

Columbia Engineering

The

2026
MAGAZINE

The University
Advantage

Fusing Strengths

100 Years
of Quantum

Edition



Engineering
for Humanity

Message from the Dean



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We are in a transformative time when advances in AI and quantum science are unlocking new possibilities. Many promising breakthroughs are on the horizon, in energy, healthcare, transportation, and more. What will bring advances from the lab to real-world impact is partnership and collaboration. In this issue of Columbia Engineering magazine, we take a look at recent partnerships between our School and industry that are solving problems and advancing progress in key sectors. Our School has more than 20 industry-affiliated centers working to help bring solutions to the hardest challenges facing some of the world's most innovative companies. From our new Columbia Fusion Research Center and the Center of Advanced Electrification to the recently launched sustainable materials hub Gotham Foundry, you'll see how relationships lead to powerful collaboration.

This year, we are also celebrating 100 years of quantum mechanics at Columbia. You can learn more about the notable history of quantum here and the current research being done that will shape the next century. Last year, in an effort to share our faculty expertise to a wide audience, we launched The Lever. In this collection of limited-series newsletters, Columbia Engineering researchers zero in on some of the biggest topics of our time. We are sharing the latest issue with you on AI agents. I invite you to see how our faculty, many of whom are part of the Columbia DAPLab, are helping our partners develop and deploy effective agentic platforms.

Over the past few years, we've been inviting more leaders in research and industry to campus to share insights with our community. This fall, we once again hosted Climate Week at Columbia, a full week of

events, lectures, panels, and presentations on the biggest issues related to sustainability. Our signature lecture series on AI and our Tech CEOs series have drawn diverse crowds eager to learn more about the intersection of AI, technology, business, and society.

We also take a look at innovation happening inside the classroom and how we're preparing engineers for 21st-century challenges. Many of our students are interested in aerospace, and student clubs like the Columbia Space Initiative and Airplane Club continue to be very popular with our students. Last spring, we announced a new aerospace minor and Guggenheim Initiative for Aerospace Structures, two opportunities for students interested in pursuing careers in this growing industry. Another new and timely class taught by applied mathematics professor Chris Wiggins and political science professor Eunji Kim brings together data and political science. "Persuasion at Scale" dives into the issue of political communication and how data can be influenced by context and meaning.

Columbia engineers are at the forefront of research and education, poised to change our world for the better. Our alumni around the globe and their contributions — some of which are captured here in this issue — advance this mission every day. Thank you for continuing to be part of these efforts and of this community.



SHIH-FU CHANG
DEAN, COLUMBIA ENGINEERING
MORRIS A. AND
ALMA SCHAPIRO PROFESSOR

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A few stories and snapshots from our global network of more than 50,000 alumni.



Breakthroughs & Insights



Some of the latest advancements and transformative research findings from Columbia Engineering faculty and collaborators:

Edited by
Meeri Kim

▶ Several Truss Links forming a tetrahedron (CREATIVE MACHINES LAB)

◀ The Large Hadron Collider's ATLAS detector measures the electrical pulses generated by particle collisions. Its vat of ultra-cold argon captures an electronic trace of every particle that passes through. (© 2014 CERN)

Bacteria Act as a Trojan Horse for Cancer-killing Viruses

Researchers are developing a new tool to fight cancer. Oncolytic virus therapy uses genetically modified viruses to destroy cancer cells. One of the technology's biggest hurdles is the body's own immune system, which can neutralize the cancer-targeting viruses before they reach the tumor.

A team of researchers led by Tal Danino, an associate professor of biomedical engineering at Columbia Engineering, solved the problem by hiding the viruses inside a bacterium. The approach combines the bacteria's instinct for homing in on tumors with a virus's knack for infecting and killing cancer cells.

"The bacteria act as an invisibility cloak, hiding the virus from circulating antibodies, and ferrying the virus to where it is needed," says Zakary S. Singer, a former postdoctoral researcher in Danino's lab. The platform includes a safeguard against

runaway infections. The team designed the virus to require a component from the bacteria to reproduce. Since the bacteria can only live inside the tumor, the virus can't spread in healthy tissue.

Robots That Can Grow Bigger, Faster, and More Capable

Living things can grow, learn, heal, and reproduce — today's robots cannot.

Researchers at Columbia Engineering created a novel platform that demonstrates how robots could act as open systems that grow, self-repair, and adapt in the future. For instance, two robots built from the team's Truss Link technology can combine to form a larger robot. The technology enables 2D structures to fold into 3D shapes, and it allows robots to replace damaged parts with new ones it finds in the environment. "Biological bodies are all about adaptation — lifeforms can grow, heal, and adapt," says Hod Lipson, the James



and Sally Scapa Professor of Innovation and chair of the Department of Mechanical Engineering at Columbia University, and director of the Creative Machines lab where the work was done. "In large part, this ability stems from the modular nature of biology that can use and reuse modules (amino acids) from other lifeforms. Ultimately, we'll have to get robots to do the same — to learn to use and reuse parts from other robots."

Chips Withstand Intense Radiation Inside the Large Hadron Collider

The Large Hadron Collider (LHC), the world's largest and most powerful particle accelerator, is undergoing an upgrade that will significantly boost its performance by 2030. The High-Luminosity Large Hadron Collider (HL-LHC) project aims to produce up to a tenfold increase in the rate of proton-proton collisions compared to the LHC.

Those collisions produce an enormous amount of data — and enough radiation to scramble the bits and logic inside almost any piece of electronic equipment. Fortunately, a research team led by Peter Kinget, the Bernard J. Lechner Professor of Electrical Engineering at Columbia Engineering, in collaboration with the Physics Nevis Laboratories, designed a radiation-hardened

integrated circuit chip that can withstand the intense environment of the HL-LHC upgrade.

The chip functions as an analog-to-digital converter that captures electrical signals produced by particle collisions and translates them into digital data that researchers can analyze. Off-the-shelf components simply can't survive the harsh conditions inside the accelerator, and the market for radiation-resistant circuits is too small to entice investment from commercial chip manufacturers.

"Industry just couldn't justify the effort, so academia had to step in," says Kinget.

Creating a Bioactive Injectable Hydrogel from Yogurt

Hydrogels are soft materials that mimic the properties of living tissues. These materials stand to transform

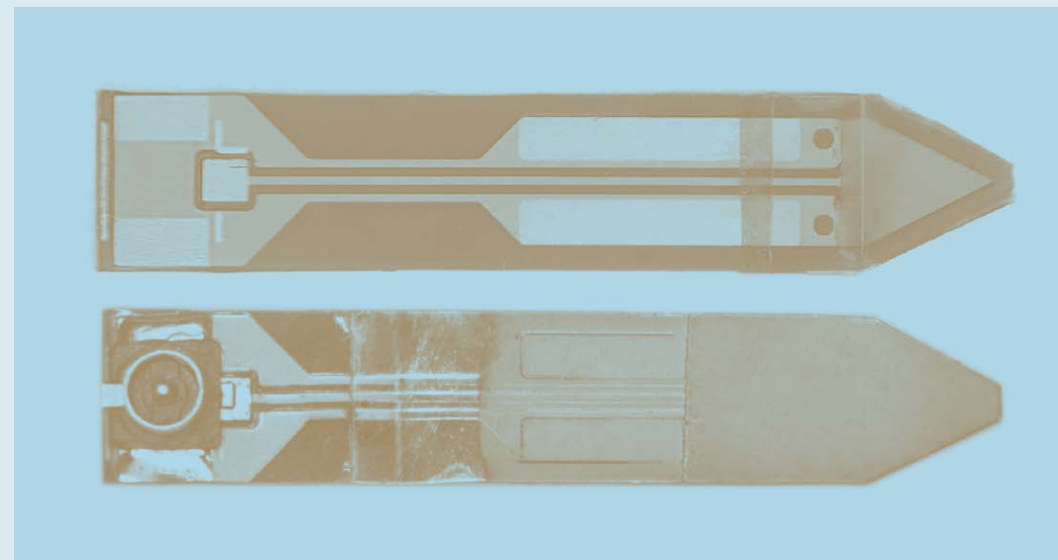
regenerative medicine by helping the body heal wounds or repair tissue.

However, traditional hydrogels are often composed of synthetic building blocks that lack bioactivity. Researchers from Columbia Engineering designed a framework for bioactive injectable hydrogels that come from an unexpected source: yogurt. They leveraged extracellular vesicles (EVs) derived from yogurt whey as crosslinkers to create hydrogels with tunable mechanical properties.

"This project started as a basic question about how to build EV-based hydrogels. Yogurt EVs gave us a practical tool for that, but they turned out to be more than a model," says Santiago Correa, assistant professor of biomedical engineering at Columbia Engineering. "We found that they have inherent regenerative potential, which opens the door to new, accessible therapeutic materials."

Early experiments showed that yogurt EV hydrogels are biocompatible and drive potent angiogenic activity within one week in mice. The material showed no signs of adverse reaction and instead promoted the formation of new blood vessels, a key step in effective tissue regeneration.

“This project started as a basic question about how to build EV-based hydrogels. Yogurt EVs gave us a practical tool for that, but they turned out to be more than a model.” — *Santiago Correa*



▲ Top image shows the sensor before depositing the ground layer and bottom image shows a finished sensor (EMMA WAWRZYNEK)

Paving the Way for Fully Internal Cochlear Implants

For decades, cochlear implants have restored a sense of sound to people who are deaf or severely hard of hearing. However, these devices rely on an external hearing aid microphone that is positioned on the side of the head, which imposes many lifestyle restrictions on users. They cannot swim, play certain sports, or sleep while

wearing the external unit. In addition, the device doesn't take advantage of how the structure of the ear can help direct, filter, amplify, and localize sounds.

As a step towards a completely internal system, researchers at Columbia Engineering, including professor of biomedical engineering and auditory biophysics Elizabeth Olson, in collaboration with colleagues at MIT and

Harvard Medical, developed a tiny microphone totally implantable within the head. The UmboMic consists of a piezoelectric sensor that detects the motion of the umbo — the tip of the hammer-shaped bone connected to the eardrum — paired with a charge amplifier.

"We're taking advantage of millions of years of evolution," says Ioannis (John) Kymissis, the Kenneth Brayer Professor of Electrical Engineering and vice dean of Infrastructure and Innovation at Columbia Engineering. "The ear is exquisitely evolved to pick up sound, and our design gets to make use of all of its adaptations for free."

The UmboMic is comparable in performance to a conventional hearing aid microphone and represents a significant advance towards a fully implantable cochlear implant, which would enhance the quality of life of users.

▶ A sample from the lab. (CORREA LAB)



▶ The technique uses the low-information results of x-ray diffraction (COLUMBIA ENGINEERING)

Leveraging AI to Uncover the Hidden Atomic Structure of Crystals

For more than 100 years, scientists have used crystallography to determine the atomic structure of materials. The method works by shining an X-ray beam through a material sample and observing a diffraction pattern.

The challenge, however, is that this technique only works well when researchers have large, pure crystals. When they have to settle for a powder of minuscule pieces — called nanocrystals — the method only hints at the unseen structure.

Scientists at Columbia Engineering created a machine learning algorithm that can observe the pattern produced by nanocrystals to infer the material's atomic structure. In many cases, their algorithm achieves near-perfect reconstruction of the atomic-scale structure from the highly degraded diffraction information — a feat unimaginable just a couple of years ago.



"The AI solved this problem by learning everything it could from a database of many thousands of known, but unrelated, structures," says Simon Billinge, professor of materials science and of applied physics and applied mathematics at Columbia Engineering.

"Just as ChatGPT learns the patterns of language, the AI model learned the patterns of atomic arrangements that nature allows."

How the Brain Actively Reshapes What the Eyes See

Perceptual categorization is a fundamental cognitive ability that helps us organize and make sense of all the different things we experience through our senses. For example, we can choose to put carrots in the same category as lettuce (both vegetables) or tangerines (both orange-colored items). Traditional accounts hold that categorizing an object is the

"Our findings challenge the traditional view that early sensory areas in the brain are simply 'looking' or 'recording' visual input."

— *Nuttida Rungratsameetaweemana*



Nuttida Rungratsameetaweemana, assistant professor of biomedical engineering. (RUNGRATSAMEETAWEEMANA LAB)

job of the prefrontal cortex, the brain region responsible for reasoning and other high-level functions that make us smart and social. In that view, the eyes and visual regions of the brain are kind of like a security camera collecting data and processing it in a standardized way before passing it off for analysis. However, Nuttida

Rungratsameetaweemana, an assistant professor of biomedical engineering at Columbia Engineering, and her colleagues show that the brain's visual regions play an active role in making sense of information. Crucially, the way it interprets the information depends on what the rest of the brain is working on.

"Our findings challenge the traditional view that early sensory areas in the brain are simply 'looking' or 'recording' visual input. In fact, the human brain's visual system actively reshapes how it represents the exact same object depending on what you're trying to do," says Rungratsameetaweemana. "Even in visual areas that are very close to raw information that enters the eyes, the brain has the flexibility to tune its

interpretation and responses based on the current task."

The researchers used functional magnetic resonance imaging (fMRI) to observe people's brain activity while they put shapes in different categories. The twist was that the "rules" for categorizing the shapes kept changing, which let them determine that the visual cortex was changing how it represented the shapes depending on how the categories had been defined.

The findings may inform designs for AI systems that can better adapt to new situations, since even state-of-the-art AI systems still struggle with flexible task performance. The results may also contribute to understanding how cognitive flexibility might break down in conditions like ADHD or other cognitive disorders. 🧠

Meet Our New Faculty

Columbia Engineering welcomed 18 new faculty in 2025 whose expertise cuts across a range of interdisciplinary areas. The newest cohort of researchers and lecturers is pioneering breakthroughs in research domains related to AI and computation, health and medicine, operations, quantum, and new materials, as well as applying innovative methods to teaching and learning computer and data science.



James Bartusek

ASSISTANT PROFESSOR, COMPUTER SCIENCE
QUANTUM CRYPTOGRAPHY, QUANTUM INFORMATION PROCESSING



Homayoon Beigi

PROFESSOR OF PROFESSIONAL PRACTICE, MECHANICAL ENGINEERING AND ELECTRICAL ENGINEERING
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Adam Block

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ASSISTANT PROFESSOR, MECHANICAL ENGINEERING
SOFT FUNCTIONAL MATERIALS, BIOELECTRONIC MEDICINE, AND SOFT ROBOTICS



Greeshma Gadikota

LENFEST EARTH INSTITUTE PROFESSOR OF CLIMATE CHANGE SUSTAINABLE ENERGY AND METAL RECOVERY, SUSTAINABLE SUBSURFACE ENERGY



Curtiss Lyman

JU TANG CHU AND WUI PING CHU ASSISTANT PROFESSOR, APPLIED PHYSICS AND APPLIED MATHEMATICS
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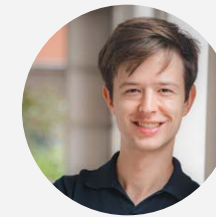
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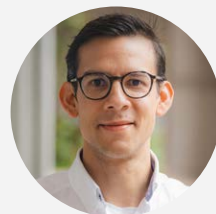
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NATURAL LANGUAGE PROCESSING



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SENIOR LECTURER IN DISCIPLINE, COMPUTER SCIENCE
SOFTWARE QUALITY, INTRODUCTORY PROGRAMMING, SOFTWARE DEVELOPMENT



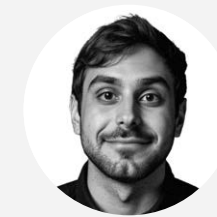
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ASSOCIATE PROFESSOR, MECHANICAL ENGINEERING
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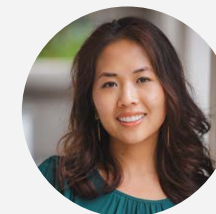
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Teaming Up to Transform Pediatric Brain Cancer Treatment

An engineer and a physician are working together to pioneer a new approach using focused ultrasound to treat dozens of brain diseases.

Words by
Grant Currin

Pontine glioma is a cancerous brain tumor that strikes five- and six-year-olds. The prognosis is grim, with few children living more than a year after diagnosis.

“Despite decades of research, there’s hardly anything we can do for these patients, beyond making them comfortable,” says Stergios Zacharoulis, a pediatric oncologist at Columbia University Irving Medical Center and associate professor at Columbia’s Vagelos College of Physicians and Surgeons.

It’s an especially tragic situation because researchers have developed several drugs that can kill the tumor. Unfortunately, giving the drugs in a meaningful and effective way to a patient has proven impossible. In a cruel irony, the barrier that protects the brain from viruses, bacteria, and toxins also protects the tumor from drugs that could extend the patient’s life. In a groundbreaking collaboration, Zacharoulis

and biomedical engineer Elisa Konofagou are developing a system that uses sound waves to gently open this barrier in the brain long enough for treatment. Now in phase I/II clinical trials, the new method could transform treatment for cancers like pontine glioma as well as dozens of other conditions of the brain.

Konofagou has spent more than two decades advancing the science of focused ultrasound, a technique that uses sound waves to treat disease without surgery or radiation. Her cross-disciplinary lab has developed new ways to use ultrasound for drug delivery, tumor ablation, neuromodulation, and more. In 2024, she received the Focused Ultrasound Foundation’s Visionary Award for her contributions to the field, and Columbia, led by her lab, was recently named a Center of Excellence by the Focused Ultrasound Foundation.

Collaborators Elisa Konofagou (right) with Stergios Zacharoulis, photographed at Columbia University Irving Medical Center (RUDY DIAZ)



“The biggest problem we have in treating brain tumors is the blood-brain barrier, which prevents viruses and toxins as well as medicine from entering the brain.” —*Stergios Zacharoulis*

“With pontine glioma, Alzheimer’s, and so many other neurological diseases, we don’t have nearly enough treatment options — sometimes there are none at all,” says Konofagou, who is the Robert and Margaret Hariri Professor of Biomedical Engineering at Columbia Engineering and professor of radiology and of neurological sciences at Columbia. “That’s why we’re working on these problems.”

How did this collaboration begin?

Stergios Zacharoulis: Shortly after I came to Columbia [in 2018], a colleague mentioned research into a technology called focused ultrasound. I’d never heard of this before and must admit that I was skeptical. Using focused beams of energy in medicine sounded like science fiction. After learning more about the technology and Dr. Konofagou, my mind immediately went to the worst possible brain tumor: pontine glioma.

The biggest problem we have in treating brain tumors is the blood-brain barrier, which prevents viruses and toxins as well as medicine from entering the brain.

Elisa Konofagou: I vividly remember learning about this terrible disease and the horrible side effects of chemical methods for opening the blood-brain barrier. You’re basically blasting kids with drugs that make them vomit and bleed from the mouth. We knew that decreasing those side effects would be an achievement. These kids only live for a year, and they live through hell with the existing treatments.

How does focused ultrasound help?

EK: The blood vessels that lead to the brain are lined with special cells that sort of “hold hands” to keep larger molecules like viruses and bacteria from getting through. With focused ultrasound, we start by injecting minuscule bubbles into the bloodstream. Then we use focused sound waves in the ultrasonic range to make the bubbles vibrate, opening a path the drugs can follow to reach the tumor.



▲
At work in the
Konofagou lab.
(RUDY DIAZ)

SZ: Pontine gliomas are very complex tumors. Focused ultrasound solves the biggest problem by enabling us to get the drugs into the brain at the right concentration.

What is the treatment like from a patient’s perspective?

EK: It’s entirely noninvasive. The patient stays in their own wheelchair and rests their head on a massage pillow with a window. They can play on an iPad and see their family in the room. The focused ultrasound comes from a specialized speaker that rests on the skull. We use it to activate the bubbles for a few minutes before injecting the drugs, which are already approved.

SZ: The patient comes in for this treatment three times a week. They are awake — there is no pain, so there is no need for anesthesia. That means we don’t have to starve a sick child three times a week because there is no risk of aspiration. It’s also free from the side effects of conventional chemotherapy, like hair loss, mouth sores, and infection. We’ve seen practically zero side effects.

How have patients responded to the treatment?

SZ: We’re now in the second phase of clinical trials, which means we’re studying the treatment in more patients and refining the protocol. Our first trial showed that the method is physically safe and can successfully open the blood-brain barrier in children — something that had never been done before. In this next phase, we’re treating more patients, targeting multiple tumor sites, and beginning to test additional drugs.

EK: Two of our first three patients even showed temporary improvement in their symptoms, which was encouraging, especially considering how advanced their tumors were.

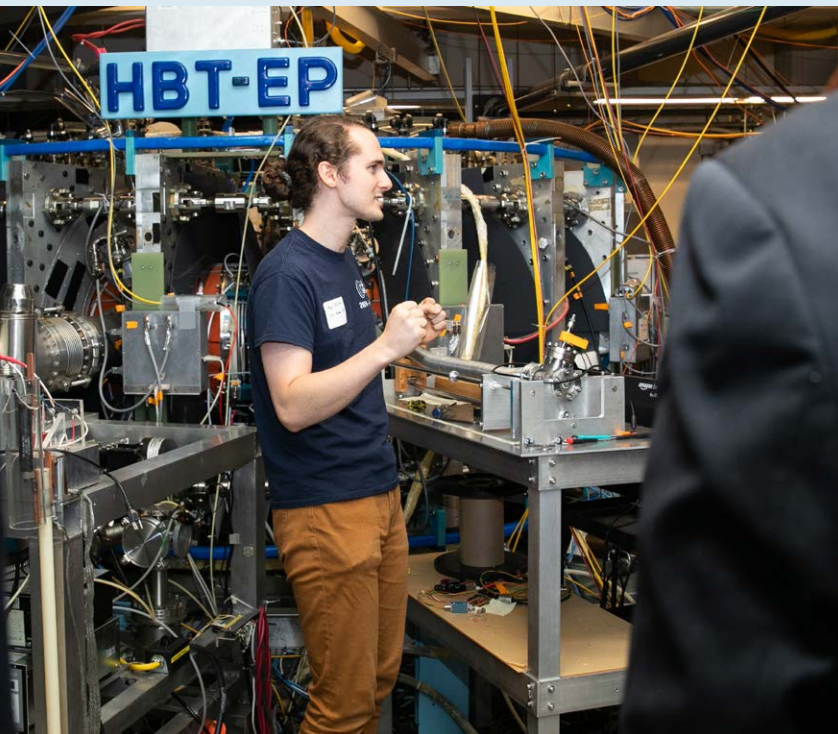
What’s the future of this technology?

SZ: The aim of the treatment is to establish safe opening of the blood-brain barrier to allow sufficient drug concentrations into the tumor. Eventually, this treatment should extend survival.

EK: Focused ultrasound gives us very precise control over the blood-brain barrier in a number of contexts. For example, gene therapy is a promising platform for treating several neurodegenerative diseases, but those molecules are gigantic. By adjusting the parameters, we can use ultrasound to create passageways that are exactly the right size. 🦋

Events at a Glance

Columbia Engineering is proud to host a wide range of speakers and visitors to campus. In keynote presentations, fireside chats, workshops, panels, and other formats, these leaders share insight and wisdom with our entire campus community.



▲ A Columbia student leads visitors on a tour of the Columbia Fusion Research Center's on-campus research facilities. (DAVID DINI)



▲ Presenter Sathish Swaminathan of the McNeill Group works with the Clean Air Toolbox for Cities Initiative on air quality in India. (CHRIS TAGGART)



▲ A climate week presentation from Pierre Gentine, Maurice Ewing and J. Lamar Worzel Professor of Geophysics; Professor of Earth and Environmental Sciences; Professor at the Climate School; and director of LEAP. (SIRIN SAMMAN)



▲ Matthias Preindl, associate professor of electrical engineering and director of the Columbia Center for Advanced Electrification, addresses the symposium audience. (DAVID DINI)



▲ L TO R: Kate Ascher, co-director of Gotham Foundry (GF) and professor of practice of urban development at Columbia; Rein Ulijn, co-director of GF and director of the CUNY ASRC Nanoscience Initiative; Helen Lu, director of GF and Percy K. and Vida L.W. Hudson Professor of Biomedical Engineering; Theanne Schiros, co-director of GF and professor of materials science at FIT; and Neena Chakrabarti, board member at Genspace. (CHRIS TAGGART)



▲ The attendees at the Columbia Electrochemical Energy Center's annual symposium (BRANDON VALEJO)



▲ Alexander Sarrigeorgiou (left) in conversation with Climate School Dean Alexis Abramson at the Tech CEO "fireside chat". (CHRIS TAGGART)

Climate Week NYC 2025

Columbia Engineering hosted 10 events Sept. 22-26 to celebrate Climate Week NYC, featuring conversations on the breakthroughs reshaping our path to sustainability. We were especially proud to celebrate the official launch of Gotham Foundry, New York City's new sustainable materials hub; host the Columbia Center for Advanced Electrification's inaugural symposium; and welcome an impressive group of international leaders in the race toward fusion energy.



▲ L to R: George Deodatis, Santiago and Robertina Calatrava Family Professor of Civil Engineering, professor of earth and environmental engineering, and vice dean for research at Columbia; Upmanu Lall, director of Columbia Water Center and director of the Water Institute at Arizona State University; and Alex Loucopoulos of Sciens Water. (CHRIS TAGGART)



◀ Catherine Corrigan, president and CEO at Exponent. (DAVID DINI)

CEO Lecture Series

The Tech CEO Lecture Series is a unique opportunity that invites the Columbia community into the inner circles of innovation. These lectures invite students to consider the larger economic, social, political, and commercial contexts of technological advancement.



◀ Thomas Caulfield BS'82, MS'84, EngScD'86, executive chairman of GlobalFoundries (BRANDON VALLEJO)



▶ Yunzhu Li, assistant professor of computer science, addresses the audience in Low Memorial Library. (EILEEN BARROSO)

▶ Alexander Sarrigeorgiou BS'79, MS'80, chairman and CEO of Eurolife FFH Insurance Group (CHRIS TAGGART)



▲ Ion Stoica, a professor at the University of California at Berkeley, director of Sky Computing Lab, and executive chairman at Databricks and Anyscale. (BRANDON VALLEJO)

AI Summit

The Columbia AI Summit in Spring 2025 brought together thousands of researchers, technologists, and students for a day of vital conversations about the development — and impact — of artificial intelligence. Hosted by the University, this event featured a strong contingent of Engineering faculty.



▲ Eric Xing, president and University Professor at Mohamed bin Zayed University of Artificial Intelligence. (LUCAS HOEFFEL)

Lecture Series in AI

Columbia Engineering was proud to host AI luminaries from leading companies and research institutions. These talks explore the most cutting-edge topics in artificial intelligence and bring to campus thinkers and leaders who are shaping tomorrow's technology landscape in a wide variety of fields.



▲ Danqi Chen, an associate professor at Princeton University, associate director of Princeton's Language and Intelligence Initiative, and co-lead of the Macro-Language Policy Group. (APRIL RENAE)

◀ Yann LeCun, chief AI scientist at Meta and a professor at New York University (BRANDON VALLEJO)



◀ Dean Shih-Fu Chang tries out a demonstration. (DAVID DINI)

Aerospace Expands at Columbia

Columbia Engineering takes major steps to formalize and advance its aerospace programming.

Words by
Jennifer Ernst
Beaudry

◀
Michael Massimino,
former NASA
Astronaut
and professor
of practice in
the Department
of Mechanical
Engineering.
(JEFFREY
SCHIFMAN)

The School's new aerospace minor graduated its first students in May 2025, while the Guggenheim Initiative for Aerospace Structures is opening new pathways for students to explore careers and research in the field.

Both efforts are part of the School's broader push to capitalize on the widespread interest Columbia students, both undergraduate and graduate, have expressed in aerospace — and they're just the beginning of Columbia's moves in this arena.

"Over the years, we have seen increasing interest from our students in space and aerospace engineering," said Shih-Fu Chang, Dean of Columbia Engineering. "We know that many of our students go on to pursue careers in aerospace, including at companies like Boeing, SpaceX, NASA/JPL, Blue Origin, and various startups across the industry. Going forward, we will continue to explore possibilities of extending the initiative to include a new major, a new graduate program, as well as new faculty members dedicated to aerospace engineering."

Mike Massimino, professor of professional practice in the Department of Mechanical Engineering, said having an academic

recognition of the School's aerospace expertise puts Columbia on par with its fellow universities — and gives students formal recognition of their work.

"Students who were interested in aerospace would still come to Columbia, and were well-qualified to get jobs in the industry for aircraft or spacecraft, but they didn't have anything official on their resume. The other Ivys have a certificate program or a minor or major," Massimino said. "We have an active club [Columbia Space Initiative] that wins great awards and wins competitions flying experiments in space, and the activities and projects they work on in the club are outstanding in quality and also a lot of fun!"

Students wishing to minor in aerospace take two foundational courses chosen from fluid mechanics, thermodynamics, controls, and signal processing, plus four exploratory electives. These electives span classical aerospace topics such as aerodynamics and propulsion, along with related areas including robotics, composites and structures, and human-centered aerospace design.

To support the minor, two new tenure-track faculty candidates have been hired: Cody Paige, director of the Space Exploration Initiative at MIT Media Lab, will join in January 2026, and Julia Di, BS'18 (one of the student founders of the Columbia Space Initiative (CSI)) is slated to start in 2027. In addition, Massimino said, a lineup of truly impressive adjunct professors will be teaching classes this academic year.

"We've had an overwhelming number of extremely qualified people wanting to come teach these classes," said Massimino, who also serves as the faculty adviser to CSI.

Adding additional weight to Columbia's push into aerospace is the Guggenheim Initiative for Aerospace Structures, which held a launch event in the fall at Davis Auditorium. The engaging day included keynote talks, panel discussions, and

networking sessions with industry and government. Formerly known as the Guggenheim Institute of Flight Structures, the Institute was founded in 1954 at Columbia as a center for advanced education and research in aeronautical and aerospace applications. Today, under its director, Marianna Maiaru, a specialist in aerospace structures and advanced materials and associate professor in the civil engineering and engineering mechanics department, the Initiative is working to, as Maiaru put it, "advance research in aerospace structures and serve as a hub of innovation," centered on research and education. Maiaru has expanded the Initiative's focus to include hands-on student engagement through seminars, internships, and collaborative projects, while driving forward critical research on structures for extreme environments.



At the launch for the Guggenheim Initiative for Aerospace Structures. Pictured in the first row, second from right, is Marianna Maiaru, the Initiative's director, alongside Dean Shih-Fu Chang (front row, third from right), with several of the guest speakers. (APRIL RENAE)

"The Initiative wants to help students understand what it means to be a structural engineer in aerospace — what kind of research activities you might do — so they can be well-positioned to lead efforts in the future." —*Marianna Maiaru*

Maiaru also serves as the faculty adviser to Columbia's popular Airplane Club, another active club on campus focused on innovative remote-controlled aircraft. In Spring 2025, they took home a big win in the AIAA Design, Build, Fly Competition, coming in 16th place out of 112 international teams.

Through workshops, seminars, and panels, as well as classes and research projects, the Guggenheim Initiative is positioned to engage the community as well as advance critical research topics, growing Columbia's aerospace footprint and preparing students to take leading roles in the field.

"Students are in the part of their life and career where they can establish where they are going, and aerospace is a very large field," said Maiaru.

"The Initiative wants to help students understand what it means to be a structural engineer in aerospace — what kind of research activities you might do — so they can be well-positioned to lead efforts in the future."



In June 2025, CSI Rockets team successfully launched its hybrid rocket using liquid oxygen. (COLUMBIA SPACE INITIATIVE)

In the coming semesters, the School expects to launch a major program, a master's concentration, and a graduate opportunity in aerospace, as well as a certificate program in aerospace structures.

"Students are signing up, the alumni are really receptive to it, the dean is supportive of it, there's a lot of support for it schoolwide," Massimino said. "We have an opportunity to do something significant here." 🚀

COLUMBIA'S CLUBS TAKE TO THE SKY

Airplane and rocketry competitions let students put their technical skills—and teamwork—to the test.

Columbia University Airplane Club

Columbians took 16th place in a field of 112 international teams at the 2025 Design-Build-Fly Competition, hosted by the American Institute of Aeronautics and Astronautics. For the first time in Columbia's history, the team's electric-powered, radio-controlled aircraft completed all three of the competition's flight missions.



▲
Courtesy Columbia University Airplane Club

Columbia Space Initiative

On a remote site in the Mojave Desert, the Columbia Space Initiative (CSI) Rockets team successfully launched a hybrid rocket powered by liquid oxygen, a first for a student-led group, according to organizers of the FAR-OUT student rocketry competition. The successful launch capped off a year-long effort by nearly 60 undergraduate engineers to design, build, and test the rocket. 🚀

How Does the Information Ecosystem Influence Politics?

A new course combines data and political science to understand some of the most vital phenomena of our time.

Words by
Grant Currin

Eunji Kim caught Chris Wiggins' attention when she started talking about memes at an event on AI and democracy.

"A string of fellow technologists—including myself—got up and made various technical claims about how technology is useful for understanding the information ecosystem," says Wiggins, an associate professor of applied mathematics at Columbia Engineering. "Then Professor Kim got up and said, in academic terms, none of you has any idea how Americans actually interact with information."

Now, the professors are teaching "Persuasion at Scale: Causal Inference, Machine Learning, and Evidence-Based Understanding of the Information



▲
Eunji Kim (right) and Chris Wiggins on Columbia's Morningside Heights campus. (CHRIS TAGGART)

Environment," a new course at the intersection of data and political science. The course was held for the first time during the fall 2024 semester.

"It's very common for researchers in computational social science to use big data to draw conclusions about society," says Kim, an assistant professor in political science who uses quantitative methods to study political communication and public opinion in American politics. "But if you don't consider political context and meaning that influences your data, the analysis will be incomplete and your conclusions could be wrong."

In their new course, Kim and Wiggins aim to give students the tools necessary to rigorously analyze the impact of

political communication—from campaigns and advertisements to partisan media and social media.

"Persuasion is happening at scale on information platforms," Wiggins says, "so we now have the chance to understand this question statistically."

Machine learning—a branch of AI—is a pillar of the course. Students learn how this technology underlies the content recommendation and moderation systems that drive information platforms. They also use machine learning techniques to interpret datasets.

“I think it’s useful to zoom out and see how persuasion — whether it’s political persuasion or marketing — has some universal aspects that we can understand using mathematics.”

—Chris Wiggins

Equipping Students to Challenge Conventional Wisdom

Persuasion at Scale pairs an examination of the research literature on political persuasion with a survey of the statistical methods necessary to make sense of complex datasets. Students use real-world data to quantify the effects of social media, marketing, and political campaigns while taking a historical view on the development of persuasion architectures.

“When we actually bring data to these questions and look at them objectively, we sometimes find that conventional wisdom isn’t supported — or that it’s wrong,” Kim says. For example, op-eds, blog posts, and cable news monologues often assume that Americans are living in partisan echo chambers, with half the country watching Fox News and the rest watching MSNBC.

“If you look at actual behavior-level data, the extent to which echo chambers exist is very limited because most people do not consume news to begin with,” Kim says. “Consumption of news content is very low relative to other media, like sports or entertainment.”

Another counterintuitive finding is that political campaigns — even those that spend hundreds of millions of dollars — often don’t have a substantial impact on voter choices.

“There’s a lot of discrepancy between what people believe versus what empirical social science has been discovering,” Kim says.

Students learn to employ causal inference techniques to distinguish between correlation and causation in real-world datasets.

▶ Chris Wiggins teaching on campus in fall 2025. (CHRIS TAGGART)

An Opportunity for Interdisciplinary Collaboration

The course, initially supported by the Provost’s Cross-Disciplinary Frontiers Initiative, proved exceptionally popular when it was first offered in fall 2024. The opening session was standing-room only, with 61 students completing the semester.

“Engineering students don’t often take classes in political science, and our own social science students do not often take many math classes,” Kim says. “These types of classes are critical for them to learn how to fix the many complex problems facing our society.”

For Wiggins, the course is an opportunity for students to bring quantitative rigor to a domain that’s often understood through conventional wisdom and unjustified assumptions.

“I think it’s useful to zoom out and see how persuasion — whether it’s political persuasion or marketing — has some universal aspects that we can understand using mathematics,” he says. “By combining that context with the language of probability, we hope to enable students to look past inflammatory anecdotes in order to think methodologically and historically.”



Delivering a Quantum Future



Words by
Ellen Neff

at Columbia Engineering

It's the 100th anniversary of quantum mechanics. Here's how Columbia's scientists and engineers are working together to shape the next century.

Across Columbia, theoretical scientists, experimental physicists, chemists, and engineers cross corridors and courtyards with quantum in mind. It's a uniquely collaborative environment, a refrain echoed by faculty, postdocs, and graduate students across departments and disciplines.

"Columbia is a remarkable place. The scale and intensity of the collaborations here are like nowhere else," said Dmitri Basov, Higgins Professor of Physics at Columbia University and co-lead of the Columbia Quantum Initiative. "It's a delightful experience, and a privilege to be part of this team."

Together, they explore the frontiers of quantum mechanics, a now-century-old theory, in a combined quest to better understand the world — and deliver new quantum technologies. Those will include computers more powerful than any today, networks that can instantaneously transmit perfectly secure information, and sensors to detect quantum-scale changes in bodies, batteries, and more. Getting there means building new foundations that exploit the quantum nature of materials, light, and how they interact.

It's an area that Columbia excels in, one hundred years in the making.

In 1925, Max Born coined "quantum mechanics" to explain, under one theory, the growing number of observations that were

upending centuries of classical, Newtonian physics. Its basic tenets: quantum objects are simultaneously particles, with masses, charges, and discrete amounts of energy called quanta, and waves, with given frequencies and wavelengths. These quantum objects, which include electrons and photons of light, can combine in unique and often counterintuitive ways.

Though scientists in Europe initially developed the theory, Columbia has had a part in quantum history since its earliest days. In 1909, Max Planck brought the concept of energy quanta — the idea that would eventually lend the field its name — to North America in a series of lectures at Columbia. In the coming decades, as theory gave way to applications, Columbians made several Nobel Prize-worthy quantum discoveries that led to now commonplace technologies, including:

- I.I. Rabi's observations of magnetic resonance, which led to today's magnetic resonance imaging (MRI).
- Charles Townes' amplified electromagnetic waves; the result, lasers, are just about everywhere.
- Louis Brus's connection between a particle's size and the color of light it emits; these quantum dots have found applications in LED displays, solar panels, and biological sensors.

A quantum device in the Zhang lab. (COLUMBIA ENGINEERING)

FEATURE

Today, Columbia's researchers are creating entirely new materials with unique quantum properties, controlling individual photons of light and entangling them together, and developing theories to guide quantum research into its second century. So, what's to come? Columbia Engineers share where they think the (quantum) world is heading:



◀
Alexander
Gaeta

"One hundred years is a pretty long time. Perhaps we will have a quantum computer with a wide variety of applications — ones we aren't even thinking about now. Quantum sensors may also become ubiquitous, all linked through a network and with capabilities we haven't even dreamed of yet. I think a lot of it will hinge on these technologies that we're working on here."

Alexander Gaeta

David M. Rickey Professor of Applied Physics and Materials Science, Professor of Electrical Engineering, and co-lead of the Columbia Quantum Initiative. Gaeta studies how laser light interacts with matter.

▼
Optical
elements
for lasers
(COLUMBIA
ENGINEERING)



"We've been studying quantum systems for several decades already, but it's been remarkable to see how quickly the field has grown recently. I'm particularly excited about using present-day quantum devices to simulate complex quantum materials and resolve long-standing, fundamental questions about how many electrons interact to create complex emergent behavior. There's a lot of synergy here that could help us discover materials that revolutionize how we store energy, perform classical computing, and more in this century."

Aravind Devarakonda

Assistant Professor of Applied Physics and Applied Mathematics Devarakonda combines physics, chemistry, and materials science to create and study quantum materials.



▲
Lasers
and optical
elements on
optical table
(COLUMBIA
ENGINEERING)

"In the next 100 years, the way we vote, earn, spend, negotiate, medicate, dress, compute, communicate, sense, and think will rely on harnessing the counter-intuitive laws of quantum mechanics. Just as the steam engine and electricity have transformed civilization, there will be no aspect of everyday life untouched by the fact that nature is quantum mechanical."

Henry Yuen

Srivani Family Associate Professor of Computer Science. Yuen studies the theoretical foundations of quantum computing.

Featured Video

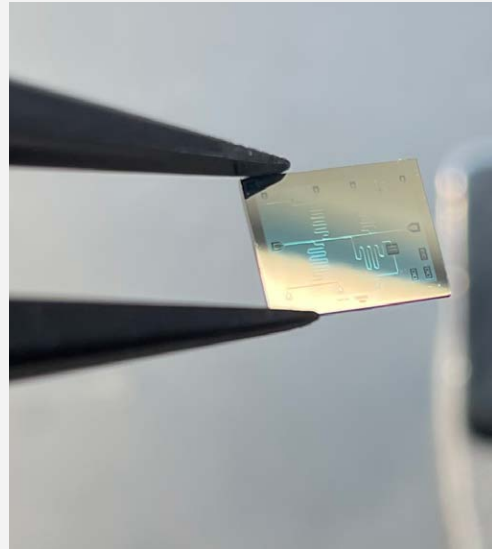
*Quantum at
Columbia:
100 Years On*

*To watch the video,
scan the QR code
or visit columbiaeng.com/quantum100.*



FEATURE

▶ A 1-centimeter-wide test chip with superconducting microwave-frequency circuitry to probe 2D material qubits. (JESSE BALGLEY)



“We’ve seen the story before with quantum dots, and lasers, and other quantum advances: a curiosity in the lab becomes a breakthrough that becomes routine and used everywhere. We’re in the earliest stages with new kinds of quantum materials and what they will enable, but some of our lab curiosities will translate and scale into real devices.”

James Hone

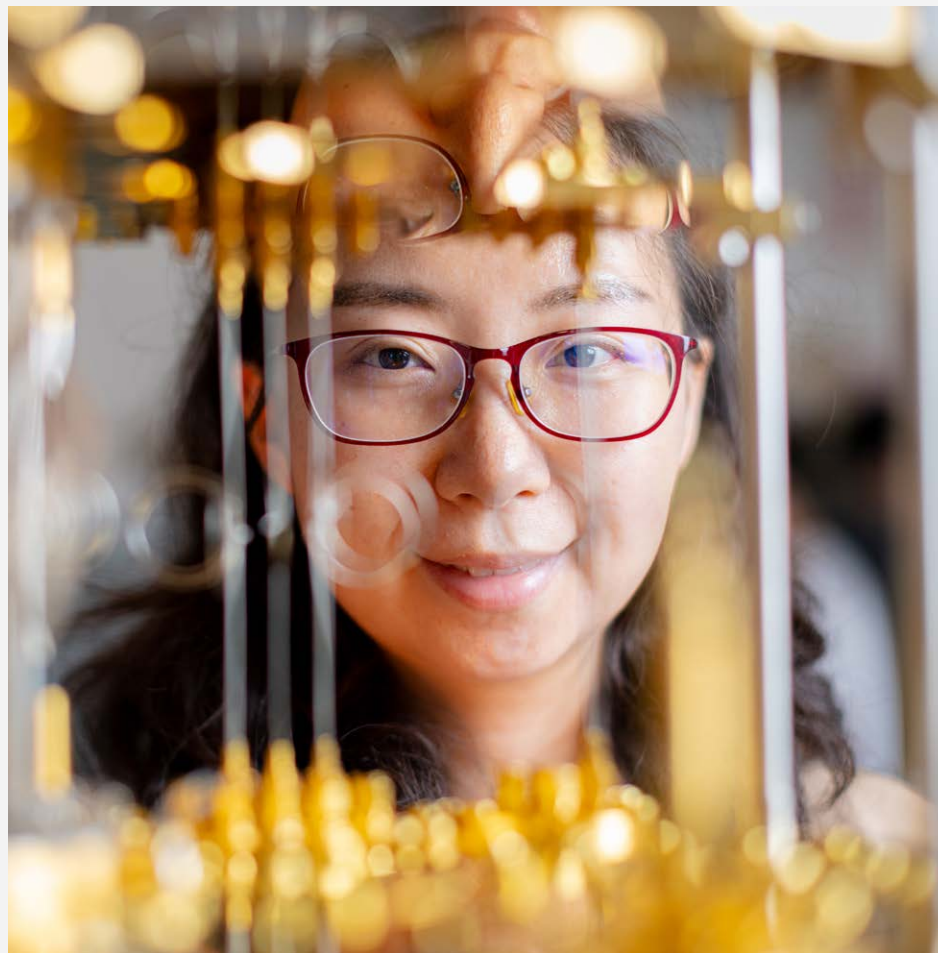
Wang Fong-Jen Professor of Mechanical Engineering. Hone studies the fundamental properties of 2D materials and their potential applications.

“The next 100 years will likely be the most exciting time for quantum technology as we build the promises from decades ago into a reality. Quantum sensing, simulation, and computing will transition from initial demonstrations to useful technologies and beyond. In the end, quantum science may stop being ‘quantum’: it will just be technology, like semiconductors or AI today.”

Sherry Zhang

Assistant Professor of Applied Physics and Applied Mathematics. Zhang is developing new kinds of quantum hardware.

▶ Sherry Zhang
(COLUMBIA ENGINEERING)

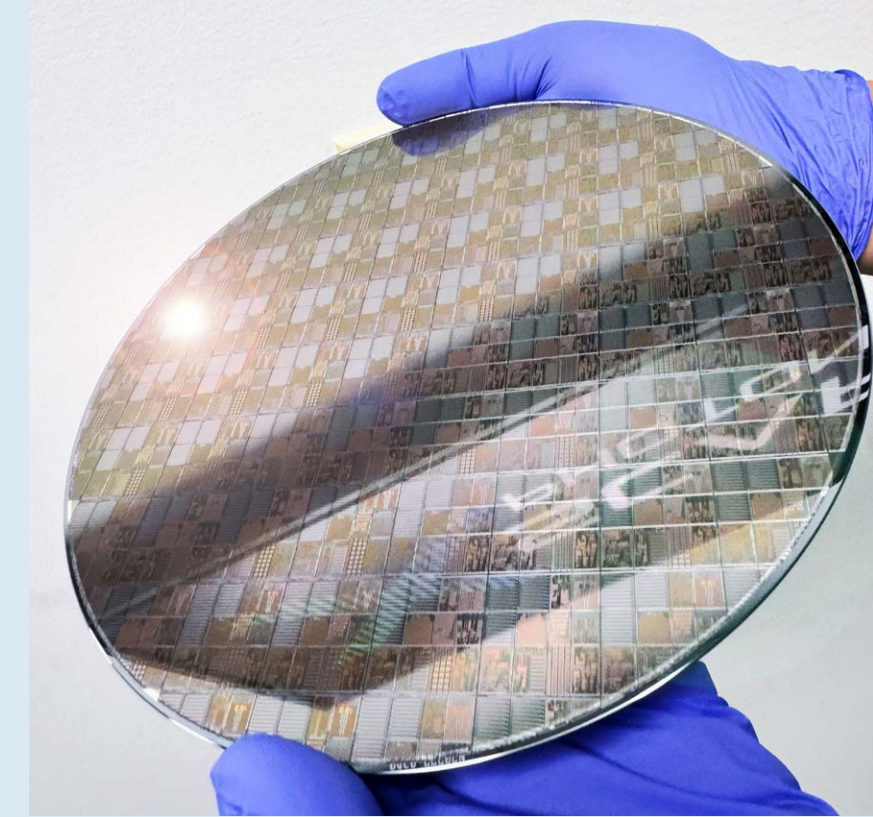


▶ The ChromX Platform
(XSCAPE PHOTONICS)

“While quantum computing currently gets much of the attention, quantum sensing may ultimately prove equally, if not more, impactful. The so-called quantum advantage originates from coherent states and quantum-entangled systems, enabling, for example, deep-brain imaging with photons that never touch the sample and detection of gravitational waves. By reducing noise and increasing precision by orders of magnitude, quantum sensing will become critical to fields spanning medical diagnostics to space travel. We have only begun to scratch the surface.”

Jim Schuck

Professor of Mechanical Engineering. Schuck builds tools that can control single photons and electrons.



TRANSFORMING DATA CENTERS WITH PHOTONICS

As Columbia’s scientists and engineers push the boundaries of quantum mechanics in their labs, they are also pushing new quantum technologies into the real world. In 2022, Columbia Engineers Keren Bergman, Michal Lipson, and Alexander Gaeta debuted Xscape Photonics, which has secured nearly \$60 million in funding to advance a multicolor photonics platform.

They launched Xscape with AI and its immense energy demands in mind. Light, with its speed and coherence, has the potential to break current bottlenecks in AI systems by minimizing its energy consumption while maximizing information flow. Xscape’s light-based platform draws on technologies that the founding trio pioneered over their past decade at Columbia, including silicon photonics, photonic interconnects, and optical frequency combs.

Optical frequency combs have particular applications in emerging quantum technologies. The integrated photonic combs, developed by Gaeta and Lipson’s labs, were initially developed to realize a new class of quantum sensors, such as atomic clocks. 🌟



From First Hellos to Bold Futures

For the Class of 2025—many of whom began their Columbia journey in the midst of a global pandemic—Commencement marks more than a milestone. It serves as a celebration of both their achievements and transformation as they embark on the next chapter.

Celebrating the Class of 2025

Words by
Beatrice
Mhando and
Allison Elliott

Columbia Engineering celebrated Class Day ceremonies May 19, 2025, in separate events for undergraduates and graduate students and their families and friends.

The undergraduate Class Day speaker, Jennifer Yu Cheng BS'03, commenced the ceremony by recounting how she pivoted from investment banking to her current career as group president of CTF Education Group. While sharing how she navigated challenges in her career and business, Cheng urged students to be engineers for humanity. "Act now to solve today's problems. Imagine the future and create innovations."

Andrew Yang, the 2025 Valedictorian, then gave his remarks. Yang, a double major in applied physics and applied mathematics, used an analogy from his own research into materials at the nanoscale to highlight the importance of waves.

"Waving hi, in orientation week, to some of your now closest friends. Tearful waves goodbye to your parents after convocation... In 1807, Joseph Fourier showed how waves sum to form beautiful functions. The sum of our interactions forms this beautiful community."

Dean Shih-Fu Chang addressed the class and noted that their first year coincided with his first year as interim dean of the School. He emphasized the problem-solving nature of engineering and that students were prepared to make an impact on society.

At Graduate Class Day, Graduate Speaker Raman Odgers kicked off the ceremony by advising his fellow graduates to see uncertainty in a positive light. "Uncertainty isn't always negative. It leads us to the joy of unexpected opportunities and new friendships," he said.

"Uncertainty protects us from becoming just like the tools that we create as engineers, and gives us the power to use that Columbia education to choose and shape the future not just of our own lives, but of the world."

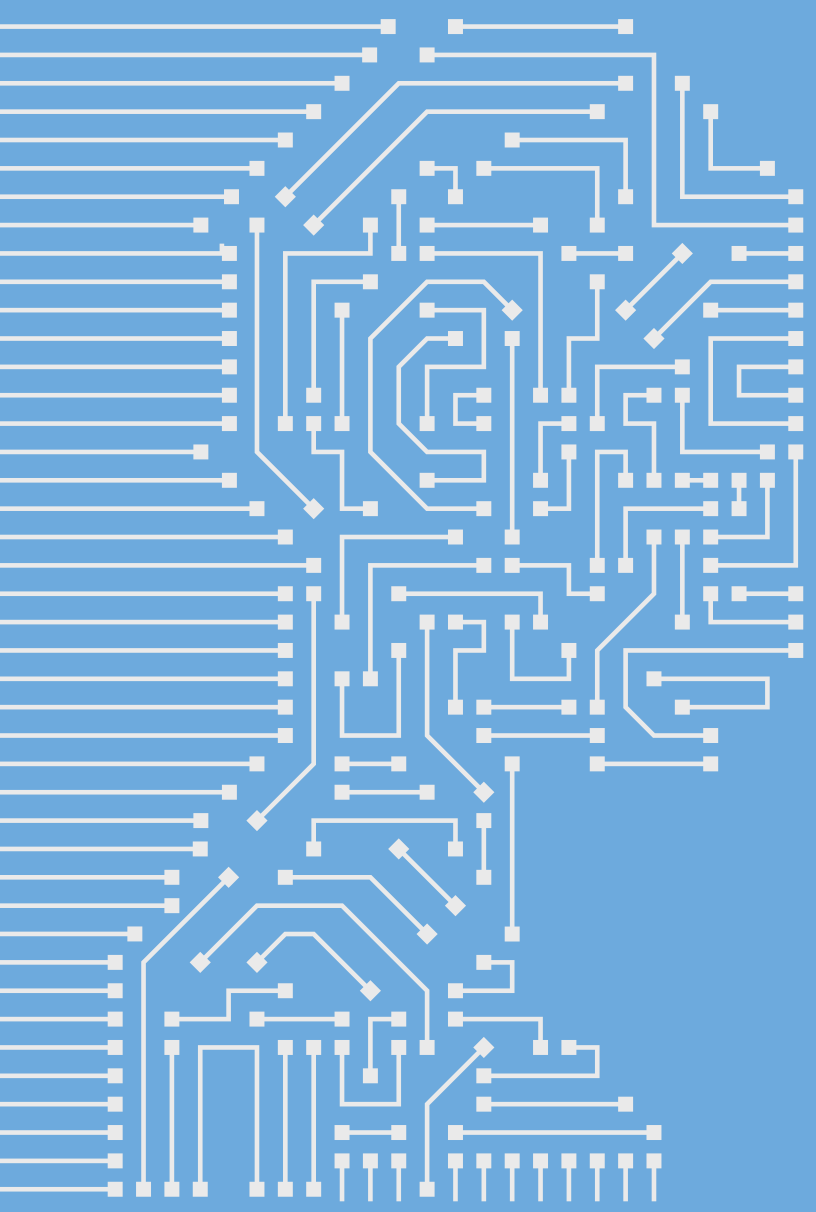
Graduates also heard from Class Day Speaker Harsh Jain '14BUS, CEO and co-founder of Dream Sports, India's leading sports technology company.

Jain, a Columbia Business School alum, stressed the importance of persistence. He shared how his love for fantasy football inspired him to create Dream Sports in India, which had no fantasy sports at the time. "Now, as you enter the real world, I have only one piece of advice. Learn how to fail. Pick yourself up and keep going."

On May 20, 2025, the Engineering School held a hooding ceremony for its doctoral students. Columbia University celebrated all graduates at the University Commencement held on May 21, 2025. 🎓

◀
Dean Shih-Fu
Chang
addresses
the class
(LUCAS HOEFFEL
AND EILEEN
BARROSO)

Putting AI Agents to Work



It's been more than three years since ChatGPT stunned the world with its near-human ability to carry on a conversation. The real breakthrough was in the underlying technology, called large language models (LLMs).

Animating chatbots was just the start. LLMs can navigate the internet, fill out forms, send emails, and make payments. When LLMs are empowered to take action beyond the dialogue box, they're called AI agents.

If you gave it the right tools, an AI agent could plan an entire trip, picking (and booking) everything from the Lyft to the airport to your hotels and excursions. But just like ChatGPT, AI agents are prone to making wild and unpredictable mistakes.

This feature showcases faculty experts whose experience ranges from fundamental research to supporting enterprises and training the first generation of full-stack AI engineers.

MAP OUT YOUR WORKFLOWS

Before you put AI agents to work, you have to know exactly what they need to accomplish.



By Lydia Chilton

Before you build an AI strategy, you have to understand how you, your team, or your whole organization are getting work done.

In most workplaces, knowledge about how things get done is buried in email threads, Slack messages, and informal agreements. When information is scattered and inconsistent, it's nearly impossible for AI to take on the drudgery that underpins complex operations.

That's why the first step is to understand how work gets done — by you, your team, or your entire organization. Especially the mundane stuff. I'm talking about filling out forms, chasing stalled conversations, and shepherding documents through layers of approval and revision.

AI agents aren't just suggesting text anymore. I've seen agents handle everything from simple scheduling to more complex coordination tasks, like planning resource allocation or accounting for unexpected hiccups that could send disruptive ripples across teams. There's more upside — and stronger competitive pressure — every day.

But agents can only help if your systems make sense to machines. That means defining inputs and outputs clearly, writing down rules, digitizing steps, and building APIs, which let digital tools share information automatically.

These articles originally appeared as a collection in The Lever, Columbia Engineering's new collection of limited-series newsletters on topics that are driving current events.

To learn more about The Lever, visit: engineering.columbia.edu/lever.



Here's how I suggest starting:

- Define your workflows. What tasks need to get done? What information is needed to do those tasks? What does success look like?
- Remove manual blockers. If someone has to write information by hand or transfer it manually, redesign the process.
- Standardize context. Agents shouldn't have to guess what "done" means. Make rules and data explicit.
- Let agents learn. If you show them a few examples, they'll remember what to do — and know when to ask for help.

Personally, I'm excited for a future where we don't waste time filling out forms or navigating clunky systems. The less time we spend pushing paper, the more time we can spend doing meaningful work. That's the real promise of this technology.

LYDIA CHILTON IS AN ASSOCIATE PROFESSOR OF COMPUTER SCIENCE AT COLUMBIA ENGINEERING AND A VISITING SCIENTIST AT AMAZON.

PERSPECTIVES

START BY SOLVING ONE PROBLEM

Finding the right initial use case is key to successfully deploying AI agents.



By Zhou (Jo) Yu

Leaders often talk about “adopting AI” like it’s a vision statement that redefines everything happening in an organization.

In my experience, success is far more likely when leaders identify one discrete use case where an AI agent can deliver measurable results. This “wedge” creates momentum, builds internal trust, and uncovers practical lessons that make future deployments easier and more impactful.

My colleagues and I have gained experience helping small and large organizations deploy agents to handle specific, repetitive jobs like responding to customer inquiries, basic bookkeeping, and managing customer records. Automating just one time-consuming task can show leaders across an organization the value that agents can bring.

My startup, Arklex.AI, is helping major corporations use AI sales agents to increase revenue by handling customer interactions faster and more consistently than their human team could. We’re also working with a publicly traded robotics company to augment their devices’ ability to interact with humans.

The key is to find a clear need that’s suited to automation. That usually means an operation that relies on repetitive communication and well-defined goals, like communicating with customers who run into common issues. Once you manage to solve that initial problem, it’s much easier to extend the model to other internal processes and departments.

Given the significant progress in LLMs and other AI technologies, the real challenge in deploying an agent isn’t technical — it’s organizational.

“Using agents to solve one problem (especially if it drives revenue or brings down expenses) can create the momentum to roll out the technology across an organization.”

—Zhou (Jo) Yu

People are protective of their work. They don’t always want to write down what they know or change how things get done. That’s why success usually requires top-down commitment. In some cases, leaders had to insist: write down your process or risk being left behind.

If you’re preparing to bring agents into your organization:

— Start with a wedge. Choose a task that’s high-volume and well understood. We’ve seen successful implementations center on sales follow-up, customer service, and internal onboarding.

— Design for flexibility. Different teams and functions have different needs. Start with this in mind, and build templates that can work across teams with minimal rewiring.

— Plan for culture change. People need to see agents as support, not surveillance. Make productivity gains visible and reward the humans who made them possible.

— Enlist leadership. Cultural resistance is real. Signals from the top of the org chart can make or break implementation.

Using agents to solve one problem (especially if it drives revenue or brings down expenses) can create the momentum to roll out the technology across an organization.

ZHOU (JO) YU IS AN ASSOCIATE PROFESSOR OF COMPUTER SCIENCE AT COLUMBIA ENGINEERING, A CO-DIRECTOR OF DAPLAB, AND THE FOUNDER AND CEO OF ARKLEX.AI

PERSPECTIVES

DON'T GET LOST IN THE HYPE

There's a lot to consider before letting agents write in critical databases.



By Vishal Misra

For years, people have predicted that AI agents would handle tasks like

booking a vacation, taking care of everything from buying flights to reserving hotels. But I don't think anyone is ready to hand over their credit card without checking the itinerary first. I feel the same way about applying AI agents to mission-critical systems in enterprise settings.

Agents that write code demonstrate why. There are already plenty of models that can scan a codebase, understand complex requests, and generate sophisticated software. But their output often includes hallucinations and code that falls short of professional standards. That software could cause significant problems if implemented without serious oversight.

Imagine a company giving that same kind of agent access to its sales database. One hallucinated instruction could delete every customer record — wiping out years of business data and leaving the sales team scrambling. It would be catastrophic.

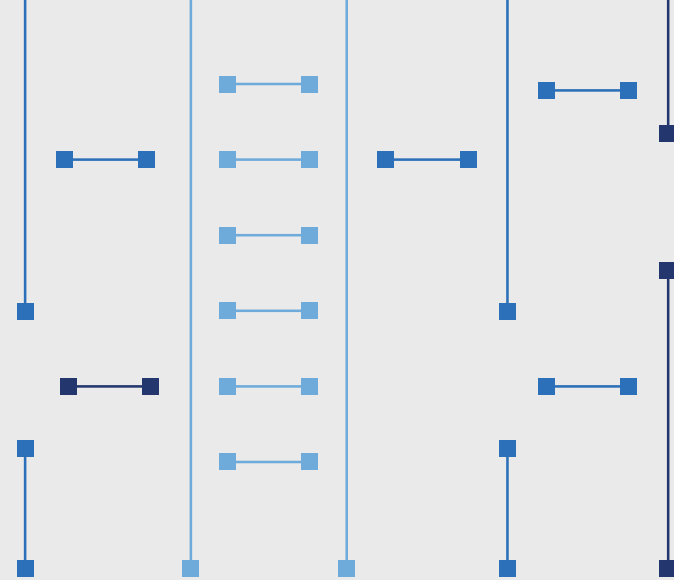
Importantly, this isn't a shortcoming of the training data. In fact, software engineering is one of the best-documented

domains, with many large repositories of code available. If agents still struggle in this ideal environment, it's unrealistic to expect dramatic improvements for agents that are trained to perform more niche tasks, much less ones that are trained on a single company's data.

That's why a growing ecosystem of tools and practices — called "scaffolding" — is emerging to keep agents in check. These safety layers help constrain agents' permissions, check their outputs before deployment, and prevent mistakes from cascading across critical systems. While developers and researchers are often enthusiastic about what agents could do, many people in industry remain cautious. The chance of a particularly consequential mistake is a huge business risk.

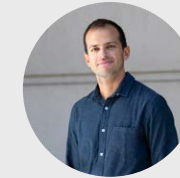
Instead of hoping for perfect models, we need better guardrails. That means designing safety layers that check agents' outputs, constrain their permissions, and ensure that failures don't cascade through key systems.

VISHAL MISRA IS RKS FAMILY PROFESSOR OF COMPUTER SCIENCE AND VICE DEAN OF COMPUTING AND ARTIFICIAL INTELLIGENCE AT COLUMBIA ENGINEERING.



IMAGINE EVERYTHING THAT COULD GO WRONG

Agents are a powerful tool, but it's essential to consider the damage they can do.



By Kostis Kaffes

Mistakes aren't the problem. Humans make them all the time. For people and

organizations that are implementing AI agents, the real threats are mistakes that happen quietly, quickly, and at scale. A hallucination sends funds to the wrong account or deletes important records that could cause enormous damage.

By definition, AI agents take actions that can't necessarily be undone. When an agent edits a database, sends an email, or initiates a credit card transaction, it makes a real-world change with real-world consequences.

When something goes wrong, it might take hours (or days) to notice.

To implement a responsible AI strategy, you have to work backward by imagining what can go wrong and taking steps to prevent unacceptable outcomes. But catching mistakes quickly isn't enough. We also need to give agents structured ways to explore, experiment, and learn safely, so they can reduce the number of mistakes they make in the first place.

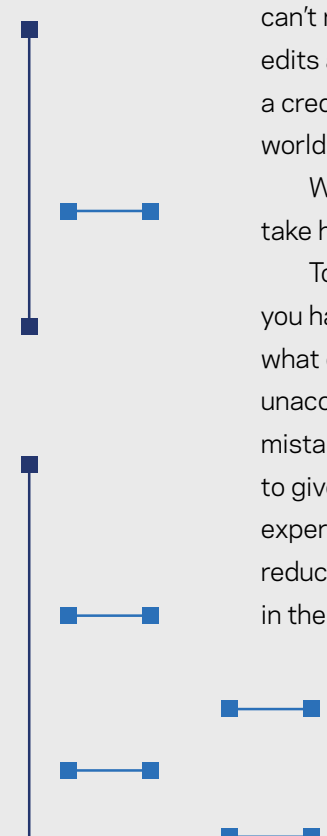
As a systems researcher, I've seen problems propagate through a network faster than the human brain could begin to understand what was going on. These issues can compromise fundamental requirements like data integrity, customer privacy, and legal obligations.

From my perspective, anyone implementing AI agents should take a few basic steps to prevent the worst outcomes:

- Track what changes. You need full lineage: what changed, when, by which agent, and who relied on it next. Without this, even basic troubleshooting becomes impossible
- Simulate first. Don't let agents take just one action. They need to test dozens before choosing. Your infrastructure should support isolated, fast simulations so they're not experimenting directly on systems with real-world implications.
- Spread out your safeguards. There's no single "safety layer." You need checks at different levels of the stack that work together to catch problems early.

At Columbia Engineering, we're working with partners across sectors to help systems handle these edge cases before they become headlines. Because in this next phase of AI, a robust system isn't a plus, it's essential.

KOSTIS KAFFES IS AN ASSISTANT PROFESSOR OF COMPUTER SCIENCE AT COLUMBIA ENGINEERING.



PERSPECTIVES

BUILD SYSTEMS WORTH TRUSTING

AI agents need the right guardrails to put humans at ease.



By Eugene Wu

Imagine a new technology that eliminates office drudgery by making business

operations faster and more efficient, but at a cost: it's prone to mistakes, hard to trust, and hungry for energy.

This isn't just the story of AI in 2025. It was also the story of relational databases from the 1980s.

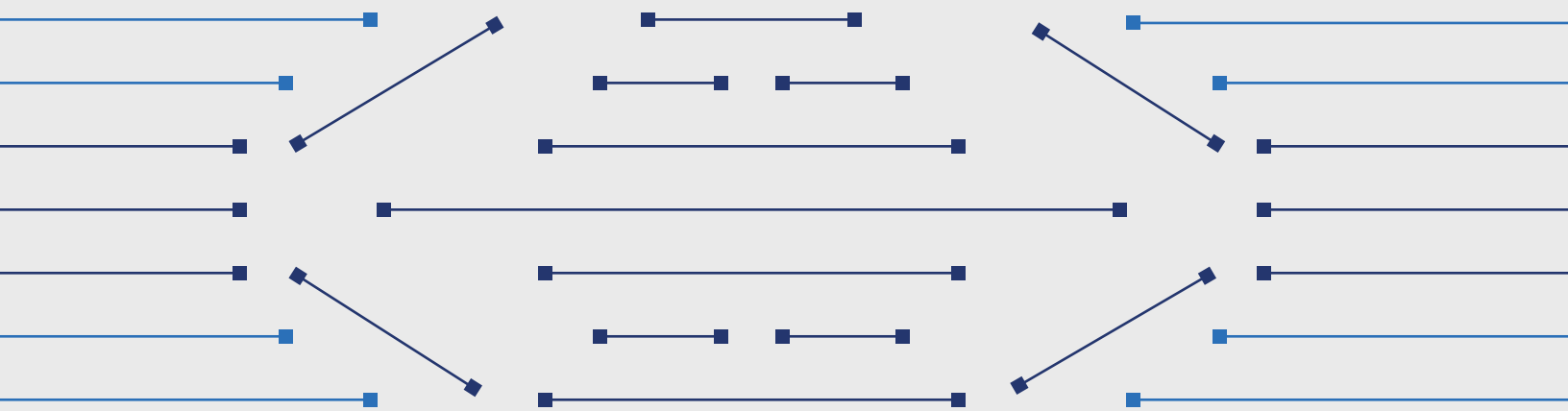
From a systems perspective, the challenges are similar — and so are the solutions.

Back then, business software was expensive and brittle, with no reliable infrastructure for managing data.

The lack of trust in the underlying data systems, which we call a “trust wall,” meant developers had to rewrite vast swaths of the application logic anytime they wanted to optimize the data layout, slightly change the data model, or simply add a new feature.

Relational databases made it reasonable to trust these digital systems. Once that infrastructure existed, entire industries scaled. That shift underpins nearly every enterprise system in use today.

AI agents now face a similar “trust wall.” Many organizations let them read data or draft documents, but hesitate to let them take action, like submitting a form or updating a record. And that's not unreasonable: while agents are powerful, they're also unpredictable, prone to hallucination, and tough to monitor in real time. Even a single mistake could be catastrophic because the systems agents operate within weren't built with those shortcomings in mind.



“We need systems that let agents plan, simulate, and act in controlled environments that are designed to take advantage of their strengths while mitigating their weaknesses.”

—Eugene Wu

So, what does it take to make agents trust-worthy? We need systems that let agents plan, simulate, and act in controlled environments that are designed to take advantage of their strengths while mitigating their weaknesses:

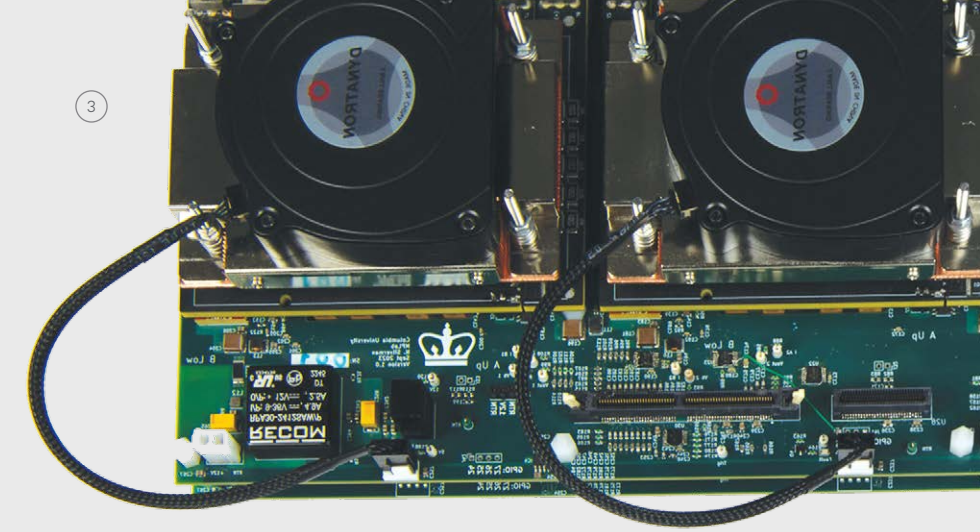
- Sandboxed environments where agents can explore hundreds of actions before committing to one.
- Forkable infrastructure that isolates mistakes, preventing them from cascading through the system.
- Built-in safeguards at the data layer that block unverified actions from affecting live operations.

When that kind of infrastructure exists, agents will move beyond offering suggestions and start taking action. These components will also fundamentally shape how agents and models are designed. They will guide what assumptions are safe to embed into models, how to optimize for efficiency and reliability, and how to structure agent interaction patterns. Moreover, this infrastructure will inform the design of user experiences that give people the right level of visibility, control, and trust in the agents acting on their behalf.

To unlock the next wave of automation, we don't just need better agents. We need to build systems that make trust possible. 🤖

EUGENE WU IS AN ASSOCIATE PROFESSOR OF COMPUTER SCIENCE AT COLUMBIA ENGINEERING AND A CO-DIRECTOR OF THE DAPLAB.

FEATURE



1. Tactile sensors give robots a sense of touch. (YUNZHU LI)
2. This NMR probe reveals physical and chemical changes inside working batteries. (LAUREN MARBELLA)
3. This 3-phase inverter is programmable and modular. (MATTHIAS PREINDL)
4. Polymers made from biomass waste could strengthen the battery supply chain. (LAUREN MARBELLA)
5. Students designed this custom chip, which was fabricated in cooperation with Apple. (PETER KINGET)

The Industry Edition

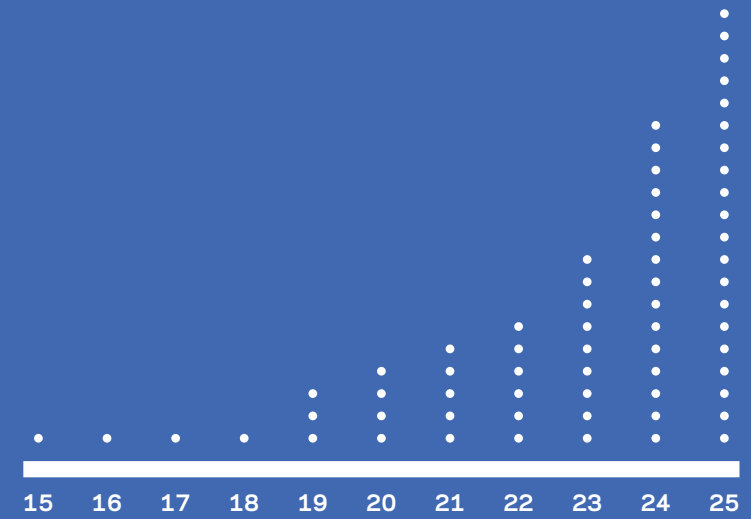
From the boardroom to the factory floor, academic partnerships with industry mean shared success and broader impact.



Impact at Scale

Centers & Initiatives

Over the last several years, Columbia Engineering deepened its efforts to work with businesses, philanthropy, and other funders in pursuit of mutually beneficial research projects. The SEAS Office for Research is committed to making these collaborations as smooth as possible. The chart to the right shows the growth of our existing center-level initiatives over the last decade.



GOVERNMENT SPONSORED CENTERS

Funding: \$5M - \$26M+

NSF ERC: Center for Smart Streetscapes (CS3)

NSF STC: Learning the Earth with AI & Physics (LEAP)

NSF NAIRI: Institute for Artificial & Natural Intelligence (ARNI)

DARPA/SRC JUMP2.0: Center for Ubiquitous Connectivity (CUbiC)

INDUSTRY SPONSORED CENTERS

Funding: \$3M - \$6M+

Center of Artificial Intelligence Technology (CAIT)

Center of AI & Responsible Financial Innovation (CAIRFI)

Columbia Center of Advanced Electrification (CCAIE)

Columbia-Dream Sports AI Innovation Center

Infosys Topaz-Columbia University Enterprise AI Center



INDUSTRY CONSORTIUM CENTERS / INITIATIVES

Corporate Members: 5 - 15+

Columbia - Ethereum Research Center for Blockchain Protocol Design

Cyber NYC Initiative

Sustainable Computing Initiative



Columbia Electrochemical Energy Center (CEEC)

Center for Digital Finance & Technologies (CDFT)

Columbia Fusion Research Center (CFRC)

Partnership for Embodied Emissions Reduction (PEER)

Data, Agents, and Processes Lab (DAPLab)

OTHER INITIATIVES

Columbia Nano Initiative (CNI)

Columbia Quantum Initiative (CQI)

Women's Health Initiative

AI in Real Estate Initiative



The University Advantage

Words by
Grant Currin

How Industry-academic Partnerships

Support Bold Ideas

From technical know-how to blue-sky thinking, Columbia Engineers are lending their expertise more widely than ever before.

There were few signs that Matthias Preindl was on sabbatical when he arrived at his office in Morningside Heights.

An associate professor of electrical engineering, Preindl was on campus to host



Wesley Pennington, the entrepreneur building Tau Motors, a technology company pioneering modern power conversion systems

that include electric motors that don't require rare earth magnets and software-defined power electronics. Pennington initially connected with Preindl in 2018, when first developing the technology platform for Tau.

The partnership started with a series of "small but impactful bets for advanced research topics that laid the groundwork for something much bigger," said Pennington, the company's founder and CEO. Tau continued sponsoring Preindl's lab to advance Tau's research agenda, eventually expanding the collaboration to include a portfolio license of IP from the university.

In 2025, Tau became the founding partner of the Columbia Center for Advanced Electrification, which Preindl leads.

"Our collaboration with Matthias and Columbia helps us pursue bleeding-edge R&D to accelerate Tau's platform in a strategic and directed manner, but outside of our day-to-day operations," Pennington said. "This highly

aligned, more fundamental work allows us to explore and push the boundaries of the field to inform the expansion of our capability while providing the university with relevant, real-world challenges."

Pennington is far from the only executive who sees academic partnerships as a chance for a competitive edge. Industry now drives the vast majority of American research. Businesses account for roughly three-quarters of the nation's total research spending, a figure approaching \$900 billion per year.

Only a small fraction of that money — less than one percent — flows directly to colleges and universities, but the absolute numbers are significant. In recent years, industry funding for academic research has exceeded 60% of the National Science Foundation's total budget.



Wesley Pennington (left) and Matthias Preindl on campus. (DAVID DINI)

FEATURE

Large companies, such as Bloomberg LP, also see value in those partnerships. “By working with academia, we can stay abreast of the latest evolution of technology and science,” says



Shawn Edwards BS'90 MS'95, Bloomberg's CTO and a chair emeritus of the Board of Visitors at Columbia Engineering.

“In so many fields, research is at the leading edge of what becomes useful, practical, and applicable.”

After decades of ad hoc partnerships with industry, Columbia Engineering began scaling up its collaboration program roughly five years ago. Today, hundreds of companies like Bloomberg and Tau Motors partner with the School to develop new technologies, attract high-caliber talent, and scan the horizon for the next big opportunity.

Developing New Product Lines



Ann Schoeb is chief research and development officer at Birla Carbon, a global manufacturer of an important material called

carbon black. She joined the company as it elevated R&D to a C-suite priority.

According to Schoeb, Birla Carbon's partnership with the Columbia Electrochemical Energy Center (CEEC) supports the company's effort to look at the fundamentals of the carbon black and synthetic graphite materials it already makes and to develop future

product lines. Working with the company exposes academic researchers and students to the challenges specific to industry and large-scale production.

“They help bring insights a lot faster than if we were working on these materials by ourselves,” she said.

Like many other companies, Birla Carbon conducts a lot of in-house research to develop new products and refine its manufacturing processes. Partnering with academia gives them an opportunity to focus on the future.

“It's easy to focus only on developing products that customers are already asking for, but that could make a company vulnerable to missing the next big market disruption,” Schoeb said. “If you're not connected to longer-term research, the next disruption may leave you out of the market or behind the rest of the industry.”

As Birla Carbon expands into a new market — carbon-based materials for batteries — the partnership with CEEC provides several advantages, including access to experimental facilities on the Morningside Heights campus.

“We're gathering data we might not otherwise get, and I value the thought partnership that academics bring,” she said.

“We partnered with CEEC because they're specialists in the energy storage space.”

In helping Birla Carbon expand the supply of materials for the batteries necessary to transform the energy storage market, CEEC faculty and students are also pursuing their own collective goal of electrifying the energy system.

▶ Columbia Engineering students engage with industry across programs and disciplines. In this photo, SURE program fellows visit industry sponsor Amazon, connecting with employees, learning from panels, and engaging in a recruiter-led session on career pathways. (COLUMBIA ENGINEERING)

“If you're not connected to longer-term research, the next disruption may leave you out of the market or behind the rest of the industry.”

—Ann Schoeb



“We're tapping into their knowledge and experience to show that one plus one is more than two and to understand the why behind our materials' performance advantages,” Schoeb said.

Attracting Talent and Building Pride

For Edwards, the CTO at Bloomberg, partnerships with universities have another benefit — building and sustaining a team of talented engineers.

“Collaboratively publishing papers with academics is a great way to recruit talent,” he said. “It's also a fantastic way to keep our talent.”

Edwards leads a global team of more than 9,000 engineers who develop and maintain Bloomberg's infrastructure and data systems. Many come from academic research back-grounds, and he sees the company's collaborations with universities as an essential outlet for that intellectual drive.

“We hire people who come from the research community, many with PhDs,” he said. “They aren't satisfied applying technology — they want to have one foot in the research world.”

Through PhD fellowships and a faculty grant program, Bloomberg engineers work closely with academic researchers to crack unsolved problems in areas including AI, cloud computing, quantitative finance, and information security. The most successful projects become new products that his team eventually integrates into Bloomberg's own systems.

“Our engineers solve specific problems from customers every day,” Edwards said. “Our collaborations with academia are

“I see engaging with academia as a way to expand the group of experts we can draw on.”

—Chris White

aimed at solving problems that would unlock capabilities or unleash new sources of value.”

The partnerships also improve morale across the engineering team.

“People want to work for an advanced tech company, and they feel great when they see that Bloomberg was involved in this academic funding or that research,” he said. Bloomberg’s partnerships with universities also strengthen its reputation in the research community, making it easier to attract new engineers. The company collaborates with Professor Ali Hirsra to host the annual Bloomberg-Columbia Machine Learning in Finance Conference, now in its 11th year.

“It helps get our name out there,” Edwards said. “We make connections when we’re presenting papers, hosting conferences, or collaborating with professors and students. It’s a great way to find and attract talent. People are attracted to Bloomberg because we’re doing this.”

For Edwards, this blend of collaboration and visibility is part of what keeps Bloomberg’s engineering culture vibrant.

“It’s also a huge morale boost for the rest of the company,” he said. “When people see Bloomberg contributing to research or open-source work, it reminds them they’re part of something that’s pushing technology forward.”

Hunting for the Next Huge Idea



Chris White is not interested in incremental improvement. As head of NEC Labs America, a subsidiary of the global technology company

founded in Japan 126 years ago, he’s looking far past the horizon.

“Our goal is not to make a product 10% better — it’s to come up with an entirely new market for NEC,” said White, who sees his lab as carrying forward the legacy of industrial labs like XeroxPARC and Bell Labs. As a bridge between the company’s business units and the U.S. research enterprise, NEC Labs America gives the company an opportunity to develop foundational technologies.

“The idea is to get a whole bunch of smart people together, make them aware of important problems, and give them the freedom and flexibility to start solving those problems,” White said. “I see engaging with academia as a way to expand the group of experts we can draw on.”

For White, the value of collaboration with Columbia doesn’t lie in the faculty’s technical expertise but rather in their creativity and ability to frame and solve problems.

“If I have an electrical engineering problem, I want to send a biologist, a mathematician, and an architect to solve it,” he said.

“The electrical engineers might laugh at their solution, but every once in a while, you get a really big disruption that really

changes the way we look at things across many domains.”

In its partnership with Columbia and the NSF Engineering Research Center for Smart Streetscapes, NEC Labs is bringing that spirit of open-ended innovation to city management and streetscapes. The company is taking what it has learned about distributed sensing, time-dependent data analysis, real-time anomaly detection, and root-cause analysis in the context of factories and telecommunications networks and applying it to cities.

“It’s a great example of taking what we learned in one setting and bringing it to another,” he said. “Interacting with professors at Columbia and experts in New York City was the only way to make that happen.”

Chris White speaks at the Center for Smart Streetscapes (CS3) on Columbia’s Manhattanville Campus (TIMOTHY LEE)



Fusing Strengths

INSIDE COLUMBIA'S PARTNERSHIP WITH COMMONWEALTH FUSION SYSTEMS

Words by
Grant Currin

Image Courtesy
Commonwealth
Fusion Systems



The new Columbia Fusion Research Center is partnering with industry leaders to make fusion power a reality.

Humanity is coming close to harnessing the source of energy that powers stars and supernovas. Once the last technical problems are solved, fusion power plants that emulate the physics of the Sun could provide cheap electricity without carbon emissions, the safety risks of nuclear fission, or the intermittent supply of wind turbines and solar panels.

Decades of publicly funded research set the stage for the vibrant ecosystem of companies now competing to develop the first power plant that runs on nuclear fusion. In the last five years, private investors have put more than \$10 billion into these efforts. Nearly one-third of that capital backs one company, Commonwealth Fusion Systems (CFS), as it closes in on passing this vital milestone.

Columbia Engineers — including a dedicated community of undergraduate researchers — are making meaningful contributions to CFS's effort.

"Columbia has been an awesome partner since shortly after we started the company," says CFS co-founder Brandon Sorbom, who serves as chief science officer. Last year, the University cemented its focus on fusion by establishing the Columbia Fusion Research Center, which has already developed partnerships with roughly a dozen companies in the fusion space. CFS joined as a founding sponsor.

The Center's founding director, Carlos Paz-Soldan, says these partnerships ensure that Columbia's research and education stay relevant in this fast-moving sector.

"We're not just pursuing academic milestones, we're working closely with companies to accelerate their progress and guide our academic work," says Paz-Soldan, who is an associate professor of applied physics and applied mathematics at Columbia Engineering. "That alignment is rare, and it reflects something distinctive about Columbia Engineering — a willingness to engage directly with industry to solve urgent global challenges."



Carlos Paz-Soldan

Columbia Engineering Magazine recently had a conversation about industry-academic partnerships with Brandon Sorbom, Carlos Paz-Soldan, and Michael Segal, CFS’s senior director of open innovation.

▶
Brandon Sorbom



What is CFS focused on right now?

Sorbom: We’re in a sprint to build a commercially viable fusion device before anyone else does.

How do partnerships with academic institutions help you do that?

Sorbom: Industry is very focused, which is a strength and a weakness. We’re moving fast, so once I get enough data to solve a problem, it’s onto the next thing. The academics we work with have the latitude to go deeper into the details and understand things at a more

fundamental level. The company may not need that information to meet our goals for the next couple of years, but it’s incredibly valuable in the long run. They can be working in parallel while we’re building the hardware that gets headline results.

Segal: CFS recognized early on that our success depends on finding capabilities and assets wherever they are. We prioritize speed in our strategy, so if we think we can accomplish something faster with a partner, we’ll do it. Academic partners are especially adept at smaller projects on faster timelines, and they’ve proven flexible when it comes to making adjustments to meet our goals. University partnerships are a growth category for us.

How did Columbia’s partnership with CFS get started?

Segal: We started collaborating with Carlos when he was at General Atomics. When he moved to Columbia, the relationship followed him and started to grow. We began with what you might call a seed project in 2021, and that went really well. We’ve expanded from there.

Paz-Soldan: That first project was focused on understanding plasma positioning and how precise the construction of the machine needs to be. What happens if magnets are off by just a few millimeters? Is the plasma still stable? We developed new computational tools to find those answers. Through that effort, we started developing specific capabilities that match what CFS was looking for. We also identified several loose ends and open questions that merited further investigation.

What’s distinctive about working with Columbia?

Sorbom: When you walk through the lab space, you can tell that people are itching to get results. Sometimes they’re cobbling stuff together because they want to get something up and running. I call it scrappy — they’re actually getting stuff done. It reminds me a lot of MIT, where CFS got its start.

Segal: In a lot of fusion departments, you find plasma physicists who run models or test basic science on a small device. As we scale to commercial deployment, CFS needs much broader expertise in areas like mechanical engineering, materials, controls, and chemistry. We’re a founding member of the Columbia Fusion Research Center, and we’re keen to see the center grow and bring in other faculty from other disciplines and departments across the University.

Paz-Soldan: Launching the center has enabled faculty members from other departments with other competencies to come out of the woodwork. We’re working closely to figure out how to get them

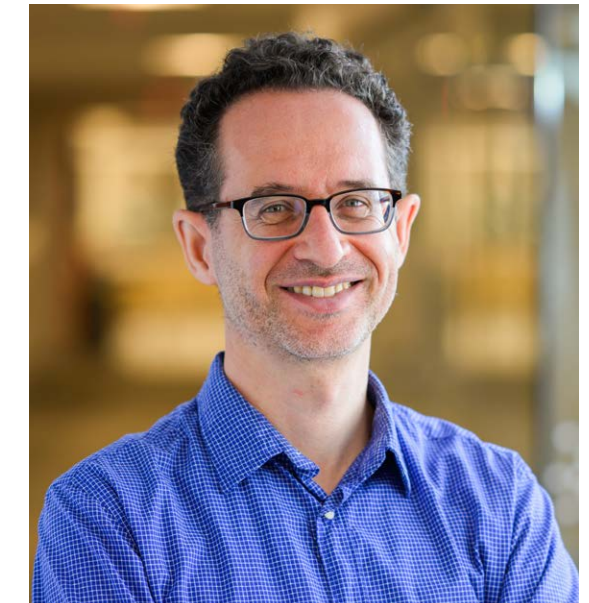
resources to execute on ideas that contribute to our goal of fusion energy.

How is the partnership helping train the next generation of fusion engineers?

Paz-Soldan: At Columbia, we’ve built a program where undergraduates are hands-on with high-temperature superconducting magnets. With hardware donated by CFS, our students are winding magnets, cooling them with cryogenics, and testing them. It’s producing graduates who are ready to step into the fusion workforce. Some of our students have already gone to work for CFS.

Segal: From our perspective, that pipeline is essential. We want to deploy thousands of power plants. That takes an enormous workforce of scientists, engineers, and technicians. We don’t want the workforce to be a bottleneck, so we’re working with Columbia and other partners to make sure the talent is there. 🦾

◀
Michael Segal



A Silicon Bridge

from Morningside Heights

Words by
Xintian Tina Wang



Joao Cerqueira

to Cupertino



Peter Kinget and students conduct a chip design review in Spring 2025. (TIMOTHY LEE)

Columbia Engineering alumnus Joao Cerqueira shares how his time at Columbia prepared him for a career designing next-generation chips at Apple — and the importance of hands-on education in shaping future hardware engineers.

When Joao Cerqueira MS'16, PhD'19 arrived in New York from his hometown of Brasília, Brazil, he carried a passion for computer hardware, an appetite for innovation, and a deep belief that hardware design was poised to shape the future of computing. A decade later, as a staff engineer on Apple's Hardware Technologies team, Cerqueira's journey embodies the powerful ways Columbia Engineering's partnerships with industry can inspire the next generation of technology leaders.

From Brasília to Morningside Heights: the VLSI Lab's role in launching careers

Cerqueira's path to Columbia was defined by an early fascination with the invisible architecture powering modern life. After earning his BS in electronic engineering at the University of Brasília in 2014, he sought out graduate programs that combined rigorous fundamentals with an applied, hands-on approach. Columbia's Department of Electrical Engineering offered exactly that.

At VLSI Design Lab at Columbia University (VLSIDL), led by Associate Professor Mingoo Seok of electrical engineering, Cerqueira immersed himself in research on ultra-low leakage, energy-efficient digital integrated circuits and microprocessors. His PhD thesis not only pushed the boundaries of how systems

consume and conserve energy but also earned him recognition as a Qualcomm Innovation Fellowship recipient in 2017.

"At some point in his PhD program, I found that Joao is not afraid of dealing with very complex digital processor design," recalls Seok, who served as Cerqueira's PhD advisor. "He seems to have a knack for transforming a complex design problem into multiple layers of simpler problems without losing the connections among the layers. This capability enabled him to design and prototype a 16-core microprocessor titled CATENA. It was the largest chip our group had prototyped at that time. I think this preparation greatly helps him in working with custom silicon, where he must deal with very complex problems across circuits and architecture."

After joining Apple, Cerqueira continued his connection to Columbia Engineering — this time through education. He became Apple's liaison for the ELEN E6350 VLSI Design Lab course, taught by Bernard J. Lechner Professor Peter Kinget of electrical engineering and Seok, which bridges academia and industry by giving students hands-on experience designing, fabricating, and testing real chips through Apple's sponsorship.

"Joao has been very instrumental to the success of the VLSI Lab course," says Kinget. "He has been particularly helpful in

“That experience of turning theory into reality has stayed with me and continues to drive me today.”

—Joao Cerqueira

managing the complex digital designs — full CPUs, accelerators — that several student groups have built over the years. He guided the students in translating their theoretical knowledge into effective design methodologies using the digital design tools that are standard in industry.”

Today, Apple’s support of the Columbia tapeout class helps ensure that this cycle goes even further. Since 2022, Apple engineers have mentored students in the electrical engineering department at Columbia, offering guidance during design reviews and supporting chip fabrication and packaging. The company also sponsors awards for standout projects, providing students with a unique opportunity to see how their classroom work translates directly into the innovations that power the devices they use every day.

Bridging Academia and Industry on Campus

In 2019, shortly after defending his dissertation, Cerqueira joined Apple’s silicon engineering team in Cupertino. His work now focuses on some of the most complex aspects of modern chip design: optimizing

energy efficiency and performance at scales that power millions of devices worldwide. Cerqueira remains closely connected to Columbia. He often returns to campus to mentor students, share career advice, and emphasize the opportunities available in hardware-related fields. He pointed to his own experiences at Columbia as formative.

“I remember the late nights in my PhD time, debugging problems that felt impossible at first,” he says. “With persistence and teamwork, we finally got it working — and seeing it in silicon was unforgettable.”

That experience of turning theory into reality has stayed with me and continues to drive me today.”

Jennifer Lee, director of career placement in the electrical engineering department, underscored the importance of the alumni connection: “I have been collaborating with Joao for the past few years to organize these annual career events, which have proven to be invaluable for our students seeking to work in hardware roles.”

In his recent presentation to electrical engineering students, Cerqueira walked through the chip design cycle, highlighting the wide range of skills involved — from

architecture and logic design to verification, physical implementation and silicon validation. He emphasized that every student brings different strengths, and that part of the journey is discovering where they fit best within that process.

The Innovation Engine

Columbia’s EE program highlights a larger truth: it prepares students for careers in hardware technology, computer architecture, and chip design. For Columbia students, Apple’s support of the Columbia tapeout class brings real-world expertise into the classroom.

As industry and academia continue to redefine what’s possible with custom silicon,

the need for engineers who can balance innovation with practical design constraints has never been greater. “Hardware isn’t abstract — it’s exciting and impactful,” he says. “The chips you design can end up in millions of people’s hands, and that’s incredibly motivating.”

For students considering a career in hardware, Cerqueira’s advice is straightforward: embrace the breadth of the field, stay curious, and take advantage of the resources Columbia offers. “The lab work, the mentorship, the partnerships — they all add up. When you get to industry, you’ll realize just how well-prepared you are.” 🚀

▶ Joao Cerqueira (right) with Mingoo Seok, Joao’s faculty advisor during his time at Columbia. (BRANDON VALLEJO)



Former PSEG CEO Ralph Izzo on Sustainable Energy and Climate Policy

As an Executive in Residence, alumnus Ralph Izzo shares why the climate crisis demands not only new technologies, but also stronger leadership and communication.

Words by
Beatrice
Mhando

Solving the climate crisis will take more than technology alone — engineers will also need strengths in communication, policy, and leadership.

That was the central message from Columbia Engineering alumnus Ralph Izzo BS'78, MS'79, PhD'81, who spoke on the future of sustainable energy as an Executive in Residence in Spring 2025. The former chair and CEO of energy giant PSEG launched his visit in February with a student breakfast, followed by a seminar and a series of one-on-one office hour sessions with both undergraduate and graduate students.

Created through a generous gift by an anonymous donor, the Executive in Residence program recruits distinguished visitors in various fields, from business, government, and the nonprofit sector, to visit students and offer perspectives from their careers and path to executive leadership.

In addition to meeting individually with students, Izzo led a seminar on Feb. 28, 2025, to discuss the future of sustainable energy, the role of policy in creating a greener future, and steps the next generation of engineers can take to mitigate the growing climate crisis.

"I really feel so thrilled and privileged to have Ralph spending time with our students to give us his insights as a leader in the energy industry," said Dean Shih-Fu Chang during the seminar held on the Morningside campus. "How do we take our Columbia Engineering training to not only lead big companies like PSEG, but also have an impact on government decision-making and policy, which is so critical in today's society?"

A member of the U.S. Department of Energy's Fusion Energy Sciences Committee, Izzo's career in energy spans policy, research, and business, with diverse expertise in bringing about the next phase of clean energy.

At the Intersection of Technology and Policy

At the seminar, Izzo discussed the main issues that are affecting energy today — increased demand for electricity and the decreasing reliability of the grid. "I believe, however, that both of those issues — whether it's load growth or grid stability — have to be viewed in the context of climate change," he said.

Izzo did not sugarcoat the reality of our climate crisis — global temperatures are rising — and improved carbon-free energy systems can help mitigate them. How does the U.S. progress toward having more sustainable energy systems? Izzo broke down the process of the transition by reciting the changes he proposed to the U.S. administration during his time on the Fusion Energy Sciences Committee.

"The five things that we have proposed at PSEG in the halls of Congress was, first and foremost, to be more efficient in our energy use," said Izzo. There's a need to grow certain parts of energy consumption, like that of data centers, as we shift from a manufacturing economy to a service-oriented economy. "Second, stop shutting down nuclear plants," Izzo continued. "Third, as you build new energy supply, make sure it's carbon-free. Fourth, now that you've added carbon-free sources, electrify the economy. And fifth, don't leave those decisions to regulators — set a price for carbon to let the market decide what's the right action."

A student asked Izzo what skills he would recommend as someone working at the intersection of technology development and policy. Izzo noted that communication was the most significant asset to career development. "One pathway is to use your technical foundation, but put it on steroids through enhancing your communication



▲
Ralph Izzo
(BRANDON VALLEJO)

skills," said Izzo. "Communicating clearly on the basis of technical knowledge is a great way to influence policy."

"The other path is to develop a better mousetrap," Izzo continued, using the company TerraPower, where he serves as a board member, as an example. By building a more efficient nuclear reactor and pricing carbon at \$50 to \$75 a ton, he said, TerraPower's technology could make nuclear energy economically competitive.

"Whether it's material science or AI that can make this technology more economically viable, it would be a huge way to help get us to that next step."

Ultimately, Izzo underscored the vital role engineers play in bridging technology and policy to build a more sustainable future — whether by advancing new innovations or shaping energy policy. 🌱

From Scholarship Recipient to Changemaker

HOW COLUMBIA SHAPED GRACE WU-PI'S JOURNEY

Words by
Beatrice
Mhando

Grace Wu-Pi BS'00 knows firsthand how Columbia Engineering's alumni network can shape a student's journey and career path.

(MBE) and one of the largest private Asian-American real estate families in New York City. Deeply engaged in civic efforts, Pi Capital builds affordable housing, charter schools, and commercial retail, and participates in many community-based projects.

Wu-Pi joined her fellow alumni at Reunion Weekend 2025 to celebrate her 25th reunion. We caught up with her to take a look back at the meaningful Columbia connections that have made a lasting impact on her life and career.

Looking back at your time at Columbia, what stands out as something that was especially meaningful?

As a first-generation student whose family emigrated from Shanghai, Wu-Pi pursued a degree in industrial engineering and operations research at Columbia on the Weinig Scholarship, funded by alumnus Sheldon Weinig MS'53, EngScD'55. That experience influenced Wu-Pi to establish the Grace and Jerry Pi Family Scholarship Fund in 2017 to financially support students from under-represented groups. Ever since graduating in 2000, Wu-Pi has been actively involved with Columbia; she is a member of the Columbia Alumni Association Board and also a member of the Alumnae Legacy Circle and Engineering Development Council.

Wu-Pi's commitment to giving back extends into her career as co-founder of Pi Capital Partners with her husband, Jerry Pi. Pi Capital is a certified Minority Business Enterprise



▲ Grace Wu-Pi (DIANE BONDAREFF)



◀ Grace and Jerry with their three children, Lianna, Selina, and Jameson. (Courtesy Grace Wu-Pi)

The friendships that I've made, the world-class education that I had, and the camaraderie of it all. There were some very difficult late nights, but we were working through it all together.

Engineering was probably one of the hardest things I've done. But looking back on it, we were in it together, and some of my friends today helped me through those years.

Do you keep in touch with your classmates?

Some I've met and reconnected with through volunteer opportunities at Columbia. But there was one instance that made me rediscover how deep the Columbia network is.

When I was in investment banking at JPMorgan London and attending the London Business School for my part-time master's in finance, I didn't have many friends (or time for that matter!). So I reached out to the Columbia London Alumni Club, looking for a community. I met so many wonderful people there, and it really brought back this shared, common experience of our time on campus. Through that, I realized this is a real international network.

What inspired you to establish the Grace and Jerry Pi Family Scholarship Fund?

I was the first in my family to attend college, and if it were not for the grants and scholarships I had received, Columbia would not have been a possibility. I have the greatest appreciation and gratitude for what Columbia Engineering has meant for me professionally and personally.

I was a recipient of the Sheldon Weinig scholarship, which really impacted me personally because Weinig not only provided the scholarship, but also met with students at annual lunches. Years later, when my

husband and I had the opportunity to pay it forward, I mentioned to the Alumni and Development team about this scholarship that I had received. They said, "Would you like to meet him?" I nearly fell off my chair — I didn't know that that would be a possibility! Turns out that Sheldon Weinig, or "Shelley", as they call him affectionately, lives around the corner from me. I reached out, and we sat down for dinner with his wife, Mary, and my husband.

That's what really inspired us to create our foundation and pay it forward. And if you're in a position where you can do so and make an impactful change, it feels very rewarding to be able to.

Why do you believe it's important for alumni to support Columbia and the future generation of engineers?

Attending Columbia is one of my greatest accomplishments and achievements. My four years taught me so much about collaborative work, engaging in constructive discussions, and personal growth. The diverse set of viewpoints provided me with a very eye-opening experience.

How has your personal background or life experiences shaped your perspective as a leader and professional in your field?

I think representation and having a seat at the table is very important. Whether it be in my first job in finance — as one of the few Asian women leaders in banking — or now in real estate development and construction, I hope my story stands out as one that is inspiring to other Asian American women.

I hope to cultivate the next generation of minority women in my line of work. It's interesting to note that my career has come full circle as I now work with many engineers. 🌱

Tough Tech: The EpiBone Mission

Meet the startup bringing decades of tissue engineering research to patients and doctors across the world.



Video by
Jane Nisselson

QR Code to
featured video:



EpiBone
co-founders
Nina Tandon
(right) and
Sarindr “Ik”
Bhumiratana

Words by
Jane
Nisselson
and Allison
Elliott

►
EpiBone uses
stem cells
to grow
personalized
bone and
cartilage
products.
(COLUMBIA
ENGINEERING)

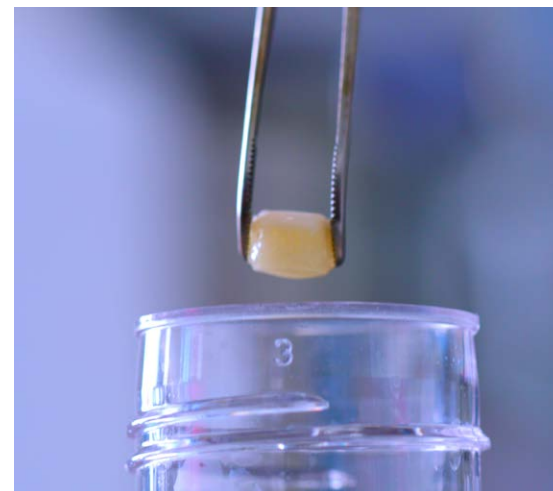
Growing replacement parts for humans sounds like a technology pulled from the pages of science fiction — but there are already people walking around with bone implants grown from their own stem cells.

EpiBone, a start-up co-founded by Nina Tandon MPhil’08, PhD’09, BUS’12 and Sarindr “Ik” Bhumiratana PhD’12, sees the body as a living ecosystem able to generate its own healing. Through innovative technology, EpiBone grows personalized bone and cartilage from a patient’s own stem cells that can be fully accepted by the body, integrated and vascularized within four to six months.

“Cells are the active ingredient,” says Tandon. “Cells don’t know if they’re in a body or not, so if we’re really good as engineers at mimicking those natural conditions for tissue

development, the better the cells grow the tissue.”

Adds Bhumiratana, “Then we come to the drawing board: Why don’t we grow cartilage from



a standard — high-quality cells?”

In our entrepreneurship video series, Tough Tech, Professor Harry West talks with Tandon and Bhumiratana about their journey across several milestones — from the bench, to clinical trials, to market. Tandon, a biomedical engineering PhD alum with an MBA in healthcare entrepreneurship, also sits on the Engineering School’s Board of Visitors and is known for her TED Talks on tissue engineering. Bhumiratana, who also received his PhD in biomedical engineering, is EpiBone’s chief

scientific officer. Both enrolled in Columbia’s Innovation Entrepreneurship Program to access the support, mentorship, and resources that would help them translate fundamental research into real solutions for doctors and patients.

As Tandon explains, “It makes surgeon’s lives better by reducing surgical time, by making patient’s lives better by reducing the number of surgeries, and the time they spend in surgery, and it saves the healthcare system money, on the time scale that matters.”



From India

AN INTERNET PIONEER, ALUMNUS RAJESH JAIN SEEKS TO HELP TOMORROW'S INNOVATORS.

Words by
Allison Elliott

Courtesy
Rajesh Jain

In 1988, when India-based entrepreneur Rajesh Jain came to Columbia for a master's degree in electrical engineering, he had an ambitious goal to graduate in nine months. Such a feat required a strong background in computer science in order to skip the prerequisite courses for advanced classes. The only problem was that Jain had no background in computer science, and his advisor was understandably reluctant to allow him to take a course like operating systems without any programming experience.

"I told my advisor... Look, give me two or three weeks," he remembers. "If I don't do well, then I'll drop the course." On his first test, Jain scored a miserable 2 out of 20, but he kept studying and improving.

to 'Proficorns'

“I write for myself because writing helps me clarify my thinking. The virtuous cycle of reading-thinking-writing is very powerful.”

—Rajesh Jain

“In that first semester, I spent 70% of my time on this single course, operating systems, and I think in the end, probably I finished second or third in the class,” he says. “That course made a very big difference because it helped me skip a level!”

Just as planned, Jain MS’89 was able to complete his degree in nine months with a summer course. That focus and tenacity would serve Jain well in the years to come. After working at NYNEX (New York New England Exchange) for two years, he returned to India just as the World Wide Web was emerging. Jain seized the opportunity, creating India’s first internet portals in the ‘90s and becoming a pioneer in Asia’s dot-com revolution. His startup, IndiaWorld Communications, was later acquired by Satyam Infoway for \$115 million in one of Asia’s largest Internet deals. As an entrepreneur, Jain had his own approach to starting companies, which he termed “proficorns”: bootstrapped companies that focused on profitability over the venture capital behind “unicorns.”

A Global Reach

In 1997, Jain founded Netcore, which later morphed into a global provider of technology solutions for the marketing technology (MarTech) industry that helps brands design and execute highly effective campaigns for customer engagement. Netcore is the largest such company in Asia, facilitating tens of billions of messages and customer interactions per month.

“I realized there was no word for companies like us — unlike venture-backed startups, which had a “unicorn” aspiration — both IndiaWorld and Netcore were bootstrapped, profitable, and scaled. That’s what I define as a proficorn.”

Throughout his successful career, he has been an invited speaker at national and international forums and has also been featured in cover stories in both TIME and Newsweek. Jain was named “one of India’s Best Strategists” by The Economic Times in Sept. 2013. His recent book, “Startup to Proficorn,” shares advice for budding entrepreneurs based on his own experiences

building two proficorns — IndiaWorld and Netcore. Along the way, he began sharing his thoughts daily on his blog at rajeshain.com.

“I write for myself because writing helps me clarify my thinking,” he says. “The virtuous cycle of reading-thinking-writing is very powerful.”

Setting Sights On America

As a child, Jain had a fascination with engineering, particularly civil (his father was a civil engineer), due to his love for buildings and bridges. Later, he fell in love with computers, teaching himself the early programming language BASIC (Beginner’s All-purpose Symbolic Instruction Code) on his father’s office computer in 1983.

After completing his undergraduate degree at IIT Bombay in electrical engineering, he was encouraged by his father to pursue his studies further. His own father had completed his master’s in the U.S. in the early ‘60s and had stayed on for two years before returning to India.

At Columbia, Jain fondly remembers staying at Hogan Hall and his first semester of courses with Charles Batchelor Professor Emeritus Mischa Schwartz, who taught computer networks, and Professor Gerry Maguire, who taught operating systems.

In 2023, Jain returned to Columbia Engineering to give a talk to students as part of the Tech CEO lecture series, a program that brings CEOs to campus to share insights. At the time, he gave students three actionable pieces of advice: to be patient, have a unique offering, and cultivate “me time.” Today, he would add that students think AI-native by imagining a future where agents and superintelligence are coming, not to be afraid of failure, and to focus on “impossible problems.”

“Take up big problems and go at them with an entrepreneurial mindset,” he advises. “The odds are that most new ventures fail, but each in their own way moves the needle forward.”

Education As A Foundation

As part of his continued engagement with Columbia, Jain decided to create the Jain Family Fellowship Fund to provide fellowship support to graduate students enrolled at Columbia Engineering, with a preference for students who have lived, worked, or studied in India. He chose graduate education because that is where he believes deep research and breakthroughs will come from.

▼
Rajesh Jain engages with students after his Tech CEO talk on campus. (DAVID DINI)



“At the graduate level, students start to think more deeply about what they want to do,” he says. “That is what is going to drive frontier innovations. And, of course, Columbia Engineering is at the forefront of a lot of areas, in terms of what’s happening.”

Along with supporting innovation, Jain has a more personal reason for contributing.

“Education is what makes us; that’s what really helps the next generation of students,” he says. “I think we should do our best for the institutions that have made us, that have created who we are and made us what we are.” 🙏

Reunion 2025:

Words by
Beatrice Mhando

Photography by
Brandon Vallejo



▶ From left to right: Reid Ellison, Savio Tung, Zvi Galil, Dean Shih-Fu Chang, Melissa McInerney, Ana Rodriguez, and Thomas Caulfied

Catching Up and Looking Back

Columbia Engineering alumni return to campus to reconnect with classmates and the School, sharing milestones and memories.

Columbia Engineering alumni from around the country and around the world came to Morningside Campus to celebrate Columbia Reunion from May 29 to June 1, 2025.

The weekend of dinners, faculty presentations, and networking gatherings brought together more than 500 alumni, from the Class of 1960 to the Class of 2020.

Reunion kicked off May 29 with the Engineering Dean's Alumni Welcome Dinner and Columbia Engineering Alumni Association (CEAA) Awards Presentation. At the pre-dinner reception, CEAA President Reid Ellison BS'08 presented the Crossed Hammer award to John Szymanski, Class of 1980, for distinguished service to the CEAA.



The CEAA awarded three medals of distinction: the Thomas Egleston Medal was awarded to **Thomas Caulfied BS'82, MS'84, EngScD'86**, GlobalFoundries Executive Chairman to the board of directors; the Samuel Johnson Medal was awarded to **Savio Tung BS'73**, chairman of Investcorp Technology Partners; and the Michael Pupin Medal was awarded to **Zvi Galil**, dean emeritus of Columbia Engineering. Acting President Claire Shipman '86CC, '94SIPA attended the event and presented the Pupin Medal to Galil.

The Reunion agenda included an All Years Reception, a special reception for master's and doctoral students, a party at Chelsea Piers, as well as featured faculty talks, including a panel on education in the age of AI, a lecture on quantum computing, and a tour of the Columbia Plasma Physics Laboratory. On May 30, the Society of Columbia Graduates hosted its Great Teachers Awards reception. Special Class Receptions included the Golden Lions Class of 1975 reception for alumni celebrating the 50th anniversary of their graduation from Columbia Engineering. Each alum received a Golden Lions pin, which marked their entry into the Golden Lions Society. 🦁

Save the date for
Reunion 2026!



Thursday, May
28 – Saturday,
May 30, 2026

◀ CEAA President Reid Ellison BS'08 presented the Crossed Hammer Award to John Szymanski, Class of 1980, for distinguished service to the CEAA. (BRANDON VALLEJO)

Alumni Milestones & Memories

With a global network of more than 50,000 alumni making transformative impacts across industries and technical fields, Columbia Engineers continue to innovate, inspire, and lead in their communities and beyond.

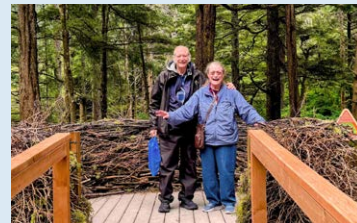
► Courtesy Bill Quirk

1957

Robert Paaswell, BS '57 (CEEM), '56 (CC) writes: Robert Paaswell was named by City and State as a "Transportation Trailblazer."

1958

Robert Drucker, BS '58 (CHEME) writes: Proud to share that my grandson, Maxwell Reid Drucker, is a member of the Engineering Class of 2027. Michael Drucker, dad, is also an Engineering School graduate. Brian Ross Albert, nephew, is also an Engineering School graduate and Bonilla Award Recipient.



1964

Neil Marmor, BS '64, MS '68 (EE) writes: I have volunteered with a dance group, a shelter providing situationally homeless people with housing, and weekly reading aloud to elementary school kids, and had the good fortune to travel and enjoy a variety of cultural events.

1965

Allan Kamer, BS '65 (EE) writes: I designed electro-optical cameras at Fairchild Camera.

1966

John Anselmo, BS '66 (CEEM) writes: During the latter part of my 52-year civil engineering career, I ventured into writing novels. My pen name is JJ Anselmo.

1967

Bill Quirk, BS '67 (APAM), '70GSAS writes: After retiring from the California State Legislature in 2022, I'm enjoying my new life at the Acacia Creek Retirement Community, where I serve as president of our Resident Council.

DEPARTMENT ABBREVIATIONS

APPLIED PHYSICS AND MATHEMATICS
APAM

BIOMEDICAL ENGINEERING
BME

CHEMICAL ENGINEERING
CHEME

CIVIL ENGINEERING AND ENGINEERING MECHANICS
CEEM

COMPUTER SCIENCE
CS

EARTH AND ENVIRONMENTAL ENGINEERING
EEE

ELECTRICAL ENGINEERING
EE

INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH
IEOR

MECHANICAL ENGINEERING
MECHE

▲ Courtesy Albert McGovern

► Courtesy George So



1968

Steve Nahmias, BS '68 (IEOR) writes: It has been 3 years since I took full retirement from Santa Clara University, where I was on the faculty for 43 years. Now I spend my time pursuing my primary hobbies: jazz and golf.

Steven Bachenheimer, BS '68 (MECHE) writes: I retired after 50+ years in the engineering business, 9 at the late Bethlehem Steel Corporation and over 40 years with three major engagements in consulting, where I concentrated on heavy industrial projects. I am now living in Scottsdale, Arizona.

1973

George So, BS '73 (IEOR), '78BUS writes: After 43 years of working in the banking and wealth management industry in Hong Kong and Singapore, I retired in January 2022. I now provide live music (guitar instrumental) entertainment full-time, performing weekly at The Foreign Correspondents Club HK Bert's Jazz Bar in Hong Kong and Blu Jazz Cafe in Singapore.

1977

Joel Rosenblatt, BS '77 (EE) writes: I was hired by Columbia the day I graduated, working for CUCCA (Columbia University Center for Computing Activities) and have been in the CU IT department for the last 48 years. I am currently the Director of Computer & Network Security. I moved to Delaware from New Jersey, June 2025 and am planning to retire in December 2025.

Robert Zimmerman, BS '77, MS '79 (MECHE) writes: I have held the Chair in Rock Mechanics at Imperial College London since 2007. I teach courses in rock mechanics, fluid flow in porous media, and geodynamics. I was recently elected as a member of the Royal Academy of Engineering (UK). Last year, Wiley published my latest book, "Fluid Flow in Fractured Rocks."



1978

Albert McGovern, BS '78 (MECHE) writes: Al and Mary Jo McGovern spent some quality time with all 5 of their grand-children when their youngest grandson joined his 4 cousins in Colorado for 2 weeks.

1980

Steven Wiezbicki, BS '80 (IEOR) writes: I retired in Europe in 2020 after a 40-year career as a management consultant and corporate executive in IT and professional services, focusing on strategy and transformation at Capgemini, PRC Inc., Price Waterhouse, Coopers & Lybrand, and EDS Corp., among others. I live in Budapest, writing histories on the 169th N.Y. Infantry (Civil War) and Austro-Hungarian 57th Infantry (WWI).

1982

Mike Farmer, BS '82 (APAM) writes: I am now the Dean of the School of Computing and Data Science at Wentworth Institute of Technology in Boston.

Asjad Iqbal, BS '82 (APAM), CC'82 writes: After graduating from Columbia, I went to MIT and earned an SM degree in Nuclear Science and Engineering, and MIT News gave me honorable mention in the November/December 2023 issue.

For a full listing of program notes, scan the QR code or visit columbiaeng.com/2026.



COLUMBIA TO THE COSMOS

Words by
Kate Cammell

Raised in Boise, Idaho, and originally from South Korea, Jeonghyun 'Jay' Chae BS'24 remembers an early fascination with space.

"I've always thought space represents something philosophically interesting," said Chae, who graduated with a degree in Mechanical Engineering. "It is very much a real thing, but it's about as intangible as something real can be. It's hard to fathom."

In November 2025, Chae will be joining the Warsaw Institute of Aviation as a Fulbright Scholar, bringing his childhood dream to fruition as he works to improve the propulsion and design efficiency of rocket engines.

Engineering was a familiar path for Chae, who followed in his dad's footsteps as a mechanical engineer. Intrigued by the versatility of mechanics, Chae specialized in aerospace and propulsion systems during his time at Columbia.

He explored these interests through the Columbia Space Initiative (CSI), where students form subteams to work on rocket mission launches. "It helped me figure out what I want to do and where I want to be," Chae noted. "I'm grateful for that." Through CSI, he honed hands-on skills in fluid engineering design work and manufacturing.



▲
Courtesy
Jeonghyun
'Jay' Chae

He now applies these to his career as an engineer at Blue Origin, where he works on powerful rocket engines.

As a Fulbright Scholar, Chae is eager to soak up the history, culture, and art of Poland while continuing to optimize rocket engines. Alongside colleagues at the Warsaw Institute of Aviation, he aims to implement more thorough and efficient testing capabilities on throttleable engines to enable better precision control for lunar and planetary landings.

It's a mission that transforms a childhood fascination with space into real-world innovation that could help humanity explore deeper into the unknown.

UNDERGRADUATE CLASS NOTES

1983

Greg Morea, BS '83 (CEEM), '82CC writes: I finally retired after 42 continuous years at Electric Boat. In July, we welcomed our first grandchild, Grant Wesley Morea.

Matthew Samarel, BS '83 (MECHE) writes: I practice pediatrics in Charlotte, NC, and I enjoy spending time with my beautiful wife, Fran, 3 sons, and 3 granddaughters.

Raul Ruiz, BS '83 (EE) writes: I worked in the technology field for decades but only recently pivoted to pursuits in oil painting.

1984

Andrew Akers, BS '84, MS '94 (IEOR) writes: Preparing to launch a new real estate fund with the firm I've been advising for the last 8 years, since "retiring" from banking and investing.



◀
Courtesy
Janice
Warner

1987

Janice Warner, BS '87, MS '89 (EE) writes: Marina Schreiber and Janice (Iwachow) Warner, both SEAS 1987 graduates, had a surprise reunion on the alumni-sponsored trip to Africa.

2025 USGA Women's Amateur at Bandon Dunes, Oregon. After her year as a graduate transfer at Clemson University, we were thankful for one more competitive event through her qualification by 1 shot.

1988

Tom Cocotos, BS '88 (EE) writes: I'm a fine artist specializing in large-scale, painterly collages exploring themes of power dynamics in both humans and nature, while borrowing compositional elements from the masters. In September, I was granted an artist residency at the Vermont Studio Center.

1991

Edward Paik, BS '91, MS '95 (EEE), '96BUS and Naxin Jiang Paik BS '91 MS '94, write: Our daughter Allison Paik '24CC, qualified for the

1993

James Feuerborn, BS'93, MS'94, (CEEM) '93CC was featured in the TIME Magazine film "Engineers at Ground Zero," a documentary examining the crucial role structural engineers played following the 9/11 attacks.

1994

Aaron Winger, BS '94 (APAM) writes: I have completed my 3-year term as chair of the American Intellectual Property Law Association's China Committee this October 2025.

◀
Courtesy
Edward Paik

UNDERGRADUATE CLASS NOTES

1996

Jamil Changlee, BS '96 (MECHE) writes: The Changlee Family is happy to announce that our eldest has completed her first degree with honors in Environmental Studies and has been accepted into the Master's Program at her University.

Enrico Marini Fichera, BS '96 (MECHE), '95GS writes: Co-founded a highly technical venture capital fund, Apertu Capital (www.apertucapital.com), with fellow Columbia University alum Donald Sheu.

2000

Daryl Delos Reyes, BS '00 (IEOR) writes: You can find me in the SF East Bay Area parenting, coaching, and driving the kiddos Jaylen (12) and Jara (9). When Jennifer (CC'00) is not working in the ER you can find her training for her next iron - "woman" race. I'm still at Genentech, currently focused on population health analytics.

John Mullervy, BS '00 (EE) writes: Was awarded an Alumni Medal, the highest honor awarded by the Columbia Alumni Association (CAA), at the 2025 Commencement. John has been volunteering with the Boston alumni club for



over two decades and served on the Columbia Alumni Association Board of Directors from 2017 to 2023.

2002

Santosh Sekar, BS '02 (IEOR), '08CBS writes: Still living here in NYC with my wife, Jyoti Menon (BC '01, SIPA '06) after all these years! Currently the Founder/CEO of Eleven Homes, a property investing service with a presence in over 23 cities across the US. Would be happy to connect with fellow entrepreneurs, and anyone else interested in chatting with someone that's a bit too preoccupied with real estate.

2003

Jarvis Buckman, BS '03 (IEOR), '03CC, '11CBS writes: Jarvis Buckman was named in the 2025 Lawdragon "100 Global Leaders in Litigation Finance." This is the second year in a row he has earned this honor.

2004

Brian Pellegrini, BS '04 (CS), '16BUS writes: Brian Pellegrini has launched a financial advisory practice focused on serving the Columbia community.

2010

Austin Brauser, BS '10 (MECHE) writes: I married my wife, Victoria, on April 26, 2025! We celebrated with many friends and family including SEAS alumni Nick Tucker (MechE) BS'08, Erin Tucker (MechE) BS'10, Albert Lee (ChemE) BS'10, and Matt Poss (MechE BS'11).

2014

Shannon Sullivan, BS '14 (BME) writes: I'm excited to have recently moved back to NYC for Neuroradiology fellowship at NYU Langone Health.



◀
Courtesy
John Mullervy

▼
Courtesy
Austin Brauser

▶
Courtesy
Angela Qiao

2015

Caleb Solomon, BS '15 (CHEME) writes: I'm the Co-founder of Jara Capital, a multifamily real estate investment firm.

Zijian Zeng, BS '15, MS '16 (IEOR) writes: I became an assistant professor of operations management in the business school of Gonzaga University.



▲
Courtesy
Aparajita
Maitra

2017

Aparajita Maitra, BS '17 (IEOR) writes: I'm enjoying life on the West Coast — both in my role as a Product Support Manager on Google's hardware team and as an aunt, getting to spend lots of time with my niece (5) and nephew (1) who live nearby! My next big adventure begins this fall, as I'll be starting the part-time MBA program at NYU Stern.

2019

Angela Qiao, BS '19 (APAM) writes: My husband and I are thrilled to share that we got married in June 2025! Both of us graduated in 2019 as Applied Math majors — we first met during our freshman year in Calculus III and lived in Furnald Hall.

2020

Kelsey Gray, BS '20 (BME) writes: Graduated with my PhD in August 2025. None of this would have been possible without Dr. Clark Huang, Dr. Tal Danino (and his entire lab - especially Dr. Tetsuhiro Harimoto, Columbia PhD '22), Dr. Aaron Kyle and the support of the BME department.

2021

Jaidev Shah, BS '21, MS '23 (CS) writes: I've been working in AI x search/ recommendations: first in Seattle as an Applied Scientist at Microsoft AI, and now in San Francisco with Prime Video.

2022

Ozgenur Celik, BS '22, MS '23 (BME) writes: I'm a rising third-year PhD student in the joint biomedical engineering program between Emory Medicine and Georgia Tech, developing protein-



engineering tools to study neurodegenerative diseases like Alzheimer's. This past winter, I was honored to be featured on CNN Türk's live news and in the national newspaper Hürriyet, where I spoke about science, the importance of girls' education, and "Engineering for Humanity" — the motto of Columbia Engineering.

2023

Katherine O'Reilly, BS '23 (MECHE) writes: I've been working towards a Master's at the University of Illinois at Urbana Champaign since graduation in 2023, completed internships at some of my dream jobs at Apple, and am now working on my thesis! I'm happy to share I've continued with my passion for Motorsport after years of FSAE involvement and started as a Mechanical Engineering Placement on the Engine Systems team at Aston Martin Formula One.

2025

Gwendolyn Seto, BS '25 (IEOR) writes: I have started a new full-time position as a Capital Markets Analyst at Bank of America in New York City.

FINDING PURPOSE IN THE CLASSROOM

Words by
Kate Cammell



▲ Sharon Collins MS'99. Courtesy of Sharon Collins

Sharon Collins, MS'99, isn't afraid to be at the frontier of learning.

A first-generation college student, Collins came to Columbia Engineering as a National Science Foundation Graduate Research Fellow and was part of one of the first cohorts to earn a master's degree from the Earth and Environmental Resources Program.

At Columbia, Collins discovered her own calling to become an educator. She attended a Teach for America (TFA) seminar and learned about the nationwide program that supports new graduates in becoming teachers. Afterward, she recalls telling her then-boyfriend, now-husband David, whom she met on the first day of classes at Columbia Engineering, "I found what I want to do for the rest of my life."

Collins began her career in New York City's public schools and has now worked for over a decade as a STEM teacher at New Heights Academy Charter School in Harlem. Drawing on her engineering background, she designs project-based curricula, from roller coasters to websites to an infamous Shark



▲ Sharon Collins at graduation with husband David; the two met at Columbia. Courtesy of Sharon Collins

Tank-style competition, to bring learning to life. Her dedication was recognized last year with the Presidential Award for Excellence in Mathematics and Science Teaching (PAEMST), one of the nation's highest honors for K-12 STEM teachers.

Receiving the PAEMST honor was a pivotal moment, bolstering her resolve to lead. She now chairs TFA's alumni association board and recently became her school's first STEAM coordinator, helping launch an AP computer science class and a new arts curriculum.

Mentors played a key role in Collins' own journey, and now she takes pride in supporting her students through similar transformative experiences, especially young women. She recalls being one of the only women in a college calculus course, where a professor instilled the confidence that she was capable of anything. It's a lesson she now passes on.

"Teaching is about relationship building," Collins said. "It's important for students to feel seen and heard. When teachers are passionate, students get passionate too."

GRADUATE PROGRAM NOTES

APPLIED PHYSICS AND APPLIED MATHEMATICS

Sicen Du (MS'17) writes: I'm now an NLP Algorithm Researcher at Kunlun Tech in Beijing, working on role-playing large language models.

Yanhua Liu (PhD'97) writes: As a regional Columbia Alumni Association (CAA), and alumni leader (CAA Shenzhen Co-President), I attended the Engineering School 2025 reunion dinner and the next day's reunion events. I visited the Fusion Lab where I did my PHD thesis experiment, and I found my Graduation PhD name tag on the wall.

Barin Moghimi (MS'14) writes: I recently completed an MS in aerospace engineering from Georgia Tech and worked several internships in the space domain before finally securing a position in the satellite industry with a small startup in southern California.

BIOMEDICAL ENGINEERING

Lawrence Kuznetz (BS'64, MS'65) writes: Writing Cli-tech screen play based on my Amazon novel, CASI's Guess.



Michael Moussourakis (BS'99, MS'01) writes: Michael Moussourakis is Vice President of Strategy at Alconox, LLC, in White Plains, NY, and is responsible for marketing & technical support, and for corporate strategy.

Sona Shah (MS'16) writes: This past year the med-tech company I co-founded, Neopenda, secured a patent in Kenya, expanded to 45+ hospital customers in five countries, and launched a Community Round on Wefunder.

CHEMICAL ENGINEERING

Yue Kuo (MS'78, EngScD'80) writes: Yue Kuo, Life Chair Professor in NYCU's Photonics Department and Yushan Scholar, is also Emeritus Professor at Texas A&M University. A Columbia-trained chemical engineer, he worked at IBM, Data General, and Bayer before entering academia.

CIVIL ENGINEERING AND ENGINEERING MECHANICS

Marc Adwan (MS'12) writes: CEO of Adwan Real Estate - Developing Affordable Luxury Homes.

Samira Ayati (MS'14) writes: I founded IVY Engineering Group, based in New York, providing civil engineering, design support, and construction management services. IVY has secured major contracts with Amtrak, MTA, and Nassau County Department of Public Works.

Jeremy Edmunds (MS'09) writes: After years of managing major infrastructure projects nationwide, I've settled in New Haven, where I'm leading Yale University's \$541M capital program.

◀ Courtesy Sona Shah

▶ Courtesy Lawrence Kuznetz

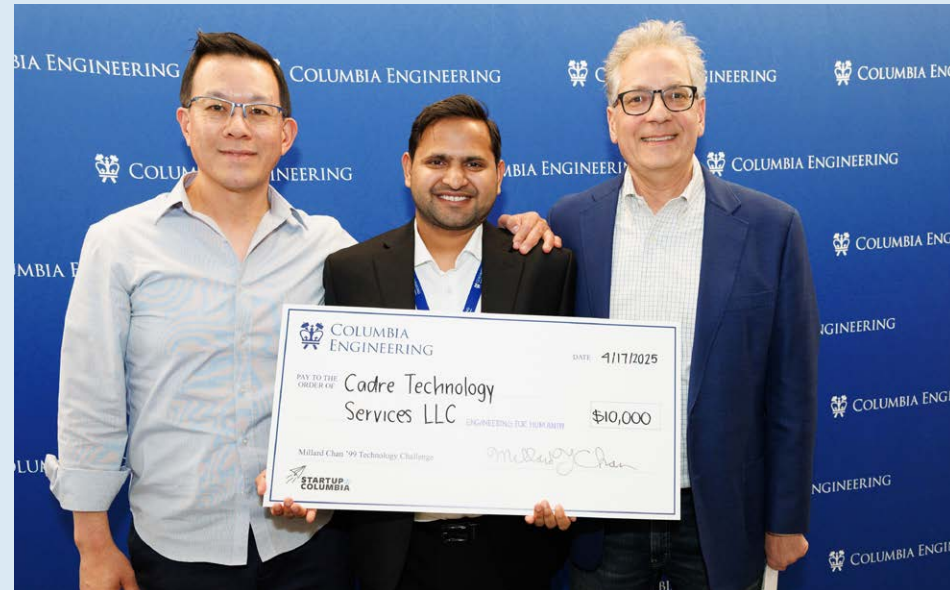


GRADUATE PROGRAM NOTES

►
Courtesy
Muneer Khan

Michael Heil (MS'76) writes: I retired from the US Air Force and the Ohio Aerospace Institute and continue volunteer service. I am board chair of the National Aviation Heritage Area and serve on aerospace industry advisory boards at the University of Cincinnati and Embry-Riddle Aeronautical University Worldwide. I serve on the boards of the Cleveland Engineering Society and the Air Force Institute of Technology Foundation.

Ahmed Jaddi (MS'61) writes: Finally, I retired from engineering practice this year after reaching age 90. We spent the last two summers in Columbia, SC. I am getting my summer house built in Bolingbrook, IL. We will spend winters in Phoenix, AZ. This year I became a great grandfather. Brooks was born in January this year to my youngest child, Salman's daughter Hanna. They live in Orlando, FL.



Lechen Li (MS'20, PhD'23) writes: I have been an Assistant Professor for 2 years.

Alok Kumar Vidyarthi (MS'24) writes: Alok is serving as a Construction Management Professional at CDM Smith in New York, where he manages a \$350 million EPA Superfund project in Brooklyn. He recently earned the PfMP credential, completing the PMI "trifecta" of PMP, PgMP, and PfMP, and also achieved the ENV SP designation.

COMPUTER SCIENCE

Feroz Ahmad (MS'22) writes: I was recently granted a U.S. Patent for a voice-first system that lets doctors search clinical knowledge.

Pranay Dharmale (MS'11) writes: In August, I moved from Bloomberg to the Bquant organization to build and lead a new engineering team dedicated to improving our clients' data experience. It was great to get away after a busy few months with a Labor Day weekend camping and hiking trip in Upstate New York with Leighton Minor (MS '11), who just started his 10th year at Google.

Deepakraj Dharmapuri Selvakumar (MS'22) writes: I am a Senior Software Engineer at Audible, an Amazon company, where I drive large-scale improvements in metadata publishing and Generative AI.



►
Courtesy
Pranay
Dharmale

►
Courtesy
Faisal Qureshi

Adam Hastings (PhD'25) writes: After finishing my PhD, I moved all the way to the faraway land of 60th Street, where I am now an assistant professor of computer science at Fordham University (Lincoln Center campus).

Pranay Jain (MS'06) writes: After an incredible 18-year journey at Goldman Sachs, I have recently taken on a new role at JPMorganChase as Managing Director & Global Head of Corporate Treasury/CIO Technology in New York.

Nader Karayanni (MS'24) writes: I completed my Master's in CS as a Fulbright Scholar, publishing research on AI systems.



►
Courtesy
Maria
Pratyusha

After graduation, I founded NewCase.ai an AI platform for insurance litigation. We secured a \$1.15M pre-seed round from leading investors in the field.



Vishal Vyas (MS'16) writes: I'm honored to share that our industry-changing paper, "Managed Resource Scaling in Amazon EMR," has been accepted for presentation at ACM SIGMOD 2025 in Berlin!

ELECTRICAL ENGINEERING

Maria Pratyusha (MS'24) writes: I had the privilege of judging an AI Hackathon at the University of Texas.

Faisal Qureshi (MS'06) writes: I am currently a lead engineer at Nintendo. Before this, I worked as an engineer at HBO and Amazon. I am also a cofounder and CTO of my startup, Hourglass Software, and have developed key IP in technology.

Rafi Saar (MS'96) writes: After working for many years in the corporate world, I became an indie developer, and this past year, I had the fortune to get my first app on the App Store. It's a fun AR game called RealMaze AR.

Samanway Sadhu (MS'23) writes: Apart from my day job at Intel, I have answered my long-time calling for aviation. I had been training to be a pilot for a while and recently received my VFR license.

Richard Gitlin (MS'65, EngScD'69) writes: Richard Gitlin, Senior Vice President of Communication Sciences Research at Bell Labs (retired) and Distinguished University Professor Emeritus at USF, was honored with the 2025 IEEE Alexander Graham Bell Medal.

Muneer Khan (MS'22) writes: I founded Cadre Tech to develop assistive technologies, including Vision-Pro AI Glasses that enhance mobility for the visually impaired. I received the Young Scientist Award (India), Young Innovator Award (Oxford), and the Engineering for Humanity Award 2025 in New York. I'll present at Cambridge University's Wearable Innovation Launch Forum this September.

Tom Koch (PhD'25) was named the runner-up for the prestigious ACM SIGCOMM

GRADUATE PROGRAM NOTES



▲
Courtesy
Phil Shpilberg

Doctoral Dissertation Award for his research on optimizing Internet routing to meet the demands of today's and future applications.

Perry Lea (EngScD'10)

writes: Perry is now a Fellow, Vice President, Chief Architect at Hewlett Packard Enterprise Co. (HPE), specializing in advanced computing, machine learning at scale, and human-like intelligent systems.

Binh Nguyen (BS'82, MS'84)

writes: I retired earlier this year. Enjoying my free time, travelling, gardening, golf, and reading. I recently met up with an old classmate, Olivier ('83SEAS), and we walked down memory lane on campus.

Fermi Wang (MS'89, PhD'91,

Trustee) and Columbia Engineering professor Dimitris

Anastassiou received the inaugural 2026 IEEE Arun N. Netravali Video Analytics, Technology, and Systems Award. They were selected "for pioneering contributions to the development and implementation of digital video compression and processing technologies."

INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH

Alexander Berenbeim (MS'12,

'11CC) writes: Finally married Jewish Theological Seminary Alum Hannah Hoffman in June. Continuing on as a Senior AI and Machine Learning Researcher at the United States Military Academy, West Point.

Jason Bylsma (MS'18)

writes: After 10 years building my dream business to help reduce global methane emissions, in June we successfully sold Kuva Systems to Sensirion AG in Switzerland.

Vishal Reddy C (MS'22)

writes: I came back to India after graduation to work on a startup where we are trying to build reusable satellites to enable zero-gravity research in space.

Alexandre Duhamel (MS'25)

writes: I joined LGT Capital Partners in Pfäffikon SZ (near Zurich) as a Quantitative Research Intern in the QIS team.

Nesrine Gharbi Ferradji

(MS'09) writes: After 2 years working in Investor Relations in Zurich, Switzerland, I have decided to move to Algiers, Algeria, where I will be leading the M&A department of Holcim Al Djazair.

Arkin Gupta (MS'23)

writes: Arkin Gupta was named to Crain's New York Business 2025 "40 Under 40" list. He is a Vice President at Morgan Stanley, where he leads AI-driven research efforts in trading and risk modeling.

Bruce Jacobs (MS'73, '72CC)

writes: In the CFA Institute's Financial Analysts Journal Fourth Quarter 2025 issue, Ken Levy and I, published "The First 80 Years of the Financial



►
Courtesy
Ziao Yan

Analysts Journal: Prolific Contributors and Major Ideas and Innovations."

Vinit Juneja (MS'24)

writes: I graduated in December 2024 with no internships, entering one of the toughest job markets. After 1,075 applications, I landed an offer at Amazon.

Pooja Sahney (MS'24)

writes: I work as a Program Manager at Lenovo.

Phil Shpilberg (MS'02)

writes: I'm based in San Mateo, CA. I sold GameChangerSF, the company I founded in 2022, took some time to recharge, and recently launched 83A Labs, a podcast intelligence

company that helps clients understand political influence and public narratives.

Antoine Treuille (MS'74,

'74BUS) writes: After a career in fund management, retailing, and venture capital, I am now happily running a B&B in the Loire Valley in France.

Ziao Yan (MS'20)

writes: Ziao Yan is excited to share that he started to be an adjunct lecturer of the MBA program at one of China's top universities from Spring 2025 semester.

Libo Zhu (MS'21)

writes: I have been working at a leading securities firm in China, specializing in margin financing services.

MECHANICAL ENGINEERING

Marvin Bennett (MS'23)

writes: Just completed 2+ years as a Senior Business Analyst at McKinsey. This month I am starting my MBA at the MIT Sloan School of Management

Jimmy Wu (MS'09)

writes: Jimmy Wu wants to welcome his son to matriculating at SEAS class of 2029! Hopes he will have fun with Applied Physics!



In Memoriam



Edward Botwinick '56CC, BS'58, Trustee Emeritus, died on January 24, 2025. A pioneer in time division multiplexing (TDM) and a visionary entrepreneur, Botwinick co-founded several influential technology firms, including Silicon Transistor Corp., Quantum Inc., and Timeplex, Inc., a leader in T1-based data networks later acquired by Unisys. He also founded VideoServer Inc. and led the Botwinick-Wolfensohn Foundation. A University Trustee Emeritus and former vice chair of the Engineering Council, he championed innovation and education throughout his career. In 1996, Columbia Engineering named the Botwinick Gateway Laboratory in his honor.



Robert L. Treadway MS'87, EE'01, 73, of Matawan, passed away on August 26, 2025. Robert was born in Jersey City in 1950 and raised in Riverhead, Long Island. After graduating from Riverhead High School, Robert attended the U.S. Coast Guard Academy, the Brooklyn Academy of Music, and Julliard. He attended City College before earning an MS in electrical engineering (1987) and a professional degree (2001), both from Columbia Engineering.



Guy S. Longobardo BS'49, MS'50, EngScD'62, of Bronxville and Amagansett, NY, passed away peacefully on July 19, 2025. Dr. Longobardo was born in Brooklyn to Alfred and Rosaria Longobardo. He graduated from Brooklyn Technical High School before earning a BS in mechanical engineering (1949), an MS (1950), and a PhD (1962) from Columbia Engineering, where he would serve on the faculty. In 1963, as an assistant professor, Dr. Longobardo began work with Columbia Medical School on the application of engineering principles to medical processes. He would go on to teach Columbia's first bioengineering course.



Elna Okin Robbins BS'51 MS'54, 94, passed away on June 3, 2025, in Basking Ridge, New Jersey. Born in Brooklyn to the late Lily and Benjamin Loscher. She earned a B.S. in 1951 and an M.S. in industrial engineering in 1954. She and her dear friend were the fifth and sixth women to earn bachelor's degrees from Columbia School of Engineering, where Elna was the first female instructor.



Sotirios Vahaviolos MS'72, PhD'76, 78, passed away peacefully in Princeton, New Jersey, on February 6, 2025. Vahaviolos earned his BS in electrical engineering at Fairleigh Dickinson University before earning MS degrees in both electrical engineering and philosophy and a PhD in electrical engineering, all from Columbia. Sotirios worked at Bell Labs and founded Physical Acoustics Corporation in 1978.



Stig Svenning Hansen BS'88, 58, passed away on November 10, 2024, in Lebanon, New Hampshire. Born in Singapore and raised in Copenhagen, Denmark, until moving to Port Washington, NY, at 16. Stig earned a BS in mechanical engineering from Columbia Engineering and an MBA in Finance from the Stern School of Business. He built a successful career in finance and shared his knowledge as a mathematics educator at the high school and MBA levels.



Russell C. Baccaglioni '62CC BS'63 MS'64 ENG'72, of Morris Plains, NJ, passed away peacefully on May 19, 2025. He attended Columbia University on a scholarship from his father's union, the IBEW. He went on to earn multiple degrees from Columbia, including a Bachelor of Arts, a Bachelor of Science, and a Master's degree in Science and Engineering.



Ralph White BS'51, 98, passed away on April 10, 2025. Born in Watertown, Massachusetts, Ralph was recruited to Columbia by vaunted football coach Lou Little. Ralph later earned an award from Columbia's post-war President, Dwight D. Eisenhower, recognizing Ralph as the top scholar on the football team.



David Peugh BS'76, 70, passed away peacefully on May 8, 2025, in Rockville, MD. He earned a BS at Columbia, where he co-captained the swim and water polo teams. He received his MBA from the University of Michigan (1978), coaching both sports while there. He retired from the coal industry in 2011 as VP-Business Development.

Engineering Sustainable Materials for Humanity



RESEARCH LEAD

Helen Lu, Director of Gotham Foundry; Percy K. and Vida L.W. Hudson Professor of Biomedical Engineering; Professor of Dental and Craniofacial Engineering (in Dental Medicine); Senior Vice Dean of Faculty Affairs and Advancement

Sustainable materials reduce the environmental impact of manufacturing and enable new possibilities in fields like fashion, construction, and regenerative medicine. Developing regenerative materials — such as those with a circular lifecycle that degrade at the end of service — requires expertise in science, engineering, and the natural world. Now, New York City's inventors and entrepreneurs can learn about this field, develop new ideas, and accelerate pathways to market at Gotham Foundry, a new state-of-the-art R&D and sustainable materials innovation hub, currently located at Harlem Biospace in the Mink Building near Columbia Engineering's Manhattanville Campus.

Supported by \$45 million from the New York City Economic Development Corporation (NYCEDC), Gotham Foundry is led by Columbia Engineering, in partnership with CUNY Advanced Science Research Center (ASRC); SUNY's Fashion Institute of Technology (FIT); Columbia's Graduate School of Architecture, Preservation and Planning (GSAPP); Columbia Business School, and Columbia University Irving Medical Center (CUIMC); and community biolab, Genspace. As a destination for material innovation, Gotham Foundry aims to serve as an open-source, open-door resource whose facilities and strategic network will enable the type of cross-disciplinary and cross-industry collaborations that can revolutionize whole industries.



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