INSIDE THIS ISSUE: GROUNDBREAKING RESEARCH FROM OUR ENGINEERS, THEN AND NOW

Columbia Engineering

1864–2014

CELEBRATING 150 YEARS OF EXCELLENCE IN EDUCATION, RESEARCH, AND INNOVATION
Welcome to the first of two special issues of Columbia Engineering magazine in honor of the 150th anniversary of the School’s founding. I’ve written previously in these pages about what I see as a Renaissance period for engineering and applied science in the world today—a coming-together of creativity, invention, and entrepreneurship that is bringing solutions that shape our world for the better. As we now celebrate our 150th year, we reflect on our history of excellence in pushing disciplinary frontiers and solving engineering grand challenges while, at the same time, preparing the next generation of engineers and applied scientists to assume the mantle of leadership.

We launched our sesquicentennial celebration in February, coinciding with Engineers Week. Launch Week featured a number of events, including a magnificent light display on Low Library! You can read more about the launch events in this issue and learn about upcoming events in the coming months that continue our festivities, culminating with a special symposium in November.

As part of our observance, we were pleased to have a history of our School, A Lever Long Enough, written by Robert McCaughey, professor of history at Barnard College. I was privileged to have been asked to write the Foreword for this book—a reprint is provided in this issue. It is impossible to fully describe the depth and breadth of the remarkable story of technical achievements and people in a brief Foreword, but I hope to have captured the spirit and the essence of who we are and where we are headed. I believe you will find that Columbia Engineering has been the home for imaginative, innovative, and interdisciplinary thinking (and doing) since its very inception. We have much to be proud of and much to celebrate!

The research feature of this issue also focuses on our past and our future—highlighting a few of our many pioneering faculty and alumni whose work exemplifies a legacy of creative thinking that cuts across the decades. It also echoes the theme of our upcoming November symposium, which pairs the research of Columbians, past and present, to show how each researcher extended the scope and reach of a discipline, solving societal problems of the day, and creating new avenues of innovation.

I invite you to visit and participate in our new 150th anniversary website, seas150.columbia.edu. There, you can learn more about the accomplishments of the Columbia engineers and applied scientists who have shaped our past, present, and future. Scroll through our in-depth timeline, see video interviews from alumni, view time capsules created by Irving P. Herman, professor of applied physics, and keep abreast of special anniversary events. I especially hope you think about your time at Columbia and upload your own special memory of a class, a professor, a classmate, a lab, a research project, a discovery, or perhaps a dorm, a club, or an athletic event! To share your recollections, go to seas150.columbia.edu/memories.

I look forward to seeing you on campus during Reunion Weekend (May 29–June 1) as we continue our celebration of 150 years of excellence in education, research, and innovation.

Mary Cunningham Boyce
Dean of Engineering
Morris A. and Alma Schapiro Professor
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*A RICH HERITAGE, MORE THAN 150 YEARS IN THE MAKING*

Dean Mary C. Boyce’s foreword to *A Lever Long Enough*, written by Robert McCaughey of Barnard College
To kick off the School’s 150th anniversary, Low Memorial Library was illuminated with this special light display the week of February 16.
Columbia Engineering has reached a major milestone. This year marks the 150th anniversary of the School’s founding and an opportune time to reflect on its past achievements, honor pioneering faculty and outstanding students and alumni, but also to celebrate the exciting future ahead.

For Whitney Green BS’10, reflecting on the School’s 150-year history gives her a chance to consider her own personal ties to the School and overall experience. “I get to really think about the incredible community I am a part of,” says Whitney, president of Columbia Engineering Young Alumni (CEYA), who attended the School’s official anniversary launch in February and was a guest speaker at the kickoff dinner. “I think about what makes Columbia Engineering so special and how its educational philosophy puts all of us in a unique position to do incredible things in this world. For example, what makes us in awe of the technical accomplishments today are not just their advanced sophistication but more so their ability to impact and influence people, societies, and human lives.”

Columbia’s School of Mines, as it was originally called, opened its doors on November 15, 1864, to 20 students and a faculty of three. The School of Mines educated
students in mining, mineralogy, and engineering. Before long some of its earliest alumni and faculty began to make significant contributions to the School’s 150-year history. Alumni and faculty like William Barclays Parson, Class of 1882, who engineered New York City’s first subway; Michael I. Pupin, a longtime faculty member, who invented rapid X-ray imaging and made major improvements to long-distance telephony; and Edwin Howard Armstrong, Class of 1913, who pioneered FM radio. Now, Columbia Engineering, with 175 faculty members, is educating more than 4,300 undergraduate and graduate students in disciplines ranging from data science to tissue engineering and nanoscience to urban sustainability. Indeed, the School has come a long way.

“I hope many alumni will take this opportunity to renew and reinvigorate their connection to the Engineering School.” —Hitoshi Tanaka BS’63, MS’65, EngScD’76

in disciplines ranging from data science to tissue engineering and nanoscience to urban sustainability. Indeed, the School has come a long way.

“It was no ordinary accomplishment for the founding fathers of the Engineering School to have foreseen the importance of engineering to the future of America, and for the School to stay true to its mission and expand on it for such a long time,” says devoted alumnus Hitoshi Tanaka BS’63, MS’65, EngScD’76, president of the Columbia Engineering Alumni Association. “I am so proud to be part of this rich tradition and will do whatever I can to perpetuate the same.”

The School has an exciting year planned for its anniversary, with more than 30 events for faculty, students, and alumni, including a special Senior Design Day Expo on May 8 to showcase the creative and innovative work of Engineering students; Reunion Weekend, from May 29 through June 1 (Save the date!); a symposium in the fall that will focus on past innovative research by faculty and students through today’s major research findings; a Founders Day Gala to be held at the Cathedral of St. John the Divine; and many more.

“I plan to celebrate all year,” says Whitney, who hopes her fellow alums will join in on the fun. “This year, the CEYA board has made the 150th our theme for the 2014 Blue & White Gala, our signature event to celebrate our alma mater! However, I plan to attend as many events as I can from February’s launch week to November’s gala. I’m looking forward to being a part of this monumental occasion.”

Lauren Wong Sheng BS’76 also plans to attend anniversary events, to honor a school, she says, that, among other ground-
Columbia Engineering granted the first PhD degree in mathematics to a woman, Winifred Edgerton, Class of 1886. “Now, the School has one of the nation’s highest percentages of women in its first-year class,” Lauren notes. One of the main reasons Lauren, who chairs the School’s Board of Visitors, remains connected to the School is to do her part in supporting future engineers.

“Engineering alumni before me paid forward the opportunity for me and others to attend Columbia to get a life-changing education,” she says. “I’ve remained involved to do the same in enabling those students after me to benefit from similar opportunities.”

Echoing this sentiment, Whitney says, “It is important for me not to waste this opportunity to do great things in this world. Even more, it is important to me to make sure I do the same for Columbians that follow me. I volunteer my time to the School to show how much I appreciate what it has given me. And, I am content engaging with this ever-vibrant and awe-inspiring community.”

By Melanie A. Farmer
A close look at one of Professor Elizabeth Hillman’s advanced \textit{in-vivo} microscopy tools used to study the living brain. This heat sink lets mirrors move 4,500 times a second, allowing Hillman and her research team to capture brain function in real time.
Columbia Engineering’s 150-year tradition of excellence and leadership in education, research, and innovation has never been stronger and more relevant. Through the years, the School’s faculty, students, and alumni have made their marks in discovery and innovation, providing path-breaking solutions in virtually every key sector and tackling many of society’s most pressing challenges.

“Our faculty has made significant, life-changing contributions to improve our human condition through every generation of our School’s 150-year history,” says Mary C. Boyce, dean of the Engineering School. “While we celebrate our present-day achievements and future trajectory, we also recognize with pride our past triumphs and their far-reaching effects on today’s world. We have come so far, and much of it is due to the scientific discovery and engineering feats realized by our faculty, students, and alumni—advancement in fields once unimaginable.”

Here, Columbia Engineering magazine spotlights a few of those exciting fields of engineering research—from the disciplinary frontiers of nanoscience and data science to the grand challenges of the urban environment, sustainability, and personalized medicine—and featuring past and present pioneers and their discoveries in these areas. From Michael Pupin’s groundbreaking development of rapid X-ray imaging in the late 19th century to Professor Elizabeth Hillman’s novel live brain-imaging systems, these innovative leaders are but a few examples of inspiring faculty at the School whose work is advancing their fields in unprecedented ways.
Elizabeth Hillman develops advanced in-vivo microscopy tools to study the living brain. She describes optical components as "very expensive Lego," which when put together, properly make breathtaking images.
Elizabeth Hillman is developing cutting-edge research technologies to capture live images of the living brain using light to determine how the brain works and, in particular, how it regulates its blood flow.

Hillman’s fascination with medical imaging stems from childhood; she grew up doing gymnastics and experienced a number of injuries that led to doctor exams, medical imaging, and physical therapy sessions. The experience of having an MRI of her back during her teens and seeing herself “from the inside out” left her captivated.

“Around this time, I discovered there was this thing called medical physics,” says Hillman, associate professor of biomedical engineering. “This was the perfect combination … using my skills in engineering and physics to have an influence on medicine. Pursuing my fascination with imaging and image formation is what got me here.”

By “here,” Hillman means concentrating on building new tools for brain imaging and performing neurovascular-coupling research in her lab. Hillman, who also has a joint appointment in Radiology, has received a multitude of honors and awards for her work in neuroscience and optics, and her investigations into neurovascular coupling—the relationship between local neural activity and subsequent changes in cerebral blood flow—are creating a lot of positive noise in research and medical communities.

“I’ve been developing my imaging and microscopy tools to let me study that interrelationship between neural activity and blood flow, trying to understand the mechanisms that govern the brain’s blood flow. This is really hard to study in the intact brain, so we need a lot of engineering to help us see deeper, faster, and at higher resolution,” she explains. “Quite recently we happened upon a new hypothesis that we think is a major component of blood flow regulation in the brain. Neuroscience over the years has focused so intently on neurons, they have barely noticed how important the blood vessels are.”

She explains that her work defining these new cellular mechanisms coupling neuronal activity to blood flow modulation, along with recent results exploring development of the newborn brain, and imaging the brains of patients during brain surgery has revealed how important regulation of blood flow is for brain health.

“Almost nobody has looked at the fact that the brain needs a lot of energy and considered how management of this energy could influence brain function and long-term brain health. Our research suggests there may be ways to look at brain disorders that go beyond looking...”

Sidebar, top: Professor Michael Pupin, circa the 1920s, when he published his Pulitzer Prize–winning autobiography, *From Immigrant to Inventor*; bottom: Early X-ray maps buckshot in the hand of an injured patient. (Photos courtesy of Columbia University Archives)

“Almost nobody has looked at the fact that the brain needs a lot of energy and considered how management of this energy could influence brain function and long-term brain health. We are starting to look at Alzheimer’s disease, dementia, and even developmental disorders in a new way.”

Michael I. Pupin (1858–1935), an 1883 Columbia College alumnus who returned to Columbia after graduation, served on the faculty for more than 40 years. During his tenure at the University, he taught mathematical physics and was one of the first faculty members to comprise the Engineering School’s newly created Department of Electrical Engineering. He taught many of Columbia Engineering’s great inventors, including Edwin Howard Armstrong (Class of 1913), maker of FM radio, and Irving Langmuir (Class of 1903), the pioneering surface chemist who was awarded the Nobel in 1932. Pupin’s pioneering experiments with X-rays and fluorescent screens made it possible to produce X-ray [continued on the next page]
MICHAEL I. PUPIN

[continued from page 11] images after only a few seconds. His 1896 discovery came on the heels of Wilhelm Roentgen, who is credited with developing X-rays that produced an image after several hours of exposure. The first use of the Pupin method, which utilized a fluorescent sheet supplied by Thomas Edison, was medical: he helped a surgeon determine where buckshot was imbedded in a patient’s hand.

Pupin received 34 patents for his inventions and won the Pulitzer Prize in 1924 for his autobiography, From Immigrant to Inventor, which tells the inspiring story of his upbringing in rural Serbia to his stature as one of the greatest American scientists of the early twentieth century. In addition to rapid X-ray imaging, he developed sonar technology and made revolutionary improvements to telegraphy and long-distance telephony. He was elected to the National Academy of Sciences in 1904.

At the Engineering School, Pupin helped lay the foundation for the Electrical Engineering Department, which continues to thrive and produce pioneering research and outstanding future engineers. Current faculty, researchers, and students have made important contributions in core areas, from communications and networking, signal processing, and digital and analog integrated circuits to electromagnetics and plasma physics, and photonics. In 1958, to mark the centenary of Pupin’s birth, the School established the Pupin Medal, given periodically to recognize service to the nation in engineering, science, or technology.

3D rendering of astrocytes and blood vessels in the living brain, imaged using Hillman’s home-built in-vivo two-photon microscopy system

3D rendering of astrocytes and blood vessels in the living brain; Hillman studies the way that cells in the brain interact with blood vessels to regulate local blood flow.

Hillman has been interested in brain blood flow, and imaging it, since she was an undergraduate at University College London. Her senior project involved using near-infrared spectroscopy to measure changes in blood flow in her own brain. During her PhD studies, she developed a more complex 3D optical imaging system to measure blood oxygenation in the brains of premature babies.

Hillman says that her recent return to studying early brain development was partially influenced by watching at neurons. We are starting to look at Alzheimer’s disease, dementia, and even developmental disorders in a new way,” Hillman says.

Hillman says that her recent return to studying early brain development was partially influenced by watching
Hillman says that her recent return to studying early brain development was partially influenced by watching the development of her two young sons. She was surprised to find so few brain imaging studies performed on children under the age of five.

“As a mother, I can completely understand how challenging it is to get young children to participate in research studies,” Hillman says. “However, I am just so in awe of the intense development that the brain goes through in these early years; it’s the period in which the brain learns basically every single thing that it does.”

As a result, Hillman recently started a project to develop new child-friendly brain imaging technologies that might make it possible to capture information about brain function and development while children play. Her goal is to better understand the brain during this critical period when autism, ADHD, and other developmental disorders are emerging, in the hope of providing new insights into diagnostics, monitoring therapy, and perhaps even the underlying basis of these and other conditions.

Hillman expects that her discoveries will soon start to change the way that doctors think about brain disorders and treating them in humans.

By Janet Haney
Before there was the Weather Channel, there was Rudolf Kálmán, a Columbia Engineering alumnus whose mathematical Kalman filtering method has been widely used in modern weather forecasting. To help reduce uncertainty, weather forecasters can apply the Kalman filter, an algorithm that takes past observations and combines them with prediction models to make optimal estimates of the current state. In addition to weather forecasting, applied mathematicians have used the mathematical technique in guidance and navigation systems of space missions and in digital computers of control systems.

Michael Tippett, a lecturer in discipline of applied [continued on page 16]
ADAM SOBEL
SUSTAINABILITY
EXTREME WEATHERMAN

It might be an insult to claim someone has his head in the clouds; for Adam Sobel, professor of applied physics and applied mathematics, it defines his scientific passion.

“The dynamics of climate and weather continually raises new questions,” says Sobel, who has a joint appointment in Earth and Environmental Sciences. “A key problem is understanding how deep, precipitating cumulus clouds interact with the larger-scale fluid dynamics of the atmosphere.”

Nowhere are clouds more important than in the tropics, where they move heat and moisture around. That’s where Sobel has concentrated his research on the dynamics of climate and weather.

“The atmosphere behaves differently in the tropics than in the extratropics and is less well understood. Short-term weather forecasts are less accurate in the tropics, and many of the largest uncertainties in our simulations of global climate are related to gaps in our understanding of tropical atmospheric processes,” he says.

Although weather and climate can be monitored by satellite and simulated on computers, Sobel likes to experience the phenomena he studies at ground level.
“Although it is exciting to travel far to see weather, the most powerful experiences were those I had during Hurricanes Irene and—especially—Sandy, right at home in New York City. They were not just objects of scientific study but major historical events that I lived through here, along with many millions of others.”

He intentionally timed a trip to Darwin, Australia, to experience an 18-inch rainfall over 10 days from the Madden-Julian oscillation, a giant disturbance to Earth’s tropical monsoon systems. Also in Australia, he drove through a thunderstorm that occurred right on top of a dust storm, resulting in a remarkable muddy downpour.

“Although it is exciting to travel far to see weather, the most powerful experiences were those I had during Hurricanes Irene and—especially—Sandy, right at home in New York City in the last couple of years,” he says. “Besides these events being fascinating scientifically, the fact that they happened where I live made me experience them in a different way than I would have elsewhere. They were not just objects of scientific study but major historical events that I lived through here, along with many millions of others.”

Inspired by the opportunity for breakthrough science and his love of warm weather, Sobel dedicated himself to the study of tropical dynamics after completing his PhD at MIT, for which he studied the stratospheric polar vortex.

“I’ve stuck with the tropics and haven’t looked back, although in recent years I have started to get back into some higher-
latitude problems,” he says. “Although I am a theorist and modeler and don’t need to go to the tropics often to do my work, my focus on that part of Earth does mean that I get to go there from time to time.”

Sobel has recently been awarded a $342,500 (€250,000), two-year AXA Award to investigate extreme weather and climate change. One aspect of his work will consider a theoretical approach to understanding how cumulus clouds interact with large-scale circulations both inside and outside the tropics.

“Such events involve large disturbances of the jet stream that evolve on the planetary scale but also individual clouds, which are much, much smaller than those jet stream disturbances,” he explains. “We need to understand how these things influence each other in more detail, and by doing so, I think we can understand some aspects of extreme precipitation events, such as the Pakistan flood of 2010, that have not been understood before.”

The grant will also fund his research into how the probabilities of extreme events change in somewhat coherent ways around the globe—as in when an El Niño occurs and the likelihood of hurricanes increases in some parts of the world and decreases in others.

“Understanding these patterns better will have implications for any applications with a global view, like reinsurance, or perhaps international disaster relief,” he says.

Sobel hopes these new projects will help him establish a Center on Extreme Weather and Climate at Columbia, with broad participation from scientists at the Engineering School, the School of International and Public Affairs, the University’s Lamont-Doherty Earth Observatory, and NASA’s Goddard Institute for Space Studies.

“I envision this Center to focus on understanding the risks to human society from all types of extreme weather events—hurricanes, tornados, floods, droughts, and heat waves—and how those are related to the climate in which they occur, accounting for both natural climate variability and human-induced climate change,” he says.

By Amy Biemiller

Nowhere are clouds more important than in the tropics, where they move heat and moisture around. That’s where Adam Sobel has concentrated his research on the dynamics of climate and weather.
Just as a watchmaker is enamored with the beauty of the miniature cogs and wheels that make a timepiece work, Simon Billinge, professor of materials science and of applied physics and applied mathematics, is equally enraptured by the minuscule world of nanoparticles. By learning how these ultrafine particles between 1 and 100 nanometers in size behave within nanomaterials measured in billionths of a meter, Billinge hopes to optimize their performance and utility in biomedical, optical, and electronic applications.

In order to see inside nanomaterials and learn how nanoparticles evolve, Billinge and a team of researchers at Columbia Engineering, the U.S. Department of Energy’s Brookhaven National Laboratory, the European Synchrotron Radiation Facility, and the University of Manchester combined computed tomography with X-ray atomic pair distribution functions to create a novel dual-imaging method that allows scientists to peer inside objects and view nanoparticles at work. By combining the two imaging methods, nanostructure signals can be separated from different parts of a material, giving scientists a view of how the atoms are working, without dismantling the object.

“We were really excited when this imaging method worked and immediately recognized it could have a transformative impact on the study of materials,” Billinge says. “Now we are excited to apply it to many different systems and to watch materials in action deep inside devices.”

His discovery would not have been possible if not for 19th-century Columbia professor and researcher Henry Marion Howe and his high temperature Fe-C phase diagram. Howe was America’s earliest metals researcher, and his phase diagram is the scientific basis for control of iron and steel in manufacturing.

“Phase diagrams tell you what chemical compounds will be stable under particular imposed conditions such as temperature, pressure, magnetic field, and average chemical composition,” Billinge explains. “The phase diagrams are like maps of the conditions you need to apply in order to get the material you want.”

For the experiment, Billinge and his team turned palladium metal nanoparticles into palladium oxide nanoparticles by flowing oxygen gas over them at high temperature. They then converted the nanoparticles back to palladium by flowing hydrogen gas over them. Information from phase diagrams helped determine what temperature and gas composition to use to make this work.

Although Billinge and his team were fairly certain their theory regarding the dual-imaging process would work, they were astonished by the actual images.

“It was totally magical when the first images came in and we were able to get
SIMON BILLINGE
NANOSCIENCE
STUDYING THE TINIEST OF DETAILS
“It was totally magical when the first images came in and we were able to get a complete nanostructure determination in each pixel of the image. The surprise was seeing how precisely we could chart out the structural nature of tiny nanoparticles in different locations deep within the object.”

Billinge and his associates were equally surprised at the animation of the nanoparticles. “It was as if they had personalities and were like people,” he says. “The little ones ventured deep into the middle of the object (which was a nanoporous catalyst support made of alumina, an oxide of aluminum) and resisted being oxidized by the oxygen gas we began flowing, as if they were hiding. The big ones stuck around the edge of the object in a very thin layer, couldn’t hide, and got oxidized.”

That view into the catalytic activity helped further define how to prepare high-performing catalysts and leverages Billing’s work in structural disorder and the development of methods for analyzing nanostructure.

“Other scientists are also working hard on this area, called atomic pair distribution function analysis,” Billing explains. “This is becoming much more widely used for nanostructure studies and is one of the most powerful tools in the bottom-up nanotechnologist’s toolkit.”

A nanostructure image of the inside of a rechargeable NiMH AAA battery. Each of the colorful pixels contains a complete mathematical map of the nanostructure. (Figure generated by Marco DiMichiel)
Billinge and his team are at the forefront of developing the tools to push the study of nanoparticles and materials further, and are excited about the potential for more discoveries.

“It is not hard to stay motivated because new discoveries in nanoscience come one after the other when you develop tools at the forefront of nanostructure analysis,” he says. “This regularly gives us new insights into how real materials do their work, for example, while absorbing light or transporting electricity, heat, or ions. We rarely cease to be surprised as we uncover the mechanisms materials use to carry out these tasks.”

By Amy Biemiller

BILLINGE AND HIS TEAM ARE AT THE FOREFRONT OF DEVELOPING THE TOOLS TO PUSH THE STUDY OF NANOPARTICLES AND MATERIALS FURTHER, AND ARE EXCITED ABOUT THE POTENTIAL FOR MORE DISCOVERIES.

HENRY MARION HOWE

[continued from page 18]  
“Phase diagrams are like maps of the conditions you need to apply in order to get the material you want.”

Howe began his academic career in his mid-30s after spending his immediate post-graduation years in industry, working domestically and abroad for iron and steel companies like Bessemer Steel Works and Taylor Iron and Steel Co. He designed and built the extensive copper smelting plants of the Orford Nickel and Copper Co. at Capleton, Canada, and at Bergen Point, NJ. He transitioned to a career in research and scholarship, first at MIT, before joining the School of Mines as professor and chair of Metallurgy in 1897. He remained at the School until his retirement in 1913.

A true pioneer, Howe was among the first to study, research, and teach metallurgy. His principal works, *The Metallurgy of Steel*, published in 1891, and *Iron, Steel, and Other Alloys*, published in 1903, were, of note, the first comprehensive books published in the field. Howe received numerous distinctions for his work and advancements in metallurgy, including induction into the National Academy of Sciences, the American Academy of Arts and Sciences, and the New York Academy of Sciences.
In our age of information overload, Tony Jebara, associate professor of computer science, is working to help make sense of it all. Armed with a keen sense of order and a penchant for applying the rigor of mathematics to solve problems, he is helping machines seamlessly integrate and organize loads of data for us.

Specializing in the science of machine learning, Jebara studies the fundamental principles of learning, combines statistics and computer science, and develops algorithms that inform the programming that allows computers to learn rules from data, adapt to changes, and improve performance with experience. These intelligent machines impact everyday life in ways most people take for granted, such as web search and spam filters, fraud detection and stock purchasing, and parallel parking without driver intervention.

“Machine learning and data science are really about finding the right blend of computational and statistical thinking,” Jebara says. “It’s a creative challenge with questions of how to map real-world problems into mathematical, statistical, and computational terms.”

Jebara’s work builds on a foundation constructed by a 19th-century alumnus of the Engineering School, Herman Hollerith.

Tony Jebara’s b-matching and minimum volume embedding algorithms are applied to visualize the scholarly works of more than 100 researchers affiliated with Columbia’s Institute for Data Sciences and Engineering. Each researcher is represented as a point. Researchers who use similar word-frequencies in their publications are placed near one another.
THE FATHER OF BIG DATA

HERMAN HOLLERITH
ALUMNUS

Before computer giant IBM became a household name, there was Herman Hollerith’s technological breakthrough that automated a once manual, time-consuming system to count mountains of data.

After graduation, Hollerith, Class of 1879, worked as a statistician at the 1880 U.S. Census Bureau. Before long, he was convinced there had to be a better, faster way to tabulate the huge amounts of data being collected and recorded by hand. His answer: punch cards and an electric tabulating machine, which was ultimately used to calculate the 1890 census.

Data was recorded by punching holes in cards of nonconducting paper and then tallying these by mechanical [continued on the next page]
counters operated by electro-magnets. Hollerith developed a hand-fed press that sensed the holes in the punched cards; a pin wire would pass through the holes into a container of mercury beneath the card, closing the electrical circuit. This process triggered mechanical counters and sorter bins and tabulated the appropriate data, allowing the census information to be tallied in a remarkably quick six months.

Hollerith (1860–1929), who was just 19 when he completed his Engineer of Mines degree at the School, produced many other innovative models of the original tabulating machine and sorter. He also invented the first automatic card-feed mechanism and the first key punch, in addition to other patents on railroad brakes and corrugated metal tubing.

An early player in computer information systems long before the words “big data” became a go-to buzzword in mainstream media, Hollerith was also one of the School’s first alumni entrepreneurs. After his success in revolutionizing the 1890 census, Hollerith founded a start-up based on what quickly evolved into a booming business in electric counting machines. His company, the Tabulating Machine Company, was one of the four companies that merged to form the Computing-Tabulating-Recording Company (C-T-R). In 1924, C-T-R changed its name to IBM.

Hollerith, who is widely regarded as the father of modern automatic computation. A statistician, Hollerith developed an electric tabulating system used in processing census data punched on cards for the 1890 federal census. Hollerith’s designs dominated the computing landscape for almost 100 years. His Tabulating Machine Company merged with the Computer Tabulating Recording Company, which was later renamed International Business Machines Corporation, better known today as IBM.

“Hollerith was the great-grandfather of computational statistics,” Jebara says. “More than a century ago, he brought computational and statistical thinking together to create the framework for modern-day study about machine learning and big data.”

In his day, Hollerith tackled the complexity of gathering and tallying data and revolutionized computation. Jebara is likewise focused on modern-day classification of computational problems based on their inherent difficulty. He is currently focusing on approximately solving problems in the NP-hard (nondeterministic polynomial-time hard) complexity class. By pioneering new computer learning techniques, Jebara is making significant breakthroughs that will help computers manage NP-hard computational decision problems, search problems, or optimization problems that require verifiable proofs, such as recognition of hand-written text, extraction of information from images, automatic translation of language, prediction of shopping behavior, or identification of genes that might be related to a particular disease.

“For a long time, we had proofs that many machine learning problems were NP-hard and therefore there was no hope of ever solving them well and efficiently,” Jebara explains. “However, we are now realizing that the worst-case situations where NP-hardness is an issue are unlikely to occur in nature. So, by creating algorithms that avoid these degenerate settings, we can essentially...
“Machine learning and data science are about finding the right blend of computational and statistical thinking. It’s a creative challenge with questions of how to map real-world problems into mathematical, statistical, and computational terms.”

solve the challenges optimally for a large class of important problems.”

Jebara has parlayed his research in machine learning into an entrepreneurial focus to impact real-world problem solving. He has founded and advised several start-ups that employ his algorithms to develop software for web and mobile applications. Among his business successes is the company Sense Networks, which created apps that compile real-time mobile location data and usage patterns to make recommendations for its users as well as more targeted advertising. Other ventures have employed Jebara’s research to create mobile personal assistant software, all-in-one vacation rental software, and marketing tools used in the hospitality industry.

Harnessing that entrepreneurial spirit, Jebara was appointed chair of the Center for the Foundations of Data Science within the University’s Institute for Data Sciences and Engineering. Under his direction, the Center’s research focus is on formal and mathematical models for data processing, as well as on issues concerning the engineering of large-scale data processing systems. The Center has a twofold deliverable: lead in translational research and in education through a collaborative effort in engineering, computation, and statistics. For Jebara, that’s a mission he has perfected.

“Through machine learning, we first collect massive amounts of diverse data. And then we computationally and statistically explore a massive number of potential hypotheses against that large data to find truth,” he says. “Statistics is a very powerful language, but if a researcher just considers statistical issues without worrying about underlying mathematics and computational efficiencies, the real-world application of their work will be drastically limited.”

By Amy Biemiller

“Statistics is a very powerful language, but if a researcher just considers statistical issues without worrying about underlying mathematics and computational efficiencies, the real-world application of their work will be drastically limited.”

Pictured above, far left: A visualization of usage-statistics from several major websites. Jebara’s algorithms place similar websites near one another in the visualization. Far right: A visualization of movement patterns from GPS location data in New York City—Jebara’s algorithms color code city blocks to indicate which places attract similar crowds.
PATRICIA J. CULLIGAN

URBAN INFRASTRUCTURE
CITY GREEN, COASTAL GREEN
With more rooftops than green space, the topography of major cities interferes with the natural exchange of precipitation between land, water bodies, and the atmosphere. When it rains in a city, some water evaporates, very little seeps into the ground, and the rest runs off to drains where it enters the sewer system. Even during small rainfall events, sewer and water treatment systems can be overpowered, carrying pollution straight into nearby rivers and streams. This off-kilter hydrologic cycle detrimentally impacts coastal zones, which end up receiving concentrated pollutants and excess nutrients.

“In order to rebalance the hydrologic cycle in urban environments, we need to introduce more vegetation,” says Patricia J. Culligan, professor of civil engineering and engineering mechanics. “Typically, 40 percent of the land area in a city is rooftops, so green roof technology has become a popular way to help establish more vegetation in urban environments.”

Culligan is principal investigator for the Columbia Green Roof Consortium and is charged with comparing and evaluating the effectiveness of different green roof technologies for use on campus and city buildings. The Consortium, which conducts research on one of New York City’s largest networks of green roof research stations, has been active in engaging high school students, undergraduates, and graduate research assistants in its monitoring efforts.

“The opportunity to advance this important work is exciting training for our students, who are able to leverage what they learn in the classroom with researching in the field,” says Culligan, who also serves as associate director of Columbia’s Institute for Data Sciences and Engineering.

Culligan’s fascination with green roof technology combines her experience in civil engineering and soil mechanics with her desire to solve the challenges associated with dense urban environments. “Through engineering we can solve challenges that affect life, through thoughtful and collaborative design,” she says.

Many cities are turning to green roof technology to help mitigate the effects of runoff on coastal zones. But green roofs are only one part of a high-performance green infrastructure.

“We think about highly engineered systems—how the plants, the growing medium, the foundation—can all work together to not only prevent runoff but also filter out pollutants and nutrients. We think about how the water can be stored to re-irrigate the vegetation growing on the roof and how that can promote evapotranspiration,” she says.
“We want to design green infrastructure that can enhance human health, result in economic efficiency, and reduce pollution.”

Her goal is well aligned with those of coastal cities around the world. With the help of a newly secured five-year, $3 million grant from the National Science Foundation, Culligan is leading a team of 20 investigators to study how high-performance green infrastructure can mitigate a city’s impact on coastal pollution. They plan to monitor dozens of sites, including green streets, tree pits, green roofs, and bioswales that impact the Bronx River. At the same time, they plan to collect data about stormwater flow, air, surface and substrate temperatures, substrate moisture content, and water quality and pollutants. Her team’s work is expected to contribute to New York State’s and New York City’s $2.7 billion investment in high-performance green infrastructure over the next 20 years.

“We are excited that our work has potential to inform how New York and other large cities near coastlines can best invest in green infrastructure to make the most difference in improving the health of coastal zones,” Culligan says.
The problem with urban runoff and its effects on human health and the environment is not new. In the late 19th century, Columbia Engineering’s dean, Charles F. Chandler, became an energetic public health advocate and sanitation reformer. His reforms included enactment of building codes with adequate provisions for indoor plumbing, which he personally designed with appropriate trapping systems. Many of his reforms became national models. “Like Chandler, it is our obligation as engineers to expand our roles in order to make our world healthier,” Culligan says. “If we are serious about sustainability, we must be serious in collaborating with other disciplines besides engineering, such as public health, social science, and economics, in order to make informed decisions. Improving the environment is no longer just about meeting performance goals but maximizing societal and economic impact as well.”

By Amy Biemiller

Pictured above, top: The USPS building in Midtown Manhattan, one of the green roofs being monitored by Culligan’s team. bottom: a Columbia campus green roof (weather station visible at the bottom right) (Photos courtesy of Daniel Marasco)

CHARLES F. CHANDLER

[continued from page 27] pointed president of the New York Metropolitan Board of Health and quickly became a leading authority on many matters of public health. He also established flash-point tests for kerosene, reducing the problem of lamp explosions, and with his campaign for vaccinations, particularly during the 1870s smallpox outbreak, he helped reduce the annual child death rate significantly. Chandler’s tenure at Columbia spanned more than 50 years. In 1864, he was appointed a professor at the University’s new School of Mines and shortly after, served as its first dean, a position he held for 33 years. He founded the Chemistry Department and served as its inaugural chair from 1866 to 1903. An industrial chemist, Chandler taught courses in chemistry, geology, and mineralogy. With his connection as a consultant to the Havemeyer family’s American Sugar Refining Company, Chandler was instrumental in the construction of a new campus building devoted to chemistry: Havemeyer Hall. As the Engineering School’s first dean, Chandler led its early beginnings as a leader in mining and metallurgy research and education, and oversaw the growth of the School’s student body and distinguished faculty.
COMING IN AT NO. 1
COLUMBIA ENGINEERING TOPS U.S. NEWS BEST ONLINE GRAD ENGINEERING PROGRAMS

U.S. NEWS HAS RECENTLY RANKED COLUMBIA ENGINEERING NUMBER ONE ON ITS LIST OF THE 2014 BEST ONLINE GRADUATE ENGINEERING PROGRAMS.

“We are pleased to receive this important recognition of our online degree programs by *U.S. News*,” says Soulaymane Kachani, vice dean of Columbia Engineering and a professor in the Department of Industrial Engineering and Operations Research. “Columbia Video Network (CVN), the graduate online and distance education unit of the School, has enabled thousands of talented working professionals and remotely located students to pursue their degrees through our fully accredited engineering courses, certificates, and degree programs over the Internet, all without having to reside on our New York City campus.”

A pioneer in distance education since its inception in 1986, CVN officially launched online in 1998. During the fall, spring, and summer semesters, it offers more than 120 distinct courses. CVN students can enroll in one of 14 Master of Science programs, 21 certifications of professional achievement, and four professional degree programs. Columbia Engineering leveraged CVN’s experience and technology in the spring of 2013 to offer three online engineering courses to more than 125,000 students on the Coursera platform, as part of a University-wide experiment in massive open online courses, also known as MOOCs. CVN is currently enhancing its in-house learning management system by incorporating the Open edX platform, another player in the nascent MOOCs field.

Kachani chaired the Online Education Faculty Taskforce at the School, which made a number of recommendations to expand CVN’s portfolio for both on- and off-campus students. These include plans to flip both undergraduate and graduate on-campus courses; to build online content for remedial courses, primers, and professional and career development workshops; and to enable more engineering undergraduate students to study abroad by allowing them to enroll in CVN courses while leveraging Columbia’s Global Centers for part of their course work.

“Expanding CVN’s offerings and use will be of tremendous value to all our students, whether they are fully online, fully on campus, or in blended learning,” Kachani adds. “Our horizons will be broadened and diversified in ways that we are only beginning to imagine!”

*By Holly Esarts*
On December 11, Dean Mary C. Boyce and a group of Columbia Engineers braved the winter weather to fete Sheldon and Mary Jo Weinig and the successful Sheldon Weinig Scholars Program at the School.

More than 40 undergraduate and graduate students have been Weinig Scholars, representing all departments. Past recipients attended the dinner, as well as this year’s Weinig Scholar, Kyoko Yoshida, a second-year graduate student in mechanical engineering.

Dean Boyce praised the Weinigs for their commitment to students. “Their love of learning—and their commitment to our students—is a shining example of how wise philanthropy truly can enhance the lives of generations of students,” she said.

A New York native, Weinig, who likes to be called, “Shelly,” graduated from Stuyvesant High School and, after military service, earned a BS in mechanical engineering from NYU in 1951. He earned a master’s in metallurgy in 1953 and an EngScD in 1955 from Columbia Engineering.

Although Weinig taught briefly at Columbia and at NYU, “academia was not an ideal career for me,” he says. He spent most of his career at the company he founded, Materials Research Corp., which manufactured alloys and highly engineered materials widely used in semiconductors and computer chips. For his contributions as the “father of electronic materials” for the semiconductor industry, Weinig was elected to the National Academy of Engineering and appointed by President Ronald Reagan to the Presidential Board of Advisors on Private Sector Initiatives.

In the late 1980s, facing a possible hostile takeover by a Swiss firm, Weinig instead sold his company to Sony. After the acquisition, Weinig agreed to stay on, and as vice chairman of Sony Engineering and Manufacturing of America, he completed a report on manufacturing education, which led to his teaching a course on manufacturing at Stony Book University. In the 1990s, he began teaching the course at Columbia Engineering.

Weinig is quick to point out that his education was paid for through the GI Bill and scholarships, including a William Campbell Fellowship from Columbia. “I had a fantastic education at no cost at all,” he says. So when he and his wife decided to set up a foundation, education was a natural choice. He was particularly interested in finding ways to motivate people to go into technical fields.

Weinig is still going strong. He teaches each fall in the IEOR Department and through the Columbia Video Network, and in the spring, an Internet course for SUNY. His wife, Mary Jo, has developed an international literacy program, Read a Recipe for Literacy, which operates in the United States and Italy. Weinig also stays in touch with his scholars, often meeting with them for breakfast at what he calls his “real office,” a diner on Manhattan’s East Side.

Clearly proud of the students he has supported, he says, “They have all done extremely well. They excite the hell out of me.”

By Tim Cross
Currently a visiting professor at Columbia Engineering, NASA astronaut Michael Massimino is teaching a new course in human spaceflight this spring.

It’s not often a child can turn his 1969 boyhood dream of becoming an astronaut into reality. But that was the case for Michael Massimino BS’84 when, in 2002, he left on the first of two space missions. Now, Massimino is a visiting professor at Columbia Engineering, teaching students about what it’s like to be in outer space.

Massimino’s introduction to human spaceflight course covers everything about space, from its environment to how it affects humans to the history of the space program.

“I’ve tried to think about what are some of the most important things I’ve learned as an astronaut,” Massimino says. “I want to try to expose the students to it.”

His class of 40 undergraduates is definitely getting an otherworldly experience. On the first day of class, Massimino had fellow astronaut Mike Hopkins call in from the International Space Station. A different time, astronaut Dan Burbank Skyped from Houston to talk to the class about his long-duration space mission. Currently, Massimino’s students are designing an app that will enable users to take photos of Earth from space. The goal of the assignment is to encourage students to think outside of the box when considering their designs.

Capturing these Earth observations is important for scientific and environmental purposes. “It would be great if the app leads to something that can be used in the future, on the ground or in space,” Massimino says.

Massimino’s own journey to space started at the age of six, when he watched Neil Armstrong become the first man to walk on the moon.
“You can read all you want in comic books, but these guys are the real heroes in the world,” Massimino reveals. “At an early age, I had the impression that this is what’s going to matter in the world.”

Massimino earned two master’s degrees and a PhD from MIT while spending summers working at NASA. He taught at Rice University and Georgia Institute of Technology, and in 1996, was selected by NASA as an astronaut candidate.

In March 2002, Massimino boarded the space shuttle Columbia for a mission to service the Hubble Space Telescope. Even though he was a rookie, Massimino logged more than 14 hours over two spacewalks on that journey. He was onboard the Atlantis in May 2009 for the final mission to the famed telescope, where he also did two spacewalks and orbited Earth 197 times.

“When you’re first looking at Earth from the shuttle through the window, it’s like looking at an aquarium,” Massimino says. “Then you go out in your spacesuit and it’s like you’re a scuba diver interacting in that environment. You can turn your head and view the Earth. It’s just extraordinary.”

Massimino’s success has earned him a whopping five guest spots on top-rated sitcom The Big Bang Theory, among other significant media accomplishments, like being the first person to tweet from space.

Through it all, Massimino carries Columbia Engineering with him—literally. He’s taken a Columbia flag and t-shirt signed by Engineering School faculty and students with him into space.

“My warmest memories of Columbia are the times I spent with my friends here or around New York City,” he says. “Columbia was able to expose me to what was possible in life. It’s not your average place.”

By Janet Haney
Alumni, friends, family, and other members of the community are invited this spring to attend Columbia Engineering’s biggest event of the year—Reunion Weekend. The four-day celebration, Thursday, May 29, to Sunday, June 1, offers the chance for alumni 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 4 and 9 (e.g., 1964, 1969, and so on). Reunion and Dean’s Day events (the latter will take place on Saturday, May 31, open to all alumni) will be held on campus and at venues throughout New York City all four days.

Reunion 2014 coincides with the School’s 150th anniversary, making it that much more special. During “Back on Campus” sessions, Columbia’s world-renowned faculty and prominent alumni will present their latest thought-provoking research and findings. Expected to deliver lectures during these sessions as of March are Jim Hone, professor of mechanical engineering, a leading researcher in graphene and MEMS, and Gordana Vunjak-Novakovic, the Mikati Foundation Professor of Biomedical Engineering, a pioneer in tissue engineering and regenerative medicine.

“I look forward to welcoming many alumni and their families to Reunion Weekend this year! Indeed, we hope to have the largest Reunion participation in SEAS history,” says Mary C. Boyce, dean and Morris A. and Alma Schapiro Professor. “This is such a special time for the School—our 150th anniversary—and we are celebrating all the groundbreaking accomplishments that have come out of the School and the exciting future that lies ahead for us. Columbia Engineering is on a great trajectory and I’m proud to be part of it.”

For many alumni, Reunion Weekend is a great opportunity to revisit Morningside and see how much the campus has changed since graduation.

“Our reunion was fabulous,” said Lee-En Chung BS’88, who attended her 25th Reunion last year. “From strolling on a private tour of the High Line to partying at trendy The Standard, we got to reconnect at fun venues.”

Nat Gale BS’08 traveled from Southern California last year to attend his Fifth Reunion and had a great time catching up with old classmates.

“Seeing our class together again was a pleasant reminder of the caliber of people who attend Columbia,” he said. “It was so exciting hearing what everyone has been up to, their travels, marriage, promotions, etc. Personally, I felt that I had grown so much during the past five years, and I wanted to share with all my friends how much Columbia had to do with that growth. Without my experiences in New York, I wouldn’t be where I am today, and I have Columbia to thank for that.”

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

By Nick Mider
A WARM WELCOME TO THE FOLLOWING FACULTY WHO HAVE RECENTLY JOINED THE SCHOOL AND CONGRATULATIONS TO CURRENT FACULTY ON THEIR PROMOTIONS

NEW FACULTY

MASANOBU SHINOZUKA
Professor, Civil Engineering and Engineering Mechanics
PhD, Columbia Engineering, 1960
MS, Kyoto University, 1955
BS, Kyoto University, 1953

A world-renowned expert in earthquake and structural engineering, Masanobu Shinozuka’s research focuses on field theory and risk assessment methodology in civil engineering. He studies systems engineering, with an emphasis on structural and system reliability; risk assessment of lifeline systems, including water, electrical power, and transportation networks; and analysis of the socioeconomic impacts of natural disasters. Shinozuka is a member of the National Academy of Engineering and a recipient of numerous national and international awards.

STEVE WAICHING SUN
Assistant Professor, Civil Engineering and Engineering Mechanics
PhD, Northwestern University, 2011
MA, Princeton University, 2008
MS, Stanford University, 2007
BS, UC Davis, 2005

Steve Sun works in the fields of theoretical and computational solid mechanics, poromechanics, and multi-scale modeling of fully coupled multi-physical systems. The objective of his research is to advance the understanding on multiphase materials under extreme conditions and enhance predictive capabilities for related engineering applications, including geological carbon sequestration, hydraulic fracture, and soil liquefaction. Prior to joining Columbia, he was a senior member of technical staff in the mechanics of materials department at Sandia National Laboratories in Livermore, CA.

“Columbia gave me a wonderful learning experience, directly from world-class academic mentors. I am extremely happy to have been given an opportunity to come back to Columbia and be a part of its superb academic excellence.” —Masanobu Shinozuka
Promotion to Full Professor

Maria Chudnovsky
Industrial Engineering and Operations Research

Maria Chudnovsky joined Columbia’s IEOR Department in 2006. She specializes in graph theory and combinatorial optimization. Chudnovsky was part of a team of four researchers that proved the strong perfect graph theorem, a 40-year-old conjecture that had been a well-known open problem in both graph theory and combinatorial optimization. For this work, she was awarded the Ostrowski Foundation research stipend in 2003 and a Fulker son Prize in 2009. In October 2012, Chudnovsky won a prestigious MacArthur Fellowship, also known as a “genius grant,” further establishing herself as a leading scholar in the field of graph theory.

Christopher Jacobs
Biomedical Engineering

Christopher R. Jacobs’s research focus is in determining the mechanism that allows cells to sense and respond to mechanical stimulation. Specifically, he is investigating how the biology of bone tissue is regulated by physical loading at the cell and molecular levels. Most recently his lab has shown that primary cilia, poorly understood antenna-like structures on the cell, function as load sensors. His numerous honors include the Van C. Mow Medal in bioengineering from the American Society of Mechanical Engineers and the 2005 Iwao Yasuda Award from the Society for Physical Regulation in Biology and Medicine. He also recently published a textbook entitled Introduction to Cell Mechanics and Mechanobiology.

Dan Ellis
Electrical Engineering

Dan Ellis is founder and principal investigator at the Laboratory for Recognition and Organization of Speech and Audio (LabROSA), which is concerned with all aspects of extracting high-level information from audio, including speech recognition, music description, and environmental sound processing. His main focus is to develop and apply signal processing and machine learning techniques to extract high-level, perceptually relevant information from sound. Before joining the Engineering School, Ellis was a research assistant in the Machine Listening Group of the Media Lab at MIT and spent several years as a research scientist at the International Computer Science Institute at Berkeley.

Elisa Konofagou
Biomedical Engineering

Elisa Konofagou, who has a joint appointment in Radiology, joined the School’s Biomedical Engineering Department in 2003. Her work focuses on the development of noninvasive imaging techniques using ultrasound-based elasticity imaging techniques such as electromechanical wave imaging and pulse wave imaging. In the area of oncology, for example, Konofagou is developing a tool that could identify and destroy tumors without the need for surgery. Her technology, called harmonic motion imaging, uses ultrasound to probe soft tissues in search of abnormal growths. Konofagou was elected to the Board of Governors of the American Institute of Ultrasound in Medicine in 2012 and the American Institute for Medical and Biological Engineering in 2014.
HELEN H. LU
Biomedical Engineering

Helen H. Lu focuses on orthopaedic interface tissue engineering and the formation of complex tissue/organ systems, with the goal of achieving integrative and functional repair of sports-related and degenerative soft tissue injuries. Lu’s group is extending the interface tissue engineering approach to the repair of another critical soft tissue-to-bone transition area, the rotator cuff. Lu is developing special nanofiber-based scaffolds that mimic the native tissue in organization as well as functionality for integrative rotator cuff repair. In 2010, Lu was awarded the Presidential Early Career Award for Scientists and Engineers at the White House.

ARVIND NARAYANASWAMY
Mechanical Engineering

Arvind Narayanaswamy’s work is on understanding the thermal and electromagnetic properties of nanoscale materials, van der Waals and Casimir forces, near-field effects on radiative transfer, and control of far-field thermal radiation with periodic structures. The big picture goal is to use these fundamental studies for improvements in energy conversion and electronics cooling applications. His research group also has projects on interfacial fluid flow phenomena and pattern formation. He is actively involved in the American Society of Mechanical Engineers and the American Physical Society.

“Each of these career milestones is hard earned, and it is wonderful to come together to collectively recognize our colleagues and celebrate their incredible contributions and achievements.”
—Dean Mary C. Boyce at a special reception she hosted this spring to celebrate faculty promotions

JASON NIEH
Computer Science

Jason Nieh has made research contributions in software systems across a broad range of areas, including operating systems, virtualization, thin-client computing, cloud computing, mobile computing, multimedia, and performance evaluation. Nieh co-directs the Software Systems Laboratory and serves as chief scientist at Cellrox, a tech start-up that enables users to carry multiple phones on a single smartphone without compromising privacy or security. Honors for Nieh’s research include the Sigma Xi Young Investigator Award, given once every two years, an NSF CAREER Award, a Department of Energy Early Career Award, and five IBM Faculty Awards.

PROMOTION TO ASSOCIATE PROFESSOR
The following is Dean Mary C. Boyce’s Foreword to *A Lever Long Enough: A History of Columbia’s School of Engineering and Applied Science Since 1864*, written by Robert McCaughey, professor of history and Janet H. Robb Chair in the Social Sciences at Barnard College. The book will be published by Columbia University Press and will be available in May.

From its beginning as King’s College in 1754, Columbia valued the academic disciplines of science, engineering, and mathematics. Indeed, some of Columbia’s early alumni were pioneering entrepreneurs and engineers. John Stevens (Class of 1768) developed steam engines that powered both the first steamships to navigate the open ocean and the first steam locomotive. As governor of New York, DeWitt Clinton (Class of 1786) was the driving force behind the Erie Canal, which connected New York City to the burgeoning Midwest. Horatio Allen (Class of 1823) was an early president of the American Society of Civil Engineers.

But it was only in 1863 that Thomas Egleston—then a mineralogist working at the Smithsonian Institution—suggested that Columbia create a separate school of metallurgy and mining. In less than a year, on November 15, 1864, the School of Mines of Columbia College opened its doors, with a student body of 20 and a faculty of three. The new school reflected in many ways the demands of its age, recognizing the need for raw materials to wage the Civil War and to supply the rapid industrialization of the United States.

Since then, Columbia Engineering has grown and expanded on every front. Today the School is home to more than 170 faculty members, 1,500 undergraduate students, 2,000 master’s degree students, and 700 doctoral students. The School quickly moved from a simple focus on mining to include civil engineering, chemical engineering, and electrical engineering. We now have a robust set of nine departments. We’ve moved from being a bastion of the city’s male Knickerbocker elite to a global institution, attracting students from around the world and an entering undergraduate class that is 44 percent women. The School’s footprint has grown as well, as we’ve moved from Midtown to Morningside Heights and from one building to multiple campus locations.

The School’s curriculum still reflects Columbia’s unfailing commitment to liberal arts instruction, while pushing the frontiers of technology and applied science.

The Fu Foundation School of Engineering and Applied Science can boast of a rich history of pioneering education, research, and innovation. Professor Robert McCaughey’s *A Lever Long Enough*, written on the occasion of the School’s sesquicentennial, offers an insightful look at the birth and evolution of an engineering school that has grown within the context of a renowned research university, evolved with the disciplines that it pursues, and interacted dynamically with its city, its country, and the world. Like any great institution, Columbia Engineering has been shaped by strong personalities, weathered terrible storms, and enjoyed remarkable individual and institutional success. Columbia Engineering’s steadfast commitment to excellence has manifested itself not simply in academic pursuits but also in pushing beyond conventional disciplinary frontiers.
Throughout its history, Columbia Engineering has always focused both on academic pursuits and on engagement with the world. The first dean of the Columbia School of Mines, Charles F. Chandler, set a high benchmark. A chemist by training, Chandler also emerged as a major public health advocate. Working with New York City’s Metropolitan Board of Health from 1866 to 1883, he developed standards for clean and safe drinking water, milk for babies, and medicines. A vocal supporter of improved tenement housing, including mandatory indoor plumbing, he has been credited with preventing a cholera epidemic in 1883.

Chandler’s 32-year leadership of our school marked a period of significant engineering and scientific advancements, not only in chemistry and chemical engineering but also in electrical engineering, civil engineering, and nascent computer science.

When Herman Hollerith (Class of 1879), who had been a statistician for the 1880 U.S. census, returned to Columbia for graduate studies, he set about finding a new way to process census data. His doctoral thesis described a punch card system in which the cards could be counted and sorted mechanically. Awarded a PhD in 1890, Hollerith went on to found the Tabulating Machine Company in 1896, which merged with three other companies to form what became International Business Machines (IBM) in 1924. Today Hollerith is recognized as the father of modern automatic computation.

Few engineers, however, can match the achievements of Michael Pupin (Class of 1883). By 1882, when Thomas Edison wrote to Columbia President Frederick Barnard about the need to educate “electrical scientists” to work for his new company, Pupin was among the Columbia students already experimenting with electricity. After graduate study in England and Germany, in 1889 Pupin joined the faculty of the newly formed Department of Electrical Engineering. Over the next four decades, Pupin won more than 30 patents in fields ranging from electricity to medicine, from telephony to sonar. Using a fluorescent screen given to him by Thomas Edison, Pupin developed an X-ray method that produced usable images while reducing radiation exposure from one hour to just a few minutes. In 1899, he patented the “Pupin Coil,” which made long-distance telephony feasible; he later sold the patent to American Telephone and Telegraph.

One of Pupin’s pupils, Edwin H. Armstrong (Class of 1913), invented the regenerative circuit while he was still an undergraduate. Upon graduation, he joined the School’s faculty. Commissioned as an officer in the Army Signal Corps during World War I, Armstrong developed the superheterodyne circuit. After the war, he returned to Columbia, where he developed the superregenerative circuit and, in 1933, completed his most famous invention: FM radio. Although best known as the “father of FM radio,” Armstrong’s inventions actually underlie all modern radio, radar, and television.

In civil engineering, William Barclay Parsons (Class of 1882) was building some of the major transportation projects of the day—railroads, rapid transit, and canals. Parsons and his younger brother Harry, a mechanical engineer, opened up their own consulting engineering office in New York in 1885. The Parsons firm had a global impact on the built environment, with projects ranging from hydroelectric plants across the United States to docks in Cuba, from China’s Hankow-to-Canton railroad to the Cape Cod Canal.
In 1894, Parsons became chief engineer of the New York Rapid Transit Commission, designing the Interborough Rapid Transit subway, which opened in 1904. That subway network secured Parsons's place in history and revolutionized transportation in the metropolis. Parsons maintained a lifelong relationship with Columbia, serving on the Board of Trustees from 1897 to 1932, the last 15 years as its chair. His firm, now called Parsons Brinckerhoff, remains a leader in the design, construction, and operation of critical infrastructure around the world.

A pioneering chemist, Irving Langmuir (Class of 1903) worked at the intersection of chemistry, physics, and engineering, investigating the properties of adsorbed films and the nature of electric discharges in high vacuum and in certain gases. He was awarded the Nobel Prize in Chemistry in 1932 “for his outstanding discoveries and investigations within the field of surface chemistry.”

After graduate study at Leipzig, Colin Fink (Class of 1903) worked for General Electric and later as chief chemist for the Chile Exploration Company. In 1921, he joined the faculty, heading up a new branch of chemical engineering, electrochemistry. Fink developed a chromium-plating process that is still used today as the standard for plating metal or plastic. His pioneering electrochemistry research led to ductile tungsten for incandescent lamp filaments, an insoluble anode for electrowinning copper, an electrolytic process to remove corrosion from antique bronzes, and several electroplating processes.

By the 1930s, Columbia Engineering alumni and professors were pushing the boundaries of their disciplines. Raymond D. Mindlin (Class of 1931), who joined the Civil Engineering faculty in 1940, was the most outstanding elastician of his generation, making contributions to the fields of applied physics, applied mechanics, and engineering science. In 1946, President Harry Truman awarded Mindlin the Medal for Merit for his work developing the radio proximity fuse, a detonator used extensively in World War II. In 1979, President Jimmy Carter awarded him...
the National Medal of Science. Maurice A. Biot, who joined the Civil Engineering Department in 1937, was another pioneering researcher, laying the foundations of the theory of poroelasticity (now known as Biot Theory), which describes the mechanical behavior of fluid-saturated porous media.

As the nation began to recover from World War II, the School began to reassert itself in a variety of areas. In electrical engineering, faculty and alumni set a new standard for industrial impact. The "father of robotics," Joseph Engelberger BS’46, MS’49 developed the Unimate robot—the first industrial robot in the United States. His industrial robots, which first appeared on automobile assembly lines in 1961, revolutionized countless manufacturing processes. Today his newest robots assist in human care, especially with the elderly.

John R. Ragazzini PhD’41, who had worked on the Manhattan Project, collaborated with Loebe Julie to develop and build the world’s first modern differential operational amplifier in 1947. In 1952, Ragazzini and faculty colleague Lotfi A. Zadeh PhD’49 established the z-transform method that is still the standard in digital signal processing and other discrete-time systems. Rudolf E. Kálmán PhD’57 developed the Kalman filter, a mathematical algorithm widely used in many prediction models. In 2009, President Barack Obama awarded him the National Medal of Science. Robert Moog MS’56 revolutionized music with his invention of the Moog synthesizer, the first voltage-controlled subtractive synthesizer played via keyboard.

In chemical engineering, Professor Elmer Gaden BS’44, MS’47, PhD’49 demonstrated that an optimal amount of oxygen enabled penicillin mold to grow and multiply more rapidly. This research formed the basis for mass production of a wide range of antibiotics, beginning with penicillin, and earned Gaden the title of "father of biochemical engineering."

In mechanical engineering, Professor Ferdinand Freudenstein PhD’54 developed the precursor of what is now known as the Freudenstein Equation, which uses a simple algebraic method to determine the position of an output lever in a linkage mechanism. Freudenstein later applied digital computation to the kinematic synthesis of mechanisms, earning him recognition as the “father of modern kinematics.”

Near the end of World War II, IBM established the Watson Scientific Computing Lab at Columbia, and the lab staff started teaching the first ever computer science courses fully integrated into a university curriculum. Joseph Traub MS’55, PhD’59 gained early access to computers through graduate work in the Watson Lab. Traub’s doctoral thesis examined computational quantum mechanics, and he continued his pioneering work in optimal iteration theory, developing significant new algorithms at Bell Labs, the University of Washington, and Carnegie Mellon.
University before returning to Columbia in 1979 as the founding chair of the Department of Computer Science.

The 1950s and 1960s witnessed interdisciplinary initiatives that applied engineering principles to medicine and the study of the human body. In 1968, Edward F. Leonard conducted path-breaking research in the engineering and design of artificial organs. Richard Skalak BS’43, PhD’54 integrated engineering mechanics and biomedical science to understand the mechanics of blood flow, bone growth, white blood cell response to infections, and biological implications of and responses to implants.

Sebastian Littauer MS’28, who joined the Department of Industrial Engineering in 1947, introduced the first courses in operations research at Columbia in 1952. By the 1990s, with the resurgence of Wall Street, the renamed Department of Industrial Engineering and Operations Research was expanding into financial engineering.

Van C. Mow joined Columbia in 1985 as the first joint faculty appointment between Columbia Engineering and the College of Physicians and Surgeons (P&S). A decade later, Mow and Leonard, joined by W. Michael Lai and Gerard Ateshian of the Department of Mechanical Engineering, became the founding faculty for a biomedical engineering program. Under Mow’s leadership, the new program won additional support, hired new faculty, and expanded its partnership with P&S. In 2000, University Trustees approved a Department of Biomedical Engineering, creating the School’s ninth department.

Near the end of World War II, IBM established the Watson Scientific Computing Lab at Columbia, and the lab staff started teaching the first ever computer science courses fully integrated into a university curriculum.

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Meanwhile, the School’s Mining and Metallurgy Department (christened the Henry Krumb School of Mines, in a nod to the School’s original mission) pivoted to embrace environmental study, later becoming the Department of Earth and Environmental Engineering. It began to support new research initiatives, including the Earth Engineering Center and the Waste to Energy Research and Technology Council, and organized the First International Conference on Environmental Issues and Waste Management in Energy and Minerals Production.

As the twentieth century came to a close, a transformational donation propelled the School forward in its mission. A $26
A LEVER LONG ENOUGH

million gift from businessman and philanthropist Z. Y. Fu in 1997 targeted four areas—computer science, biomedical engineering, applied mathematics, and electrical engineering—and gave the School a new name. The new resources enabled the School to expand, attracting and retaining new faculty talent and increasing interdisciplinary collaboration within the School and with other divisions of the University.

By the beginning of the twenty-first century, Columbia Engineering had developed a new paradigm of highly interdisciplinary engineering and applied science research. Columbia Engineering professors eagerly responded to major challenges that were inherently interdisciplinary and could only be met with an expansive approach.

In the early 1990s, Dimitris Anastassiou and his student Fermi Wang PhD’91 developed a key patent essential to the MPEG-2 video and systems coding standards used in TVs, DVD players and recorders, personal computers, computer gaming, and cameras. But then, Anastassiou shifted his research to systems biology, specifically cancer research. He has developed a new computational model to predict breast cancer survival and is searching for precise genetic signatures present in multiple types of cancer.

Jingyue Ju, who joined the Department of Chemical Engineering in 1999, has directed his research toward biomolecular applications for personalized medicine. His revolutionary research developed a novel DNA-sequencing platform that heralds a new era in the field. His innovations could reduce the cost of DNA sequencing, so that it can become a routine part of medical research and individualized health care.

In 2005, Gordana Vunjak-Novakovic joined the Department of Biomedical Engineering. Expanding the department’s strength in tissue engineering, she has developed novel bioreactors to advance her research on engineering functional tissues. She has successfully grown bone grafts that can match a patient’s original jawbone for facial reconstruction surgery and has engineered functional cardiac tissue.

Founded in 1978, what is now the Department of Applied Physics and Applied Mathematics quickly expanded beyond its original core of plasma physics and nuclear science to include areas such as solid-state physics. Today Adam Sobel uses sophisticated climate modeling in his research of extreme weather events, such as hurricanes, and their relation to climate, seeking engineering solutions to ameliorate the social impact of extreme weather.

Computer Science expanded into new areas as well. In 2001, Kathleen McKeown, a leading scholar in the field of natural language processing, developed Newsblaster, a trail-blazing system that automatically identifies, sorts, and summarizes the day’s top news stories; now she is beginning research on using data from social media to track and respond to disasters. Shih-Fu Chang has developed information analysis and machine-learning techniques to process voluminous online video images into useful data and conduct unprecedented searches using large visual databases. Eitan Grinspun integrates concepts from graphics, applied mathematics, and engineering, applying the budding field of discrete differential geometry to create practical computations that enable film studios to produce detailed, lifelike animation.

In mechanical engineering, Vijay Modi uses engineering to transform both developing and highly developed regions of the world. His research optimizes electric grids, not only in New York City but also in self-contained micro-grids that supply local power in the developing world. He currently leads the UN Millennium Villages Project on the role of energy and energy services.

Columbia Engineering now stands at the nexus of many of the University’s interdisciplinary initiatives. Engineering professors are making key contributions to the Earth Institute’s initiatives in water, climate, energy, and sustainability. Engineering professors are helping shape the new Mortimer Zuckerman Mind Brain Behavior Institute, which is closing the gap between our fundamental understanding of the brain and what the social sciences, humanities, and professional disciplines tell us about behavior.
In 2012, the University announced the launch of the new Institute for Data Sciences and Engineering, which is poised to become a world-leading institution in research and education in the theory and practice of the emerging field of data science. Based at Columbia Engineering and led by Engineering professors, the Institute’s six centers encompass faculty from nine University schools, an acknowledgment not only of the Institute’s inherently interdisciplinary subject matter but also of engineering’s pivotal place in meeting all aspects of the challenge.

This year’s sesquicentennial celebration is an unprecedented opportunity to contemplate our school’s bright future even as we celebrate our storied past. I firmly believe that we are in a Renaissance for engineering—a period of great research, great innovation, great invention, and incredible translation of these innovations to solutions that will benefit people around the world. We are privileged to build on our school’s remarkable legacy in a time when engineering and the applied sciences have never been more important to the progress of society.

As we embark on our next 150 years, our school continues its proud tradition of educating leaders, whose vision, creativity, and innovation have enabled us to enjoy a more advanced and livable world. Columbia Engineers are inventors and entrepreneurs, Fortune 500 CEOs and finance leaders, outstanding academicians (including multiple Nobel Prize winners), and even astronauts. These women and men—whether in academia, government, or industry—share an innate intellectual curiosity and drive that have always been hallmarks of a Columbia education. As Professor McCaughey’s fine history of our school shows, Columbia Engineering has always provided a lever long enough to move the world.
LETTER FROM THE ALUMNI ASSOCIATION PRESIDENTS

Dear Columbia Engineering Alumni and Friends,

In July 2013, Dean Mary C. Boyce created a committee to organize the efforts surrounding the 150th anniversary. We have both had the honor of representing the Engineering alumni community in this planning process and could not be more pleased with the result: 2014 will be a year of events to recognize the achievements of our students, alumni, and faculty, and honor the storied history of our School.

While there are a multitude of events planned throughout the year, we would like to extend an invitation to you and your guests to join us for one special evening in particular. On Thursday, May 29, 2014, the Columbia Engineering Alumni Association will host the annual Engineering Reunion Welcome Dinner & CEAA Awards Presentation in Low Memorial Library. While this dinner marks the official return of our Reunion classes to campus for Alumni Reunion Weekend, all alumni and their families are invited to attend, regardless of whether they are celebrating a Reunion this year or not.

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

• **The Egleston Medal for Distinguished Engineering Achievement** to Mr. Charles Hoberman MS’85, renowned inventor, designer, and mechanical engineer;
• **The Pupin Medal for Service to the Nation** to Dr. Wafaa El-Sadr, MacArthur Fellow, University Professor of Medicine, and director of ICAP of Columbia University; and
• **The Samuel Johnson Medal for Distinguished Non-Engineering Achievement** to Ms. Ursula Burns MS’82, chairman and CEO of Xerox.

For more information or to make a reservation, please contact Cliff Massey in the Engineering Alumni Office at cam2171@columbia.edu or 212-854-2317.

We would be proud to have you join us in celebrating Columbia Engineering ingenuity and achievement. We encourage all alumni to visit the School’s 150th anniversary website (seas150.columbia.edu) and share their favorite Columbia Engineering memories. Who was your most influential professor? What notable events took place during your time—both on and off campus? What was your favorite class? We look forward to sharing in your stories.

**HITOSHI TANAKA**  
BS’63, MS’65, EngScD’76  
President  
Columbia Engineering Alumni Association

**WHITNEY GREEN**  
BS’10, ’13TC  
President  
Columbia Engineering Young Alumni

CLASS NOTES: UNDERGRADUATE ALUMNI

1944

In response to Harry Levey’s BS’46 request in the last issue of Columbia Engineering to hear from other surviving V-12 classmates, Bill Carr writes, “In January 1944, I was a chemical engineering student at North Carolina State and volunteered in the Navy and reported to the Columbia V-12 Program March 1. It was a cultural shock for me from a small town in North Carolina to be thrust into the exciting life in the Navy, on the Columbia campus and Manhattan. I will be forever grateful for the hospitality shown by many V-12 mates who invited me home for weekends to show off a Southern accent, which many New Yorkers had not heard at that time except in the movies.

“I completed enough credits to go to Ft. Schuyler Midshipmen’s School and graduated July of 1945. Navy orders sent me to San Francisco to board the USS Eastland, which sailed to Tokyo Bay to pick up Army and Marine troops to return them to San Francisco. We then sailed the ship to Norfolk for decommissioning and a desk job for me at Norfolk Navy Base for the summer. I then returned to North Carolina State and graduated in June 1947.

“After a career with Dupont in Delaware and a very happy, fulfilling 31-year retirement, I can recall an extraordinary number of great memories. I’m thankful to say bridge, some bridge teaching, needlepoint, and genealogy keeps me moving here in Center City Philadelphia. If there is a V-12 survivor out there who remembers me, please email me at wwillcarr@aol.com.”
Editor's note: V-12 was a U.S. Navy and Marine college program for training future officers.

1945
Class Correspondent:
Gloria Reinish
reinish@verizon.net

1950
Class Correspondent:
Joe Alvarado
alvarado@behlman.com

Fred DeVries MS'51, '49CC writes, "After receiving my MS in chemical engineering in 1951, I went with the DuPont Co. in Niagara Falls, NY. We began to form a disorganized group of alumni in the Buffalo, NY, area. In 1955, at one of our gatherings, we were joined by George Maegelhaes [= Magellan!], Class of 1893, who said this was his first alumni meeting since he had graduated. He'd been 'retired' by Westinghouse two years earlier because they said he was too old to be retained (!), and he'd come to Buffalo to live with his son. Among his earlier years, he'd worked in Cuba building a subway (I believe) in Havana. He'd worked in Cuba building a subway (I believe) in Havana. He'd worked in Cuba building a subway (I believe) in Havana. He'd worked in Cuba building a subway (I believe) in Havana. He'd worked in Cuba building a subway (I believe) in Havana. He'd worked in Cuba building a subway (I believe) in Havana. He'd worked in Cuba building a subway (I believe) in Havana. He'd worked in Cuba building a subway (I believe) in Havana.

1951
Class Correspondent:
Ted Borri
tjb63@columbia.edu

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

1953
Class Correspondent:
Don Ross
rossd@jjb.com

1955
Class Correspondent:
Leo Girino
lc550@columbia.edu

1956
Class Correspondent:
Lou Hemmerdinger
lhemmer@aol.com

Lou Hemmerdinger writes, "This has been a very good year and I hope it continues. Last year, we sold our home of 35 years and threw our lots of 'stuff,' which many are familiar with. This was a horrendous task, which took months to accomplish. However, it was also a chance to consolidate and bring similar items together. We bought a townhouse with a basement. I wanted the basement to hold all our remaining 'stuff.' I don’t think I will move again. Luckily our house in Boynton Beach, FL, does not have a basement. In the meantime, the stock market has been good to us retirees who fortunately had money in the market. Therefore, we have the freedom to do many things. This summer I will be reaching a decade year birthday, which we will be spending on the Danube with many days in Budapest and Prague. We had another baby (not my doing), which makes nine grandchildren from three sons in 10 years. There may be some competition going on that I don’t know about, but it is wonderful. My golf is not quite the game it used to be, but still a lot of fun.

"As most of you know, the Class of ’56 gets together once a month either at the Faculty House on campus or the Columbia Club off 5th Avenue and 43rd Street, and in the summer, we have been meeting at Dan Link’s golf club, Bonnie Briar, in Larchmont, NY. Everyone is welcome to those gatherings. I send out emails to both the College and Engineering alumni, alerting alumni of the date and location. So please join us if you can. If you haven’t received my emails, please send me your latest one at LHemmer@aol.com. Some of the people that have joined our meetings are Stephan Easton ’56CC, ’57BUS (Class Pres.), Ed Botwinick BS’58, ’56CC; Al Broadwin BS’57, ’56CC; Mark Carter, Eric Donath, Murray Easton, Jerry Fine ’56CC; Al Franco MS’57, EngScD’62; Ron Kapon ’56CC, ’57BUS; Ralph Kaslick ’56CC; Jack Katz ’56CC; Don Kazimir, Maurice Klein ’56CC; Peter Klein ’56CC; Danny Link ’56CC; Stan Manne, Marty Mayer ’56CC; Mark Novick ’56CC; Bob Paaswell ’56CC; Allen Press ’56CC; Don Roth ’56CC; Lee Seidler ’56CC, ’57BUS, ’66GSAS; Bob Siroty ’56CC; Stan Soren ’56CC; Mike Spett ’56CC, ’60BUS; Art Tepper ’56CC; Les Wilder, and Leonard Wolfe ’56CC. So if you are in the neighborhood, come and join us for a great time with 'old' friends!"

1958
Robert F. Drucker writes, "Highlights of 2013 included a visit to Monaco as part of a Mediterranean cruise. The main casino architecture was a throwback in time to an earlier opulent era with Ferraris and other fancy vehicles parked outside. Although the presence of high rollers similar to James Bond was not noted, we managed to contribute a few euros to help the local citizens keep their tax-free economy. The palace and the customary changing of the guards were also included in the city tour scope.

"Another port of call was Cadiz, Spain, where Columbus left for the New World in 1492 and where I had an engineering construction project some 20 years ago. What a change. From a sleepy port city in need of business stimulation, it now was a busy tourist town complete with new commercial and residential buildings.

"Gibraltar was also on the itinerary but, in contrast to Cadiz, not much change since my last visit except for some additional residential/retirement type construction.

"The 2013 holidays were spent on Cunard’s Queen Mary 2 on a Caribbean cruise. New Year’s Eve was celebrated with a champagne party bash on board.

"My Columbia family of graduates continue to be active—children: Ellen (Barnard), now manager of IT; Beverly (Physicians and Surgeons), oncology practice; and Michael BS’88, cardiology; grandson: Brian Albert is a graduate student at MIT."

1959
Class Correspondent:
Betsey Altman
bmeca@comcast.net

1960
Matthew J. Sobel writes, “The 55 years since graduation were exciting but of course too brief! After four years in business and government and subsequent doctoral education at Stanford, most of my career was in the professoriate at Yale, Georgia Tech, SUNY Stony Brook, and Case
Western Reserve University, from which I’ll retire in a few months. I’ve directed academic programs, chaired departments, and been a dean. Most of my published research contributes to ‘applicable’ mathematics, and it has been mainly about stochastic models of operations research, environmental and energy management, economics and game theory, and operations management.

“My wife, Susan A. Slotnick, is a professor at Cleveland State University. She too has Columbia degrees. We are avid road bicyclists and cross-country skiers. I bicycled 800 miles to the 2009 annual reunion, which was the fiftieth reunion of my 1959 Columbia College class. I have three children and four grandchildren. Postretirement, I’ll spend most of my time on research and writing, prolonged visits with my grandchildren (and their parents), and bicycle trips at times of the year that were precluded until now due to teaching responsibilities. It would be grand to see any classmates who are traveling through northeast Ohio. Contact: matthew.sobel@cse.case.edu.”

1961
Bruce M. Gordon writes, “2013 was a time of nostalgia and memories for five graduates in the 1961 class of chemical engineers. “In January, Luigi Giamundo, who returned to Italy to live and work some years after graduating from Columbia, had the occasion to be in Orlando, FL, for a convention. I had the opportunity to meet with Luigi in Orlando, and we both had the chance to catch up on events in each other’s lives and families. In July, I took the opportunity to visit with Luigi and his family in Sorrento, Italy, to assist in the celebration of his birthday. What a happy and meaningful occasion!”

Classmate Howard Seyffert ’60CC and I have been in contact with each other regularly but infrequently over the years since graduation and realized that we haven’t been in contact with classmate Harry Taylor MS ’63, ’60CC since graduation, and we were determined to make this right. We made contact with Harry, a longtime resident of Cincinnati, OH, who immediately invited us for a visit. We did so for several days, and Harry hosted a number of culinary events, culminating in a Cincinnati Reds baseball game in the President’s box! A superb reunion that also included Harry’s son, Kevin.

“Following our visit with Harry in Cincinnati, Howard and I went on to visit the Rock and Roll Hall of Fame in Cleveland. A memorable visit in all respects! Also during 2013, Howard and his wife, Carole, visited with classmate Ira Weinryb and his wife, Lucia, in November in Philadelphia. They meet about once a year to catch up on family and to have lunch at a Philly classic restaurant, Parc on Rittenhouse Square. Another great reunion!” Editor’s note: If anyone wishes to contact these classmates, please send an email to engineeringmag@columbia.edu.

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

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

Mark Herman writes, “As many of you know, my career as a translator began while I was working for Exxon Engineering and was asked to translate materials for the Exxon Library. Since then and many strange turns later, my wife Ronnie Apter and I have written 22 translations of operas, operettas, and choral works, which have been performed in the United States, Canada, England, and Scotland. Our most recent production, which I hope some of you managed to see, was The Little Opera Theatre of New York’s production of Rossini’s Opportunity Makes the Thief in February and March. Last November, we were fortunate enough to be invited to Stockholm as guest lecturers at the University College of Opera, recently merged into the Stockholm University of the Arts.

“While in Europe, we also visited Edinburgh and playwright director son Ry and astrophysicist daughter-in-law Beth Biller, who recently began a research professorship at the University of Edinburgh. Lest any of you think that I am the only person with a technical degree who branches out, I invite you to view Beth Biller’s appearance on the ‘Alien Planets’ episode of the second season of the History Channel’s series about The Universe. An online review of the available DVD cites Beth as ‘a very goth-looking scientist from the University of Hawaii [where she was a postdoc at the time] who also happens to be a belly dancer and fire performer.’ And some of her fire performance, demonstrating the gravitational interaction of a sun and a planet, is right there on the DVD.

“Meanwhile, here in Nashville, we are enjoying being near veterinarian son Dan, pediatric nurse-practitioner daughter-in-law Susan, and fourth-grade granddaughter, Charley. During the short time we have lived here we have attended one event of the Columbia alumni club of Nashville and hope to attend more.

“And finally, let me put in a plea for alumni/ae to send me items for future issues of Columbia Engineering. Send me anything you like, even incoherent chicken scratches. I will put it into publishable form and always submit it to you for final approval before I submit it to the magazine.”

Carl Jakobsson is retired from his engineering career and spends time tutoring math in his retirement and being heavily involved with the NAACP, the Bremerton, WA, branch, where he serves as chair of the political action committee and treasurer. His chapter recently held a Mission Outreach Day. Carl writes that it is an “annual event to highlight some occasions in the history of the modern day church, in which the church took successful action to protect the basic human rights of people who were under attack.” The event took place at the House of Refuge Fellowship Church near Poulsbo, WA.

Carl shares, “With the passing of Nelson Mandela, I could not help noticing that much of what was written about his life was inaccurate or incomplete. I was somewhat active in the anti-apartheid movement in the U.S., and at that time, I met some of the then-exiled members of the African National Congress (ANC) who were in our country to line up American support for the establishment of a legitimate government in their home country. To accurately tell the story of Mandela’s life, you would have to say that he was a committed team player on a great team that he himself put together. The reason it is important to remember that is because there is reason to believe that there is still some of that great revolutionary ANC team in that mediocre ANC government currently in place in South Africa. If that is the case, it means there is still a chance to build up the bilateral relationship between the U.S. and South
Africa into a global diplomatic partnership to promote global peace. By building up general public support for that kind of global diplomacy, that can be a step in the direction toward prevailing upon our government to take imaginative diplomatic initiatives in the search for solutions for global problems.” Carl has been married for 26 years to wife, Estela, and they have seven children and 22 grandchildren.

1964
50th Reunion
To take an active role in your Class Reunion activities, please contact Nick Mider at nm2613@columbia.edu or 212-851-0734.

Class Correspondent:
Tom Magnani
tm421@columbia.edu

1967
Bernard Strauss MS’69, PhD’70 writes, “It is with great sadness that I report the passing of my wife, Helen, on June 12, 2013, of pancreatic cancer. She spent the last 20 years as my chief caregiver.”

1968
After almost 32 years as a personal finance advisor in New York City, Jeff Franklin has recently sold his personal financial planning and asset management firm, Life and Wealth Planning, to his younger partner who will continue to provide these services to the firm’s clients. Jeff will now pursue his growing passion and appreciation for all things wine. To utilize his certifications from the Wine and Spirits Education Trust and the Society of Wine Educators, Jeff has created NY Wine Advisors, which will provide wine education to individual consumers as well as wine list consulting and wine service training to neighborhood restaurant managers and staff.

He and his wife, Linda, will remain in Greenwich Village, where they have lived since 1974, and plan to move ardentl pursue their desire to “experience the world,” especially its many wine-producing regions.

1969
45th Reunion
To take an active role in your Class Reunion activities, please contact Nick Mider at nm2613@columbia.edu or 212-851-0734.

Class Correspondent:
Ron Mangione
ronaldm@archeng.com

1970
In October 2013 after a successful two years as a postdoctoral fellow at CPRIT (Cancer Prevention and Research Institute of Texas), Mary F. McGuire MS’71 was appointed assistant professor and director of the Advanced Medical Consulting Group (AMCG), Department of Pathology and Laboratory Medicine at the University of Texas Medical School at Houston. The AMCG offers expert personalized clinical pathology consults and therapeutic recommendations, and collaborates with oncologists whose patients have failed conventional therapy. Mary is continuing her innovative research in biomedical analytics, developing novel computational methods to enhance patient diagnoses, prognoses, and therapies. To date, she has designed methods to analyze biological pathways in multiple organ failure, dry eye, hemophilia, Parkinson’s disease, and numerous cancers— all based on patient bio-fluid and tissue data combined with published findings.

1972
Martin Gimovsky, who is married to Arlene Joan Glaser BS’73, writes that they are doing well in Watchung, NJ. Their daughter, Alexis, is a fellow in Maternal Fetal Medicine at Jefferson, and her twin brother, Matt, is a practicing attorney in Bethesda, MD, who recently became engaged. Arlene continues to metal smith and study Chinese. Martin is in full-time practice.”

1973
Larry LEGIN has recently retired as deputy program manager for the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory (LLNL). He has spent a 40-year career as a devoted scientist and engineer, more than 30 years of which have been towards fusion energy research. At LLNL, Larry co-led the engineering and controls team for the NIF, which is the world’s largest and most energetic laser experimental system, providing a scientific center to study inertial confinement fusion and matter at extreme energy densities and pressures. NIF’s laser beams are designed to compress fusion targets to conditions required for thermonuclear burn. Prior to joining NIF, Larry worked as a senior scientist/engineer at Princeton University’s Plasma Physics Laboratory and worked on the Tokamak Fusion Test Reactor (TFTR) magnetic fusion project since 1982. Larry was sent as part of a team of engineers in 1982 from Grumman Aerospace Corporation to help build and commission TFTR. Larry began working as an engineer and research scientist in the Advanced Development and Research Departments of Grumman in 1974.

1974
40th Reunion
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

1975
Larry Turyn has written a textbook, Advanced Engineering Mathematics, which was published by CRC Press/Taylor & Francis in September 2013.

1977
Robert Zimmerman MS’79 is currently professor of rock mechanics at Imperial College in London, UK. On December 5, 2013, he delivered the plenary keynote talk, entitled “Measurement and Modelling of the Failure of Anisotropic Rocks such as Shales” at the Annual General Assembly of the Comité Français de Mécanique des Roches in Paris. He has been serving, since April 2013, as a member of the Steering Committee for the “Long-term Subsidence Study in the Wadden Sea Region,” at the invitation of the Royal Netherlands Academy of Arts and Science.

1978
Class Correspondents:
Larry Chung
lpc34@columbia.edu
Peter Luccarelli
peter.luccarelli@pliplaw.com

1979
35th Reunion
To take an active role in your Class Reunion activities, please contact Star Sawyer at ss3858@columbia.edu or 212-851-2402.

Class Correspondent:
Stewart Levy
srlevy@att.net

1981
Class Correspondent:
James Reda
jfreda@jfreda.com
1982

**Class Correspondent:**
Dan Libby  
kdl26@columbia.edu

Dan Libby MS’84 writes, “My son Alex Libby was accepted to Columbia College, Class of 2018, for this fall. Alex (in my unbiased opinion) will make a wonderful member of the Columbia community. He excelled in his high school career in many different ways in addition to academically. In sports he was an integral member of his highly competitive soccer team and a second-degree Black Belt in Tae Kwon Do—very nearly third degree. He performs three musical instruments beautifully (see him on YouTube under the archaic username of ‘JoJoLaLa104,’ especially the second piece in his 2006 video). He was an Eagle Scout among other achievements too numerous to mention here. Oh yea and it doesn’t hurt that he is a really handsome and nice young man or at least the ladies seem to think so!”

1984

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

1985

**Paul Chiu ’94BUS and Laiyan Wong** recently bought an apartment on the Upper West Side, close to Columbia’s Morningside campus. Their son, William Nicholas, currently attends The Trinity School in Manhattan.

1986

**Alex Gorelik** has started a new Silicon Valley company, Sherlock Data Science, funded by Menlo Ventures, Sigma West Ventures, and Stanford University. Sherlock is focused on helping companies increase the adoption of data science and analytics. Alex is a former IBM Distinguished Engineer and serial entrepreneur whose previous companies included Exeros (acquired by IBM and marketed as InforSphere Discovery) and Acta (acquired by Business Objects/SAP and marketed as Business Objects Data Services). He resides in Palo Alto, CA, with his wife and four children.

1988

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

Marylee Jenkins, partner and head of the New York Intellectual Property Group at Arent Fox LLP, has been reappointed by U.S. Secretary of Commerce Penny Pritzker for a further term of service to the Patent Public Advisory Committee (PPAC) for the United States Patent and Trademark Office (USPTO). Her appointment will now run through December 2016. PPAC reviews USPTO policies, performance, and budget with respect to patents and issues annual reports that are transmitted to the president, judiciary committees in the Senate and House of Representatives, and the secretariat of commerce. The nine committee members are appointed by and serve at the pleasure of the president, judiciary committees (PPAC) and the secretary of commerce.

1990

**Class Correspondent:**
Laura Cordani Christopher  
zchristophers@gmail.com

1991

**Class Correspondent:**
Radhi Majmudar  
radhi@majmudar.org

Pavan Dhingra, who is married to Alda Monteiro ’91CC, has two children, Amar Dhingra, a current SEAS student in computer science, and Sana Dhingra, who is in the 12th grade. They live in Gurgaon, a suburb of Delhi, India. Pavan writes, “We work together running our insurance broker specializing in corporate insurance. It has been a great journey since graduating from Columbia, and our highlight this decade was seeing off our son as a freshman at our Alma Mater. Alda has recently taken up running and has participated in three full and several half-marathons and hopes to run in the New York Marathon in the near future.”

1992

**Class Correspondent:**
Janneth Ignacio Marcelo  
jannethmarcelo@gmail.com

1993

**Class Correspondent:**
Herbert Kreyzig  
Hek@7000@gmail.com

1994

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

Vineet Madan ’00BUS and his wife Laura ’94BC moved to Short Hills, NJ, three years ago. Vineet has been bit by the entrepreneurial bug and after stints at Booz and McGraw-Hill, where he most recently headed strategy, corporate development, venture investments and founded a tech R&D lab, he is now running an education tech start-up focused on improving hybrid learning with mobile devices. Look out for their public launch this spring!

1996

**Class Correspondent:**
Enrico Marini Fichera  
em75@columbia.edu

Rod Covlin won third place in the 2013 American Backgammon Tour (ABT).

1997

**Class Correspondent:**
Kelly Lenz  
kal23@columbia.edu

Brian O’Dwyer and his wife, Monisha Saldanha O’Dwyer are delighted to announce the birth of their third child, Kiara Elizabeth O’Dwyer. Kiara joins big brothers Rohan Liam O’Dwyer (age four) and Rahul Michael O’Dwyer (age two). Brian left Skywest as CFO last year following the sale of the company to Virgin Australia and is still working on what is next, targeting the education and technology sectors. Monisha is now into her 15th year at Givaudan Fragrances. The family continues to reside in Singapore and looks forward to seeing classmates in the area.

1998

**Mike Giambra** writes, “I continue to work at MRE Consulting, a niche IT consultancy in the energy space. Between 2010 and 2013, I started and headed up the UK office for MRE. I have since returned to Houston, TX. In April 2010, I married Victoria Slater ’01BC in Houston. Two
weeks later, we moved to London. On November 29, 2012, our daughter, Emma Regina, was born at St. George’s Hospital in Wimbledon, UK. We returned to Houston in June 2013.

1999
15th Reunion
To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

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

Eric Rhee writes, “Hello, Class of 2004. Time to celebrate 10 years since graduating from Columbia! Please register to attend reunion May 29 to June 1. It’s going to be awesome to catch up with you all, share old memories, and create new ones.

“As far as class updates, here is a nice update from Matt Sisul in his words: ‘Last year I returned to New York City after 15 months in Port au Prince as PM and lead engineer for a local construction company called YCF Group, participating in the rebuilding effort after the earthquake. Since then, I’ve started my own engineering consulting company, Sisul Consulting LLC, specializing in structural design in developing countries, and picked up my Civil PE. I’m looking forward to the 10-year reunion this May.’”

Jonathan So is currently living in Hong Kong, where he founded and runs a beer festival called Beertopia. Started two years ago, it is now Hong Kong’s largest craft beer festival, reports Jonathan. This year’s event took place from March 13 to 15 and featured over 400 different beers and anticipated a crowd of 12,000 attendees!

2004
10th Reunion
To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

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

2000
Class Correspondent:
Daisy Chow
daissy@caa.columbia.edu

2001
Class Correspondent:
Catherine Marcinkevage Miller
cmarcinkevage@gmail.com

Catherine Marcinkevage Miller and her husband, Randy, welcomed their second son, Aaron Samuel, in June. Aaron joins the family and his big brother, Nate, in Sacramento, CA, where Cathy is a biomodeler and natural resources specialist with NOAA Fisheries.

2002
Class Correspondent:
John Morris
jmp53@columbia.edu

2003
Class Correspondent:
Amar Doshi
abd19@columbia.edu

This spring, Gary Shu is completing a yearlong tour with the U.S. Agency for International Development as the energy and water infrastructure chief in the Kabul, Afghanistan, mission. This summer, Gary plans to move to Nairobi, Kenya, to be the energy coordinator on the U.S. government’s Power Africa initiative.

2004
Class Correspondent:
Devang Doshi
devang.doshi@gmail.com

2005
Class Correspondent:
Nick Jennings
nfj2003@caa.columbia.edu

2006
Class Correspondent:
Mark Herman BS’63
(page 48)
Dan Libby’s BS’82, MS’84 son, Alex
Pavan Dhingra BS’91 with his family
Brian O’Dwyer BS’97 welcomed daughter Kiara in June.
Kevin Tung BS’01 and Ya Tung BS’01 welcomed their daughter, Vesper Ava, born on October 20, 2013.
Roger Kwan BS’01 and Tiffany Ha welcomed their first child, Eta Harper Kwan, born November 13, 2013.
Tamsin Davies writes, “On Halloween, the ’07 family expanded when Mark Tabry and his wife welcomed Hudson Marcel Tabry. Fangyun (‘Flying Tom’) Tam completed his PhD in operations management from Wharton in 2012 and is now an assistant professor at Cox Business School at SMU. As for me, I will be spending more time in London working in product development for J.P. Morgan. If you are in London feel free to drop me a line.”

Juan Camilo Dorado has recently launched Ezenciel, a company that aims to develop creative products and whose proceeds help fund various social causes, such as education and nutrition programs in developing countries. Ezenciel is currently working on projects helping to provide aid in the Philippines. Juan invites fellow alumni to read more about his social causes start-up at www.ezenciel.com.

Laurene Aigrain writes, “I spent the last two years living in Gabon on the west coast of Africa, working on their National Infrastructure MasterPlan Development and Implementation. Our scope covered roads, dams, transmission lines, rail, social housing, etc. The experience was fantastic and life changing. I am ready to move back to developing countries in the near future. I recently moved to Houston, TX, to work on the new challenge of helping manage Chevron’s major capital projects worldwide.”

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

Class Correspondent: Ramya Pratiwadi
ramyap@gmail.com

Everett Lin proposed to his classmate Tian Wei He at the Hayden Planetarium Ross Terrace on October 22, 2013… and she said YES! They met during their junior year in Broadway Hall through a mutual friend (her next door neighbor; his high school classmate). Everett is graduating from the University of Pennsylvania School of Dental Medicine in May 2014 and has matched to the orthodontics residency program at Rutgers School of Dental Medicine. Tian is graduating from the Rutgers School of Dental Medicine in May 2014 also and has matched to a Pediatric dentistry residency at St. Christopher’s Hospital for Children. They are planning a NYC wedding at which many of their Columbia classmates and friends will be in attendance!

2010 Class Correspondent: Michelle Madejski
michelle.madejski@gmail.com

2008 Class Correspondent: Amy Lin
seas2008.engineeringnews@gmail.com

2007 Class Correspondent: Tamsin Davies
tamsin.davies@gmail.com

2011 Class Correspondent: Justin Merced
jmm2238@columbia.edu

2009 5th Reunion
To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

Class Correspondent: Ramya Pratiwadi
ramyap@gmail.com

Alex Weinstein reports that he will be returning to Columbia in August to begin his MBA. He is excited and can’t wait to return to Morningside!

Lauren Aigrain writes, “I spent the last two years living in Gabon on the west coast of Africa, working on their National Infrastructure MasterPlan Development and Implementation. Our scope covered roads, dams, transmission lines, rail, social housing, etc. The experience was fantastic and life changing. I am ready to move back to developing countries in the near future. I recently moved to Houston, TX, to work on the new challenge of helping manage Chevron’s major capital projects worldwide.”

2009 5th Reunion
To take an active role in your Class Reunion activities, please contact Cliff Massey at cam2171@columbia.edu or 212-854-2317.

Class Correspondent: Ramya Pratiwadi
ramyap@gmail.com

Annie Perizzolo and Jeremiah Root got engaged last fall and are keeping themselves busy in Northern Virginia with work, wedding planning, and anything they can find to do on the weekend!

Juan Camilo Dorado has recently launched Ezenciel, a company that aims to develop creative products and whose proceeds help fund various social causes, such as education and nutrition programs in developing countries. Ezenciel is currently working on projects helping to provide aid in the Philippines. Juan invites fellow alumni to read more about his social causes start-up at www.ezenciel.com.

Save the Date!
Reunion:
May 29–June 1, 2014
Dean’s Day:
May 31, 2014
Gaining additional knowledge in supervision. She writes, “It is hard to believe how the years have flown. Three children are almost grown and 10 years in administration at Loyola University Maryland as well. I am in the Engineering Department and enjoy STEM outreach, teaching in a program for first-year students. Some of my areas of interest continue to be materials science and education, biomedial signal processing, the auditory system and sound, speech, and music processing, as well as design education and universal design or design for persons with disabilities. Baltimore has become home for us, though I guess my heart will always be in New York. I am very involved with the American Society for Engineering Education and am on the national board for the next two years. I am also chair of the board at my synagogue and had the wonderful opportunity last year to go on an Ignatian Pilgrimage to learn about St. Ignatius Loyola, who founded the Jesuits, who run Loyola University and 27 other Jesuit colleges and universities in the U.S. Would love to hear from other alums at Skeilson5@gmail.com.”

Chemical engineering and learning how to apply that knowledge into research and development, was given the opportunity to translate those experiences into the biotech/pharmaceutical industry. Currently, I work in the Pre-Clinical Manufacturing and Process Development Department at Regeneron Pharmaceuticals as a process development engineer. I am so fortunate to have been able to work with such great and helpful individuals in the Banta Lab that really allowed for me to develop myself, professionally. The patience, dedication, and guidance of each member of, not only the Banta Lab, but also the Columbia Engineering community, really helped me make the transition into the ever-feared ‘real world.’ Thank you!”

For more than 37 years since graduation, C. S. Sunny Sea MS’76 has been working as an environmental professional around the world, from California/Oregon (10 years) to Saudi Arabia (4 years), to Japan/Okinawa (12 years), to Korea (5 years), to Thailand (1 year), and Germany (5 years). C. S. writes, “I utilized my knowledge and experience, learned from my Columbia education, to resolve and mitigate environmental-related issues and problems, and, in addition, to discover new techniques around the globe.”

Jacques L. Zakin MS’50 writes, “From 1951 to 1962, I worked at the Socony Vacuum (later Socony Mobil and still later Mobil) Research Laboratory in Greenpoint, Brooklyn. I was fortunate to receive an employee incentive fellowship and completed doctoral studies at NYU in 1959. In 1962, I left New York for an academic position at the University of Missouri–Rolla (now MIST) and in 1977 came to Ohio State as department chair, a position I held until 1994. In 2000, I became professor emeritus, but I am continuing to teach and do research. “The highlights of my experiences at Columbia were interactions with Professor Linford. He and his wife, Becky, were genial hosts at social occasions in their home in Fort Lee, NJ. They attended my wedding to Laura Pienkny ’50BC, and he organized a cabal of mischief makers who sabotaged our borrowed honeymoon car by placing stones inside the hubcaps. They roared as I struggled to remove the hubcaps and take out the stones as we finally drove off. Linford held regular research review meetings with his graduate students in his office and they were always interesting and valuable and lots of fun. “Academia has provided me with many opportunities for interesting interactions, both with students and with colleagues in the U.S. and many other countries. In addition to faculty duties in Rolla, I served as director of both the Minority Engineering and the Women in Engineering Programs. My recent research has focused on reducing the energy requirements for pumping liquids in turbulent flows in pipes (drag reduction) by addition of small amounts of high polymers or surfactants, and I have published more than 120 refereed research papers on these and other studies.”

Civil Engineering and Engineering Mechanics

Michael R. Dunham MS’05 has recently accepted a new position as co-director of engineering at W&L Glass.

James W. Workman EngScD’62 began his eighth year working as a volunteer chef’s assistant for student activities and events at Caltech. His work includes buffet meals for 35 to 900 guests, assisting with a cooking class for 20 to 50 undergraduate students, cooking and serving gourmet (12- to 21-course) dinners for small parties, cooking for student leadership retreats and weekend ski trips, and a summer party for Caltech alumni in the New York metropolitan area. James writes, “Working with undergraduates is challenging but rewarding. I also get to work with a cadre of other alumni, members of the staff, and a few faculty wives. During finals week I cook crepes for 800 students at a midnight brunch. It’s not as academic as my daughter’s teaching at Columbia College, but I’m retired.”

Computer Science

The Karen Spärck Jones Award for 2013 has been awarded to Eugene Agichtein MS’00, PhD’05, associate professor in the Mathematics and Computer Science Department at Emory University. This award recognizes advances in the understanding of information retrieval and natural language processing with significant experimental contributions. Eugene also is a Sloan Research Fellow.

Chen (Jane) Yen MS’87 has recently joined the Enterprise Solutions Product Management team at Bloomberg LP in New York City. She is very proud that her older daughter just graduated from NYU early and has a job!

Earth and Environmental Engineering

After graduation, Cüneyt Arslan MS’86, PhD’91 returned to his home country, Turkey. Currently, Cüneyt is with Istanbul Technical University (ITU), instructing several courses in the Metallurgical and Materials Engineering Department as a full-time professor. In 2012, he was appointed director of the Applied Research Center, located at ITU’s main campus.
Nathaniel Thayer Wight MS’11, a teacher at Bronx Design and Construction Academy (BDCA), has recently won the Zayed Future Energy Prize for his school. BDCA was named the winner of the Prize for the Americas (South, Central, North) region. It was one of five schools around the world awarded the $100,000 prize. Nathaniel writes, “We will use the funding to build an Energy-Environment Research Center (E2RC) in front of our school!” BDCA is home to the first approved public school green roof in New York City. The ninth grade ecology class and after-school Green Science Club use the green roof to investigate and develop environmentally sustainable practices.

Richard Gitlin MS’65, EngScD’69 was named Distinguished University Professor at the University of South Florida (USF). He joined USF in 2008 after a distinguished career in the private sector, particularly over 30 years spent at Bell Labs, Lucent Technologies. He is currently a State of Florida 21st Century Scholar as well as Agere Systems chair and now Distinguished Professor of Electrical Engineering. At Bell Labs, he was a pioneer in the research and development of digital communications, broadband networking, and wireless systems. Among his 47 patents are key ones in these areas including the DSL (digital subscriber line) concept, which allowed Internet access over telephone networks. He is a fellow of the IEEE, a Bell Labs fellow, and the only USF member of the National Academy of Engineering.
In 2005, he was co-recipient of the 2005 Thomas Alva Edison Patent Award. At USF, his research has focused on the integration of advanced communications technologies and biomedical systems for the wireless networking of miniature wirelessly controlled devices to accomplish minimally invasive surgery. The research is in collaboration with other members of the College of Engineering and several USF/TGH/Florida Hospital surgeons. Richard is an exceptional and acclaimed researcher who has won numerous awards for his significant research contributions, which have been sustained and prolific over several decades.

Yiwei Thomas Hou MS’93 has been named an IEEE Fellow, being recognized for “contributions to modeling and optimization of wireless networks.” IEEE Fellow is the highest grade of membership and is recognized by the technical community as a prestigious honor.

Pavlos Kouros MS’78, EngScD’80 writes, “I am still working at the Department of Computer Systems Engineering at Technological Educational Institute of Piraeus in Athens, Greece. I have three boys (Alexander, Achilles, and Odysseus) and I hope that all of them will be able to some day acquire the great experience of being students at Columbia in New York.”

**INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH**

In 1992, Andre Cappon MS’71 founded the CBM Group, Inc., a general management consulting firm. Andre serves as president and founding partner, and has more than 25 years experience as a consultant to financial services companies. Since its launch, CBM has served more than 60 different clients, all leading financial services firms. Prior to founding the CBM Group, he was a senior partner of Oliver Wyman & Co., a vice president and shareholder of Booz, Allen and Hamilton, a manager with Andersen Consulting (now Accenture). He began his career as an analyst for the Organization for Economic Cooperation and Development (OECD).

Dimitri Mongeon MS’08 writes, “I graduated from Columbia in the summer of 2008, just before the storm that shook the financial markets.” Dimitri worked as a fixed-income swaps trader at ING Financial Markets New York a couple of months before graduation and remained with ING for three “very beneficial years.” To diversify his professional experience, Dimitri moved on to Societe Generale Americas in December 2010, which gave him the opportunity to develop international experience. A year later, he moved to London on the USD swaps desk and another two years later, in September 2013, he was sent to Hong Kong to trade USD swaps and run the AUD and NZD swaps desk.

After graduation, Carlos Augusto Moreno-Vivot MS’63 worked as a junior consultant at an industrial consulting firm in Buenos Aires. He spent the majority of his professional career at Coca-Cola in Latin America in management and supervisory roles. In 2010, Carlos retired and started research activities in the eolic energy area. He is married and has two sons, seven daughters, and 38 grandchildren!

Don Sutaria EngScD’70 is founder and president of CareerQuest, located in New York and New Jersey. Also known as Career Doctor Don, he is a consultant to individuals and corporations offering executive coaching and career management services. He is the author of Career and Life Counseling from the Heart (Your Career is a Pathway to Your Soul!) and has been quoted in numerous publications including the Wall Street Journal, New York Times, Working Smart, and Fortune.

He is also a member of Columbia Career Coaches Network. His areas of expertise are career assessment, job search strategies, changing careers, résumés and cover letters, salary negotiation, executive coaching, reentering the workforce, work/life balance, self-employment, and age issues. His specialties also include counseling of international professionals, Generation X and Y, people over age 40, mid-career executives, career changers, freelancers, and consultants. Don’s portfolio of clients includes a broad spectrum of professionals in various age groups.

Prior to starting CareerQuest in 2001, Don served for 35 years in various ascending positions in engineering and management in the pharmaceutical, fine chemical, food, beverage, and brewing industries, in companies such as Pfizer, Hoffmann-La Roche, CPC International, and Schaefer Brewing. He also worked internationally in engineering, design, construction, and consulting firms.

**MECHANICAL ENGINEERING**

After working at two different companies in New York City, Bryce Anzelmo MS’11 has decided to pursue a PhD at Stanford. He is currently researching ways to utilize natural gas without emitting carbon into the atmosphere. Bryce writes, “My experiences at Columbia shaped the way I viewed my future and helped direct my efforts into a PhD program.”

Rai Bhargava MS’49, PhD’57 passed away in August of 2013, writes his friend of over 60 years and former Furnald Hall roommate, Jeff Broido BS’56.

Rai’s specialty was analysis of shock wave attenuation. Jeff writes, “In the days when grinding out numerical solutions on high-speed computers was not yet possible, Rai had unique skills in analytical solutions in this critically important area that allowed vitally needed solutions to be obtained. After returning to India, Rai embarked on a long career with the United Nations in the area of economic development in the developing world. He had extended assignments in Libya, Kuwait, Zimbabwe, and other third world nations. He retired to Hyderabad, India, from the U.N. about the year 2000 and did occasional consulting. Rai is survived by his daughter, Arti, of Mill Valley, CA.”

Kenneth Chen MS’97, PhD’07 has taken on a new position with Amazon’s Web Services (AWS) as global data center services engineering manager in the Fairfax, VA, area. He was previously with Dell’s Global Data Center Practice as chief solution architect for the past three years and was last based in Singapore before joining Amazon. During his tenure with Dell, he helped develop the Asia Pacific Data Center Solution Team and designed many major Internet service provider’s high-density and high-reliability data centers in China and around the world. He is currently licensed to practice engineering as a professional engineer in all 50 U.S. states. Ken lives with his wife, Maggie, and two boys, Kayden and Marcus.
IN MEMORIAM

1940

Donald W. Oakley MS‘42
passed away at his home in Salem, OR, on August 7, 2013. He was 94. Don was born in Queens Village, NY. After graduating from Columbia Engineering, he married Elinor Mae Haskins, his teenage sweetheart. They were faithfully married for more than 60 years until her death in 2004. Don became president of the chemical division of Mobile Oil Co. while still in his 30s and later was a vice president of Georgia Pacific in Portland, OR, and then a vice president at Cabot Corporation. While at Cabot, he permitted and constructed a liquefied natural gas (LNG) import terminal in Boston and negotiated a contract with the Algerian government to import gas by tanker to that facility. While working full time at Cabot, he attended Suffolk Law School in the evenings and received his JD degree. Don loved to garden, contemplate nature, read about history and science, and engage friends and strangers alike in conversation. Don is survived by his three children, five grandchildren, and four great-grandchildren.

1943

Gilbert S. Bahn of Moorpark, CA, died on July 3, 2013. He was 91. Born in 1922 in Syracuse, NY, Gilbert moved to California in 1990 after his retirement from a career of 45 years as an engineer. He was an intellectual, a great lover of science, and engage friends and strangers alike in conversation. Don was survived by his three children, five grandchildren, and four great-grandchildren.

1946

Clifford F. Berninger MS‘47, who led the development of the re-entry heat shields used on Apollo missions to the moon, died December 30, 2013, at the age of 88. Born in New York City, he attended Brooklyn Technical High School and graduated from Columbia Engineering under the U.S. Navy’s V-12 program during World War II. After the war, he earned a master’s from Pratt Institute and his doctorate from Brooklyn Polytechnic Institute. Clifford was among the first class of scientists and engineers trained under the Atoms for Peace program and had a long career in the aerospace industry. He was an engineering executive at Bell Aerospace. He lived in Massachusetts and Chicago before moving to Williamsville, NY, when he joined Bell Aerospace in 1967, first as vice president for research and development, then vice president for engineering. His wife of 47 years, Maria Clare Johansen Berninger, died in 2004. He is survived by three sons, Mark, Donald, and Robert; a daughter, Ann Unterberg; and eight grandchildren.

1947

Daniel Frankfurt (MS, Civil Engineering and Engineering Mechanics) passed away on January 20, 2014. Daniel, 88, was a loving and cherished husband of Ruth for 62 years, and proud father and grandfather. He was founding president of Daniel Frankfurt P.C. Engineers and Architects in New York City, following career involvement in major projects such as the Telstar communications satellite and the U.S. space program’s testing facility for the Lunar Excursion Module for the 1969 landing on the moon. His family and friends will miss his keen mind, calm spirit, and warm soul.

1948

Roy D. Fisher, 87, a longtime resident of East Harriet, CT, and a key contributor to the manned U.S. spaceflights to the moon, died on August 5, 2013. A native of Springfield, MA, he
1950

Harold S. Braham passed away on November 2, 2013, at age 86. Born in New York City, Harold attended Regis Catholic High School and graduated with honors. He continued his education at Columbia Engineering, where he earned a degree in electrical engineering. Harold completed his PhD from Cal Tech and used his education to work on communication satellites and aerospace engineering. He was a pioneer on the Egyptian communication system and other world network systems, and a major player in high-level top-secret government work. In “space technology,” Harold was the eyes and ears to the U.S. Air Force in the 1960s and 1970s and served in top-level administration for many companies including General Electric, TRW, and Hughes Aerospace. He loved writing and studying aerospace as well as the Yankees and the N.Y. Giants. He is survived by his wife of 54 years, Elizabeth L. Braham, and their three children.

1954

Arthur “Herb” Murk passed away November 12, 2013, at the age of 83. Herb was born in northern New Jersey to parents Arthur and Minna, who emigrated from Estonia in 1923. Herb was proud of his heritage and was part of an active Estonian community growing up. After graduating from Columbia Engineering, Herb was drafted into the U.S. Army in 1954 and was assigned to White Sands Proving Grounds, NM. After an honorable discharge from the Army in 1956, Herb started his career as a mechanical engineer with Pratt and Whitney and eventually retired in 1992 from General Electric, where he had worked for 24 years. His passion for engineering was volunteered for the U.S. Navy during World War II and was selected for officer training at Columbia Engineering School. After leaving the Navy as a Lieutenant J.G., he completed a master’s degree in engineering at Rensselaer Polytechnic Institute. A licensed professional engineer, Roy began his career with American Bosch but soon moved to Hamilton Standard in Windsor Locks, CT. There, he eventually became director of design and development for the space suits and other life-support systems for the astronauts of NASA’s Apollo program, including Neil Armstrong. He also worked on the development of maneuvering rockets used to reposition satellites while in orbit and was a consultant to the government of India on its communications-satellite program. Roy lived for nearly six decades in Hartland, serving the town in various capacities including volunteer firefighter, constable, member of the board of finance, and tax assessor. An avid gardener and landscaper, he maintained a large vegetable garden, fruit trees, a trout pond, and berry groves. He was an accomplished pianist and, in retirement, became a stained-glass craftsman, building precise reproductions of complex Tiffany lampshades. He was an enthusiastic fisherman and, for some 30 years, spent several weeks each summer pursuing salmon and trout on Alaska’s Kenai Peninsula, where he owned a cabin and a share in a rustic fishing camp. He is survived by his wife of 61 years, Jean A. Fisher, his daughter, Lynne (Gary) Henry, and granddaughter Sarah Henry, and his son, Mark (Barbara) Fisher, and granddaughter Sophia Fisher.
Julius Jermanok (MS, Mechanical Engineering) died April 7, 2013, in Naples, FL. He was 83. Born in Brooklyn, Julius graduated at the top of his class at United States Merchant Marine Academy in 1953, earning a degree in mechanical engineering. He then spent four years in the U.S. Navy as an officer on the USS Point Cruz, before returning to New York and earning his master’s at the Engineering School. In 1959, Julius moved to Schenectady, NY, to work under Admiral Hyman Rickover at Knolls Atomic Power Laboratory’s (KAPL) nuclear submarine department. He later made the transition to General Electric and its gas turbine division, where he had an esteemed career until his retirement in 1992. One of the highlights of his work was leading the breakthrough research project on coal-to-gas liquefaction. Julius was known for his enthusiasm, sense of humor, compassion, generosity, and sage advice, especially to younger GE employees who looked upon him as a mentor. In 1998, his first wife, Beverly Rieger Jermanok, succumbed to brain cancer. He was fortunate to meet Virginia Bury, whom he married in 2000. Julius is survived by his wife, Virginia; three children; Virginia’s two sons; four in-laws; and six grandchildren.

1963
Steven H. Chestnut (MS, Engineering Mechanics) passed away December 16, 2013, after spending 12 years at City College of New York and Columbia Engineering with degrees in engineering, Steve moved to Seattle, WA, to take a position at Boeing, where he met his future wife of 47 years, Evelyn Chestnut (Goldfine) from Fargo, ND. In 1971, Steve earned his law degree from the University of Washington and became deeply involved in the field of Indian Law, winning in front of the United States Supreme Court and writing federal and tribal legislation on behalf of numerous tribes. He practiced law without avarice and freely gave his time and expertise to a breadth of friends and acquaintances. Steve is survived by his wife, four children, and 10 grandchildren. His love, loyalty, wit, and generosity will be missed.

1967
Azriel Harari (EngScD, Civil Engineering and Engineering Mechanics) died peacefully on January 14, 2014, at Heatherwood Nursing Home in Newport, RI, following a long illness. He was 87. Born in Tel Aviv, Israel, Azriel received his...
BSc in engineering from The Technion in Haifa in 1955 and an MSc in engineering, also from The Technion in 1959. Immigrating to the United States in 1960, Azriel attended Columbia Engineering. After graduation, he began his professional career at various engineering firms in Israel and the United States before settling at Naval Underwater Warfare Center (NUWC), where he worked as a physicist and expert in structural acoustics, retiring in 1999. An avid dancer and lover of chocolate, Azriel devoted much of his spare time to working in his garden and caring for his beloved fig tree, priding himself on his ability to make a desert tree grow and produce fruit in the harsh Rhode Island climate. Quick to laugh, Azriel spent the remainder of his time celebrating life with his loving wife of 51 years, Sheila. Azriel was a member of Touro Synagogue, a member of the Acoustical Society of America, and a registered professional engineer. He is survived by his wife, Sheila, his three sisters, a brother, and several nieces and nephews.

1989

Ben W. Harris passed away peacefully at his home in Bloomington, IN, on August 15, 2013. He was 46.

Ben was born on January 2, 1967, in Menomonee Falls, WI, to William and Claire Harris and attended high school at Northfield Mount Hermon boarding school. After receiving his bachelor’s in applied physics from Columbia Engineering, he went on to earn master’s degrees in both philosophy and physics from the UC Riverside, and subsequently worked as a dosimetrists and later calibration physicist at Loma Linda University Medical Center. He was granted certification by the American Board of Radiology in 2005. He continued to work with protons when he moved to Bloomington, where he was employed as director of Medical Physics by ProCure Treatment Centers. Since first learning of his ALS in January 2011, Ben showed incredible courage and indomitable will to make a difference in the face of something that most would have succumb to just out of hopelessness. Ben is survived by his wife, Rebecca; son, Rawden; parents, William and Claire; siblings, Michael, Daniel, Kathy, Amy, and Jason; as well as four nieces and seven nephews.

1991

Paul V. Christianson (MS, Industrial Engineering and Operations Research), of New York City and Haddam Neck, CT, died October 26, 2013. With his wife, Paul started a youth and student travel business in 1968, which became InterExchange in 1988. The Christiansons began with the mission of facilitating international understanding, friendship, and cooperation between U.S. citizens and young people from countries around the world. Earlier, Paul served in the U.S. Navy and worked with defense contractors in Europe and Asia. He also worked as an administrative director at Columbia University and held various jobs with government agencies and NGOs. He is survived by his wife, Uta, brother, Howard Christianson, and sisters Janet Johnson and Carol Harris.

2009

Scott Kim Pelletier passed away September 11, 2013, after a courageous battle with cancer. He was 26. Born in Pusan, South Korea, Scott taught science at the World Journalism Preparatory School in Queens, NY. He studied biomedical engineering at the School and later received his master’s in education. Scott was also the salutatorian of his Putnam Valley High School graduating class. He volunteered for New York Cares, enjoyed bowling, and was an avid Jets and Mets fan. He is survived by his loving parents, Ronald and JoAnne Pelletier.

OTHER DEATHS REPORTED

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

Charles D. Preusch BS’39, MS’40
Norman L. Lindsay BS’45
Bernard Goldman BS’47, ’48JRN
Howard R. Petrie BS’47, MS’48
John G. Busharis BS’48
Theodore M. Rosenblatt BS’48
Sidney Rush BS’48
Rai Bhargava MS’49, PhD’57
Francis L. Kelsey BS’49
William D. McDonough BS’50
Jennings Braun MS’53
George J. Peters BS’53
John D. Leahy BS’54, ’53CC
Robert A. Spinnler MS’54
Matthew A. Medick PhD’58
Edward F. Schaack BS’58
John L. Cifu MS’59
Karl G. Ludloff BS’59
Stephen Prigozy MS’60
James V. Toto MS’60
Richard G. Vorce BS’60
Irwin Etter BS’61, ’60CC
Walter A. Hoelderich MS’61
Frank Y. Soliman MS’61, PhD’65
John J. Erglis MS’64
Jack W. Goldstone MS’66
Alexander Labounsky BS’68, MS’69
Arthur G. Silvers BS’68, ’67CC
David M. Woodall MS’68
Walter Y. Lee BS’69, MS’73
Frederick S. Carroll BS’73
To celebrate the School’s 150th anniversary, *Columbia Engineering* will publish a series of questions—on our website, our Facebook page, or via our Twitter feed—to test your knowledge of the School’s history. We’ll be digging up fun facts from 1864 to the present day that will indeed show just how far we’ve come.

From 1903 to 1965, almost every Columbia Engineering student, like the ones pictured here, spent part of the summer at this site in Connecticut. What was it called?

We hope you’ll keep playing as we continue our 150th anniversary celebration. The answer can be found at the bottom right-hand side of the page.

Share your photos and Columbia Engineering memories on our new 150th anniversary website: Remember. Post. Celebrate. [seas150.columbia.edu/memories](http://seas150.columbia.edu/memories)