DARTMOUTH
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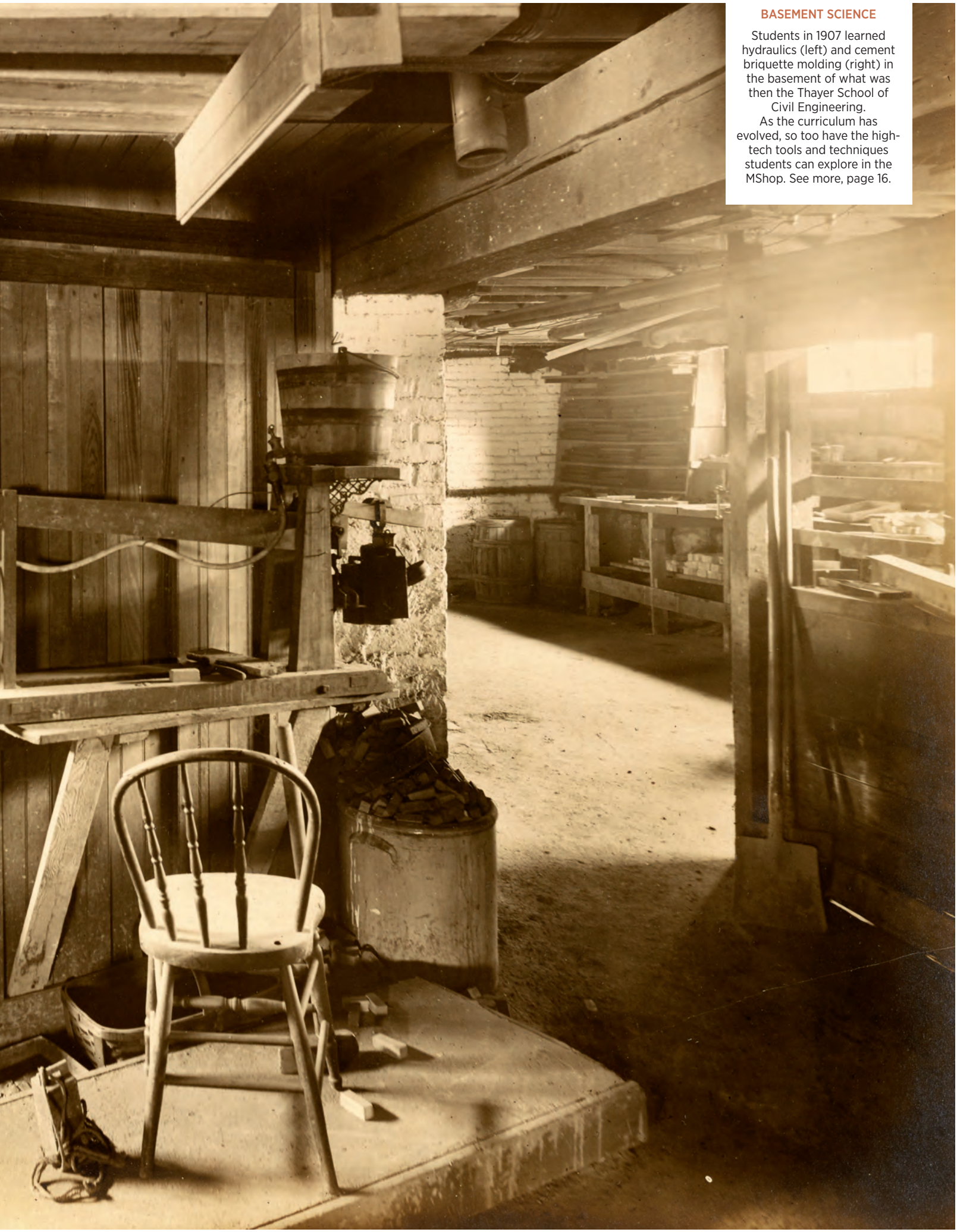
THE OPTIMIZER

FROM AIRPORTS TO ENERGY GRIDS TO HOSPITAL ROOMS, PROFESSOR VIKRANT VAZE USES DATA TO MAKE THE WORLD RUN BETTER—ONE COMPLEX PROBLEM AT A TIME.

inside

First Look



BASEMENT SCIENCE

Students in 1907 learned hydraulics (left) and cement briquette molding (right) in the basement of what was then the Thayer School of Civil Engineering.
As the curriculum has evolved, so too have the high-tech tools and techniques students can explore in the MShop. See more, page 16.

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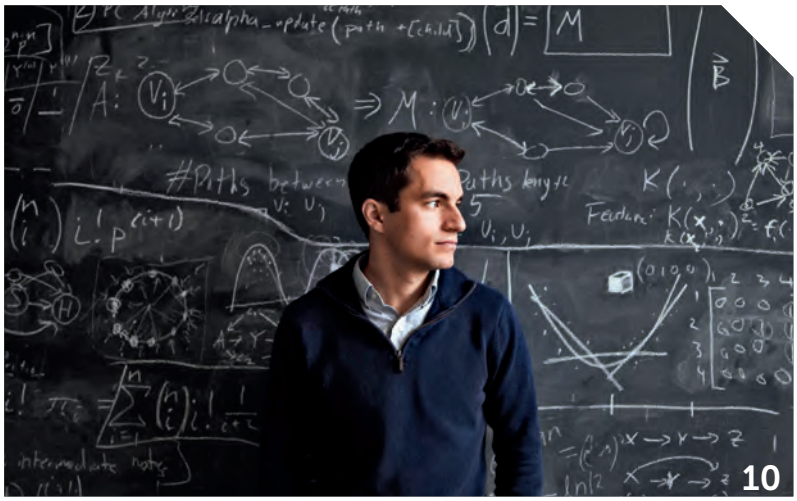
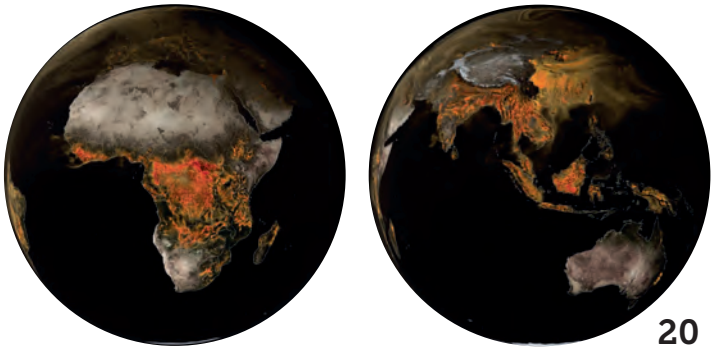
➤ Victoria Ruiz, a BE candidate with a concentration in bioengineering, finishes a project on one of the MShop's six mills. See page 16 for more students using tools and techniques to create.
Photo by Mark Washburn





DEPARTMENTS

Leading Thoughts

Designing Next-Gen Devices

Professor John Zhang explains how his work developing miniature medical systems will improve health on a global scale.

Since he came to Dartmouth 12 years ago, Zhang has been building on the school's long tradition of translating biomedical engineering advances into clinical use. Here, he speaks with Interim Dean Doug Van Citters '99 Th'03 Th'05 about research in biosensors for continuous monitoring and self-powered devices.

You've been working on small, flexible, wearable energy harvesters and sensors. What advances have you seen in your laboratory and in the field?

ZHANG: Dartmouth has this long tradition of exciting research in biomedical engineering, starting from biomaterials and biomechanics for orthopedics to medical imaging—some of which are in clinical use right now. I hope my research adds a new dimension to this exciting portfolio. My recent work is about making devices that can do continuous monitoring of biomarkers and medical implants with a self-sustainable power supply for long-term operation. Along those lines, we have two different projects. One of them is looking at the next-generation "battery-less" cardiac pacemakers. In this country alone, 10 percent of the population have medical implants, and among these, 10 percent have pacemakers. One big issue is you have to replace a battery every few years to make the device function. To address that issue, my lab has been working on a flexible material and devices that can harvest mechanical motion from the human body, especially heart motion, to supply power to the pacemaker. Another direction is to continuously monitor physiological signals using lab-on-chips technologies. In addition to orthopedic sensors in collaboration with colleagues at Thayer, I work with Dartmouth Health anesthesiology to develop a wearable sensor that can monitor blood pressure 24/7.

With the self-powered devices, we are working closely with a group of clinicians across the country and a major industrial partner. The goal is to reduce the overall size of the current leadless pacemaker. Currently, about 60 percent of its volume is just the battery. What if we can reduce that by having a much smaller device supply the power while opening the other space for sensing? With continuous power supply, we also open up opportunities to detect all the other parameters in the chamber. This close academic and industrial collaboration is to accelerate the development of next-generation, intelligent, self-sustainable medical implants.

That's incredible. Can you describe the breadth of your team?

ZHANG: It's a really multidisciplinary team that covers sensor materials development, device design and modeling, micro and nanofabrication, and preclinical trials. As an example, I started this energy harvesting project almost 18 years ago in collaboration with a cardiologist, Dr. Marc Feldman, a long-term collaborator at UT San Antonio. The spectrum of the work is broad, from coming up with a new type of porous, soft piezo material to tuning piezo constant efficiency and conformable device design to fit in a pacemaker prototype for animal studies. We have been trying pig model studies to demonstrate the prototype's power is over the desirable power threshold that industry is passionate about.

Precise engineering is a key enabler of our work. That's the beauty of the enhanced microengineering lab we will have here. WeFab [the West End Fabrication facility] is opening this spring, which I'm very excited about.

What's the next big thing that you want to tackle?

ZHANG: Moving forward, computation will play an increasingly important role in our "hardware" research, including device designs, understanding of operations under various physiological conditions, and data integration and analytics. In the coming decades, artificial intelligence will be part of a massive network of sensors, at low cost and massively deployable, that will enhance our life quality. Autonomous medical devices will make us very powerful.

The questions are how to seamlessly integrate more functions without the limitation by power

"Autonomous medical devices will make us very powerful."

—PROFESSOR JOHN ZHANG

CAMPUS CONVERSATIONS
Interim Dean Van Citters discusses Professor Zang's research.

and how to make the data not only abundant but meaningful. In that regard, my recent projects sponsored by the National Science Foundation and National Institutes of Health all involve computational experts on design modeling, algorithms, and machine learning to turn sensor data into meaningful analytics to benefit decision-makers.

The course you teach in sensors is taking advantage of this cutting-edge technology. It sounds as though your research plays right into the needs of the course.

ZHANG: Engineering education is an integrated part of our research. This is beyond just having undergraduate and graduate researchers in the lab. It's having the research outcome incorporated into the curriculum and energizing students in the classroom. When I started the course on molecular sensors and nanodevices 10 years ago, it was a lecture-based class that discussed various sensor technologies. What I quickly learned from students is they really want to see the ongoing impact of technology development on healthcare.

So I added a sequence of lab modules directly from our research—starting with making microfluidic chips on polymers and then synthesizing nanosensors to benchmark biomarkers on a chip—so students can understand better the real-world context of what they learn. Our students are top-notch intellectually, but they're also very hands-on. I think this course serves that well.

PHOTOGRAPH BY ROB STRONG '04

THE Great Hall

NEWS FROM AROUND THAYER

ISTOCK

INNOVATION

Next Chapter in AI Leadership

DARTMOUTH ENGINEERING is expanding efforts to develop and deploy responsible artificial intelligence—70 years after the historic 1956 Dartmouth Summer Research Project on Artificial Intelligence.

The College has joined more than 50 other leaders in industry, government, research, and higher education as a founding member of the AI Alliance. The group—led by IBM and Meta and including engineering professors Peter Chin and Eugene Santos Jr.—is designed to enable developers and researchers to accelerate responsible innovation in AI. Students and faculty will gain access to a state-of-the-art AI model tailored for academic environments—and Dartmouth will help its partners define what the role of AI should be in teaching and research.

"This is more than a collaboration," says President Sian Beilock. "It's the next chapter in a story that

began at Dartmouth 70 years ago, as we ensure that the institution where the term 'AI' was first introduced to the world will also show the world how to use it wisely in pursuit of knowledge."

At the same time, the Faculty Leadership Group on AI, chaired by Chin, is developing a strategy to guide how AI can be used to accelerate Dartmouth's mission as well as outline where restraint will be essential to safeguard values and pedagogy. Chin will draw on his experience leading the Learning, Intelligence + Signal Processing Lab, which seeks to understand the neuroscientific basis of intelligence. "My lab draws on mathematics, computer science, neuroscience, and economics to answer fundamental questions like, 'Can intelligence be learned?'" he says.

Meanwhile, Thayer is offering more ways for students to develop expertise and earn credentials in a world impacted by AI-driven technologies. Thayer recently announced the launch of a new AI track within the MEng program, and BE undergraduates can now choose a concentration in AI. Courses within both degree programs emphasize project-based learning to prepare engineers to assess, design, and implement solutions to real-life problems.

Across campus, the Center for Technology and Behavioral Health is a leading partner in the National Science Foundation-funded AI Research Institute on Interaction for AI Assistants, spearheading research on AI-powered devices and wearables. And the Center for Precision Health and Artificial Intelligence is building AI tools to improve diagnostic accuracy and personalize treatments, especially in cancer care.

"AI is about humans and AI will always interact with humans—it's not something that exists out in the wild," says Santos. "We want students to be 'AI architects' who not only understand AI but also know how to create solutions that ultimately improve lives."

—Jeremy Martin

ROB STRONG '04

▲ "We pushed to ensure our presentation was informative and that our prototype was discoverable and intuitive," says Cole Yasuda '29.

"It's an opportunity to practice the full cycle of a design project."

—PROFESSOR EUGENE KORSUNSKIY

CLASSROOM

Responsible Innovation

THE CHALLENGE? HELP STUDENTS CARRY THE VARIOUS THINGS they need to navigate a day. Using the five-step "Design Thinking" process—empathize, define, ideate, prototype, and test—student teams in ENGS 12 focused on responsive and responsible solutions.

"It's an opportunity to practice the full cycle of a design project: user research to identify needs, iterative physical prototyping to try out new solutions, testing with users to get feedback, and refinements to improve their designs," says Professor Eugene Korsunskiy.

Cole Yasuda '29 says his team focused on carrying laundry, then narrowed to a specific pain point: transferring laundry from the hamper to the washing machine. The prototyping stage involved a lot of trial and error before the team settled on a rolling mechanism to raise the hamper's bottom, reducing the need to bend down when transferring laundry. Students' subsequent presentation to the class—with videos and graphics—"focused on proving the need and showing our process," he says. "Our team's diversity was a strength. Some members had sewing skills, others had graphic design experience."

He found the process as important as the product. "The course reinforced how much design shapes our everyday lives," says Yasuda. "Nearly everything around us, aside from nature, has been designed—and therefore can be improved."

It's a mindset that Korsunskiy stresses in both this foundation engineering course and the senior design capstone sequence he teaches. "I hope to equip my students with tools for conducting research, analyzing information, generating ideas, creating prototypes, and implementing their solutions," he says. "At the end of my courses—if I've done my job—my students feel confident and empowered to go out into the world and make a real impact."

But what kind of impact are they making? It's a question Korsunskiy is tackling with the recent launch of ENGS 15.09: "Design Ethics." He hopes students will develop a deeper understanding of the role of design in shaping the world as well as the skills needed to become more responsible innovators.

MEM STUDENT AND THAYER Community Fellow Riya Yadav grew up in Jabalpur, in central India, surrounded by strong women. "My mother built her own school from scratch with teachers and aunties who didn't take 'no' for an answer," says Yadav. "I watched her take a vision and turn it into reality. That's why women's empowerment will always be at the heart of everything I do. When you grow up with that kind of energy, it becomes part of who you are."

When Yadav moved a full day's drive south to Bangalore for college, everything changed. "I went from feeling like a big fish in a small pond to being completely out of my depth," she says. "But that's where I learned the most important lesson: You don't wait for opportunities. You create your own luck."

She threw herself into student organizations, building community and finding her footing. When she graduated with a BE in information technology, Yadav worked as a solutions architect at Akami Technologies, supporting clients, guiding product updates, and analyzing 100-million-plus daily bot interactions to improve models. "After two years in the professional world, I realized I wanted to explore more of what I'm capable of, more of the world," she says. "That's what brought me to Dartmouth."

"That's my story: A girl from Jabalpur learning to take up space in bigger and bigger rooms—one step at a time." —RIYA YADAV

"This is how Dartmouth creates the leaders we're known for."

—INTERIM DEAN DOUG VAN CITTERS

FINANCIAL AID

Expanding Opportunities

DARTMOUTH IS AIMING TO SECURE $35 MILLION IN endowed scholarships to expand financial aid for fifth-year BE students to ensure they have the opportunity to access the full Dartmouth experience.

Most engineering undergraduates earn two degrees: the liberal arts-based AB in engineering sciences and the BE, an accredited, professional degree awarded by Thayer. The initiative—with $10 million in commitments already received—will enable the School to offer more loan-free support to students who want to complete the two degrees across five years.

Thayer usually recommends a fifth year for students who wish to earn the two degrees so they can explore a range of courses across the liberal arts and participate in extracurricular activities such as a study abroad, intramurals, and clubs. "This is how Dartmouth creates the leaders we're known for—engineers who understand the social, economic, and environmental impacts of their work, communicate effectively across cultures, and are ready to engage with the world from day one," says Interim Dean Douglas Van Citters '99 Th'03 Th'06.

He says Thayer currently cannot fully meet the demonstrated need of most fifth-year BE students, forcing some to take on debt to finance their fifth year, give up portions of the full Dartmouth experience to complete the two degrees in four years, or skip the BE altogether. The BE requires nine additional courses, and students choosing to earn both degrees in four years face a challenging academic workload.

"For students who want to dive into engineering faster and deeper, this pace may be their comfort zone," says Van Citters. "But for students who want to also explore the humanities, the arts, and social sciences, pushing to complete the BE in four years takes away from the academic experience that they originally sought from Dartmouth."

MARK WASHBURN

▼ BE students (from left) Abbey Clutterbuck '26, Matthew McPherson '26, and Isabella Casaretto '26 test their joystick-controlled design for ENGS 76: "Machine Engineering." The new initiative will support future fifth-year students pursuing BE degrees.

lab report

Professor Boys holds the miniature implant fabricated in his lab.

ROBERT ANDERSON

Studying the "Gut-Brain"

A MINIATURE DEVICE—THINNER THAN THE WIDTH OF A HAIR—developed by Professor Alexander Boys and University of Cambridge researchers has captured the first-ever measurements of electrical signals in the "second brain in our guts." The device, placed between the layers of the colon, offers a more complete understanding of the gut's interconnection with the brain.

"This platform creates a pathway to a variety of therapeutic interventions in the gut, which has connotations for conditions such as inflammatory bowel disease, gastroparesis, and others," says Boys, first coauthor of "Implantable Bioelectronics for Gut Electrophysiology," published in *Nature Communications*. "The gut's nervous system has been historically difficult to access, and we show here not only that it can be done, but that we can extract fairly intricate information."

The tiny device, which could be inserted laparoscopically as an outpatient procedure, would enable researchers to study how the gut responds to physiological stimuli, treatments, or dietary changes. Boys and team believe the secret to many neurological disorders lie in the way the enteric nervous system, the gut's own complex nervous system, and the brain interact. Their invention opens the door to new treatments for digestive and neurological disorders. *—Catha Mayor*

"This platform creates a pathway to a variety of therapeutic interventions in the gut."

—PROFESSOR ALEXANDER BOYS

LEADERSHIP

Serroussi Heads Ice Sheet Team

PROFESSOR HÉLÈNE SEROUSSI has been appointed to head the science team modeling the evolution of the Antarctic ice sheet for the seventh Ice Sheet Model Intercomparison Project (ISMIP7). Her team is part of a global network of scientists simulating changes in ice sheets worldwide to inform the Intergovernmental Panel on Climate Change's (IPCC's) projection of future sea-level rise.

Seroussi will coordinate the design, gathering, and analysis of scientists' latest experiments from the Antarctic ice sheet to refine projections of the timing and amount of ice loss from the continent during the next century. She expects about 20 research groups to take part in simulating Antarctica, providing data to authors of the IPCC's Seventh Assessment Report.

"ISMIP7 will bring the international ice-sheet modeling community together to provide the best possible estimates of polar ice-sheet evolution in the next decades and centuries," Seroussi says, "and provide actionable information on sea-level rise for policymakers."

In Greenland, Professor Seroussi studied ice-sheet melting and sea-level rise.

New Faculty

JUNBO ZHAO

CONG CHEN

BETH ALTRINGER EAGLE

BRYCE FERGUSON

BIJAN MAZAHERI

ANTHONY RIZZO

Dartmouth Engineering welcomed new engineering educators throughout 2025.

"My mission is to develop the next generation of cyber-physical intelligence," says **Junbo Zhao**, the Todd M. Cook ['93 Th'95] and Elizabeth Donohoe Cook ['94] Associate Professor of Engineering. His research focuses on power and energy system modeling and monitoring, renewable energy integration, reliability and resilience, data analytics, dynamics and stability control, and cybersecurity. Zhao is also the director of DOE Northeast University Cybersecurity Center for Advanced and Resilient Energy Delivery and a research scientist at the National Renewable Energy Laboratory.

Assistant Professor Cong Chen focuses on advancing the global energy transition through optimization, economics, and modern machine learning/AI principles. "I have research experience in large-scale, distributed energy resource aggregation, pricing under uncertainties, energy storage integration in the electricity market, behavioral generative agents for energy operations, and hydrogen storage for grid resilience," says Chen, who earned her PhD from Cornell.

Beth Altringer Eagle has been named the inaugural Distinguished Professor in Design and the new director of the Design Initiative at Dartmouth (DIAD). "Design helps us understand and respond to human needs in all their complexity, and Dartmouth's commitment to interdisciplinary collaboration creates extraordinary potential for collective impact," says Eagle, who was previously a professor at Brown University and founding director of its joint MA in design engineering program with Rhode Island School of Design.

"I work to provide answers to emerging questions such as 'How should multiple autonomous systems interact?' and 'How should systems adapt to collective human behavior?' " says **Assistant Professor Bryce Ferguson**, who researches the control and automation of large-scale systems. "My research provides relevant insights into many application areas, including critical infrastructure, robotics, security, and the environment." He received his PhD at the University of California, Santa Barbara.

Assistant Professor Rebecca Gallivan seeks to understand micro- and nano-scale material design from processing to performance. "I am particularly interested in developing new techniques for nanoscale manufacturing am excited to tackle how these advances can be made while still addressing sustainability concerns," says the California Institute of Technology PhD graduate. She recently coauthored a study in the journal *Small* on a new technique to tailor the microstructure of metals.

"How can we detect AI-generated or adversarially manipulated data?" is a question driving **Assistant Professor Bijan Mazaheri**'s work with tools from theoretical computer science and statistics. "I aim to make AI more adaptable to scientific problems by studying the mathematics of combining information from multiple places," says Mazaheri, whose work has applications in information security, biology, and human health. He earned his PhD from the California Institute of Technology.

"My group is working to develop the next generation of photonic chips for applications in quantum computing, data center interconnects, and biosensing," says **Assistant Professor Anthony Rizzo**. These photonic circuits—integrated in computing, communications, and sensing—use light rather than electricity to process information and thus enable a dramatic reduction in energy consumption. He received his PhD from Columbia University.

REBECCA GALLIVAN

KATIE LENHART

Kudos

SUPPORTED **Professor Wei Ouyang**'s research on implantable technologies for monitoring internal organ health earned a $2.2-million Maximizing Investigators' Research Award from the National Institutes of Health.

PUBLISHED Postdoc **Yanan Li**, PhD students **Julia Huddy** and **Masha Klymenko**, and **Professor Will Scheideler** coauthored "Spatial-Uniformity-Driven Bayesian Optimization for Rapid Development of Printed Perovskite Solar Cells," published in *Small*.

HONORED Former **Professor Hany Farid** has earned the 2025 McGuire Family Prize for Societal Impact, established by **Terry McGuire Th'82** and **Carolyn Carr McGuire Tu'83**. During two decades on Dartmouth's faculty, Farid pioneered the field of digital forensics.

COMPETED PhD students **Prabhat Hegde** and **Yueyun Xia** and **Alan Ngouenet '25** took first place in the 2025 Modeling and Optimization: Theory and Applications Competition at Lehigh University.

STUDIED PhD student **Laasya Devi Annepureddy** is co-lead author of a study, published in *iScience*, that reveals pathways for how breast-milk cells produce sugars critical to infant health and development and paves the way for adding them to formula or as a food supplement.

PUBLISHED **Professor Yoshihiro Nakayama** coauthored the first study, published in *Nature Geosciences,* to systematically analyze how the ocean is melting ice shelves in just hours and days rather than seasons or years.

COAUTHORED In an opinion piece in *The Guardian* about efforts to stop total collapse of the world's glaciers, **Professor Colin Meyer** wrote, "Technologies we can bring to bear include satellite-based radar, solar-powered drones, robot submarines, lab-based 'artificial glaciers,' and advanced computing technologies."

AWARDED PhD student **Bruno Miranda Henrique** earned a research award for his presentation on the need for a method for measuring trust between humans and AI at the fall International Forum on Research Excellence (IFoRE).

PRESENTED Three members of **Professor Peter Chin**'s Learning, Intelligence + Signal Processing (LISP) Lab—PhD students **Mai Pham** and **Junyan Cheng** and postdoc **Xavier Cadet**—presented at the 39th annual Conference on Neural Information Processing Systems, which drew a record 26,000 attendees.

COMPARED PhD student **Ruixu "Rachel" Huang** was co-lead author of "Systematic Benchmarking of Imaging Spatial Transcriptomics Platforms in FFPE Tissues," the first study to compare commercial platforms for generating spatial data, published in *Nature Communications.*

HONORED **Professor Junbo Zhao** received a 2025 IEEE PES Technical Committee Prize Paper Award for "State Estimation for Integrated Energy Systems: Motivations, Advances, and Future Work," published in *IEEE Transactions on Power Systems.*

"He invented the tech that made the selfie possible."
—Forbes

Fossum (center) was feted for earning the Draper Prize by Interim Dean Doug Van Citters (left) and former Thayer Dean and Dartmouth Provost Joseph Helble.

CHARLES STARK DRAPER PRIZE FOR ENGINEERING

Pixel Pioneer

Professor Eric R. Fossum has been awarded the 2026 National Academy of Engineering Charles Stark Draper Prize for Engineering, one of the world's preeminent honors for achievement. The NAE recognized him "for innovation, development, and commercialization of the complementary metal-oxide semiconductor active pixel image sensor," which remains the core technology behind roughly 7 billion cameras produced each year. He "invented the tech that made the selfie possible," noted *Forbes* in February, when it named him—as well as Thinking Machines founder **Mira Murati Th'12**—to its list of "America's Great Innovators." It's just the latest honor for the John H. Krehbiel Sr. Professor for Emerging Technologies, who has received the Queen Elizabeth Prize for Engineering, the National Medal for Technology and Innovation from the White House, the Jun-ichi Nishizawa Medal from IEEE, and a Technical Emmy Award recognizing the invention's impact.

THE OPTIMIZER

FROM AIRPORTS TO ENERGY GRIDS TO HOSPITAL ROOMS, PROFESSOR VIKRANT VAZE USES DATA TO MAKE THE WORLD RUN BETTER—ONE COMPLEX PROBLEM AT A TIME.

BY MICHAEL BLANDING

The schoolchildren of Hanover, New Hampshire, were caught in a bind. Every morning, they woke early for long bus rides along winding rural roads and through gridlock in the town center, arriving addled and exhausted before class. To help, some parents began driving their children, but with every passenger car, traffic increased and buses were further delayed, creating a vicious cycle.

It's the kind of problem most academics might pass up in favor of larger and more visible systems. "When I say nobody was looking at this, I mean literally nobody," says Vikrant Vaze, Stata Family Career Development Associate Professor of Engineering. "No papers, nothing." But it is precisely the kind of problem Vaze likes to sink his teeth into.

Its solution could transform U.S. transportation and education systems. The national school bus network is the largest transportation system in the world, with more than twice as many rides as all other U.S. public transportation combined. "Also, the length of a student's school bus ride is related closely to health and well-being, including physical and mental health and academic success," Vaze says. "It's a potentially massive impact."

Vaze first tackled transportation engineering problems as an undergrad in Mumbai and continued as a master's student in transportation at MIT. There, he discovered a whole new field in operations research, which deploys a variety of mathematical tools to find the optimal solutions to complex problems. "I took classes in optimization, probability, game theory, and statistics—and realized there was this whole world with the ability to solve some of the nastiest problems humans face," Vaze says. "If you do it well, it's almost like a free

PHOTOGRAPHS BY ROB STRONG '04

lunch—it requires mathematics and algorithms, but you're not inventing new materials or pouring money into new resources." All you need is a change in approach to reap the rewards.

In the case of the school bus problem, Vaze worked with current PhD student Prabhat Hegde Th'21 to develop a classic mathematical model that first figured out the locations each vehicle should visit and then the best order to visit, a method they called a "cluster-and-route heuristic." Solving those optimization problems in sequence enabled the pair to cut bus time an average of 40 percent, reduce car trips by around 15 percent, and turn a vicious cycle into a virtuous one. They look forward to seeing how Hanover school district administrators will implement their suggestions.

While a victory for the schoolchildren of Hanover, the true value of the solution stretches beyond town lines. Some 30 to 40 percent of U.S. school districts are rural, facing challenges comparable to Hanover, and could benefit from comparable route optimization. That fact allows Vaze to have his free lunch and eat it, too: "I'm creating a blueprint for many places while already applying it to one. We all hope people will find value in our work 100 years from now, but it's nice to have some immediate validation at the same time."

PEOPLE FIRST, MATH SECOND

Through the years, Vaze has applied his techniques to a wider array of problems, from transportation to energy and health—a focus that was pleasantly and unexpectedly validated on a recent trip to Walt Disney World, where an exhibit named those three areas as the greatest challenges of the future. "I've been fascinated with these things for quite a while now, so it was an amazing validation for me," he chuckles. In each of these areas, he says, there are three major obstacles.

The first is the "needle in a haystack" quality of finding the perfect optimization solution. For one problem, he once calculated, there were 10^{50} possible solutions, "roughly the number of atoms on Earth." Of those, there were maybe a few billion that were strong enough to consider, but only one that was truly the best.

Second, most problems are missing some of the data necessary to find a solution, requiring a method to deal with uncertainty.

And third, because many problems have multiple stakeholders, what defines the "best" solution can be subjective.

That's why when Vaze starts investigating a new problem, he doesn't begin with math but with people. "You ask them what the problem is, what they think of as the objective, what are their constraints or limitations, and what levers they have to pull," Vaze explains. Based on those answers, he and other researchers can determine the best tools—from classical modeling to artificial intelligence—to solve a problem.

In another transportation project, Vaze was trying to optimize flight routing in the face of disruptions due to weather, equipment malfunctions, or staff shortages.

"Airlines have designed this incredibly large network over months of planning, and they need to redo everything in five minutes," Vaze says. In those circumstances, a time-consuming classical calculation to get the best answer isn't feasible. Instead, Vaze and students Navid Rashedi Th'25, Nolan Sankey '21 Th'22, and Keji Wei Th'20 used AI to get a timely answer that was "good enough."

By training a machine learning algorithm on the most likely areas to face scheduling disruptions, the engineers could prune calculations and focus on the most probable solutions. In a test with a major U.S. airline, they found that AI came within 1.5 percent of the most optimal solution. At the same time, the solution saved the airline $400,000 a day compared to existing techniques. "If you can make a small improvement, the overall impact can be huge," Vaze says.

PROBLEM SOLVERS
PhD candidate Pushpendra Singh (left) works with Vaze in his Operations Research Group.

"I TOOK CLASSES IN OPTIMIZATION, PROBABILITY, GAME THEORY, AND STATISTICS—AND REALIZED THERE WAS THIS WHOLE WORLD WITH THE ABILITY TO SOLVE SOME OF THE NASTIEST PROBLEMS HUMANS FACE."

—PROFESSOR VIKRANT VAZE

EXPANDING APPLICATIONS IN ENERGY AND HEALTH

Two years ago, Vaze saw an opportunity to apply his operations research to the field of energy management and international peacekeeping. Victoria Holt, the director of Dartmouth's Dickey Center for International Understanding, invited Vaze to partner with the center on a project called "Powering Peace," which aims to overhaul energy systems of United Nations peacekeepers in war-torn countries. Currently, such missions rely on diesel generators, which not only have harmful environmental impact but are also susceptible to sabotage or extortion by violent groups, with supply lines stretching hundreds of miles. The project aims to replace generators with alternative energy grids that could both help the UN and create infrastructure for local communities.

"I knew nothing about it, but it sounded like an important problem," Vaze says. "I came back with a notebook full of ideas."

Holt appreciated the enthusiasm that Vaze and graduate students Lilly Yang, Siqi Ke, and Ryan Proulx Th'25 showed in approaching the challenge from an operations research perspective. "I've spent most of my career addressing issues from a policy perspective, and it was exciting to bring the rigor of engineering analysis and decision-making models that are heavily based in data," Holt says. "The modeling seems fresh and new to anyone working in the field."

From the data they examined from Somalia, South Sudan, and Central African Republic, team members knew funding would be a constraint. They developed a model that would yield significant energy improvements without breaking the bank. "We were really trying to push the envelope up to where you could make improvements without exorbitant costs," Vaze says. "Fully getting rid of diesel isn't necessarily a good idea but getting rid of 95 percent of diesel is in the realm of the pragmatic."

In addition to the Dickey Center, Vaze has pursued collaborations in health and medicine with doctors from the Geisel School of Medicine at Dartmouth. In one recent effort, he worked with Dartmouth clinicians to explore a machine learning algorithm to diagnose a genetic disposition to high cholesterol, which can cause complications if left untreated but can be effectively managed with medicine.

Although researchers had already developed an AI model that could examine electronic health records to determine the likelihood of the condition, they still faced the challenge of coordinating broader clinical reviews of patients that could determine the final diagnosis. Vaze applied optimization techniques to create an effective system for patient outreach, including getting buy-in from primary care physicians upfront and reaching out to them through a medical professional, sometimes multiple times, which increased rates of eventual diagnosis.

The many opportunities Vaze has had for such cross-disciplinary collaborations stem from the nature of close-knit relationships across Dartmouth, from the arts and sciences to its graduate and professional schools and partnerships with Dartmouth Health.

"Interdisciplinarity is easier said than done," he says. "A lot of that is very unique." In addition, he credits Thayer's broad-based focus, which allows for a more expansive scope of projects than a narrowly focused mechanical or civil engineering-based curriculum. "Here it's about engineering solutions for the betterment of humanity—to paraphrase Thayer's mission—and if you do that, there is always interest and excitement."

As an indication of his growing leadership role at Dartmouth, Vaze was recently named executive director of the Master of Engineering Management (MEM) program. He steps into the role previously held by Professor Geoffrey Parker, who, as the current faculty director of the Irving Institute for Energy & Society, collaborates closely with Vaze. Parker admires the thoughtfulness and rigor of Vaze's approach. "These are very complex systems with lots of data, and once you bring in limits on what you can and can't do, that means there are tradeoffs," Parker says. "Vikrant brings a data modeling approach using rigorous optimization techniques that is world class."

Vaze has also developed a reputation as a great mentor, imbuing students with an infectious excitement about the possibilities of optimization and efficiency in operations research. Prabhat Hegde, the lead doctoral student on the school bus project, transferred from a program in energy and initially wasn't sure about the field. "Vikrant took me under his wing and supported me through the transition," Hegde says. "I really came to love my research projects, and a lot of that was working with him and admiring and appreciating the elements in his line of research."

As he looks towards a postdoc career in the energy field, Hegde hopes to follow his mentor's example of using complex calculations to improve the world. "He has a deep connection to being useful in the real world," Hedge says. "Pursing those types of opportunities is something meaningful I want to continue doing."

Meanwhile, Vaze continues to prove it is possible to have major impact with a minimum of resources if you can tackle the problem in the right way. "The truth is right there in front of us," he says. "We just need to find the right solution."

MICHAEL BLANDING is a Boston-based journalist whose work has appeared in *WIRED, The New York Times, The Nation*, and *The Boston Globe Magazine.*

In the MShop, the Thayer community learns to innovate and bring ideas to life.

Hands-on experience meets real-world projects throughout an astounding array of lab spaces in the West End. Perhaps most popular is the MShop in the lower level of Cummings Hall, where students, faculty, and researchers find the resources to move from concept to creation.

The MShop crew—an operations manager, six technical instructors (TIs), up to 20 student TAs, and an operations specialist to coordinate support—welcomes designers at every stage of the process. The shop offers the tools and training that enable Thayer's project-based curriculum, with intensive support to four to eight courses per term.

Students are paired with TIs throughout "Introduction to Engineering," learn CAD and sewing in "Design Thinking," use Solidworks to design bridges for "Solid Mechanics," and gain competency in mills, lathes, and lasers to complete projects in "Machine Engineering." Researchers work with TIs on designs, material choices, rapid prototyping on 3D printers, and fabrication. The doors are also open to a variety of independent projects.

"The MShop is where students of all different skill levels can bring their designs into reality," says Operations Manager Lee Schuette. "We help them find the right pathway."

Tinker Tailor

PHOTOGRAPH BY JUANCARLOS GONZALEZ

Solder Pry

➤ *MShop TA Chingpheng Phoun Th'25 Th'26 (left) supervises fellow TA Johan Munguia '27 on the lathe.*

PHOTOGRAPH BY JUANCARLOS GONZALEZ

➤ *Student uses a lathe to create a copper pen as the culminating project to become an MShop TA.*

➤ *Eva Hymes '25, an MEng candidate in mechnical and operational systems with a background in in human-centered design and business development, works on a mill.*

PHOTOGRAPH BY JUANCARLOS GONZALEZ

PHOTOGRAPH BY MARK WASHBURN

➤ *Diego Turrubiartes '28 uses a file to deburr an aluminum part. As an MShop TA, "I honed my technical expertise in designing using CAD software, machining, and fabrication," says the aspiring electrical engineer.*

➤ *The large scale of the Dartmouth Formula Racing car means teammates Liam Cotter Th'25 (left) and MShop TA Will Foox Th'25 work on it in one of Thayer's other fabrication spaces, the Allyn Large-Frame Lab.*

PHOTOGRAPH BY MARK WASHBURN

PHOTOGRAPH BY MARK WASHBURN

➤ *Technical Instructor Dan DeNauw works with Achla Gandhi '25 on a testing tank to check the end-tidal CO_2 monitoring device she and her team developed for their capstone in ENGS 89/90: "Engineering Design Methodolgy and Project Completion." Such monitoring is considered the ideal way to verify correct placement of advanced airway devices and guide patient ventilation.*

Synthesis & Stewardship

PROFESSOR ERIN MAYFIELD WILL HELP SHAPE GLOBAL CLIMATE POLICY AS A LEAD AUTHOR OF THE NEXT UN ASSESSMENT REPORT.

INTERVIEW BY CATHA MAYOR

"I see the role as … fostering a transparent process that strengthens the scientific basis for climate action and supports equitable, informed decision-making."

—PROFESSOR ERIN MAYFIELD

PHOTOGRAPH BY ROB STRONG '04

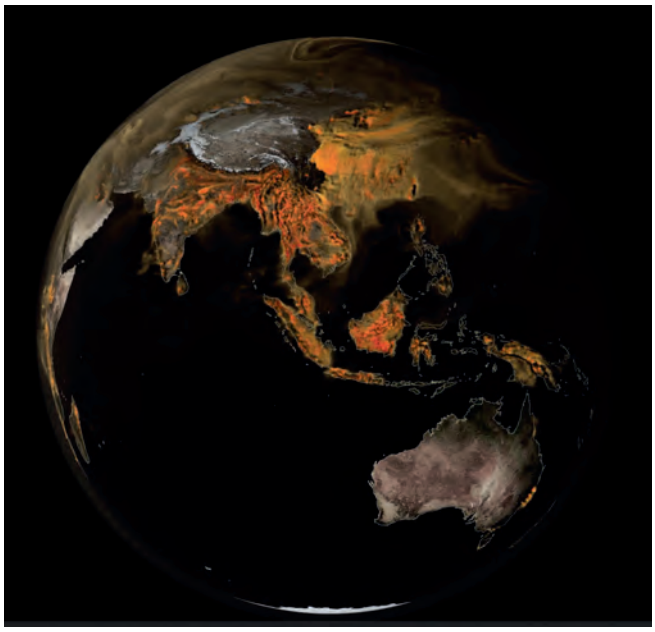
An expert in sustainable systems engineering and public policy, Mayfield will guide the Intergovernmental Panel on Climate Change (IPCC) Seventh Assessment Report, one of the world's most influential assessments of the science related to climate change.

She joins 664 experts from 111 countries appointed to the organization under the auspices of the United Nations that recommends measures for mitigating climate change based on a thorough, yearslong analysis of the latest science. It is an assignment that builds on Mayfield's recent work as strategic advisor at the U.S. Department of Energy Office of Policy and the White House Office of Science and Technology Policy.

Her efforts will focus on Working Group III, which deals with limiting greenhouse gas emissions and enhancing activities that remove them from the atmosphere. The group will address all aspects of mitigation—including technical feasibility, cost, policy instruments, governance options, and social acceptability—in a report expected in mid-2028, with the final comprehensive report to be approved by late 2029.

"I expect to help guide the assessment of evidence on the barriers and enablers of climate change mitigation, ensuring that findings are both analytically sound and policy relevant," says the Hodgson Family Assistant Professor of Engineering. "I see the role as not only about synthesis but also stewardship, fostering a transparent process that strengthens the scientific basis for climate action and supports equitable, informed decision-making."

Here, Mayfield explains the group's first steps, her appreciation for interdisciplinary research, and how various perspectives improve decision-making.



Mayfield worked on the 2020 Net-Zero America report, researching what it would take to achieve net-zero emissions of greenhouse gases, such as CO2, tracked here by NASA's Scientific Visualization Studio. As lead investigator of the Dartmouth Engineering Sustainable Transitions Lab, she translates such climate research to better inform policymakers.

Mayfield's research bridges quantitative and qualitative approaches to solve real-world problems and facilitate stakeholder decision-making.

How did the first meeting of lead authors go?

It offered a valuable forum for collaboration and collective planning among contributors. Over several productive sessions, we worked together to shape the overarching structure of the report and gained a deeper understanding of the broader IPCC process. Just as importantly, the meeting created space to connect with colleagues from across the world, each bringing distinct expertise and perspectives rooted in their regional contexts.

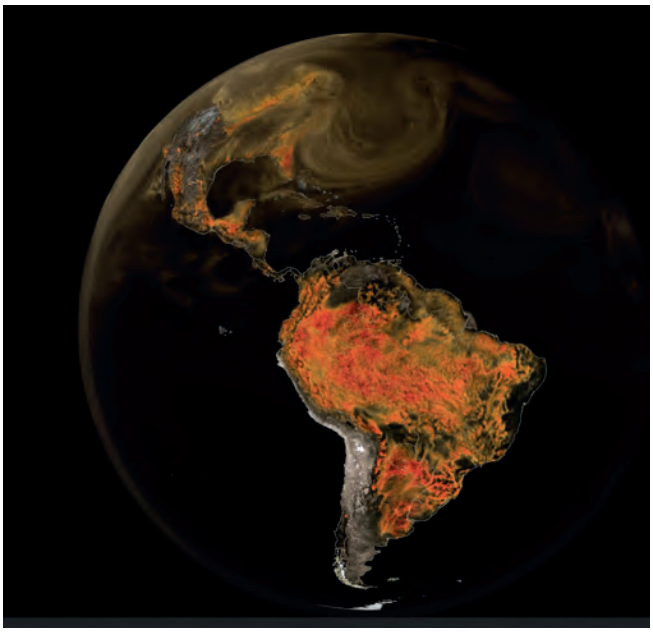
What do you bring to the table?

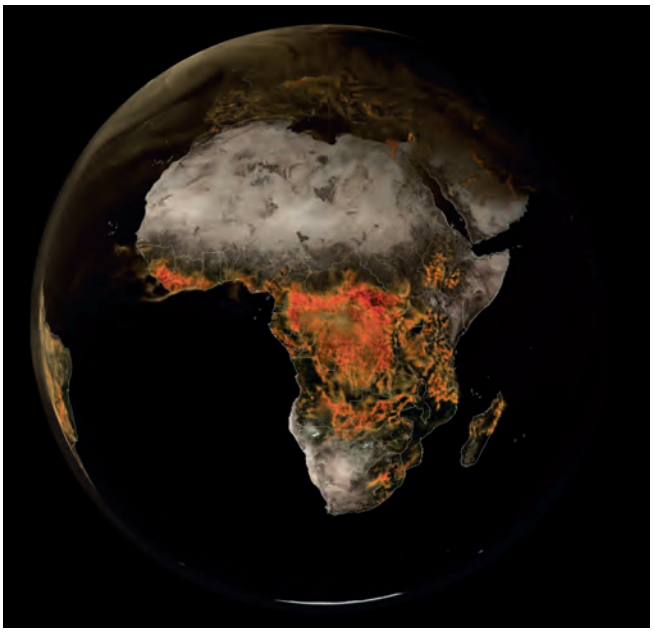
My training and experience is highly interdisciplinary between engineering and public policy, which are usually distinct areas of expertise. While people often lament that interdisciplinary work is difficult, I find disciplinary work hard and constraining. In the context of climate change mitigation, and many other complex challenges, both the technological details and the economic and governance systems that shape technology deployment are critical.

I've been involved in policy for many years, including as a strategic advisor in the Office of Policy at the U.S. Department of Energy and as an assistant director in the White House. I've also participated in several large-scale collaborative studies on climate mitigation. These experiences, combined with my work integrating dimensions often overlooked in earlier analyses—such as equity, labor, and air-quality across multiple scales and contexts—led to my nomination.

How do those experiences inform your research?

We can model systems, decisions, and tradeoffs in a vacuum and untethered from how the real-world works, and while that may be a recipe for generating journal articles, it does not necessarily translate into social impact. Integrating yourself into real-world decision processes expands and sharpens research questions and provides perspective on what matters.





Time and again, these experiences have reminded me that a multi-objective lens is essential—and what may at first glance seem irrational or illogical often turns out, upon closer examination, to be the very heart of the problem.

When did you start to combine engineering and public policy?

I began to see public policies as levers for systemic change while working as an environmental engineer. I recall thinking, "I don't want to solve that particular problem for that one contaminated site. I want to solve that problem for the entire system."

Internships at the U.S. Congress and the Environmental Protection Agency further revealed how decisions are made, not just through evidence and analysis, but also through politics, negotiation, and competing priorities. That realization pushed me further into systems thinking. My master's degree deepened my focus on environmental engineering and systems modeling, and then I found my intellectual home during my PhD in engineering and public policy. Since then, I've found that engaging deeply with real-world problems is not only socially meaningful, but also it forces innovation in how we model and understand complex systems.

Do you expect to learn new things?

Absolutely! The lead authors I'll be working with most closely are an extraordinary group—political scientists, engineers, economists, policy scholars, behavioral scientists—representing an interdisciplinary range of perspectives. I'm going to learn a tremendous amount from them, something that I'm excited about.

Even last year, at the scoping meeting where we helped shaped the report's structure and defined its chapters, I felt my own thinking shift. I spend so much time working within a U.S. context that I sometimes lose sight of how fundamentally different the landscape looks elsewhere. Climate mitigation priorities in Europe diverge from those in Asia or Africa—not just in goals but also in what is technically, economically, and politically feasible. Listening to colleagues from across the world challenged my assumptions and forced me to reframe the problem entirely.

What is the value of these varied perspectives?

Integral to the conduct of science is the reflection of diverse perspectives. For decades in my field of modeling energy systems and climate change mitigation, there was a homogenous group of people working in this space. This often led to a narrow, reductive framing, where the only objectives that mattered were cost minimization and profit maximization. That lens, however, neither captures the full spectrum of what people value nor reflects the complex ways individuals and systems actually behave. As the field begins to diversify, including more representation from developing countries and women, we are witnessing a broadening and deepening of the dimensions considered.

The central aim of my research is to integrate multiple objectives—climate, equity, security, air quality, land use, and other priorities that drive decisions. This multidimensional perspective must inform the assessment report if it is to reflect the realities of decision-making.

What do you hope the main benefit of this work will be?

Since the last assessment, the landscape of climate change mitigation has evolved from ambition to action, offering a new understanding not only of what could work in theory, but also of what has, and has not, succeeded in practice.

This assessment is an opportunity to gather evidence, to learn from both progress and setbacks, to discern patterns across regions and sectors, and to illuminate the gaps in our understanding. Such synthesis can aid policymakers and decision-makers to act with greater insight and confidence. I also hope this report resonates with researchers, students, and all those seeking to make sense of solutions to climate change.

This interview was edited for length. For full conversation visit engineering.dartmouth.edu/magazine

Alumni News

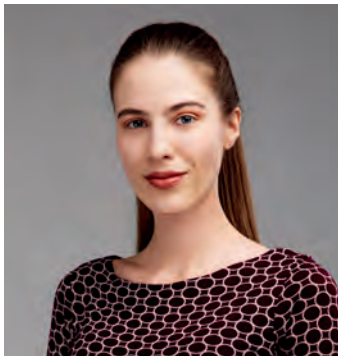
FROM AROUND THE WORLD

spotlights

"30 Under 30"

Biomedical engineering major **Syed Rakin Ahmed '18 MED'26** was noted in the latest *Forbes*' "30 Under 30" list for his research creating AI models to help both diagnose cancer and create more precise treatments for it. The Cambridge, Mass.-based MD candidate led the AI arm of a global consortium that built a screening and treatment pathway for cervical cancer; he also developed models to predict actionable mutations in brain tumors using MRI images. In Berlin, Germany, **Tristan Fogt '19 Th'19** is "making robots that redefine safety in industrial automation" as cofounder and chief technology officer of Sensory Robotics. Fogt uses 3D sensors and proprietary algorithms to track human-robot proximity in real time while meeting the strictest global safety standards. "With customers including Boeing, Denso and General Motors, Sensory Robotics is on track to make more than $2 million in revenue in 2025," reports the magazine. And *Forbes*' "30 Under 30 Romania," highlights **Andrada "Andra" Pantelimon '22 Th'23**, an analyst at Rose Rock Bridge (RRB), one of the leading deep-tech pilot deployment studios in the United States. The organization is backed by Fortune 500 companies and a major philanthropic foundation with more than $4.5 billion in assets. Pantelimon drives commercialization and deployment efforts across RRB's startup portfolio; she previously coordinated an industrial robotics initiative as a technical program manager at Amazon and developed an application that accelerated the adoption of robotics across European fulfillment centers.

Tristan Fogt '19 Th'19 ▲



Andrada Pantelimon '22 Th'23 ▲

The Connector

As an aging grid faces rising demand, increasing complexity, and more frequent stress events, one thing has become clear: The United States doesn't just need more power, it needs power that can show up at the right time, in the right place, and at the right price. **Dana Guernsey '06 Th'08**, Voltus CEO and cofounder—with **Matt Plante Tu'06**—is tackling that challenge at the intersection of demand and supply, energy users and grid operators. The Boulder, Colo.-based virtual power plant operator works across all major North American markets, managing more than eight gigawatts of flexible capacity and supporting tens of thousands of customer sites. Guernsey's energy career was sparked by work on her MEM thesis converting a combustion engine from a Formula I car into a hybrid. "This was the first time I experienced entrepreneurship," she told the Powerhouse podcast *Watt It Takes*, "because it wasn't just building a car, source parts, coordinate as a team, systems had to talk, so on and so on. What really hooked me was this idea that high performance and environmental benefit did not have to be at odds."

Syed Rakin Ahmed '18 MED'26 ▲

"This was the first time I experienced entrepreneurship."

—DANA GUERNSEY '06

The Founder

Nigerian-based serial entrepreneur **Sim Shagaya Th'99** recently shared lessons from decades focused on building systems that elevate society. Named to *Forbes*' 2014 list of the "10 Most Powerful Men in Africa," Shagaya is founder and CEO of uLesson, an app that makes education available to learners across

Coleman, shown here summiting Mount Kilimanjaro in 2025, led a team across four continents for a recent system migration.

On the Job

MAXWELL COLEMAN TH'18
MIGRATION ARCHITECT

As an architect specializing in cloud infrastructure at San Jose, Calif.-based NetApp, Coleman leads complex, big-data migrations. He works with clients such as Epic Games, Nike, Netflix Animation Studios, and Atlassian to deliver large-scale system optimization—including a massive effort he compares to a "fully remote ENGS 89/90 project—except at production scale with millions of dollars and zero downtime requirements on the line."

Can you share an example of your work?
The highlight has been architecting a migration for Atlassian's Bitbucket application, moving 2.3 petabytes (think 2 million HD movies) of production data plus 2.3 petabytes for disaster recovery to general purpose file systems with essentially no downtime (about 60 seconds total) while thousands of software engineers around the world continued using the platform. The technical challenge was substantial: We were implementing real-time data replication across separate global regions with essentially no documentation, building the solution as we went. But the hardest part wasn't the migration itself; it was what came before. We built an *Ocean's 11*-style mock architecture in house to stress test multithreaded loads, simulating thousands of engineers accessing the same data blocks in parallel. That testing consumed massive internal resources but gave us the confidence that 60 seconds of downtime was actually achievable.

How did you pull it off?
During those nine months, I led an interdisciplinary team across four continents, including subject matter experts in data residency, performance optimization, architecture design, cost optimization, security, and networking, syncing with teams early in the morning (West Coast time) in Amsterdam and troubleshooting late into the night with colleagues in Australia. Success came from approaching cloud infrastructure as a systems design problem. It's not about raw capacity—it's about designing for resilience and operational simplicity from day one. Automation became a hard requirement not just an efficiency gain. It was a surreal moment watching petabytes migrate with only 60 seconds of downtime—and delivering $2.1 million in annual cost savings and 17-percent reduction in application latency (as the software engineers became more productive).

How has Thayer influenced your path?
The Dartmouth connection runs deep for me. I got my job at Net-App through a connection I made on the first Thayer Silicon Valley Career Trek. Since then, I've hosted Thayer students at our Silicon Valley campus twice to pay it forward. Seeing their eyes light up about tech possibilities has been incredibly gratifying.

—Theresa D'Orsi

Africa, and founder and former CEO of Konga, one of West Africa's largest e-commerce sites. He spoke last fall at the Sterling Leadership Series, stressing the need for resilience and flexibility. Some highlights include: "The world where you learned something and did it repeatedly for the rest of your life is over." Instead, he suggests developing meta skills such as humility, curiosity, and adaptability that feed other skills to stay relevant. As for education, the founder and chancellor of Miva Open University says, "Being educated today is measured by execution." For Shagaya, the value of learning shows in what you can build, not the paper you hold.

The Tipping Point

Nick Foukal '10, a researcher at the University of Georgia, recently led a two-week expedition in the ice-choked waters off eastern Greenland. Profiled in *The New York Times* feature, "Dodging Icebergs and Storms on the Hunt for an Ocean Tipping Point," the engineering sciences major sought to advance scientists' understanding of how and when ocean currents might reach critical tipping points. "There's just very little data here," he says, "so any data is going to be really, really important." The seas around Greenland form an immense loop of water that winds through the world's oceans, linking changes in the climate far and wide. In the tropics, strong sunshine warms the water and makes it extra-salty through evaporation. When it travels up to Greenland and Iceland, this warmer water meets cold air, sinking as it becomes colder and denser. Researchers worry this circulation may grind to a halt due to increased amounts of fresh water—caused by increased rain that in turn melts ice on land and at sea—sloshing around in the North Atlantic. Foukal and team dropped a series of moorings loaded with instruments to measure various aspects of the water along a 35-mile stretch. He told *The Times* that collecting data this way reminded him of the lobster fishing he did growing up in Massachusetts: You don't know what you've got until you pull up the cages. "It's rolling the dice," he says.

ESTHER HORVATH/THE NEW YORK TIMES/REDUX

Nick Foukal '10 ▲

"Go where nobody is. If people are moving in one direction, do something different."

—SIM SHAGAYA TH'99

Biotech Backer

As teens filled a Paris convention center last winter to discuss their science projects, Stanford professor **Drew Endy Th'98** wanted to see more U.S. teams. "It's urgent that leadership of the next generation of biotechnology has a strong presence in America and it's represented by young American leaders," he told *60 Minutes*. Of the more than 400 teams, 14 were from U.S. high schools and 120 were from Asia. They were competing at the International Genetically Engineered Machine (iGEM), using synthetic biology to solve real-world problems. Endy cofounded iGEM back in the early 2000s, when he was at MIT teaching genetic engineering. "We started iGEM because the people who wanted to work with us were the 18-year-olds." As biotech boomed, iGEM thrived—though Endy has warned the U.S. Congress that America's lead in the field of synthetic biology is giving way to China. He was cheered by the project presented by the Lambert High School team from Atlanta, Ga., which earned honors for best software tool.

The Professor

Tuck Professor of Marketing and Economic Policy **Bryan Bollinger '03 Th'03** studies questions that lie at the intersection of marketing and economic policy. "Some examples include drivers of renewable energy diffusion, the role of home automation, and consumer response to health information," says Bollinger, named to the faculty in 2025. "I am studying the impact of tariffs on the U.S. solar market, sustainability labels on consumer loyalty, and the ability of AI to increase patient access and engagement in healthcare."

Storytelling & Tech

Imagine stepping into a theater for a play and interacting with an AI character inspired by the narrative. **Richa Ranjan Th'25** offered that experience to audiences in White River Junction, Vt.—blending storytelling with cutting-edge tech to introduce interactive AI chatbot Greta 2.0 at the Northern Stage production of *Sisters*. "I had the incredible opportunity to lead a team of eight to bring this concept to life," says Ranjan, former project manager with the Digital Applied Learning and Innovation (DALI) Lab at Dartmouth. "From concept to launch in less than three weeks, this project was a perfect blend of art and innovation, offering a unique touchpoint for the audience while complementing the dramaturgy. Positioned in the lobby, Greta 2.0 engaged with theatergoers, sparking conversations about the play, technology, and what being human means." Ranjan is now using her MEM degree—as a product manager of AI Search at Santa Clara, Calif.-based ServiceNow.

Richa Ranjan Th'25 ▲

thayer notes

1950s

Ron Read '57 Th'58: At age 90, I don't have many new activities to report except for, as the Bee Gees song goes, just "Stayin' Alive." I can only report on events from ancient memories. During Green Key Weekend, Tuck-Thayer held an annual tricycle relay bike race around the circle in front of Tuck. Our team from '58 Thayer was Marty Anderson, "Snitch" King, myself, and a fourth member, maybe Wendell Smith or Clark Griffiths or Bill Davidow. These were fun times.

1960s

Harris McKee '61 Th'63: The year 2025 was marked by travel and Chicago activities, including the Alzheimer's walk, an event we've supported for several years, and a family trip to the Galapagos Islands with kids Laura, Tom, and Margaret. (It allowed me to recreate the famous race of the "tortoise and the Harris.") A 10-day trip to Iceland in August with my friend Minna provided another opportunity to see an island shaped by volcanic activity. Like the Galapagos Islands, Iceland was uninhabited until the Vikings arrived by accident in the 800s. We saw waterfalls, glaciers, and soaked in naturally heated hot pools. My Dartmouth Class of 1961 responsibilities continued as I served as webmaster, co-head agent, necrologist, and publisher of our newsletters. I was again able to participate in our fall mini reunion in Hanover. Activities at my Admiral at the Lake community in Chicago have continued to provide a meaningful life. Golfing with a member of the Admiral group and Laura nearly every week of the summer has been a great physical outlet. I've also continued to handle the AV for a weekly satellite Second Unitarian Church service. Once again, I represented Santa at several Admiral functions, including presenting gifts to the third graders from Goudy School.

Neil Drobny '62 Th'64: I recently browsed through two books I purchased in 1964: *The First Hundred Years of the Thayer School of Engineering at Dartmouth College* by William Phelps Kimball and *The Beginnings of the Thayer School of Engineering at Dartmouth College*, edited by Edward Connery Lathem. Both brought back wonderful memories. I knew several of the people mentioned (had a few in classes) and I had heard stories about others. It would be interesting to find a PhD history student to tackle the task of doing an update on the last 50-plus years at Thayer to see if and how the "early years" impacted the recent ones—and what that portends for the future. My favorite prof was Ed Bown. He was my advisor and an accomplished woodworker and taught me as much about woodworking as engineering (though there is a strong connection). Hopkins Center was brand new during my two graduate years at Thayer and had a great woodshop. I spent many hours there with Ed learning how to use all the high-tech tools of the day, such as electric-powered wood saws and drills. I still have furniture I built with Ed's guidance.

1980s

Rick Rundell '80: In recognition of my work fostering research and innovation in the building industry, I was named a fellow of the American Institute of Architects in February. During the last decade, in my role at Autodesk, I led the development of digital fabrication labs and a global, open-innovation network advancing the use of technology in design and building. I am now focused on my advisory practice, Track 5, which I founded in 2024.

Joseph A. (Csizmadia) Peck '88: Truth is, I never got to really use my engineering training as I became a pilot. When it came time to apply for my first major airline job, it was my Dartmouth engineering background that more than likely got me ahead of my peers. Furthermore, my engineering background made systems training a breeze and proved invaluable many a time when I was a captain on the Boeing 777. My two daughters, however, became biomedical engineers. One daughter works at Johnson & Johnson in San Jose, Calif., building robots that do surgery, and the other daughter is in Philadelphia working for Globus developing spinal implants to reduce pain. They grew up knowing their father studied engineering at Dartmouth and without a doubt that set their aspirations very early on. They ended up at Tufts and Boston University. My son, Carson, who is applying to med school now, is a Dartmouth '22. I'm currently enjoying Florida, having flown down in my light twin Cessna 340 with my wife, Darcie. We're having such a wonderful time here we're planning on selling our home in New York and moving here permanently.

Himraj Dang '89 Th'90: I have not been active professionally since I last worked on financing for e-buses here in India, where I live. However, I am pleased to note progress in my efforts at "rewilding," aiming to reforest parcels of land near a national park in central India, using native, less-water-consuming tree species. This can be a demonstration for local farmers to follow once commercial success is evident. The work done every year is to keep the trees I have planted safe, and occasionally watered, while nature does the rest. This experience brings me solace living in a country and a world I can scarcely understand—solace in "internal exile," a tribute to Jean Giono, whose work was first shared with me by Prof. Dana Meadows at Dartmouth.

Moriya Chesler Th'89: I've been involved in the clean energy industry for the past four years as a senior software engineer. I solve complex problems involving modeling and upgrading distribution power networks via Kevala Analytics' web platform and collaborating with U.S. Department of Energy partners in cyber-security projects at Kevala Analytics. I enjoy working with power system engineers, data engineers, and other web software engineers across the company. The engineering courses I took at Thayer as well as at UMass Amherst provided a solid background for my current work. Kevala is currently hiring, so visit www.kevala.com/careers for more information.

1990s

Kially Ruiz '98: I am developing data center power for artificial intelligence. My company, Ruiz Hyperscale Power Co. Inc. (RHPC), is developing the largest portfolio of energy for AI in the world, and we are at the forefront of solving a $1-trillion problem in energy and electrical distribution.

2000s

Robbie Barbero '01 Th'02: In 2025, I stepped down from my role as chief business officer at Ceres Nanosciences to join Renaissance Philanthropy. There, I'm developing a thesis-driven, philanthropic fund to catalyze the development of a low-cost, easy-to-use blood lead test for the 800 million kids worldwide who have lead poisoning.

George Tsung Th'05: I am working at Amazon on Project Kuiper, recently rebranded to Amazon Leo. We are creating a mesh network of 3,000-plus satellites in space. I am working on the optical inter-satellite link team as the senior enterprise planner. Amazon Leo is designed to deliver high-speed internet around the world, even in rural and remote locations. There are three systems, for personal, business, and government use. It will offer personal portable service options so individuals can be as connected as they want, no matter where they go. The business option will provide flexible networking solutions from primary

thayer notes

Gallery

1. Harris McKee '61 Th'63 recreates the race of the "tortoise and the Harris" during a trip to the Galapagos Islands.
2. Chad Danger Klaas '23 Th'24 Th'25, fourth from left, competed in his last water polo game as a student last spring, winning the Ivy title with his team.
3. Chris Bilger-Salinas '11 Th'12 Th'13 and husband Erick welcomed daughter Sierra in October.
4. Avery Moorhead '25 Th'25 (from left), Jenna Martin '24 Th'25, Megan Leung '24 Th'24, and Joselyn Lopez Bonilla '22 Th'23 work at Draper.
5. Marine Corps Capt. Lota Ezenwa '17 Th'18 is a naval aviator.

to backup, while the version for government agencies will deliver secure connectivity for mission-critical needs.

2010s

Benjamin Meigs '10 Th'11: I joined PhysicsX in January as a leader in the delivery engineering team. PhysicsX is building an AI platform for hardware engineering from simulation to design-for-manufacturing. We work with customers in aerospace, automotive, electronics, process engineering, and others. On the personal side, I'm enjoying spending time outdoors on the sled and ski hills with my 1- and 4-year-old daughters.

Chris Bilger-Salinas '11 Th'12 Th'13: My husband, Erick, and I welcomed Sierra Tinsley Bilger-Salinas in October. I am enjoying my last year on Thayer Dean's Council and am a mechanical engineer at Nvidia.

Lota Ezenwa '17 Th'18: Since graduating with a BE in systems engineering, I joined the Marine Corps and was designated a naval aviator early last year. So far, I've flown the Cessna 152, the T-6B Texan, and T-45C Goshawk, acquiring several memorable experiences and meeting some incredible people. I have recently qualified as a pilot of the F-35B, and I'm currently stationed at Marine Corps Air Station Miramar in San Diego, Calif. I have continued my education in aerospace engineering at the Naval Postgraduate School and hope to become a test pilot for the Joint Strike Fighter program.

Junfei "Fish" Yu Th'19: Lately I've been focused on building Hunter.AI (www.huntrix.ai), a YC China-backed startup focused on using artificial intelligence to reinvent high-volume hiring. In Asia, we help platforms recruit thousands of delivery drivers each month. In the United States, demand for delivery services (food, groceries, last-mile logistics) is booming, but labor supply often lags behind—creating a real opportunity to improve how frontline hiring works. This year, we are also collaborating with an ENGS 89/90: "Engineering Design Methodology and Project" group on a project exploring how we can better support New Hampshire's blue-collar workforce—especially truck drivers and caregivers—by improving job matching, outreach, and the end-to-end path from interest to placement. Outside of work, I'm an avid golfer and a swing dancer—both are great reminders that progress comes from feedback loops, patience, and staying calm under pressure.

2020s

Chad Danger Klaas '23 Th'24 Th'25: I finished my MEM at Thayer last June. Before graduation, I played my final Dartmouth water polo game as a student at the Ivy championships hosted by Yale, which Dartmouth won again! And then played my first game as an alumnus, joining alums **Colin Fristoe '17, John Hill '12, Dan Harnish '14, Cris Calby '12, Brian Yeh '14**, and several current team members, including **Nic Nikcevic '27, Max Sweeney '27**, and **Elton Sjoenell '25**. Since graduation, I have been enjoying reconnecting with Chi Gam brothers and other friends in Boston and N.Y.C. Dartmouth water polo alumni who would like to be notified of future alumni games can reach me at chad.d.klaas.th@dartmouth.edu.

Jenna Martin '24 Th'25: I work at Draper in Cambridge, Mass., alongside three other female engineers who graduated from Thayer: **Avery Moorhead '25 Th'25, Megan Leung '24 Th'24**, and **Joselyn Lopez Bonilla '22 Th'23**. Thayer has given us a community within Draper, and I have found it a very special part of my experience here. I hope that we can bring more female engineers to Draper because it is such an amazing place to work!

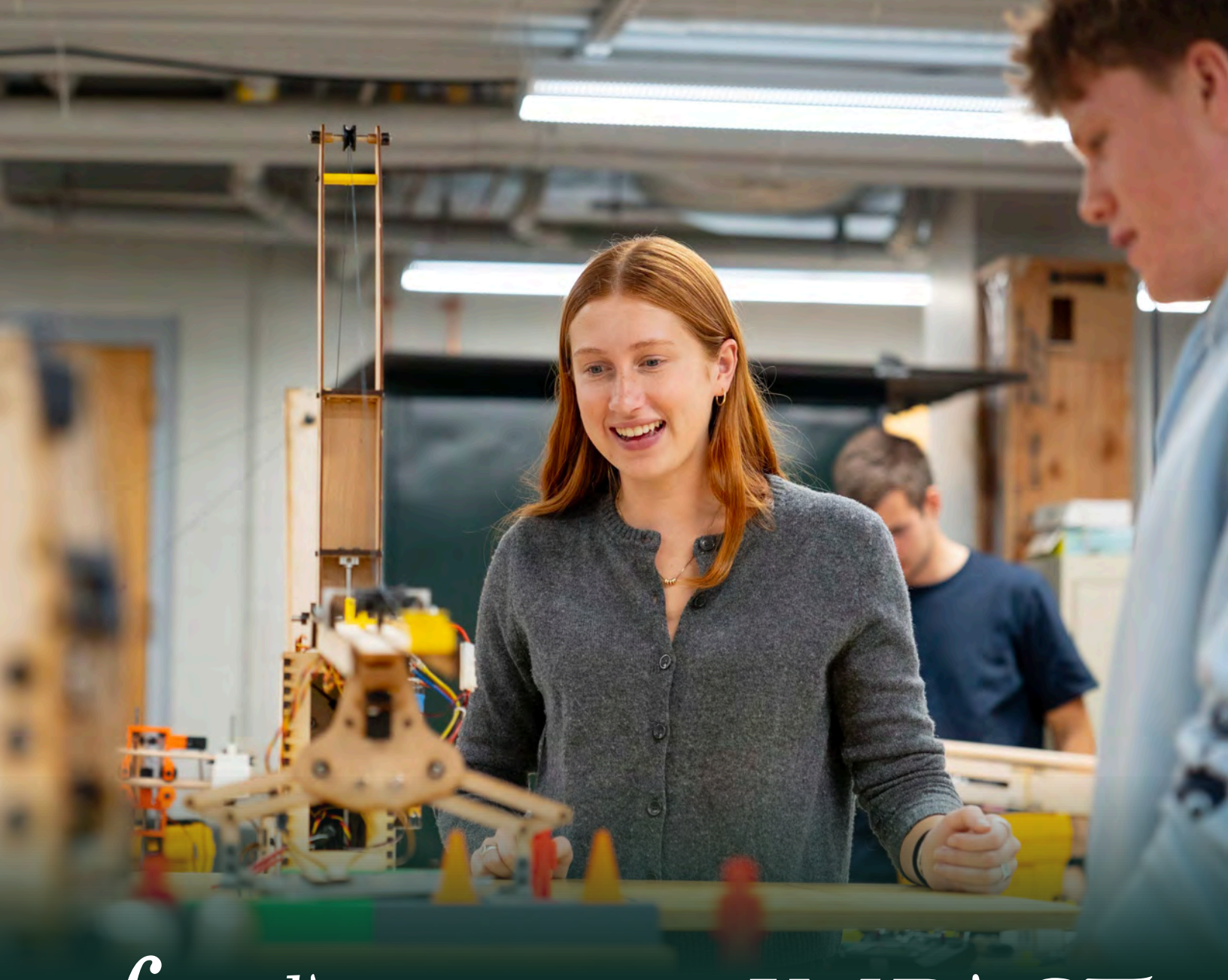


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Photo by Mark Washburn

in memoriam

LOUIS V. GERSTNER '63

— 1942-2025 —

Engineered IBM's Comeback in the 1990s

Louis V. Gerstner Jr.—an outsider who led a remarkable revival of computer giant IBM—died on December 27, 2025, in Jupiter, Fla.

At Dartmouth, he majored in engineering sciences and was active as class treasurer, chair of the Undergraduate Judiciary Committee, Kappa Sigma brother, member of Casque & Gauntlet and Palaeopitus, and participant in the Newman Center. He earned his MBA from Harvard Business School and joined McKinsey & Co., where he rose to become partner at 28 and senior partner at 31. In 1977 he joined his largest client, American Express, to head its credit card and traveler's check businesses. During his 11 years there, Gerstner developed "a sense of the strategic value of information technology," he recalled in his 2002 memoir, *Who Says Elephants Can't Dance? Inside IBM's Historic Turnaround.*

He came to IBM from RJR Nabisco, and when he arrived in 1993, the mainframe era of computing the company had dominated was in eclipse. The shift to personal computing hit IBM hard, and its mainframe revenue was plummeting. Upon examining the company's finances at headquarters in Armonk, N.Y., "We were precariously close to running out of money," he recalled in his book. Gerstner slashed costs and the workforce and shifted focus to consulting and services, helping customers use technology effectively rather than just selling them products. He oversaw the overhaul of its mainframes to run on lower-cost chip technology and positioned IBM as a trusted partner to companies that were uncertainly embracing the new online technology.

When he left in 2002 to chair the Carlyle Group, the company's market value had risen from $29 billion to $168 billion. "Lou Gerstner saved IBM," Harvard Business School professor David Yoffie told *The New York Times.*

His business success enabled Gerstner Philanthropies to make grants totaling more than $300 million in biomedical research, the environment, prevention of homelessness, and education. At Dartmouth, the Louis V. Gerstner Jr. Scholars program launched in 2020 to support a cohort of 18 student leaders from varied socioeconomic backgrounds in STEM fields. He was also active as an alumni councilor, class president, and Alumni Fund agent. The College awarded him an honorary degree in 2013.

Gerstner was predeceased by son Louis III; he is survived by wife Robin, daughter Elizabeth, and four grandchildren, including Olivia '27.

obits

Robert Edward Prétat '46 Th'48 of Tampa, Fla., died September 6, 2025. At Dartmouth, he earned a BS and then an MS in civil engineering from Thayer and was active in the Navy V-12 program. He served in the U.S. Navy and then worked as an engineer for General Portland Cement Co. for his entire career. He enjoyed his years at Dartmouth and returned for many reunions, the last being his 70th in 2016. Tracking his family history was a challenge he enjoyed for many decades, resulting in the publishing of a book and family trees shared with dozens of family members. He was predeceased by his wife of 51 years, Donna. He is survived by partner Carol, daughter Linda, sister Barbara, and two grandchildren.

Arthur F. Worden Jr. '51 Th'52 Tu'52 of Fort Pierce, Fla., died September 4, 1925. At Dartmouth, he was involved with Casque & Gauntlet, Theta Delta Chi, and football. He earned his AB in engineering sciences and then a Tuck MBA and a Thayer MS in 1952. That year he also married Ruth, and together they raised five children. He spent his career in architecture consulting for Wilson Klaes Brucker Worden. He was an active alumnus, supporting Dartmouth Society of Engineers and Friends of Football and serving as an admissions volunteer and Alumni Fund class agent. He is predeceased by his wife and survived by five children, including Amy '84, and granddaughter Emily '13.

Walter Patrick Gramm '52 of Lantana, Fla., passed away on March 22, 2025. At Dartmouth, he majored in engineering sciences and was a member of Alpha Delta Phi. He served in the U.S. Army Counter Intelligence Corps for three years, then joined Republic Steel while earning a master's from Northwestern University. He joined the family business, Great Lakes Car-

bon Corp., serving in management until retirement. An active alumnus, he served on the boards of Thayer, Hood Museum of Art, and Hopkins Center for the Arts. His family endowed the Dorothy and Walter Gramm Professor of Engineering at Thayer in honor of his parents. He is survived by three former wives and four children, including Melise '88.

Charles Joseph Queenan Jr. '52 Th'53 Tu'53 died at home in Pittsburgh, Pa., on December 3, 2025. At Dartmouth, he was member of Beta Theta Pi and played lacrosse. He graduated cum laude with a combined Tuck-Thayer degree in business administration and engineering, then went on to earn his JD at Harvard Law School in 1956. He practiced his entire career at the K&L Gates, one of the country's most noted law firms. He became senior counsel and chairman of the firm's audit committee before retiring. He was also active in business, education, and community organizations, serving on many boards including the Allegheny Conference on Community Development and as chairman of Carnegie Mellon University. In 2014, he received an honorary degree from Saint Vincent College. He was predeceased by his wife of 68 years, JoAnn. He is survived by children Suzanne and Charles III '78 and four grandchildren.

Thomas Tyler '54 Th'56 of Granger, Indiana, died January 8, 2026. He came to Hanover with wife Kaye, and they started a family while he majored in mechanical engineering, ran track, and was active in Casque & Gauntlet, Green Key Society, Psi Upsilon, and ROTC. After graduation, he served in the Army, then joined the family business, Tyler Refrigeration. He moved to lead the international division of Clark Equipment Co., where he was responsible for developing business across Mexico and South America. He also worked with Wheelabrator Frye and Shuttleworth Inc., retiring as president. He was predeceased by Kaye and son Stephen. He is survived by children Jennifer '89 and Terence '75, and granddaughter Kate '00.

Carles Raber '60 Th'62 of Clarkson, Mich., died December 5, 2025. At Dartmouth, he captained the swim team, earned his AB and MS in computer engineering, and married Barbara. He started his career with Pratt & Whitney, where he reverse-engineered an old relay-based control system and translated it to computer code. Presenting at an industry event, he was recruited to be one of the early engineers at manufacturing data systems in Ann Arbor, Mich. He subsequently worked for Applicon, Genigraphics, and Ilford. He was predeceased by Barbara and is survived by four children and their families.

Rhoderick Charles Hawk '62 of Wilmington, N.C., passed away on November 19, 2025. At Dartmouth, he was active in the Dartmouth Outing Club, Dartmouth Society of Engineers, and Winter Carnival Council. He graduated with an AB in engineering sciences and went on to earn an MS in industrial engineering from Stanford University. He enjoyed a distinguished 25-year career with the General Electric Co., and later with a Westinghouse Co., Western Zirconium, in Utah, retiring as engineering and logistics manager in 2005. He was predeceased by his wife, Frances, and is survived by two children, two stepchildren, and two grandchildren.

Fred "Fritz" Offensend '65 Th'66 passed away in Portland, Ore., on October 17, 2025, from complications of advanced Parkinson's and a cerebellar stroke. At Dartmouth, he majored in engineering sciences and was active in Dartmouth Forensic Union/Debate and Dartmouth Society of Engineers. He earned his BE at Thayer and then an MS in industrial engineering and a PhD in engineering economic systems from Stanford University. He then began a distinguished 30-year career—first at SRI International as a decision analysis consultant and later as vice president in financial engineering systems at Bank of America in San Francisco, Calif. He is survived by his wife, Susanne, son Ashley, and two grandchildren.

Edward H. Truex IV '67 Th'68 of Brownsville, Vt., died November 12, 2025. At Dartmouth, he participated in Dartmouth Society of Engineers, Kappa Kappa Kappa, and student workshops. After graduation, he and wife Barbara, who he married in 1967, moved to Maryland, where he helped build General Electric' time-sharing computer system. In 1976, he founded software company Product Systems Inc., serving as CEO and president until retiring in the early 2000s to Brownsville. Survivors include Barbara, son Edward '91 (who works in Thayer's instructional labs), daughter-in-law Samantha (Scollard) '92 Th'93 Tu'95 (a former Thayer board chair), son Richard, grandson Edward VI '22, and brother Richard '70.

Richard Allan Livingston '68 Th'69 died December 6, 2025, in Laguna Woods, Calif. At Dartmouth, he was captain of the fencing team and a member of the Dartmouth Society of Engineers and Tau Epsilon Phi. After earning his AB and BE, he went to Stanford for a master's in nuclear engineering. An internship with the U.S. Atomic Energy Commission (AEC) drew him early on and he spent his career in the D.C. area with the AEC and the U.S. Environmental Protection Agency and received a Ph.D. in geochemistry at the University of Maryland in 1990. He later worked in advanced research at the Federal Highway Administration. Rich retired in 2007 but continued to teach and conduct research at Maryland and Columbia. He was predeceased by siblings Robert '70 and Barbara and is survived by sister Nancy.

Peter Roitman '71 Th'72 of Gaithersburg, Md., died of throat cancer on October 2, 2025. At Dartmouth, he earned his AB and BE and was active in student workshops and the Tucker Fellowship. He then obtained a PhD in engineering from Princeton in 1977, joining what is now the National Institute of Standards and Technology (NIST) upon graduation. He worked his entire career at NIST, publishing numerous papers and conducting research on topics including radiation effects on microchips, silicon materials and processing, SOI technology, and electron microscopy. In 1992 he and his coauthors received the 1992 NSREC Outstanding Conference Paper Award at the IEEE Nuclear and Space Radiation Effects Conference. He is survived by his wife, Doris, and siblings Judy '78 and Michael '76.

Richard Patrick Lena Jr. '83 Th'84 of Madison, Conn., died unexpectedly on December 10, 2025. At Dartmouth, he played football, was a brother of Beta Theta Pi, participated in a French language study abroad program, and earned his AB and BE. After graduation, he began an 18-year career at IBM as a system engineer. In 2003, he took an executive position with Tangoe Inc., managing operations in India and Asia and enjoying domestic and international travel. He worked as an IT consultant for Stanley Black & Decker at the time of his death. He is survived by wife, Christine, daughters Jaclyn and Kendra, and siblings Chris '88, Dan '91, and Michael '84.

Collaborations

"We looked at solving two problems at once: developing a method for long-term access ... and regrowing the skull over an implanted electronic device."

—PROFESSOR ALEXANDER BOYS

PhD Innovation Fellow Jonathan Pelusi examines the neural device in the Boys Lab.

ROBERT ANDERSON

Better Access to the Brain

A study led by Professors Katie Hixon and Alexander Boys demonstrates a skull-healing electronic implant for safer access to the brain. The two labs combined their research in regenerative tissue engineering and thin-film bioelectronics, respectively, to produce the neural device—featured on the cover of the March issue of *Advanced Materials Technologies*.

"Katie's done a lot of work on bone regeneration in the skull, and my lab has built neural interfaces for various applications," Boys says. "So we looked at solving two problems at once: developing a method for long-term access to larger regions of the brain and regrowing the skull over an implanted electronic device."

The study—coauthored by PhD Innovation fellows Levi Olevsky, Jonathan Pelusi, and Peter Bertone, postdoc Amir Khan, PhD student Aleyna La Croix, Avery Jones '26, and Dartmouth-Hitchcock Medical Center neurosurgery resident Caleb Stewart—demonstrates the feasibility of integrating the thin-film recording arrays developed in the Boys' lab (see page 9 for more on his work) with bone-regenerating cryogel scaffolds developed in the Hixon Lab.

—Catha Mayor

IN THE NEWS

"Why Do We Trust ChatGPT? The Science of How AI Chatbots Captivate, Entertain, and Influence Us"

Mother Jones

Professor Eugene Santos Jr. advises developers to better define how chatbots should be used and set guidelines: "We need to be able to lay down, 'Did I have a particular goal? What is the real use for this?' "

"Underwater 'Storms' Are Eating Away at the Doomsday Glacier"

CNN

Storm-like ocean circulation patterns under Antarctic ice shelves are causing glaciers to melt, according to Professor Yoshihiro Nakayama. Sandwiched between an ice shelf and the seafloor, eddies churn up warmer water from deeper in the ocean, enhancing melting when it "hits" vulnerable ice.

"Could There Ever Be a Worldwide Internet Shortage?"

Live Science

On the possibility of a worldwide internet outage, Professor George Cybenko says: "It is possible but would require significant resources and/or huge coincidences, which makes it a highly unlikely."

"More Than 11,400 Flights Canceled Sunday as Massive Winter Storm Sweeps Across U.S."

Associated Press

Professor Vikrant Vaze discusses restoring service: "It's going to come down heavily to the individual airline's network structure ... and just the intrinsic capacity of the airlines to handle these massive disruptions."

@thayerschool

"The Bonfire WILL Return," promised Interim Dean Doug Van Citters (DVC) after a drought prompted a state-wide fire ban—and the College replaced the traditional bonfire with a light show.

2 Degrees in 1

Faculty and students describe the advantage of Dartmouth's holistic systems approach to teaching engineering within a full liberal arts education.

www.dartgo.org/ab-be

Dartmouth Engineering Professor Arthur Pétusseau (far right) teamed up with research fellow Dylan Parker, MD, and dermatology professors M. Shane Chapman, MD, and Brian Simmons, MD, at Dartmouth-Hitchcock Medical Center and Clinics to launch a clinical study focused on the diagnosis of nonmelanoma skin cancer.

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Fine-tuning the Finish

Oliver Shapiro '26 tweaks his team's bridge-building prototype during the end-of-term competition for ENGS 76: "Machine Engineering." On a scaled-down obstacle course, student designs spanned trenches, cleared orange cones, and dodged a tiny road crew.

Photograph by Robert Anderson