.

MARIA CHUDNOVSKY

Liu Family Professor of Industrial Engineering and Operations Research

Maria Chudnovsky is an expert in graph theory and a 2012 MacArthur Foundation Fellow. Ming Chung Liu and Yin Zhang P'09, founders of Nine Dragons Paper Holdings, Ltd., the largest producer of containerboard products in China, endowed the Liu Family Professorship.

APPOINTMENTS TO ENDOWED PROFESSORSHIPS *[CONTINUED]*

QIANG DU

The Fu Foundation Professor of Applied Mathematics

Qiang Du is an applied and computational mathematician internationally recognized as one of the world's leading researchers in the study of Ginzburg-Landau theory. This professorship was established by the late Z. Y. Fu.

JAMES HONE

Wang Fong-Jen Professor of Mechanical Engineering (Inaugural)

An innovative researcher and scholar, James Hone has achieved in his work significant breakthroughs in atomically thin two-dimensional materials. This professorship was established by entrepreneur Fermi Wang PhD'91 in honor of his late brother, who earned his MS, MPhil, and PhD in mechanical engineering at Columbia.

KAM W. LEONG

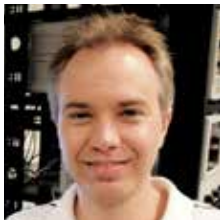
Samuel Y. Sheng Professor of Biomedical Engineering (Inaugural)

Kam W. Leong is a leading international authority on understanding the mechanism of cellular interaction with nanomaterials for drug delivery and regenerative medicine. This chair was established by Mr. Sheng's daughter, Jean Sheng-Larkin; son, Kent Sheng; and daughter-in-law, Lauren Wong Sheng BS'76. Mr. Sheng '51 was a distinguished chemical engineer who graduated from Columbia's master's program in industrial chemistry.

PETER SCHLOSSER

Maurice Ewing and J. Lamar Worzel Professor of Geophysics

Peter Schlosser is a leading earth scientist studying water movement, developing novel instruments and models to understand the effects of the changing hydrosphere on ocean circulation, groundwater flow, and climate. This professorship was established by a gift of the Palisades Geophysical Institute and other donors to honor Ewing and Worzel, two pioneering geophysicists and engineers.



KENNETH L. SHEPARD

Lau Family Professor of Electrical Engineering (Inaugural)

Kenneth L. Shepard, who holds joint appointments as professor of biomedical engineering and of electrical engineering, is a pioneer in developing systems and applications based on heterogeneously integrating new devices and materials with complementary metal-oxide-semiconductor technology. The Lau Family Professorship was established by Engineering parents Lee and Margaret Lau to support research and teaching at the School. Mr. Lau is a partner and cofounder of Alignvest and founder of ATI Technologies.

YANNIS TSIVIDIS

Edwin Howard Armstrong Professor of Electrical Engineering

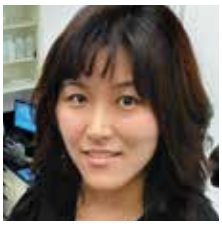
Yannis Tsividis is a leader in the development of analog and mixed-signal integrated circuits across a variety of platforms. The Armstrong Professorship was endowed in part by Mrs. Marion Armstrong to honor her husband, a member of the Class of 1913, who was the inventor of FM radio, among many other advances in radio technology, and a Columbia faculty member.

PROMOTION TO TENURE

V. FAYE MCNEILL

Chemical Engineering

Associate Professor V. Faye McNeill investigates the profound effect that atmospheric aerosol particles and ice in the environment have on Earth's climate and atmospheric composition. She and her team perform laboratory and modeling studies of the chemistry and physics of atmospheric aerosols and ice in the environment, with a special focus on heterogeneous chemistry and interfaces. The results of these studies are increasing our understanding of the effects of human activities on the environment and are helping to improve the predictive power of atmospheric chemistry and climate models. McNeill is a coeditor of *Atmospheric Chemistry and Physics*, vice chair of the AIChE Environmental Division, and a recipient of a National Science Foundation CAREER Award. Her latest publication, "Aqueous Organic Chemistry in the Atmosphere: Sources and Chemical Processing of Organic Aerosols," was a feature article in *Environmental Science & Technology*.



AH-HYUNG (ALISSA) PARK

Earth and Environmental Engineering

Ah-Hyung (Alissa) Park is the Lenfest Chair in Applied Climate Science of Earth and Environmental Engineering and Chemical Engineering and Interim Director of the Lenfest Center for Sustainable Energy at the Earth Institute. She focuses on carbon capture, utilization, and storage (CCUS) and sustainable energy conversion pathways with emphasis on innovative materials and reaction schemes based on the principles of particle technology and advanced carbonate chemistry. Park's group is researching fundamental studies of CCUS by developing nanoscale materials for coupled CO_2 capture and conversion and better carbon storage via carbon mineralization. Founded on these new materials and reaction schemes, her team is also working on fuel synthesis pathways using unconventional energy sources, while minimizing environmental impacts. Park is the recipient of an NSF CAREER Award and James Lee Young Investigator Award.

JUNFENG YANG

Computer Science

Associate Professor Junfeng Yang's research centers on making reliable and secure software systems by creating effective tools that advance that goal. Current projects involve efficient and reliable multithreading, tools for cloud computing, and systems support for reliability, security, and privacy. As codirector of the Software Systems Laboratory, he works with a research team to pursue all aspects of the design, implementation, analysis, and evaluation of software systems at all scales, from handheld devices to cloud computing data centers. Yang is a recipient of a Sloan Fellowship, an Air Force Office of Scientific Research Young Investigator Award, and a National Science Foundation CAREER Award. He recently published the paper "Determinism Is Not Enough: Making Parallel Programs Reliable with Stable Multithreading" in *Communications of the ACM*.

GIL ZUSSMAN

Electrical Engineering

Associate Professor Gil Zussman focuses on the area of networking, and, in particular, on wireless, mobile, and resilient networks. Among his projects is the multi-PI Energy Harvesting Active Network Tags (EnHANTs) project where the objective is to design small, flexible, and energetically self-reliant tags that can be attached to objects that are traditionally not networked. A network of these tags can support novel tracking applications and become one of the enablers for the Internet of Things. Other projects focus on designing scheduling and resource allocation algorithms for emerging wireless technologies, improving the resilience of communication and power networks to large-scale attacks, and designing cross-layered algorithms for dynamic optical networks. Zussman is a recipient of a few best paper awards, the Fulbright Fellowship, two Marie Curie fellowships, a Defense Threat Reduction Agency Young Investigator Award, and an NSF CAREER Award.

PROMOTION TO ASSOCIATE PROFESSOR

MARTHA KIM

Computer Science

Martha Kim leads the ARCADE Lab at the Engineering School. Her research interests are in computer architecture, parallel programming, compilers, and low-power computing. Kim's work has explored low-cost chip manufacturing systems, reconfigurable communication networks, and fine-grained parallel application profiling techniques. Currently, she is focusing on hardware and software techniques to improve the usability of hardware accelerators as well as data-centric accelerator design. Kim is the recipient of a 2013 NSF CAREER award and the 2013 Rodriguez Family Award in recognition of the research achievements of underrepresented junior faculty at Columbia.

HARISH KRISHNASWAMY

Electrical Engineering

Harish Krishnaswamy's research interests broadly span integrated devices, circuits, and systems for a variety of RF and mmWave applications. His current research efforts are focused on silicon-based mmWave PAs, sub-mmWave circuits and systems, and reconfigurable/broadband RF transceivers for cognitive and software-defined radio. Krishnaswamy directs the Columbia high-Speed and Mm-wave IC (CoSMIC) Lab and serves as a member of the Technical Program Committee (TPC) of several conferences, including the IEEE RFIC Symposium. He is the recipient of a 2014 IBM Faculty Award, a 2011 Defense Advanced Research Projects Agency (DARPA) Young Faculty Award, the IEEE International Solid-State Circuits Conference (ISSCC) Lewis Winner Award for Outstanding Paper in 2007, and the Best Thesis in Experimental Research Award from the USC Viterbi School of Engineering in 2009.

MARIANA OLVERA-CRAVIOTO

Industrial Engineering and Operations Research

Mariana Olvera-Cravioto's research interests are in applied probability, in particular, in asymptotic analysis involving heavy-tailed distributions. Her current work is focused on the analysis of information ranking algorithms and their large-scale behavior, which is closely related to the study of the asymptotic properties of solutions to certain stochastic recursions, in particular, weighted branching processes. She also is interested in the analysis of queueing networks with parallel servers such as those encountered in cloud-computing platforms. Other research areas include stochastic processes, queueing theory, power-law graphs (e.g., social networks), large deviations, and simulation.

Page 42: Joshua Jacobs (Photo by Jane Nisselson), Steven M. Bellovin (Photo by Eileen Barroso), Maria Chudnovsky (Photo by Johannes Kroemer)

Page 43: Qiang Du (Photo by Jeffrey Schifman); James Hone (Photo by Jeffrey Schifman); Kam W. Leong (Photo by Matt Lenz); Peter Schlosser, Kenneth L. Shepard, Yannis Tsividis (Photos by Eileen Barroso)

Above: Photos by Eileen Barroso

Opposite page: V. Faye McNeill (Photo by Eileen Barroso); Ah-Hyung (Alissa) Park (Photo by Eileen Barroso); Junfeng Yang (Photo by Nicolas Viennot); Gil Zussman (Photo by Jeffrey Schifman)

LETTER FROM THE ALUMNI ASSOCIATION PRESIDENTS

Dear Columbia Engineering Alumni and Friends,

During the fall semester, Columbia Engineering closed its celebratory 150th anniversary year with two incredibly successful events: the TEDx-style symposium highlighting the past, present, and future achievements of the School; and the 150th Gala at the Cathedral of Saint John the Divine, which offered a stunning setting for the evening's celebration.

While 2014 will be a tough act to follow, there are a multitude of events planned throughout the year to build on that momentum. On Monday, May 18, 2015, we would be delighted to have you join us at the Alumni Pre-Reception, and also march in the **Parade of Classes** at the start of the Class Day ceremony, as we welcome the Class of 2015 into the Columbia Engineering alumni community.

On Thursday, May 28, 2015, the Columbia Engineering Alumni Association will host the annual **Engineering Reunion Welcome Dinner** and **CEAA Awards Presentation** in Low Memorial Library. This dinner marks the official return of our Reunion classes to campus for Alumni Reunion Weekend, and all alumni and their families are invited to attend.

During the dinner, as part of celebrating our tradition of excellence, we will present the following prestigious awards:

- *The Egleston Medal for Distinguished Engineering Achievement*
- *The Samuel Johnson Medal for Distinguished Non-Engineering Achievement*
- *The Pupin Medal for Service to the Nation*

On Saturday, May 30, 2015, all alumni and their families are welcome to attend **Dean's Day**. Mary C. Boyce, dean of Engineering and Morris A. and Alma Schapiro Professor, will provide updates on the School during breakfast; Columbia's world-renowned faculty and prominent alumni will present their latest thought-provoking research and findings during morning and afternoon lectures; and Columbia Engineering will host its marquee Magill Lecture in Science, Technology, and the Arts to close out the afternoon.

For more information, contact the Engineering Alumni Office at seasalumni@columbia.edu or (212) 851-7937.

We would be proud to have you join us in celebrating Columbia Engineering ingenuity and achievement.

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, "Seventy-one years later we include a bit of history. We were supposed to graduate in June 1943. It was war time and instead of going to Camp Columbia in the summer of 1942, the engineers went to classes all summer to accelerate their graduation from June 1943 to January 1943. The class of 1944 graduated in June 1943. Now we are getting older, but there are still a few January 1943 graduates here (like myself). The message to them is: Identify yourself in a message to Columbia Engineering News at engineering.mag@columbia.edu."

1945

Class Correspondent:
Gloria Reinish
reinish@fdu.edu

1947

Louis Silbert MS'48 writes, "After 66 years of a continuous, active, construction career, Parkinson's disease compelled me to retire early in 2014."

1948

Vincent Megna writes, "I graduated in 1948 with a BSIE, and a major in mechanical engineering. When I graduated, ME and IE positions were difficult to find. Consequently, my first job was in electrical design for sugar facilities construction in Santo Domingo, Cuba. When the economy improved, I proceeded with mechanical and electrical design at Welton Becket and DMJM in California, both architectural and engineering firms. At that time, I obtained my Professional Engineering registrations in

mechanical and electrical by examination. No computers to help at that time—we did it all via slide rule. On my next challenge, I was engaged by LBCW to form an engineering department in Virginia, which I did. It offered civil, structural, mechanical, and electrical services. I retired in 1987 as their director of engineering. A strong education in engineering can get you through most anything in engineering."

1951
Class Correspondent:
Ted Borri
tjb63@columbia.edu

1952
Class Correspondent:
Peter Mauzey
p.mauzey@ieee.org

1953
Class Correspondent:
Don Ross
dross52@optonline.net

1955
Class Correspondent:
Leo Cirino
lcirino3333@gmail.com

1956
Class Correspondent:
Lou Hemmerdinger
LHemmer@aol.com

In November, **Harold Reisman PhD'65** and wife, Miriam, cruised from Lisbon to Cadiz to Tangiers to Cape Verde and across the Atlantic to Brazil, with ports of call in Recife, Salvador, and Rio de Janeiro. Harold writes, "It was a relaxing time spent eating well, meeting fascinating people, and seeing more of the world. The ports were outstanding. Rio is especially beautiful! But the most memorable experience was in Recife, the site of the first Jewish settlement in the New World, where, after Sabbath services, a congregant, fluent in English, took us on a tour of Jewish and other historic sites in the city. After Maya, the oldest of our three grandchildren, graduates from high school in San Diego this May, we plan to travel to Israel for the June Bar Mitzvah of our grandson, Ephraim, who lives in Efrat with his family. Four of our eight grandchildren from Israel, and their parents, spent almost six weeks in Carlsbad as part of an extended visit to the U.S. last summer. One of the Israeli grandchildren just completed her MS in biochemistry at Hebrew U. and is living in LA with her husband, who is on scholarship at UCLA in an MBA program. They are expecting their first child in late January, and we are excited in anticipation of the arrival of our first great-grandchild."

1958
Robert Drucker writes, "I just returned from a three-week round-trip Miami cruise through the Caribbean and up the Amazon River as far as Manaus, the major city there. The Amazon is one muddy navigable river, complete with some six-foot-long ugly-looking fish, which outclass the stereotypical piranha. The most famous landmark in Manaus is the opera house built circa 1898 in the European style to emulate a continental ambiance desired by the ruling establishment. It's quite ornate, in four tiers, and the faces of renowned European composers are sculpted in relief on the columns. It's very similar to the Iolani Palace in Honolulu, Hawaii, whose king at about the same time wanted to convey a European aura as well. The area has seen an attempt at commercial rubber plantation but lost out to Malaysia. Growing threats to the environment can also be noted by clear-cutting of jungle areas to support agricultural industries and, as usual, the government has to provide support to threatened indigenous Indian tribes. The cruise encompassed port calls to St. Lucia, St. Barts, Grenada, Trinidad, St. Johns, and San Juan—quite standard for a Caribbean voyage. One port call included that stands out however is Devil's Island, French Guyana. It really consists of three islands—the main being Isle Royale, the site of the main notorious French prison. Touring the site reveals a cruel hellhole for the inmates, who often risked death by trying to escape through shark-infested waters with powerful currents. The most famous political prisoner was Dreyfuss, who was unjustly held for four years, shackled, and isolated with a 24-hour guard on one of the smaller islands, clear-cut at the time to increase the isolation factor. He was released about 1898 after Emile Zola wrote the article "J'accuse," published in a Paris newspaper. It is very strange that today the main island is now a French resort with a small hotel, shop, and restaurant as well as camping facilities."

After earning three degrees from Columbia in metallurgical engineering, **Milton Ohring MS** and **DSc'64** taught metallurgy and materials science at the Stevens Institute of Technology. In addition to the expected teaching and research activities, he wrote four books published by Academic Press: *The Materials Science of Thin Films* (1992, 2nd Edition in 2002), *Engineering Materials Science* (1995), and *Reliability and Failure of Electronic Materials and Devices* (1998). However, it was in retirement that he returned to his first love, art, and, in particular, sculpture. He writes, "In the past dozen years or so I have created many pieces in stone and metal dealing with biblical and Holocaust themes, and exhibited them in various venues over the years. A sample of these works can be seen on my web page, ohringart.com. I believe my Columbia education benefitted me in more than the usual ways."

1959
Class Correspondent:
Betsey Altman
bmeca@comcast.net

1962
Class Correspondent:
Marshal (Mickey) Greenblatt
mg840@columbia.edu

1963
Class Correspondents:
Chuck Cole
ccole6250@att.net
Mark Herman
mnh18@columbia.edu

1964
Class Correspondent:
Tom Magnani
tm421@columbia.edu

1965
50TH REUNION
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

1967
Bill Quirk '70GSAS was reelected to the California State Assembly for a second two-year term. He represents 435,000 residents in Hayward, Union City, Fremont, and the surrounding unincorporated areas. He is now chair of the Public Safety Committee, where he will be facing issues such as police use of force, medical cannabis regulation, and reducing the prison population.

1969
Class Correspondent:
Ron Mangione
Ronaldm@archeng.com

Ta Li has been elected an honorary member to the AIME. Honorary membership is one of the highest honors AIME bestows on an individual. Ta was presented with the award at the Society for Mining, Metallurgy, and Exploration's annual banquet in February.

1970
45TH REUNION
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

1974
Neil Marmor writes, "I read weekly to fourth graders at Normal Heights Elementary in San Diego. I tried working with high school kids but found their interests and so-called maturity rather baffling. The little kids have yet to discover sex, drugs, or rock 'n' roll. They are enthusiastic and sincere. When given the option of being green like a frog, three kids out of 28 opted to be green. Three kids also said they wished they could have long furry tails like cats, despite the obvious attendant difficulties meeting society's norms for attire when you have a tail. The kids are a joy. I now also know better how Gulliver felt when he was among the Lilliputians."

1975
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@pliplaw.com

Jason Makansi was honored to receive the 2014 Alumni Achievement Award from the McCallie School in Chattanooga, TN, during his 40th high school reunion. He is seeking publication of his debut novel, *The Moment Before*; continues to provide technology deployment and policy development services in the electricity industry to his clients through his independent consulting business, Pearl Street Inc. (now in its fifteenth year); enjoying regular social media updates from his nephew, Benjamin Makansi, a third-generation family member majoring in physics and philosophy at Columbia; and is helping his father, **Munzer Makansi PhD'57**, edit and format his autobiography.

1979
Class Correspondent:
Stewart Levy
srlevy@att.net

1980
35TH REUNION
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

1981
Class Correspondent:
James Reda
jfreda@jfreda.com

1982
Class Correspondent:
Dan Libby
kdl26@columbia.edu

1983
Angela Washington, who majored in industrial engineering, has recently stopped working after her last job in Florida at WellCare.

1985
30TH REUNION
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

Brian Kenneth Swain MS'87 has just released his third novel (sixth book), entitled *Sistina*. It is a religious thriller spanning over 2,000 years—from the crucifixion of Christ to the present day. The book is available from Amazon, Barnes & Noble, and other book sites.

1987
After serving as the executive director of the General Electric edgelab for 12 years, **Chris Kalish** has taken on the role as president and CEO of The IP Factory in East Hartford, CT. He writes, "IP Factory works with large corporations and research firms to acquire dormant or underutilized intellectual property and, with the expertise of seasoned entrepreneurs, launches new spin-offs based on that intellectual property." In August of 2015, Chris will be starting a 27-month tour with the U.S. Peace Corps in Botswana, Africa.

1988
Class Correspondents:
Caryn Frick
carynfrick@gmail.com
David Shofi
dshofi@atmi.com

1989
Class Correspondent:
Shreosee Roy
Shre.roy@att.net

1990
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:
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

Ara Bederjikian writes, "After working on Wall Street for over 17 years, I have decided to start my own company, which is based in Raleigh, NC. OBX Computing Corporation ("OBX") was founded by Tom Sullivan and me in October 2012 on the premise of connecting LED lights via a WiFi mesh network and creating an eco-friendly platform to deliver various cloud-based products and services. Each LED light contains a module that includes a microprocessor, WiFi antennas, and ports for sensors and cameras. The platform of technology-enhanced LEDs can be installed inside or outside and provides enhanced lighting control, Internet connectivity, and computing power to its owners. The company has a patent pending on its platform. The platform is targeted for installation in office buildings, schools, government buildings, and homes, etc. To date, OBX has raised $535K from outside investors and completed its first commercial installation in December 2014. Currently, I am a board member and the president of the Institute of Management Accountants (IMA) New York chapter, an association for accountants and financial professionals in business, a not-for-profit organization, which has over 700 members."

Scott Genzer writes, "I have recently moved to rural Norwich, VT, and live here with my wife, Kim, and two girls, Sarah (age 13) and Katie (age 10). I ended my 20-year career working in K12 schools in June 2013 and

have started an educational consulting business, Genzer Consulting. I primarily work with K12 schools on data analysis and predictive analytics, allowing schools to leverage their data to help kids learn. It's been a little eerie to use those engineering skills that have been residing dormant in my brain for so many years, but I am grateful to Teachers College Professor Ryan Baker and others for helping me along. I continue to visit CU whenever I am in the city and still do ARC interviews for CC/SEAS (now going on 10-plus years, I think). I'd love to connect with other CC/SEAS folks here in the Upper Valley, if there are any. In the heart of Dartmouth country, I wear my Columbia sweatshirt proudly. My daughter Sarah has her eye on Barnard's dance program, so maybe you will see her there for Class of 2024."

1995

20TH REUNION

To take an active role in your Class Reunion activities, please contact Beth Manchester at em2702@columbia.edu or 212-854-4472.

1996

Class Correspondent:
Enrico Marini Fichera
em75@columbia.edu

1997

Class Correspondent:
Kelly Lenz
kal23@columbia.edu

2000

15TH REUNION

To take an active role in your Class Reunion activities, please contact Beth Manchester at em2702@columbia.edu or 212-854-4472.

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

2001

Class Correspondent:
Catherine Marcinkevage
marcinkevage@gmail.com

Daniel Haders, his wife, Allison Haders, MD '01BC, and their two sons, Danny and Cole, welcomed a new addition to their family, Grant Patrick Haders, on October 22, 2014. Daniel is currently the cofounder and CEO of Sanar Biosciences, an emerging nanopharmaceutical company focused on the development of targeted nanotherapeutics for the oncology market.

2002

Class Correspondent:
John Morris
jpm53@columbia.edu

Saurabh Jain writes, "My wife, Seema, and I had our second son, Saarik, last March. My oldest, Aarav, just turned 3 in November. I am a partner at an investment firm called BHR Capital, based in New York. I am still playing lots of basketball and hope to see the Lions go all the way this year."

2003

Class Correspondent:
Amar Doshi
abd19@columbia.edu

Kelly (Lawson) Brancaleone MS'04, PE, is owner and principal engineer of the company she established, Brancaleone Engineering, LLC. The firm provides structural engineering consulting for residential and light commercial projects in the Greater Boston area. She resides in Gloucester, MA, with her husband, Jack, and two children, Janelle, age 5, and Jack, age 2.

2004

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

Eric Rhee writes, "Greetings Class of 2004! I've had the pleasure of catching up with several classmates who have all done such interesting things recently. According to Facebook, **Pia Ambardar** is now married and works for Amazon.com. Congrats Pia! Also, check out the ultimate collection of designer jewelry at Rocksbox.com, where **Jenn Chu** is now the VP of merchandising. Congratulations to **Jiwon Chung**, who got hitched to his wife, Sena, this past fall. Last but not least, a big shout out to **Brian Ballan**, who is growing his awesome condiment business, A&B American Style. The pepper sauce with garlic is my favorite."

2005

10TH REUNION

To take an active role in your Class Reunion activities, please contact Jonathan Whitford at jw3091@columbia.edu or 212-854-2317.

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

Alan Chia and **Eiffel Zhang** were married on September 9, 2014.

Christine Luu finished her federal clerkship for a district judge in Memphis, and just joined the intellectual property department of Kirkland & Ellis, focusing on patent litigation, specifically infringement of medical devices.

2006

Class Correspondent:
Nick Jennings
nfj2003@caa.columbia.edu

2007

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

2008

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

2009

Ricardo Saavedra MS'10 is founder of a Washington, DC–based tech company, Vizonomy, that is basically making the cost for developing climate risk assessments much cheaper. His start-up helps cities become aware of this risk in order to promote climate-resilient and sustainable development. If it's of interest, I could provide a summary. Thx!

2010

5TH REUNION

To take an active role in your Class Reunion activities, please contact Jonathan Whitford at jw3091@columbia.edu or 212-854-2317.

Class Correspondent:
Heather Lee
meheatherlee@gmail.com

Austin Brauser writes, "I'm still living in the Midlands of England and working for Zytek Automotive as a mechanical designer, where I specialize in developing prototype electric powertrains and motorsport hybrid systems. As far as my personal life goes, I have joined a baseball team over here, and I have also gotten into cycling and running over the past year."

After being dissatisfied with her post-grad job in the Greater Los Angeles area, **Alysha Chan MS'14** returned to Columbia for an MS in earth and environmental engineering, which she also studied as an undergrad. Alysha now resides in San Diego, CA, and works at the San Diego office of Tetra Tech. She is excited for

Left column, from top to bottom: Jonah, a sculpture by Milton Ohring BS'58, MS and DSc'64; Ta Li BS'69; a new novel by Brian Kenneth Swain BS'85, MS'87; Chris Kalish BS'87; Scott Genzer BS'93 and family. *Right column*: Daniel Haders BS'01 and family; Brian Ballan BS'04 (left) and partner; Alan Chia BS'05 and Eiffel Zhang BS'05; Erin Crafts BS'10 and Nicholas Tucker BS'08 engaged; Christine Luu BS'05.

the SEAS Class of 2010 Reunion in May and hopes to see many of her classmates!

Erin Crafts and **Nicholas Tucker** are engaged! Erin was recently licensed as a Professional Engineer, and Nick accepted a job with the Titan Aerospace division of Google.

Varun Gulati writes, "Friends, I'm writing from sunny California, which I've had the privilege of calling my home for the past two-and-a-half years. It's a fascinatingly different world out here in Silicon Valley. Every other person has a startup idea, and, if you play your cards right, you can make your idea into a reality. I am fortunate to have had the opportunity to do just that. I've cofounded an education technology company called UClass with two former Columbia roommates (what up, East Campus!), Zak Ringelstein '08CC and Chris Yim '10CC. I'm in a book club with a few Columbians here in San Francisco. We mostly read novels from the *New York Times* bestseller list, and occasionally we'll do 'hoity-toity' things like drink wine and eat charcuterie. Basically, it's just like Lit Hum all over again. If you're ever in the Bay Area, please say hello! Would love to grab a bite with you and chat about Columbia football, or whatever else it is that we're supposed to talk about!"

Edward Kim recently moved back to New York after spending four years in Boston, first as an energy market consultant and then at Harvard Business School. He remains a Yankees fan and looks forward to seeing everyone at the five-year Reunion in May.

Vickram Mohan writes, "I am living in London, working for the investment bank Evercore (absolutely nothing to do with chemical engineering!). I'm also involved with a few nonprofits and continue to be an avid runner, most recently in a local half-marathon. I am planning to move back to the U.S. in 2015 and hope to land up in NYC. A Columbia graduate degree in economics/finance may be in my future."

Brian Pan writes, "I continue to work at Galt and Company as a strategy consultant, where I have been since leaving Accenture strategy nearly three years ago. I am based in NYC but have been privileged to work on global projects, traveling extensively in Europe, the Middle East, and Africa. This past year, I visited more than a dozen countries and over 25 cities, getting to know Johannesburg and Istanbul the best. I hope to see some of you folks that left the Heights at our five-year Reunion!"

2011
Class Correspondent:
Justin Merced
jmm2238@columbia.edu

2012
Class Correspondents:
Rebecca Frauzem
rfrauzem@sbcglobal.net
Hannah Cui
hannah.cui@gmail.com

2013
Class Correspondent:
Mary Byers
mbyers2202@gmail.com

2014
Class Correspondent:
Victoria Nneji
vcn2101@columbia.edu

Save the Date!
Reunion:
May 28–May 31, 2015
Dean's Day:
May 30, 2015

PROGRAM NOTES: GRADUATE ALUMNI

CHEMICAL ENGINEERING

Chains-Sun Sunny Sea MS'76 writes that some of his happiest days were spent at Columbia University, at a time when he was young and full of the dream "to succeed and to love." Almost 40 years later, "my dream is not yet fulfilled, but I still have my Columbia dream in my blood and deep in my heart. I am still searching for my Columbia dream to come true. I have not had a chance to return to my Columbia campus, but I have carried its torch and its working spirit to such places as California, Taiwan, Thailand, Saudi Arabia, Korea, Okinawa, Japan, Tennessee, Oregon, Germany, Czech Republic, and Europe, and, at this moment, Discovery Bay near San Francisco. I do not think I am able to fulfill my Columbia dream until I enter the eternal paradise with my dear family and loved ones, surrounded by the heavenly angels, full bloom of flowers, and smiling sun-shining sky."

CIVIL ENGINEERING AND ENGINEERING MECHANICS

Jih-Jiang Chyu MS'73, EngScD'81 writes, "Prior to my graduation, I was working as a consulting engineer/project manager (with a P.E. license) both in the U.S. and in Europe (mainly in Western Germany) doing structural engineering projects. In 1978, I invented and developed the Plane Strain Analogy in the theory of elasticity, while participating in ASCE activities as an active member. Then, structural design (with construction) of buildings and bridges as well as college teaching in mathematics and structural engineering constitutes my 'integrated career' for decades. In the meantime, my research results in the fields of constitutive laws of materials, structural dynamics, general theory of elasticity, and wave propagation were published in various technical journals. As a result of all these, I became interested in the interconnected nature of many seemingly unrelated things and started promulgating, via publishing a technical book and presenting an ASCE technical lecture, the Method of Analogy, in addition to the promotion of interactions among engineering research, design, construction, and maintenance in the practical world of structural engineering, as well as the link between teaching and research aspects of engineering, and finally the interconnected characteristics between the theoretical and practical sectors of engineering.

"I have been doing this for the past 10 years and am still ardently involved in promoting the philosophy that 'open-mindedness induces innovation and reveals the interconnected nature of things (of interest).' The most recent book in this context was published last November, and I am doing the second volume of the same book title in the New Year."

After graduation, **Michael Milgram Cohen MS'13** started as an associate project manager for Group PMX LLC, providing owner's representative services for the new Medical & Graduate Education Building (MGEB) at the Columbia University Medical Center. The new construction comprises 107,000 gross square feet and plans to have 15 floors plus one floor below grade. The program for the building includes state-of-the-art assembly and classroom spaces, centralized student support services, and an advanced simulation center. Michael is part of the team responsible for serving as the liaison between the client, construction manager, consultants, and end users. In addition, he is responsible for the project controls; MEP 3D coordination; clean construction within the construction process; LEED certification; presentations; and the procurement of the medical and simulation equipment, low voltage cabling, furniture, signage, and audiovisual and security equipment. The building is scheduled to open in 2016.

Matt Scanlon MS'13 writes, "The Commonwealth of Virginia has recently approved my request to sit for the Civil PE exam, thanks primarily to the quality and rigor of my Columbia graduate engineering coursework. I'm thrilled about this professional opportunity and thankful for the CE department professors from whom I learned so much (Profs. Meyer, Smyth, and others)."

COMPUTER SCIENCE

Since completing work in artificial intelligence at Columbia, **John Akbari MS'86** has gone on to work with several early-stage software companies as a sales and go-to-market contributor. He writes, "Two IPOs and four acquisitions at TIBCO, ITRS, SeeBeyond, Zoologic, and counting!" John currently serves as chief business officer with 3Forge, a software start-up in Brooklyn. He helps enterprise customers apply software for cost reduction, margin growth, market share growth, and customer service improvement. He helps innovative vendors find early adopter customers, define initial use cases, and scale these into repeatable solutions.

Riddhi Mehta MS'13 started working at Microsoft as a program manager on Bing in March of 2013. In August 2014, Riddhi was promoted to program manager II. She was also invited to participate in a panel with 11 other recent college hires (one to three years at Microsoft) to talk with Microsoft CEO Satya Nadella to share their perspective on technology innovation, current work, and culture at Microsoft.

EARTH AND ENVIRONMENTAL ENGINEERING

Florian Purguette MS'14 is doing an internship at EGIS in Paris. He is studying the energy efficiency and environmental performances of buildings for several projects.

INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH

Geoffrey Akers MS'70 has started a financial services company that utilizes mathematical finance to optimize market returns in these volatile markets but utilizes mutual funds as its core.

Wael Ayache MS'12 writes, "After graduation, I joined Bank of America Merrill Lynch's 2-year Quantitative Management Associate program. I finished the program in March 2014 and joined Merrill Lynch Wealth Management as an assistant vice president with the Portfolio Construction & Investment Analytics team. I am also a CFA Level III candidate (Expected June 2015) and currently living in New York City."

Akshat Pathak MS'11, formerly a senior consultant in the Financial Services Office at Ernst & Young, has taken up a role as an assistant vice president of the internal consulting group at MUFG, Bank of Tokyo, in New York City.

Lingqing Zhang MS'13 is now an analyst at Vidrio Financial LLC.

MECHANICAL ENGINEERING

Sevgin Oktay MS'60 writes, "What started as a career in mechanical engineering with a BS degree in engineering science from Antioch College, followed by graduate school at Columbia Engineering under the guidance of wonderful professors such as Dudley Fuller, Ferdinand Freudenstein, Jerome Weiner, and Herbert Deresiewicz, prepared me well to delve into other fields of engineering and endeavors, including management, history, and politics. It has been a wonderful journey." Sevgin had a longstanding career at IBM that began in 1963 as a research staff member at the IBM Watson Research Laboratories. He held many technical, managerial, and senior engineering positions at IBM until his retirement in 1993. During his career at IBM, he published extensively in scientific and professional journals and books in the areas of heat transfer, microelectronics, and computer systems technology. He has more than 40 published inventions of which 13 are U.S. patents. He is an elected fellow of ASME as well as a life member of both ASME and IEEE. He cofounded the Society of Turkish American Architects, Engineers and Scientists, and served as its president in 1994. In retirement, Sevgin works in intellectual property protection and as a registered U.S. patent agent. He runs his own firm, Oktay Enterprises International, LLC. He enjoys flying to the extent that he has put his airplane to work in his job as a Flying Patent Agent to reach his clients more readily (www.flyingpatentagent.com), in addition to having provided volunteer work with Angel flight organizations in transporting people who are financially distressed and in need of time-critical but nonemergency medical attention (Sevgin earned his pilot's license in 1968). Sevgin and his wife have flown in their Turbo Skylane airplane from Poughkeepsie, NY, where they currently reside, to Alaska, Nova Scotia, and the Bahamas. He hopes to cross the Atlantic Ocean someday to visit his home country, Turkey. He writes, "For that, I am considering an amphibian airplane called SeaWind."

Recently **William T. Sha MS'60, EngScD'64** (Nuclear Engineering) authored a book, *Novel Porous Media Formulation for Multiphase Flow Conservation Equations*, published by Cambridge University Press in 2011, and a paperback edition in 2013. Last year he published a paper, "Recent Improvements on Novel Porous Media Formulation for Multiphase Flow Conservation Equations," in the *International Journal of Heat and Mass Transfer* 73 (2014): 859-874. He has developed a theoretically derived multiphase flow conservation equation for the first time. He writes, "This is a major milestone for conservation of mass, momentum, and energy equations for multiphase flow."

MINING ENGINEERING

Jean-Michel Rendu MS'68, EngScD'71 writes, "After more than 40 years in the mining industry, I am trying to retire while giving a few short courses at universities, writing technical books, and doing some consulting. Over the years, I had senior management roles in mining and consulting companies worldwide, wrote more than 50 technical papers, received multiple awards from the Society for Mining, Metallurgy, and Exploration, and was elected a member of the U.S. National Academy of Engineering (1997). I now live in Santa Fe, NM, where my wife and I are enjoying the nice weather, relaxed atmosphere, and the multiple art activities that the city offers. I had a very enjoyable and successful career, which I attribute a great extent to the exceptional education which Columbia University offers to its students."

Top Row, from left to right: **John Akbari MS'86**; **Riddhi Mehta MS'13** (third from left in blue top), pictured with Microsoft CEO Satya Nadella (center). *Bottom Row, from left to right*: **Wael Ayache MS'12**; **William T. Sha MS'60, EngScD'64**; **Jean-Michel Rendu MS'68, EngScD'71**.

IN MEMORIAM

ALUMNI

1932

Columbia Engineering lost a devoted alumnus and friend when **Bernard "Bernie" Queneau** '33CC passed away on December 7, 2014, at age 102. He was a distinguished metallurgist who began his remarkable career at Columbia and was a veritable font of insights into how far both the school and profession had come since 1928, when he first arrived on campus.

Bernie had Columbia Engineering in his genes. His father, Augustin L. Queneau (ME, Class of 1901), was himself a legendary metallurgist who received the 1960 Egleston Medal for developing processes for the recovery of nonferrous and rare metals; and his older brother, Paul E. Queneau AB'31, BS'32, ME'33, was also renowned in process metallurgy and was a longtime member of Dartmouth's engineering faculty, living to age 101.

Entering Columbia at just 16, Bernie was already seasoned beyond his years. In his capacity as an Eagle Scout, he'd been one of four selected to cross the country as an ambassador for highway safety, riding in a REO Speedwagon modified to look like a covered wagon. On campus, before Butler Library was built and when traffic still cut across 116th Street, he rose to become captain of the wrestling team (students were required to pursue a sport, he explained) and did his calculations on slide rules and cumbersome mechanical calculators.

After graduation, Bernie obtained a PhD from the University of Minnesota in 1936. He worked briefly at U.S. Steel's research lab before returning to Columbia in 1938 as an assistant professor. In 1941, he went on active duty in the U.S. Navy, rising to become commander in charge of the Armor and Projectile Lab in Dahlgren, VA. He returned to U.S. Steel after the war, serving as chief metallurgist at several mills around the United States before concluding his career in Pittsburgh, where he oversaw quality assurance.

Following his retirement in 1977, Bernie served as technical editor of the Iron & Steel Society's magazine, continued working as a consulting engineer, and completed his memoirs. He was a fellow of the American Society for Metals and, the day before he died, received the Boy Scouts of America's rare Distinguished Eagle Scout Award.

Bernie enthusiastically attended his 80th SEAS reunion in 2012, having some years earlier endowed the Bernard R. Queneau Fellowship for students in earth and environmental engineering. He will be remembered as much as a friend and mentor as for his many contributions to the field of metallurgy.

1947

Bernard Spitzer (MS, Civil Engineering and Engineering Mechanics), a civil engineer, real estate developer, and philanthropist, passed away on November 1, 2014, at the age of 90. A gifted student, Bernard graduated from high school at the age of 14 and went on to complete his bachelor's degree in civil engineering from CUNY. He joined the U.S. Navy and was posted to Bremen as a lieutenant junior grade in naval counterintelligence. He later earned his MS from Columbia and, shortly after graduation, he established Spitzer Engineering, working on a string of successful projects beginning in Riverdale and then expanding across New York City. His successful real estate developments included The Corinthian, a 55-story apartment building, which at the time it opened in 1988 was the largest apartment building in New York City; the historic Crown Building on Fifth Avenue; and an iconic 35-story apartment building at the corner of Central Park South and Seventh Avenue. Most recently, Spitzer Engineering acquired a retail condominium in SoHo and a development site in the Hudson Yards area. Bernard and his wife, Anne, established a family foundation, which endowed a new architecture and urban planning school at City College as well as the Hall of Human Origins at the American Museum of Natural History. They also funded stem cell research at Columbia University, Public Theater productions of Shakespeare in the Park, and many other philanthropic initiatives. According to his obituary in *The New York Times*, Bernard and his wife shared a passion for city life, classical music, tennis, skiing, and literature. He served on the boards of the Julliard School, the Museum of Jewish Heritage, the Michael J. Fox Foundation, and other organizations. He is survived by his wife; his sons, Eliot, the former Governor and Attorney General of New York State, and Daniel; his daughter, Emily; and seven grandchildren.

1948

Guido C. Dattaro, a loyal Columbian and former member of the Board of Managers of the Columbia Engineering Alumni Association, died on December 4, 2014, at age 89.

Born in New York City in 1925, Guido joined the U.S. Navy during World War II and served aboard the *USS Heyliger*

Esther and **Bernard "Bernie" Queneau BS'32, '33CC**

Vinod Kumar Vemuri BS'11 (page 55)

in the Pacific. Like many veterans of his generation, he came to Columbia after his discharge, and went on to study civil engineering as faculty like Hans Bleich, Jewel Garrelts, and Mario Salvadori were building the department's global renown.

After graduating in 1948, Guido became a professional engineer, working on numerous projects around New York City, including the Brooklyn Battery Tunnel and the Coney Island Aquarium. Later in his career, he served as building inspector for the Village of Tuckahoe and the Village of Scarsdale, retiring in 1996.

Guido is survived by four children and five grandchildren in addition to many friends and colleagues.

1950

John B. Cochrane died peacefully on January 6, 2015, at the age of 89. John was a World War II veteran, serving as an army staff sergeant in the 294th Field Artillery Observation Battalion in Germany until the Liberation and the end of the war. He worked for several companies during his career in manufacturing, including Davidson Rubber Company, which took him and his wife to Georgia and Tennessee before retiring to Wolfeboro, NH, in 1987. He is survived by Mary Lou, his wife of 63 years; his children, Meg and Mark; and three grandchildren.

1952

Alexander (Alec) Feiner (MS, Electrical Engineering) passed away on August 30, 2014, of Parkinson's disease. For the first two decades of his life, in Europe, Alec lived through World War II. He experienced dislocation and deprivation in Poland and northern Russia where his father died in a labor camp. He lost three years of schooling and experienced child labor in a factory. He came to the U.S. in 1950 with his mother and brother, which was when he obtained his master's degree from Columbia Engineering. In 1952, he was recruited by Bell Laboratories where he built a successful career for the next 40 years. He held 47 patents in telephony ranging from the small ferreed switch, seminal to telephony in the 1960s and 1970s, to large communications systems for industry, commerce, and the military. Alec was elected a fellow of the National Academy of Engineering in 1983, and was the recipient of the International Society of Electrical and Electronic Engineers (IEEE) Engineering Excellence Award in 1991. He is survived by Helen Feiner, his wife of 45 years; his children; and seven grandchildren.

1957

Donald J. Peragallo '56CC passed away on November 19, 2014, in Bethlehem, PA. He was 80. After graduating from Columbia Engineering in 1957 with a degree in industrial engineering, Donald spent two years in the military stationed in Huntsville, AL, working on the Redstone rocket program (the first U.S. ballistic missile). He worked under the leadership of Dr. Wernher Von Braun, considered one of the "fathers of rocket science." After his service, he joined Bethlehem Steel where he held various positions in the information services department until his retirement 28 years later. He is survived by his wife of 55 years, Donna Boyd Peragallo; his son, Jeffrey; grandchildren; a sister; nephews; and nieces.

1960

Arthur Irving Newman (MS'65, Industrial Engineering and Operations Research) passed away at the age of 76 on September 21, 2014, in Houston. Raised in the South Bronx and Jackson Heights, Arthur attended Stuyvesant High School in Manhattan, and in addition to his Columbia Engineering degrees, he obtained a BA from Columbia College in 1959. At Columbia, he played the clarinet in the Columbia marching band. From 1960 to 1962, Arthur was a lieutenant onboard the *USS Monticello* in the Pacific. After the U.S. Navy, he began his career with Western Electric and Lever Brothers in New York City. A few years after starting a family, Arthur and his wife, Bobbie, moved to Houston in 1974 where he founded his own executive search firm, Arthur Newman & Associates. After two decades, his firm was acquired by Lamalie Amrop International where he continued as head of their worldwide energy practice. He is survived by his loving wife of 47 years, Bobbie Wadler Newman; sons, Stephen and Douglas, and their wives; and four grandchildren.

1961

Constantine T. Tsitsera (MS, Electrical Engineering, EngScD'65) passed away on September 18, 2014, in New York, NY. Constantine earned a BS degree in electrical engineering from MIT and, following service in the military during the Korean War, earned his master's and EngScD in electrical engineering from Columbia Engineering. Born of Greek immigrants, Constantine began his career at the Newport News Shipyard, and later had a long and distinguished career with IBM. He was a generous supporter of the arts, education, and medical research. He is survived by his wife of 60 years, Litsa, his four sisters, his brother-in-law, and many nieces and nephews.

Bruce M. Gordon passed away on November 1, 2014, in Carmel, CA. Bruce worked for Chevron for 38 years and enjoyed a successful career there, including heading Chevron's interests in the Northwest Shelf Gas Project—the largest natural gas project at the time and the largest single resource development in Australian history. In his professional life, he traveled extensively and spent significant time in Australia, Asia, and the Middle East. In retirement, he was very active in his community as a whole and with his family. He is survived by his son, Scott; daughter, Kirsten; son-in-law, Alan; three grandchildren; and longtime love, Marilyn Post.

1966

Entrepreneur, teacher, philanthropist, and devoted Columbian **Gary F. Jonas** passed away unexpectedly on September 26, 2014, at age 69.

Born in Queens in 1945, Gary was quick to make his name at Columbia. In addition to stellar academics, he was a talented fencer and served in student government, rising to become copresident of his class. In 1966, he received the Charles Kandel Medal for his tireless devotion to Columbia Engineering.

Gary went on to earn his MBA from Harvard Business School and settle in the Washington DC area for an accomplished and remarkably varied career.

For 20 years he worked with consulting firms supporting numerous federal and state antipoverty programs. Then, he took on an array of other challenges: president and CEO of University Research Corporation, president and COO of the advertising agency Earle Palmer Brown, cofounder and CEO of 20/20 Laser Centers (now known as TLC Laser Eye Centers), the first managing partner of Venture Philanthropy Partners, and president and CEO of Strategic Planning Advisors. He taught an

entrepreneurship course at the Johns Hopkins Carey Business School and cofounded the Lever Fund, a not-for-profit that helps disadvantaged people in the capital region out of poverty.

Throughout his life Gary remained a proud member of the Columbia Engineering family. In 2001, with his classmate Jonathan Isaacs BS'66, MS'67, Gary endowed the Isaacs-Jonas Memorial Scholarship, an undergraduate scholarship for rising entrepreneurs at the School. He also supported a series of Isaacs-Jonas Lectures in Entrepreneurship at the School. Columbia Blue was his favorite color, and Gary proudly served as a hood marshal during graduation ceremonies in 1991.

He is survived by his wife of 41 years, Rosalyn Levy Jonas, and two daughters. His warmth, generosity, and good works will long be remembered at Columbia Engineering and beyond.

1981

Pierre T. Kabamba (PhD, Mechanical Engineering) passed away on September 20, 2014, in Ann Arbor, MI. Born in the Democratic Republic of Congo, Pierre graduated summa cum laude from the Université Catholique de Louvain, Belgium, in 1977, before moving to the U.S. to earn his doctorate from Columbia Engineering. In 1983, he joined the University of Michigan's Department of Aerospace Engineering as a professor. A distinguished control engineer, Pierre authored more than 100 journal papers, was a fellow of IEEE, served as associate editor for *Mathematical Modeling of Systems and Mathematical Problems in Engineering*, and served as a program committee member for several American Control Conferences. His teaching awards include the Aerospace Engineering Department Teaching Award (1994) and the Silver Shaft Award for Undergraduate Teaching (2002). He was an accomplished musician who played the guitar and the piano, and became a prolific composer of Christian and gospel music. He is survived by his wife, Josephine Kasa-Vubu, and three children.

2006

Kathryn Vanessa Lundberg passed away unexpectedly on September 1, 2013. She was 30. Kathryn, known as Kate, was born in Seattle and attended Epiphany School (Seattle) and Forest Ridge School of the Sacred Heart (Bellevue). At Columbia Engineering, she studied earth and environmental engineering. After graduation, she worked in San Francisco as a consulting engineer on water quality issues. Kate returned to her hometown of Seattle in April 2013 to be near family. She is survived by her parents, Larry and Lauren Lundberg; her brother, Michael; her sister and brother-in-law, Nicole and Sean McCormick; and her extended family.

2011

Vinod Kumar Vemuri passed away on December 30, 2014, in New York City. Vinod was born in Columbus, OH, and grew up in Murrysville, PA. He ventured to New York City in 2007 to attend school, and he immediately found his niche within the Columbia community. Freshman year, he joined the Hindu Students Organization and Columbia Raas Dance Troupe. One could frequently find him scrambling to finish his problem sets on the Lerner ramps just before he rushed off to catch up with friends on the Low steps or attend dance practice. On the weekends, Vinod explored other parts of the city, always returning home with a lengthy adventure to retell.

Vinod excelled at SEAS in applied mathematics. He cofounded the a cappella group CU Sur. Perhaps his most meaningful experience at Columbia was as Columbia Raas captain his senior year. Anyone who knew Vinod at Columbia would be able to hear his booming voice and infectious laugh from any corner on campus, and they would rush to hear about his latest adventure.

After graduation, Vinod joined Novantas, Inc., a financial services firm. He developed a solid reputation as one of the likable and talented young associates. In his spare time, Vinod enjoyed traveling, often to visit his parents and dog, Chester, in Murrysville. While Vinod believed he was developing into a foodie, he covered nearly everything he ate in hot sauce and pepper. His stories were long and animated, but he could hold a crowd's attention for hours. At Columbia, he took fashion advice from no one, and he frequently braved the bitter winter in flip-flops and shorts. Fortunately, he developed a more tasteful style upon entering the work force, but still maintained that December wasn't cold enough for a coat.

These descriptions do not relay even a fraction of the person Vinod was, because he is best embodied through the hearts he conquered. He turned strangers into friends, and he had a rare spirit of enthusiasm and excitement for life. While Vinod continues to live through the people he touched during his incredibly short time, he will forever be missed. The person the world has lost was more than just a good friend and son. He was truly our companion.
—Puja Dave '10BC

OTHER DEATHS REPORTED

We also have learned of the passing of the following alumni:

Antoine F. Gagne BS'40, MS'43, '40CC
Carl J. Scheiner BS'42
Edward A. Fox BS'43, PhD'58
Donald Kerr BS'43, PhD'47
Paul V. Dalley BS'45
Alexander D. Kline BS'46
Edward P. Reid BS'46
Milton L. Wolfson MS'47
Howard E. Brooks BS'48
John G. Busharis BS'48
Franklin G. Hastings BS'48, MS'50
Raymond J. Rice BS'48, '48CC
Carl Fechtman BS'50
Alvin V. Filer Jr. BS'50, EngScD'51
Charles W. Hendershott BS'50, '52BUS
Spencer B. Smith MS'50, EngScD'58
Samuel Rock Jr. BS'51, MS'54
Emanuel S. Diamant BS'52
Hans K. Landesman BS'53, '56GSAS
Thomas H. Ford MS'54
Herbert Groginsky MS'54
Leroy C. Jacox Jr. MS'54
John D. Cerruti MS'60
Donald L. Beckman MS'61
Stephen B. Brown BS'61, '60CC
Elliot M. Olstein BS'61, '60CC
Andre J. Eydt PhD'66
Ling Mei BS'67, MS'74, '68GSAS
Charles F. Vachris MS'68
Anthony A. Karkosza MS'69
Abraham Friedberg BS'71
Donald R. Bloomfield BS'73, '72CC
James L. DeRosa BS'73, MS'76
John L. Varanelli MS'75
Pedro I. Lopez-Hurtado MS'77
Peter Lewis Bretz BS'86, MS'89, '85CC
Stephen G. Mauldin BS'92

ASTRONAUTS

TOUCH DOWN AT COLUMBIA ENGINEERING

Five astronauts touched down in Morningside Heights this past fall, sharing unforgettable memories of their mission aboard the Space Shuttle Atlantis to upgrade and repair the Hubble Space Telescope.

Michael J. Massimino BS'84, a professor of professional practice in mechanical engineering, and four fellow astronauts from STS-125, the record-setting final Hubble Space Telescope Servicing Mission, convened on November 13 at Columbia's Rennert Hall for a special look back at their incredible journey as Columbia Engineering marked 150 years and the Hubble nears its 25th birthday in space.

In May 2009, the astronauts blasted into orbit to rendezvous with the Hubble and execute a series of painstaking adjustments and installations in five space walks spanning an unprecedented 36 hours and 56 minutes. The refurbished Hubble, still going strong, now includes four new or enhanced scientific instruments, replacement batteries, new gyroscopes, and a new computer.

Massimino introduced his cosmic colleagues, Captain Scott "Scooter" Altman; mission specialist Michael T. Good; pilot Gregory C. Johnson; and flight engineer/robotics expert Megan McArthur. They presented a film compiling key moments from their journey, reflected on the roles they played in achieving all mission objectives, and took questions from the capacity crowd of students, faculty, and scientists.

Recalling feeling profoundly moved by the breathtaking view of Earth roughly 347 miles below, and the intimate camaraderie the crew developed together, Massimino encouraged students not to let earthly bounds limit their ambitions.

"I made more memories in one week than in years doing anything else," he said. "Follow your bliss."

By Jesse Adams

Top, from left to right: Michael J. Massimino BS'84, Michael T. Good, Dean Mary C. Boyce, Megan McArthur, Gregory C. Johnson, and Scott "Scooter" Altman. *Bottom row, far left:* More than 300 attendees packed Rennert Hall to hear the astronauts talk about the final mission in 2009 to repair the Hubble Space Telescope; *far right*: Michael J. Massimino. (Photos by Timothy Lee Photographers)

Opposite page: Steven Chulik (Photo courtesy of Mr. Chulik)

GIVING BACK

STEVEN CHULIK BS'89

Steven Chulik has always had an eye for a good investment. As a key portfolio manager at Morgan Stanley and at Redstone, a firm he cofounded, Chulik has analyzed more than 1,000 companies and 500 initial public offerings, focusing on technology, health care, industrials, and energy.

"When I was 16, I decided that I wanted to be a space engineer: I wanted to design spacecraft and rockets," he says. "Columbia helped focus my intellect and transform me into a rigorous problem solver." Chulik received his BS in mechanical engineering in 1989, earning honors with distinction.

"In March of my senior year, I was offered a job in General Electric's engineering management training program focusing on spacecraft design. Simply put, the Columbia Engineering experience enabled me to fulfill my career dreams."

Chulik spent five years in the General Electric/Lockheed Martin design and engineering groups, where he worked on satellite design. When he was 25, he changed his mind. "I decided I wanted to be a professional investor," he says. "The confidence I developed from the Columbia Engineering education, with the assistance of the Columbia pedigree, enabled me to talk my way into an investing job and eventually into a top business school. In fact, it was a Columbia Engineering classmate that helped me get my foot in the door at that first finance job."

He earned his MBA from The Wharton School in 1997. After a stint as a hedge fund analyst at IBJ Schroeder, he joined Morgan Stanley, becoming co-portfolio manager for the Small and Mid-Cap Growth investment team, which managed $8 billion.

"Columbia SEAS has consistently delivered throughout my career," he says.

In 2002, Chulik cofounded Redstone Investment Management with fellow Morgan Stanley veteran Arden Armstrong. He was a partner and co-portfolio manager at Redstone, a long-short small and mid-capitalization focused growth hedge fund; the firm started with $6 million and peaked at $850 million in assets. Now retired from Redstone, Chulik is a private investor, running a family business that invests in public, private, and start-up companies.

A consistent and loyal donor to the School, he serves on both its Entrepreneurship Advisory Board and Engineering Development Council. In 2013, Chulik and his wife, Michele, made another bold investment. Their leadership gift—on the occasion of his 25th Columbia Engineering reunion—helped enable the Columbia Engineering Internship Fund to more than quintuple its size, funding 21 students during the summer of 2014. The Internship Fund is a new program that offsets housing and living expenses for students on financial aid who have secured low-paying or unpaid summer internships.

"Summer internships are paramount to a student finding fulfilling full-time employment. The student gets invaluable work experience and they get to 'kick the tires' on a career path," he says. "Many of the best opportunities are unpaid and therefore not pursued by students on financial aid. This program is intended to even the playing field and ensure all students have the opportunity to gain valuable work experience regardless of their financial situation."

By Timothy P. Cross

COLUMBIA | ENGINEERING
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