

VANDERBILT ENGINEER

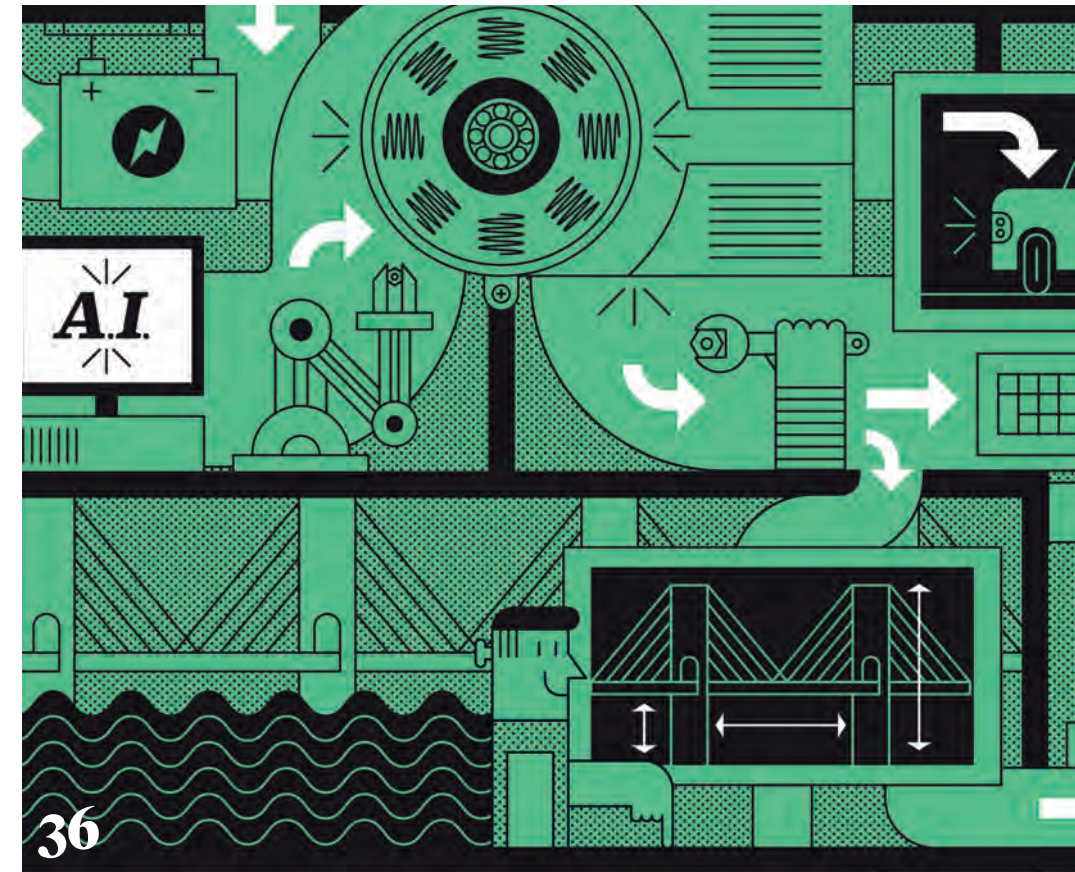
SPRING/SUMMER 2023





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alleviate traffic
jams — and save
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COVER ILLUSTRATION BY
Chad Hagen



HARRISON MCCLARY (OPPOSITE); JOHN DEVOLLE

A SECOND DIGITAL REVOLUTION

At our past two Board of Visitors meetings—last October and most recently in April—we devoted a significant portion of the agenda to discussing a technology that has done far more to transform the world than anything I’ve seen throughout my career. And it will continue to do so for decades to come. That technology, of course, is computers.

As a broad description, computers encompass everything from hardware to ever sophisticated programs capable of parsing unfathomable amounts of data and yielding revolutionary insights. Most recently, these disparate technological components have combined to usher in what I truly believe will be a new era dominated by artificial intelligence. ChatGPT and similar large language models (LLMs) represent the very beginning of what this technology can do—which, if you’ve sat in on some of the recent presentations by Vanderbilt School of Engineering faculty, is both fascinating and a little frightening.

My view of this coming age of AI is not a pessimistic one, however. To me, AI is not a replacement for human ingenuity. It reflects and expands upon what we are able to achieve as intelligent beings. It’s a tool, in other words. And the sooner we learn how to master its use—and train future generations of engineers to use AI, if not the entire population of Vanderbilt undergraduates—the better off we will be.

This issue of *Vanderbilt Engineer* magazine, which has undergone an exciting redesign, explores the expansion of this incredible technology. As you’ll see in the story about the growth of the computer science major at Vanderbilt, we’ve gone from having less than 100 students focused on the topic in 2011 to nearly 800 a decade later. In fact, the computer science major is so popular that it accounts for *negative* attrition in the School of Engineering. That is, we end up graduating more students from the School of Engineering than we enrolled four years previously. That’s because so many are transferring to major in computer science! To help manage this growth, the \$100 million Destination Vanderbilt hiring initiative has allowed us to double the computer science faculty in just a couple of years.

Two other stories in this issue showcase how computer technology can en-

hance our everyday lives. One piece follows the work of Gautam Biswas, a path-breaking researcher who is working with colleagues at the Peabody College of Education and the School of Nursing to document and analyze *how people learn!* This team uses eye-tracking technology to understand how everyone from nurses-in-training to middle school students learning about STEM grasp and retain complex information. Their work will allow critical personnel, like healthcare workers or soldiers in the field, to learn new concepts more quickly, while shedding new light on effective teaching methods for young students.

The other story is one that I hope you’ve already heard about. In November of 2022, a team of Vanderbilt engineering researchers, led by Daniel Work, professor of civil and environmental engineering and Jonathan Sprinkle, professor of computer science, were part of an academic coalition undertaking the world’s largest known real-world traffic study. Employing more than 100 cars equipped with AI-powered cruise control, the experiment could lead to improvements in both traffic congestion and fuel economy.

It is this relentless pursuit of innovation and education that underlies the recently announced, \$3.2 billion Dare to Grow capital campaign, the largest ever undertaken by Vanderbilt—and one that coincides with the 150th anniversary of the university’s founding. We are already a great institution that has long contributed to society in meaningful ways, both here at home and across the globe. But we have the potential to become *even* greater! This is what the Dare to Grow campaign is all about and I would encourage each of you to give.

Speaking of growing...I am pleased to welcome my successor as dean, Krishnendu (“Krish”) Roy, to Vanderbilt. He is an esteemed biomedical engineer who joins the School of Engineering this summer from Georgia Tech. His impressive roster of awards spans research breakthroughs as well as recognition for his teaching excellence. A perfect fit for Vanderbilt, in other words.

As for me, I am taking a sabbatical next year and will return to the faculty in 2024. I’m even told my new office in Featheringill Hall will be ready by then.

It has been an honor to serve as dean for the last 11 years and I want to thank you for your steadfast support of our School of Engineering.

Sincerely,

PHILIPPE FAUCHET
BRUCE AND BRIDGITT EVANS DEAN OF ENGINEERING



CHAD DRIVER

Prototype



THE FUTURE OF FRESH FOOD

WHAT

Featured here is a prototype of a food freshness sensor developed in the Vanderbilt Institute of Nanoscale Science and Engineering (VINSE) facilities as part of the inaugural Nanoscale Innovation and Making class, which was launched in Fall 2022 with funding support from a VentureWell grant.

WHO

Students in the course were taught fundamentals of nanotechnology and societal impact; how technology transitions from the lab to the marketplace; how to build a prototype nano-device in the VINSE cleanroom; and how to give a product pitch.

WHY

Highlights for the students included hands-on, immersive labs in the VINSE facilities, meeting with entrepreneurs who started their own companies in micro- and nano-technology, and the capstone group project in which they fabricated a prototype device of their own design and delivered a product pitch to an audience of experienced entrepreneurs and Wond’ry mentors. Said one participant: “I learned significantly more content and real-world applications than I have in any other course at Vanderbilt.”

HARRISON MCGLARY

first

VANDERBILT SCHOOL OF ENGINEERING NEWS

SUMMER TECH CREW MEMBERS WORK IN THE VANDERBILT INSTITUTE OF NANOSCALE SCIENCE AND ENGINEERING (VINSE) CLEANROOM LITHO 2 BAY PERFORMING SOFT LITHOGRAPHY PROCESSES. VINSE PROVIDES ACCESS AND TRAINING ON STATE-OF-THE-ART FABRICATION AND CHARACTERIZATION EQUIPMENT INSIDE THE ENGINEERING AND SCIENCE BUILDING (ESB). ITS FACILITIES INCLUDE A CLEANROOM, ANALYTICAL SUPPORT CORE AND ADVANCED IMAGING SUITE. THE CLEANROOM PROVIDES CUTTING-EDGE NANOFABRICATION TOOLS FOR THE DEVELOPMENT OF MATERIALS AND INTEGRATED DEVICES AS WELL AS MICROFLUIDIC AND NANO-PHOTONIC SYSTEMS.

JOE HOWELL

first

Fauchet Urges Congress to Support Engineering Education and Research

Philippe Fauchet, the Bruce and Bridgitt Evans Dean of Engineering, met with members of Congress in February to emphasize the integral role that engineering research plays in strengthening the United States' competitiveness and security. He urged members of Tennessee's congressional delegation to continue to support this work by ensuring adequate federal funding in fiscal year 2024 for the agencies that support engineering education and research—namely the National Science Foundation, the National Institutes of Health and the federal departments of defense and energy.

Fauchet was joined by several engineering deans from across the state, including Interim Dean Lin Li from Tennessee State University and deans Matthew Mench from the University of Tennessee-Knoxville, Okenwa Okoli from the University of Memphis and Joseph Slater from Tennessee Technological University.

"I welcomed the opportunity to tell the story of the productive partnerships Vanderbilt's School of Engineering and our peer institutions across the state have with numerous federal agencies to support vital research in areas ranging from health care and defense to energy and entrepreneurship," said Fauchet, whose visit was facilitated by Vanderbilt's Office of Federal Relations. "My colleagues and I also delivered positive news about the healthy outlook for educating and training a new generation of innovative STEM leaders."

VANDERBILT WELCOMES KRISH ROY AS NEW DEAN

Krishnendu "Krish" Roy, a Regents' Professor at Georgia Institute of Technology and a nationally renowned researcher, will be the next Bruce and Bridgitt Evans Dean of Engineering of the Vanderbilt University School of Engineering. Provost and Vice Chancellor for Academic Affairs C. Cybele Raver announced on April 17.

Roy is a champion of big ideas who has helped secure more than \$85 million in funding from federal, state, industrial and philanthropic sources. He and his collaborators have applied this funding to discover new therapies to treat complex diseases like cancer and tuberculosis.

As Vanderbilt's next dean of engineering, Roy also will strengthen interdisciplinary and cross-college collaborations at Vanderbilt, and he will expand faculty opportunities to work with federal and industry partners. At Georgia Tech, he has directed multiple centers that lead cutting-edge biomedical research, including the National Science Foundation Engineering Research Center for Cell Manufacturing Technologies, the Marcus Center for Therapeutic Cell Characterization and Manufacturing, the National Institutes of Health's in-depth cell characterization hub and the Center for Immunoengineering.

"Krish Roy has made multiple pathbreaking contributions in the fields of vaccines and immunotherapies, biomanufacturing and regenerative medicine. His research focuses on new biomaterials-based strategies to tackle a wide range of diseases, including cancer, infectious diseases and trauma," Raver said. "Professor Roy's award-winning work as a pioneering biomedical engineer and leader of large, high-impact research centers places him in excellent position to lead our School of Engineering as we pursue bold, collaborative discovery and innovation. In expanding the school's work not only in biomedical engineering, but also in other important areas such as climate solutions, transportation, cybersecurity and big data, Professor Roy will build on the faculty's accomplishments made under Dean Philippe Fauchet, to whom we are grateful for 11 years of transformative leadership."

Roy, who earned a Ph.D. in biomedical engineering from Johns Hopkins

University, is a leader in the emerging field of immunoengineering and cell manufacturing. Immunoengineering focuses on creating scientific tools to investigate, understand and modulate the immune system while cell manufacturing brings engineers, scientists and clinicians together to develop engineering-driven technologies for scalable manufacturing of high-quality and affordable cell therapies. He is also interested in the use of disease-on-a-chip technologies and micro- and nanotechnologies for drug delivery, drug discovery and tissue engineering applications.

"Bringing Professor Roy to our campus signals our continuing intent to make our School of Engineering one of the most respected and consequential in the world," Chancellor Daniel Diermeier said. "It shows once again that our university is a destination of choice for many of the world's most expert and accomplished faculty."

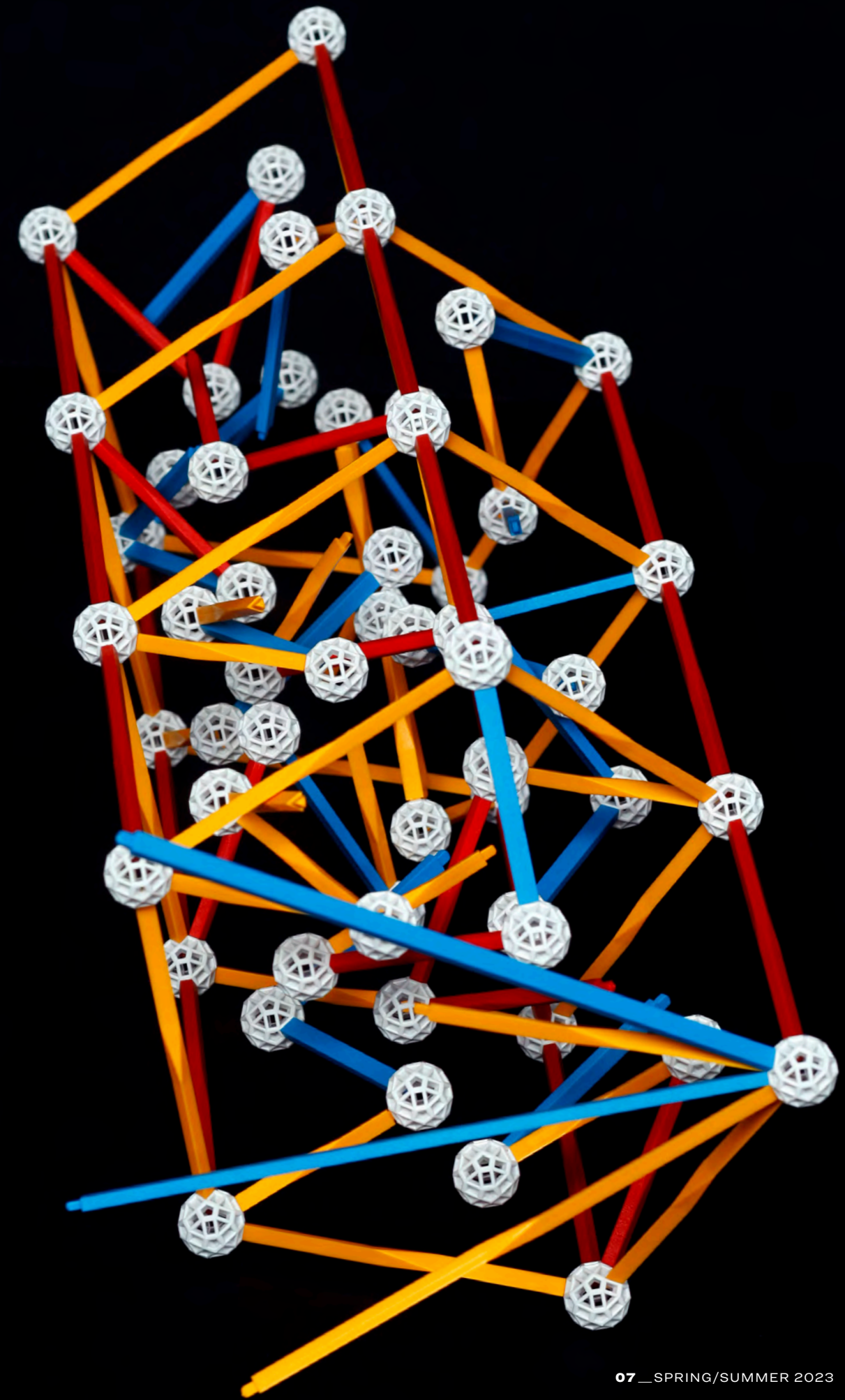


COURTESY OF GEORGIA TECH

STEVE GREEN



Each February, engineering students across the country participate in E-Week activities, a long tradition at Vanderbilt. Featured here is a digital image of the winning Zome Stick entry during the school's 2008 E-Week. This year, students showcased their ingenuity through some challenging—but fun—competitions and events that took place in Featheringill Hall's Adams Atrium. The Engineering Council pulls the week together each year with help from student organizations. This year, sponsoring organizations included Engineers Without Borders, VandyHacks, VUSat, National Society of Black Engineers, Society of Women Engineers, Out in Engineering, as well as student chapters of ASME, AIChE, SHPE and ASCE. In addition to spotlighting engineering professions, the competitions and activities are designed to interest students in engineering fields and call attention to the contributions to society that engineers make. E-Week is observed by more than 70 engineering, education, and cultural societies, and more than 50 corporations and government agencies.



Commercial Impact

BY LUCAS JOHNSON

HOW A GRAD SCHOOL “MIDLIFE CRISIS” INSPIRED A BREAKTHROUGH SURGICAL DEVICE

A Champion of Diversity

Dr. André L. Churchwell was honored with a Diamond Award for lifetime achievement in advancing diversity during a Not Alone Foundation celebration that brought together prominent leaders in business, education, entertainment, government and more at the Byers Theatre in Sandy Springs, Georgia, on Jan. 21.

In addition, a new Diamond Award for diversity and inclusion has been named in honor of Churchwell and Cynthia W. Turner, who is chief diversity officer at Ohio State University. The Churchwell/Turner Global Diamond Award in Higher Education will be a permanent category of these preeminent community service awards.

Churchwell, BS’75, is vice chancellor for outreach, inclusion and belonging at Vanderbilt. He also is a professor of medicine and inaugural holder of the Levi Watkins, Jr. M.D. Chair.



When Robert Webster was working on an engineering project for his Ph.D. at Johns Hopkins University, he was struck with an unnerving thought: The technology he was helping create seemed interesting, but it wouldn’t reach patients for at least 20 years. “And that’s only if everything went well,” he recalls.

So Webster, the Richard A. Schroeder Professor of Mechanical Engineering and associate professor of medicine and urology, began exploring how his robotic designs could have a more immediate impact.

“Then I hit upon trying to make robots so small they could do sinus surgery through a single nostril,” says Webster, who is a co-founder of the Vanderbilt Institute for Surgery and Engineering. “That led me to invent concentric tube robots, and feel really good not only about my Ph.D., but also about launching my faculty career at Vanderbilt with them as a major focus area of my lab.”

In 2016, Webster launched Virtuoso Surgical with his colleague Dr. S. Duke Herrell, professor of urology and director of VUMC’s minimally invasive urologic surgery/robotics program, to commercialize a surgical device using concentric tube technology.

The Virtuoso device has two robotically controlled, needle-sized manipulators that work from the tip of a rigid endoscope that is less than half the diameter of a dime, giving surgeons better control of their instruments during difficult procedures.

Two years later, Webster and Herrell, who also was a co-founder of VISE, helped start another company, EndoTheia Inc., to develop the next generation of medical devices for flexible endoscopy, with the goal

of increasing therapeutic efficacy through added flexibility and dexterity.

Patents for the technology were initially filed through Vanderbilt, with both companies licensing the devices through the university.

Webster says part of the enjoyment of working with his companies is seeing the benefits they provide in academia.

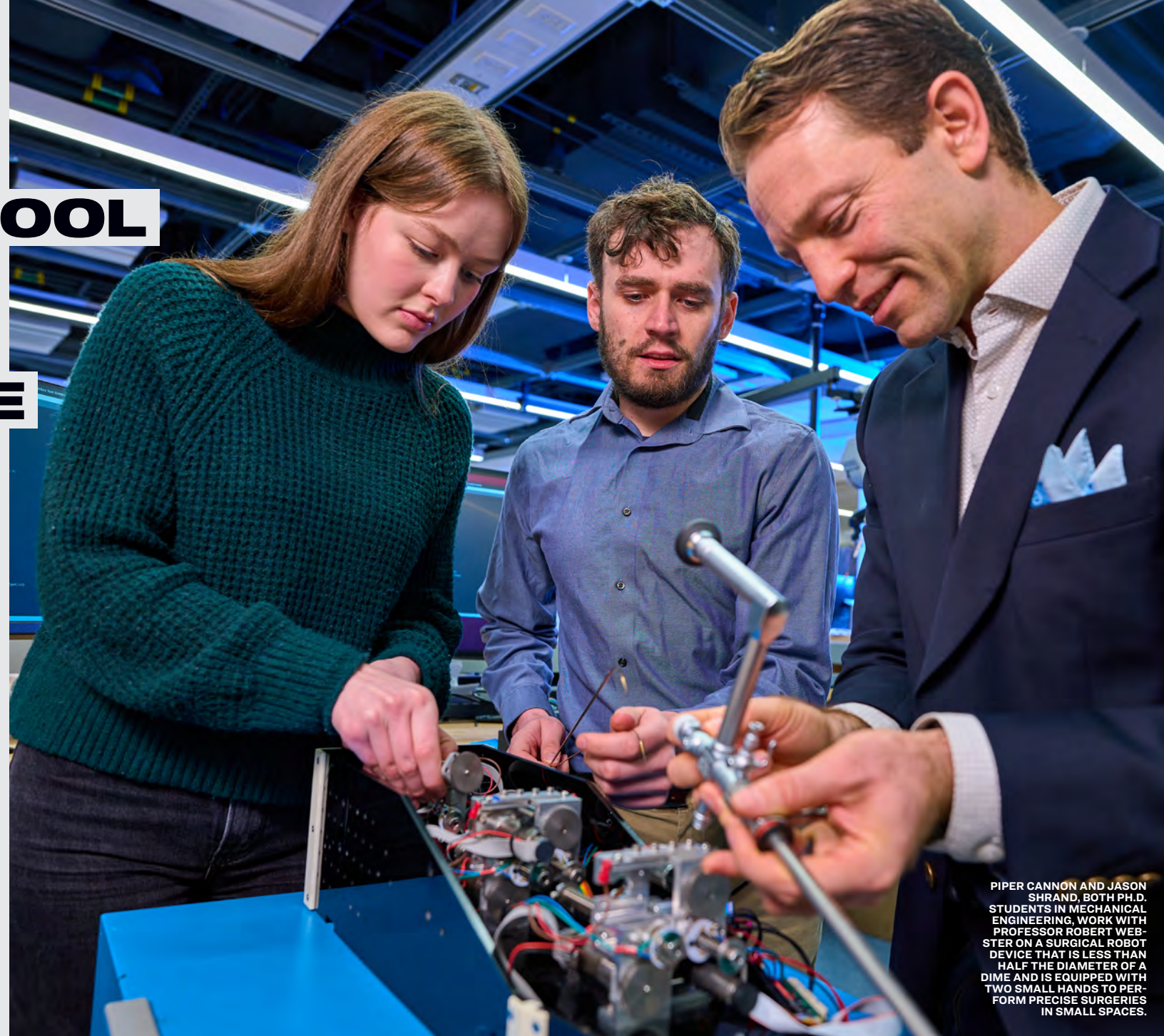
“Being a professor and an entrepreneur is a lot of work, but it is nearly all fun work,” says Webster, who serves as president of EndoTheia and Virtuoso. Herrell is chief medical officer for both. “Vanderbilt empowers professors to spend about a day a week consulting. I use this time to provide high-level strategic input to my two startup companies. I am also bringing the lessons back to the classroom, where I teach entrepreneurship in an innovative class that brings together engineering, business and law students to study how to build potentially world-impacting businesses out of Vanderbilt technologies.”

Virtuoso has raised investments totaling more than \$13 million and in September 2022 announced a \$20 million direct stock offering.

EndoTheia, which focuses on flexible endoscopy and non-robotic devices, has raised nearly \$5 million. In January 2023, the company received a breakthrough designation from the U.S. Food and Drug Administration that will streamline the regulatory process.

The company’s primary technology uses thin-walled, laser-machined metallic tubes, enabling the creation of highly flexible, steerable devices that can pass through standard endoscopes while also carrying interventional tools.

EndoTheia’s device can be used



PIPER CANNON AND JASON SHRAND, BOTH PH.D. STUDENTS IN MECHANICAL ENGINEERING, WORK WITH PROFESSOR ROBERT WEBSTER ON A SURGICAL ROBOT DEVICE THAT IS LESS THAN HALF THE DIAMETER OF A DIME AND IS EQUIPPED WITH TWO SMALL HANDS TO PERFORM PRECISE SURGERIES IN SMALL SPACES.

“There’s no better feeling as an engineer than knowing that you empowered a physician to save a life that otherwise would have been lost.”

HARRISON MCCLARY

across an array of clinical specialties, including urology, gastroenterology, neurology and otology, to vastly improve minimally invasive flexible endoscopic surgery. Webster says the device will particularly benefit ear, nose and throat specialists and is only the seventh device in the ENT category to receive the FDA breakthrough designation.

“EndoTheia’s technology is currently the only viable option to add dexterity to flexible endoscopy, without re-engineering the endoscope itself,” Webster says. “This empowers surgeons to provide much more accurate and precise therapeutic interventions in a wide range of clinical specialties.”

Webster and Herrell say the experimental work they conduct at VISE allows them to “push the envelope” in developing next-generation technology for both companies. This is true across multiple disciplines, they add.

The ultimate goal of all his work, Webster says, is to not just provide physicians with better tools, but to design those tools for specific procedures where lives can be saved.

“There’s no better feeling as an engineer than knowing that you empowered a physician to save a life that otherwise would have been lost,” Webster says. “What surgeons do today with very limited tools continually astonishes me.”

White House Appointees

Corey E. Thomas, BE’98, was named as one of 14 new members of the President’s National Security Telecommunications Advisory Committee in February.

The National Security Telecommunications Advisory Committee (NSTAC) advises the White House on the reliability, security, and preparedness of vital communications and information infrastructure. Thomas is the CEO of Rapid7, as well as the chairman of its Board of Directors. He also serves on the Vanderbilt University Board of Trust and in 2022 he was named to the School of Engineering’s Academy of Distinguished Alumni.

Keivan Stassun, Stevenson Professor of Physics and Astronomy and director of the Frist Center for Autism and Innovation in Vanderbilt’s School of Engineering, was appointed to the National Science Board in January.

The National Science Board created the National Science Foundation, which supports fundamental research and education in all the non-medical fields of science and engineering. The board directs the goals and workings of the NSF, including the duty to “recommend and encourage the pursuit of national policies for the promotion of research and education in science and engineering,” according to a White House release.

Specifically, Stassun will be on the board that determines NSF policies and strategic budget directions, approves new major programs and awards, and submits the annual budget.

first

To watch video footage from one of Blue Origin's crewed space launches—six have taken place so far, carrying passengers ranging from Alan Shepard's daughter, Laura Shepard Churchley, to a member of the YouTube sensation Dude Perfect—is like seeing science fiction unfold in real-time. One of the people responsible for getting those passengers, and other payload items like scientific equipment, into space aboard a Blue Origin flight is Erika Wagner, who graduated in 2000 with a degree in biomedical engineering. Speaking at a TEDx event near Seattle in 2015, Wagner told the audience she always loved to play on the swings as a child because they got her that much closer to the sky, where she might one day "swim among the stars." Because of private space companies like Blue Origin, that dream may soon become a reality for Wagner and many others like her.



1 DESCRIBE YOUR ROLE AT BLUE ORIGIN.

I lead strategy, marketing, and sales efforts for the Orbital Reef space station, our joint project with Sierra Space, which will help replace the International Space Station at the end of its life later this decade. Orbital Reef is a unique step forward for Earth orbit, as it is being built from the ground up to support a mix of research and development, commercial activities, and personal space journeys. Each of these is exciting in its own way. Researchers are using the microgravity environment of space to study everything from aging to materials science to sustainable built environments. Commercial users are exploring manufacturing of unique products for use both in space and back on Earth, as well as novel ways of engaging the public through art and media. And personal space journeys are perhaps the fastest growing market of all, as we move from an era of career government astronauts to one where the rest of us are welcome at that table.

2 HOW DID YOU GO FROM STUDYING BIOMEDICAL ENGINEERING AT VANDERBILT TO GETTING A MASTER'S AND PH.D. IN AERONAUTICS AND ASTRONAUTICS? AND WERE YOU INVOLVED IN THE VANDERBILT AEROSPACE TEAM?

Sadly, I didn't get involved with the Aerospace Team when I was a student. When I came to Vanderbilt, I was already passionate about spaceflight, so my professors did a great job of helping me to connect my biomedical engineering major to opportunities in the field. I took astronaut Taylor Wang's freshman seminar and did research with astronaut Drew Gaffney at VUMC. While serving as a student officer in the Engineering Council, I had the great chance to help host VUSE alum Michael Mott, who was then an executive at Boeing. That connection helped land my resume on the right desk in Huntsville and ultimately to land a summer job working Space Shuttle payload support. After graduation, I realized I needed to deepen my understanding of the aerospace industry, so I applied to graduate schools in a NASA-run network for Space Biomedical Engineering. Vanderbilt had prepared me well for interdisciplinary life. I did my master's at MIT in aeronautics and astronauts, focused on space human factors, and my doctorate in a joint Harvard/MIT program in bioastronautics. Even today, I still get to thank my Vandy network for connecting me to opportunities for board service, community service, and professional speaking. The Commodore connection really is lifelong.

3 CAN YOU TALK A BIT ABOUT YOUR WORK ON THE XPRIZE—AND SHARE SOME THOUGHTS ABOUT HOW "MOONSHOT" PROGRAMS LIKE THAT ADVANCE SCIENCE AND TECHNOLOGY?

I spent five years working with the XPRIZE Foundation, a nonprofit that funds large incentive prizes for breakthrough innovations. As a young PhD, I started off running their university programs, developing a teaching and research lab at MIT and later sharing it to other universities in the US and Canada. Later, I ran the foundation's portfolio in space and deep-sea prizes, occasionally reaching back to my biomedical roots to support our work in global health. I think the most important thing I learned at XPRIZE was the power of good questions and new metrics to change the way we pursue our goals. In a study of the Progressive Automotive XPRIZE for ultra-efficient automobiles, we found that teams were able to really focus their development around the XPRIZE's new metric of MPGe, or miles per gallon equivalent, which allowed us to compare combustion, hybrid, and electric technologies on an even playing field. And the presence of a multi-million-dollar prize allowed passionate innovators of all stripes to justify investing time and money towards the goal of a 100 MPGe vehicle that could also make it in the market.

7 QUESTIONS ERIKA WAGNER, BE'00 SENIOR DIRECTOR EMERGING SPACE MARKETS BLUE ORIGIN



ERIKA WAGNER, BE'00, LEADS STRATEGY, MARKETING AND SALES FOR THE ORBITAL REEF SPACE STATION AT BLUE ORIGIN.

BLUE ORIGIN

4. HOW DO YOU SEE COMPANIES LIKE BLUE ORIGIN SHAPING—OR RESHAPING—SOCIETY'S RELATIONSHIP WITH SPACE?

Our vision at Blue Origin is a future that someday enables millions of people living and working in space for the benefit of Earth. We are a long way from that vision, but we are absolutely trending in the right direction. In the early days of spaceflight, access was limited to a handful of governments and driven almost exclusively by geopolitical forces. The first wave of commercialization was driven by communications satellites, and that really opened a new era of innovation and investment in the fundamental infrastructure of space launch, ground stations, and workforce development. The second wave of commercialization was driven by access to space data—Earth imaging is used to monitor everything from crop fields to war zones, GPS position, navigation, and timing signals are embedded in our daily lives in dozens of ways, from the maps on our phone, to the timing behind our financial transactions. Now, we're entering a third wave of commercialization as reusable rockets bring down the cost of launch, and both technology and experience improve reliability. We are finally ready to start putting space to work across the rest of our economy. Companies like Blue Origin are helping build the road to space so that industries as diverse as tourism, manufacturing, and energy can harness the opportunities beyond our home planet.



7 QUESTIONS

5. WHAT ARE SOME OF THE MOST EXCITING OR PROMISING OPPORTUNITIES IN SPACE OVER THE NEXT 10-15 YEARS?

Personally, I still hold on to the dream I've had since I was a kid at Space Camp down in Huntsville, Alabama: I want to see the Earth from space and experience life in free fall. Over the next decade, those doors will be opening wider and wider. Professionally, I'm excited about the ways that this increasing access is leading new users to space. The International Space Station was built by a consortium of 15 nations, but commercial space stations like Orbital Reef will be open for global use. There are more than 70 space agencies now in existence worldwide and they are just getting started in sharing space to inspire our next generation and serve their national needs. On the commercial frontier, companies as diverse as Merck, Target, and Goodyear are bringing their research portfolios to space. We are increasingly realizing that every company is a space company. Every business plan can leverage space knowledge and data and access. We also see positive trends in opening human spaceflight to broader audiences. The Inspiration4 private space mission in 2021 included a pediatric cancer survivor with a prosthesis; in 2022, the European Space Agency named its first "parastronaut"; and nonprofits like Astro-Access are advocating for universal design to open space for an ever wider range of physical abilities.

6. WHAT ARE SOME OF THE BIGGEST CHALLENGES TO OVERCOME?

Many of the big challenges we face in the next decade are very human ones—how do we bring the best of humanity to space rather than the worst? The U.S. Space Force was stood up to protect an increasingly contested environment, and to hopefully keep the promise of the 1967 UN Outer Space Treaty that space is intended for peaceful uses and the benefit of all humankind. Increasing launch cadences and intentional anti-satellite technologies have also increased the orbital debris environment by orders of magnitude. We are going to need both new technologies and economic models to incentivize that cleanup so we can continue to use space for the benefit of Earth. And as we return to the moon, this time to stay, we need good international dialogue around healthy norms and regulations to help balance national prestige, economic growth, and equitable space access so that we can have a sustainable lunar future. I'm grateful that Vanderbilt gave me a chance to learn engineering in an environment that also valued the liberal arts, because it definitely takes more than just technology to get us to space.

7. WHAT TYPES OF BACKGROUNDS DO YOU TYPICALLY HIRE FROM AT BLUE ORIGIN—IS IT STRICTLY TECHNICAL?

Our team at Blue Origin comes from a diverse set of backgrounds. On the technical side, we hire from mechanical and aerospace engineering, software and avionics development, materials science, human factors, manufacturing, operations, and logistics. But it takes a broader skillset than that to build a road to space. We also need lawyers, political scientists, business professionals, designers, program managers, hospitality professionals and a wide range of other fields to support our team and customers. For students who are passionate about joining a company like Blue Origin, my number-one piece of advice is to join a technical student team. Whether you're developing rockets, satellites, racecars, submersibles, or medical devices, that sort of real-world, hands-on teamwork and leadership is the first thing I look for in an application.

“Many of the big challenges we face in the next decade are very human ones—how do we bring the best of humanity to space rather than the worst?”

BLUE ORIGIN

DANIEL DUBOIS

GIFT EXTENDS SUPPORT FOR AWARD-WINNING ROCKET TEAM

The inaugural Mark Dalton Faculty Director of Experiential Learning in Aerospace Engineering is Amrutur “A.V.” Anilkumar, professor of the practice of aerospace engineering and director of the Vanderbilt Aerospace Design Lab. Anilkumar has served as the faculty adviser to Vanderbilt teams that have won numerous national and international aerospace engineering awards over the past two decades.

“I am so appreciative of Professor Anilkumar’s commitment to our Vanderbilt ethos of team-based discovery,” said C. Cybele Raver, provost and vice chancellor for academic affairs. “One of the hallmarks of a Vanderbilt education is being able to translate classroom theory into real-world action, and our award-winning aerospace teams truly embody this spirit of innovative learning and bold thinking.”

Dalton—a longtime Vanderbilt supporter who has served in a variety of leadership roles for the university—established the Dalton Vanderbilt Aerospace Design Laboratory Fund in 2022 to support the rocket team and its work. This latest gift extends those efforts. Since its inception, more than 100 alumni have participated in VADL activities. Many of them are now pursuing advanced studies in the field or working in the space industry.



IBM Program to Equip Learners for STEM Career

The Wond'ry, Vanderbilt's innovation center, is working with IBM to equip Vanderbilt community members with no-cost STEM education and career readiness resources through IBM SkillsBuild, a no-cost education program focused on underrepresented communities.

As part of this collaboration, the Wond'ry will work directly with students to enhance their IBM SkillsBuild experiences, by exploring how the Enterprise Design Thinking framework can empower diverse teams and drive business results by focusing on users' needs and quickly developing solutions. Students will be matched with local non-profit community partners providing real-world field experience and the opportunity to learn within an established socially impactful organization.



MICHAEL R. KING NAMED NATIONAL ACADEMY OF INVENTORS FELLOW

Vanderbilt University engineering professor Michael R. King has been elected a fellow of the National Academy of Inventors. The NAI Fellows Program recognizes academic inventors who have created or facilitated outstanding inventions that make a tangible impact on quality of life, economic development, and the welfare of society. Election to NAI Fellow is the highest professional distinction accorded solely to academic inventors.

King, J. Lawrence Wilson Professor and chair of the Department of Biomedical Engineering, is an expert in the transport and adhesion of cells and particles in the circulation, and technologies for cell and particle separations and cancer drug delivery. The NAI Fellows Selection Committee noted King's highly prolific spirit of innovation in creating inventions that serve society. King is the lead inventor on four U.S. patents.

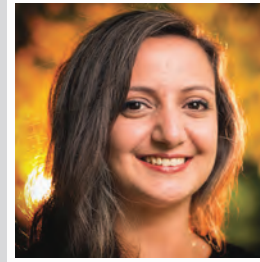


VANDERBILT EXPERTS SELECTED TO DEVELOP TRAINING TOOLS TO EXPAND ACCESS TO MINIMALLY INVASIVE SURGERIES

A team from the Vanderbilt Institute for Surgery and Engineering has received a multi-year, multi-million dollar contract to develop a low-cost simulation tool to train medical personnel in Kenya to perform minimally invasive laparoscopic procedures.

The project will be led by Nabil Simaan, professor of mechanical engineering and a globally renowned expert in robotic surgery. It is part of Wellcome Leap's "Surgery: Assess/Validate/Expand" (SAVE) initiative that awarded similar grants to 13 teams from leading academic institutions and corporations. The goal is to find solutions that allow safer, minimally invasive surgeries for global populations.

The system proposed by Simaan and his VISE colleagues—as well as members of VUMC's Institute for Global Health—draws on augmented reality, machine learning, soft-tissue modeling, eye-tracking technology and assistive (haptic) force feedback to make training more effective for new users.



HIBA BAROUD SELECTED FOR GLOBAL YOUNG ACADEMY

Hiba Baroud, A. James and Alice B. Clark Foundation Faculty Fellow and associate chair of the Department of Civil and Environmental Engineering, has been selected for membership in the Global Young Academy. She joins the world's top 200 young researchers and professionals to contribute innovative and creative solutions that address critical global challenges.

The GYA's new member cohort of 41 includes representatives from 31 individual countries, covering all GYA general disciplines, and includes 16 women, 1 non-binary and 24 men.

Baroud was selected for her pioneering research in understanding the resilience of infrastructure to climate-driven disasters and the tools and methods she has developed to support decision makers in communities who rely on this infrastructure. She has exercised her methods in communities round the world, including in Bangladesh, Sri Lanka, Jordan and Guatemala.

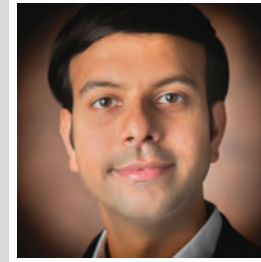


PETER CUMMINGS NAMED TO NATIONAL ACADEMY OF ENGINEERING

Vanderbilt scholar Peter T. Cummings, the John R. Hall Professor of Chemical Engineering, emeritus, has been elected to the National Academy of Engineering.

In an announcement released February 7, 2023, the Academy cited Cummings for his "simulation-based solutions to chemical engineering problems, and for innovations and leadership in modeling and computational nanoscience."

Cummings spent 20 years at Vanderbilt as a faculty member and administrator for the School of Engineering before retiring in the fall of 2022. His work has made a significant impact on the field, resulting in numerous publications, patents, and innovations.



PIRAN KIDAMBI RECEIVES DISTINGUISHED GRANT TO DEVELOP HIGH-RES IMAGING OF LIVE VIRUSES

Piran Kidambi, assistant professor of chemical and biomolecular engineering, has been awarded a grant to further his research into capturing high-resolution images of live viruses in tissues. The three-year grant from Chan Zuckerberg Initiative's Frontiers of Imaging is one of 20 awarded worldwide with the aim of revolutionizing the study of viruses, human health and vaccines.

Kidambi's project will work to develop devices to enable direct imaging of live viruses—which would allow scientists to witness the physical changes to viruses in real time. His research is focused on understanding the synthesis of nanomaterials for health care, energy, electronic and catalytic applications. The success of this project could dramatically improve virology, vaccine development, oncology and human health.

In June 2022, his work received funding through the U.S. Department of Energy.

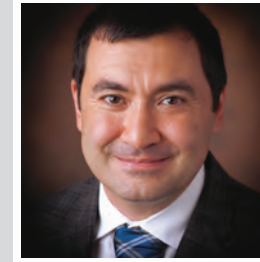


SANKARAN MAHADEVAN RECEIVES PRESTIGIOUS ASCE GEORGE WINTER MEDAL

The American Society of Civil Engineers has honored Vanderbilt engineering professor Sankaran Mahadevan with the 2023 George Winter Award for technical contributions as a structural engineer, creativity as a professional musician, composer and teacher, and exemplary research in the fields of risk and reliability and machine learning.

Mahadevan is the John R. Murray Sr. Professor of Engineering and an internationally recognized Carnatic classical music composer, vocalist and teacher. The Winter award honors the achievements of a structural engineer who exhibits equal passion for science and art. The award was presented at the 2023 Structures Congress in May.

Mahadevan is a professionally trained vocalist in Carnatic music, commonly associated with South India, and has performed for 30 years in concerts and music festivals in India and the United States. He lectures and offers workshops on Carnatic music, composes music and produces recordings.

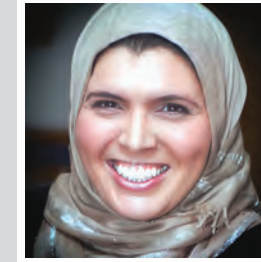


MIKAIL RUBINOV RECEIVES NSF AWARD TO DEVELOP NEURAL ANALYSIS METHODOLOGY

Mikail Rubinov, assistant professor of biomedical engineering, has been awarded \$600,000 from the National Science Foundation to develop new computational methods for analysis of large-scale brain activity data.

The three-year project was awarded alongside a companion project from the U.S.-Israel Binational Science Foundation (BSF). Catie Chang, assistant professor of electrical and computer engineering, and computer science, is Co-Principal Investigator.

"Ongoing changes in motivation, mood, and alertness, play an important role in healthy brain function, and are disrupted in neurological and psychiatric disorders," Rubinov said. "The project will analyze neural circuitry that underpins these changes."

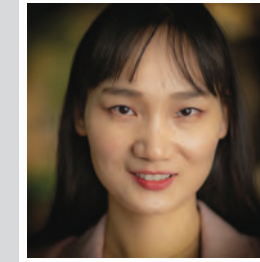


MONA EBRISH NAMED SENIOR MEMBER OF THE IEEE

Mona Ebrish, who joined the Vanderbilt faculty in January 2023 as assistant professor of electrical and computer engineering, has been designated a senior member of the Institute of Electrical and Electronics Engineers, the highest professional grade of the IEEE.

Prior to joining Vanderbilt, Ebrish was a postdoctoral fellow at the U.S. Naval Research Lab in Washington, D.C., investigating wide-bandgap semiconductors for high-voltage applications.

Ebrish's research focuses on developing multiple techniques to fabricate and evaluate biological and chemical sensors that can be integrated with specialized circuitry. That work has resulted in more than a dozen patents. Her research also complements projects underway at the Vanderbilt Institute of Nanoscale Science and Engineering and the Institute for Space and Defense Electronics.

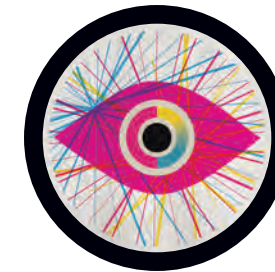


MAIZIE (XIN) ZHOU RECEIVES OVER \$2 MILLION FOR GENOME SEQUENCING RESEARCH

Maizie (Xin) Zhou, assistant professor of biomedical engineering and computer science, is the recipient of a \$1.9 million award from the National Institutes of Health. She has also received \$120,000 from Complete Genomics, a leader in human genome sequencing.

The Maximizing Investigators' Research Award (MIRA) from the NIH will support Zhou's research on designing the next generation of computational genomics algorithms for the detection of challenging variations of the human genome known as structural variants, using cutting-edge, high-throughput sequencing data.

She will use funding from Complete Genomics to improve computational tools for assembly and genome-wide variant detection.



EYE

ON THE PRIZE

Engineering professor **GAUTAM BISWAS** applies eye tracking technology and machine learning algorithms to education and training environments.

Story _ **LENA ANTHONY** Photographs _ **ROBBIE KLEIN**

F

First-year nursing students, U.S. Army soldiers and a middle school science class might seem very different at first glance. But when you consider the recent work of Cornelius Vanderbilt Professor of Engineering Gautam Biswas, the similarities become clear.

Each group has been a test case for Biswas' research, which collects multimodal data such as clicks on a computer, hand gestures, eye gaze position and speech and then applies artificial intelligence and machine learning algorithms to help analyze how students learn and how trainees perform.

The goal is to provide constructive feedback to the learners and instructors so they can do their work more effectively, as well as to give useful insights to curriculum and simulation designers so they can improve learning tools.

"What students are looking at, where they're standing, how they move around and interact with the other people in the room, all of these are important details that can be captured, analyzed and used to improve the learning process," Biswas says. "Instructors can't observe all of this detail on their own. Or if they do capture it in the moment, it is difficult for them to remember all the details and be able to point back to them later. The idea of the technology, then, is not to replace the instructor, but to empower them and help them provide more contextualized feedback to their students."

For a study that appeared in the July 2022 edition of *Frontiers in Artificial Intelligence*, first-year nursing students in the Vanderbilt School of Nursing simulation lab worked in teams to diagnose and treat an interactive manikin controlled by a simulation program

and their instructor. The lab was rigged with a variety of sensors which the students wore, including eye-tracking glasses, which helped the researchers detect where the students moved, what they touched and where they looked as they diagnosed and treated the manikin's condition. Meanwhile, machine learning algorithms operated in the background to detect relevant objects around the room and help piece together a timeline of who did what and when. A follow-up paper that will focus more specifically on the eye-tracking data and analytics has been accepted for presentation at the 2023 International Learning Analytics and Knowledge Conference.

This study and a similar one Biswas did with U.S. Army soldiers conducting a room-clearing exercise were funded by an Army Research Laboratory Award and a National Science Foundation Cyberlearning Award.

Mary Ann Jessee, assistant dean for academics in the School of Nursing, says this type of interdisciplinary collaboration has the potential to transform both the teaching practices of instructors and the professional capacity of graduates. For health care providers, the end result is more "safe, quality nursing care," Jessee says.

Cracking the Code of Education

Biswas' work in K-12 education falls under the \$20 million National Science Foundation AI Institute for Engaged Learning, which was formed in 2021 and includes engineering and education faculty from Vanderbilt, as well as contributors from

North Carolina State University, Indiana University, the University of North Carolina at Chapel Hill, and the educational nonprofit Digital Promise.

Peer-reviewed journals, multi-year grants from the NSF—Biswas sees these as progress in his efforts to apply AI to education. But there's still a long way to go before AI can be seamlessly introduced into classrooms to benefit students and their teachers.

"We have a variety of sensors that can collect this data. We have machine learning experts who can help process this data and give us the results we're looking for," Biswas says. But, he observes, everything in between—such as processing the data online and using methods that are grounded in education theories to provide personalized feedback to students and help teachers analyze the situation in a classroom in a way that benefits students—is a technical, computational and, in some cases, intellectual challenge.

Biswas, who also is a professor of computer science and computer engineering, has been interested in AI since the beginning of his career, around 1984.

"When I got my Ph.D., artificial intelligence was well known, but it wasn't the hot topic it is today," he recalls. "My training was in pattern recognition and image processing, but to me, AI always had the potential to solve much more interesting problems. Luckily, it wasn't difficult to make the transition, because the basic techniques are the same."

Since joining Vanderbilt's faculty in 1988, Biswas has focused on AI in a variety of applications. He is well-known for his role in the development of autonomous fault detection

"Schools don't have the computing infrastructure needed to support our data needs. This infrastructure exists, but not in education."



and fault adaptive control mechanisms for complex machines, like spacecraft, smart buildings, aircraft, and now unmanned aerial vehicles.

They may seem like different research topics, but anomaly detection in a machine is not that different from parsing the actions of a learner. “In each case, we’re applying computing methods to an engineering problem,” Biswas says.

A few decades ago, researchers at Peabody College of education and human development at Vanderbilt had an engineering problem on their hands, i.e., reams of paper-based student learning data that were too tedious to analyze. And so, John Bransford, the late Centennial Professor of Psychology and Education and director of the Learning Technology Center at Peabody, and Dan Schwartz, who co-created the “How People Learn” framework with Bransford, tapped Biswas to build a computer-based system to collect the necessary data and analyze it quickly using AI methods.

Biswas says this project opened his eyes to the possibility of using engineering models to help teach STEM topics to kids.

“Bransford and Schwartz were all about trying to teach students science using problems that are realistic,” he says. “The idea was to get kids excited to solve those problems and then introduce them to the scientific concepts behind them.”

During the 2022–23 school year, students at a Nashville middle school piloted a computational program to help them learn about scientific processes, like flooding and water runoff after a heavy rainfall, as well as coding concepts used to build science models and solve engineering problems.

Biswas designed the program with collaborators from the University of Virginia and the nonprofit education research institute SRI International. Vanderbilt Engineering students developed AI and analytics methods to gain insight into students’ activities in the computing environment, which in turn helps teachers understand how students work to solve scientific problems and where they have difficulties. A future iteration of the program will feature an AI agent that can interact with the students as they work

through the problems.

This, in fact, is the goal of the AI Institute for Engaged Learning—to create embodied AI agents that serve as participants and can play multiple roles in the learning exercise, such as mentor, peer or teachable agent.

“The agent might notice that one student in a group is doing all of the work, for example,” Biswas says. “Or if students seem stuck on a concept, the agent might suggest trying a new method. Because we’re capturing all this multimodal data—via cameras, microphones, eye tracking devices—our algorithms can analyze students’ learning processes and behaviors and respond accordingly via the agent.”

First, Biswas and his colleagues need data—lots of it—to train these agents. Luckily, just five minutes of interactions throughout a classroom can produce megabytes of data. Imagine the data from a three-week-long coding curriculum. “Schools don’t have the computing infrastructure needed to support our data needs,” he says. “This infrastructure exists, but not in education.”

Applying AI in the Real World

To help address this challenge, Biswas and his colleagues at the AI Institute have applied for NSF funding to build a demonstration classroom at Vanderbilt. “This will be a controlled environment where we can build the infrastructure and test our algorithms before we try to migrate it to the noisy real world of a classroom.”

But therein lies an interest-

ing question. Can data collected in one classroom at one type of school translate to a different classroom setting that might have different demographics? Should the AI agent behave the same or differently?

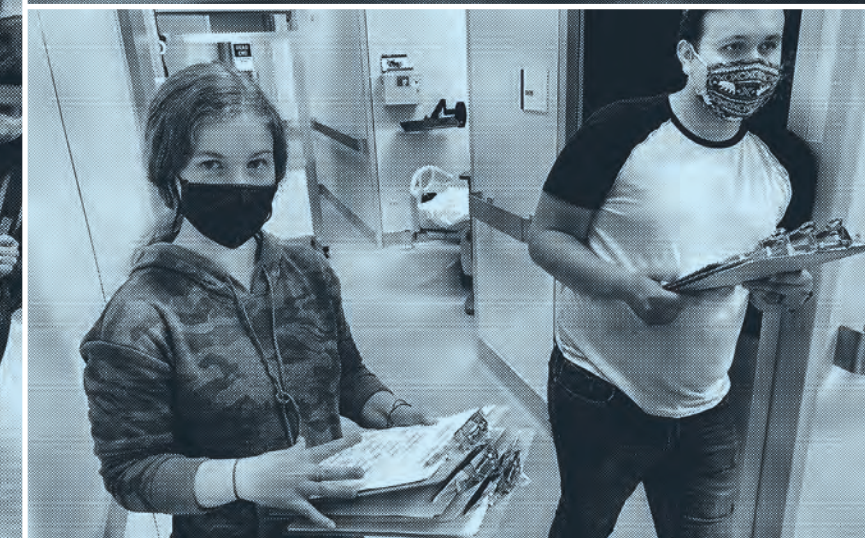
“How students gesture, their poses and their speech might be quite different depending on the demographics of the classroom,” Biswas says. “Our challenge is training our algorithms to recognize those differences.”

Other ethical questions revolve around consent, privacy and security, but Biswas is not alone in working through these and other challenges. Part of the AI Institute, his multimodal analytics group includes Maithilee Kunda, assistant professor of computer science and computer engineering, research scientist Nicole Hutchins, PhD’22, and four graduate students.

His colleagues also come from other parts of the university—the College of Arts and Science, Peabody College and the Wond’ry, Vanderbilt’s Innovation Center.

The AI Institute has made questions of ethics, diversity and social impact foundational to their approach, tapping Ole Molvig, assistant professor of history, as head of AI ethics across the institute.

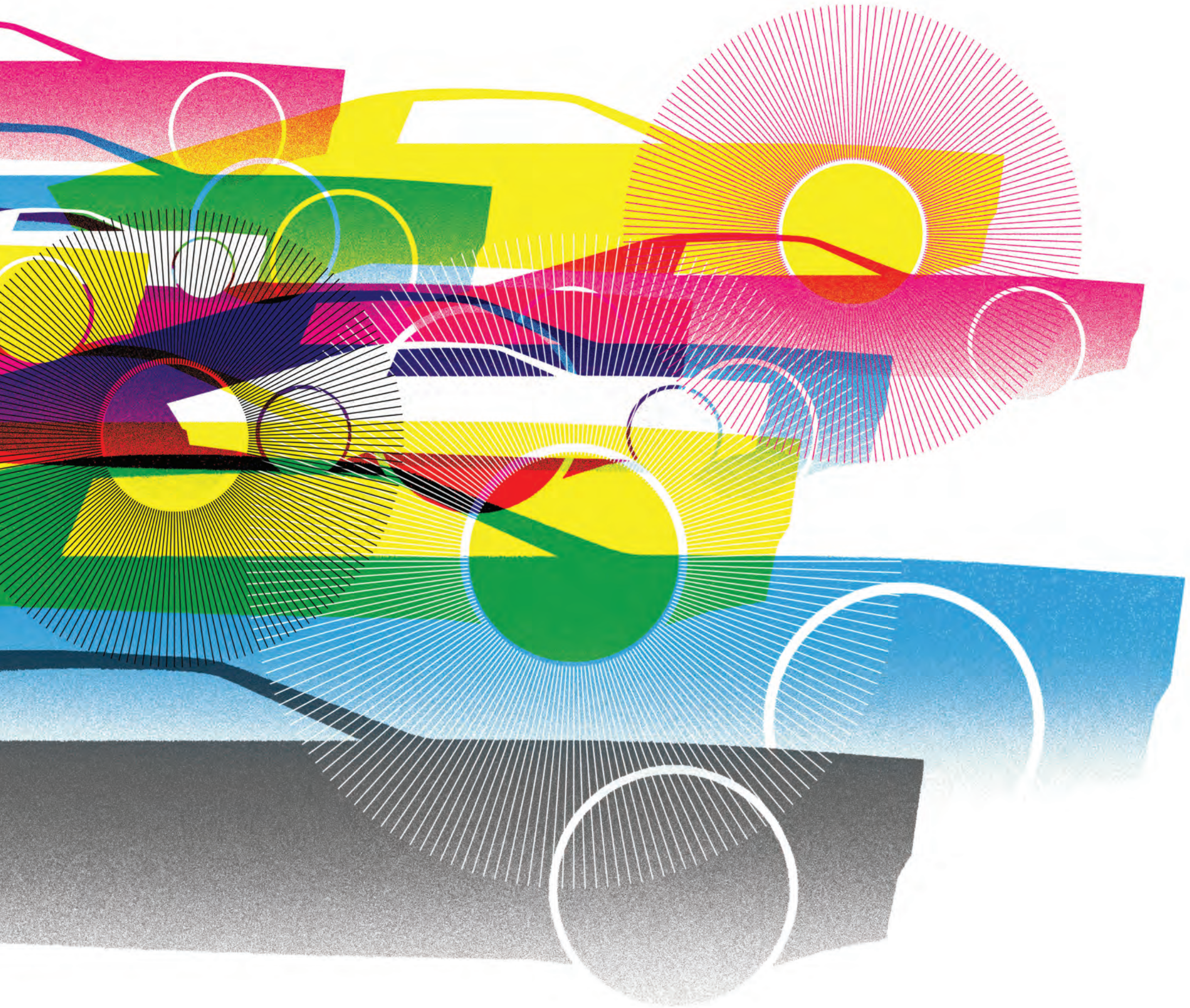
“This type of cross-disciplinary, even cross-school, collaboration is precisely what makes working at Vanderbilt so exciting,” Molvig says. “As a humanist working in technology and innovation, the opportunity to work with colleagues from computer science and education on thorny problems that really matter has been incredibly rewarding.”



CASTING AN “AI” ON HOW STUDENTS LEARN

Vanderbilt graduate and undergraduate students from the School of Engineering, as well as the Peabody College of Education, work in the School of Nursing’s simulation lab to test equipment that tracks the eye movement of learners as they make health assessments and search for correct patient diagnoses. The work is part of a collaborate research project between Gautam Biswas, Cornelius Vanderbilt Professor of Engineering, Daniel Levin, professor of psychology and human development at Peabody and Mary A. Jessee, assistant dean for academic and associate professor, in the School of Nursing.

DINA BAHAN



Can AI end traffic jams? Vanderbilt researchers help lead real-world test of AI-powered cruise control system that may pave the way to fuel efficiency, traffic relief

STORY
Lucas Johnson
ILLUSTRATION
Brian Stauffer

10 Car Test

Researchers at Vanderbilt University are playing a major role in the development of an AI-powered cruise control system that could ease traffic congestion and lessen trips to the gas pump. The CIRCLES Consortium, consisting of Vanderbilt and several other universities, in coordination with Nissan North America, Toyota, GM, and the Tennessee Department of Transportation, concluded a five-day open-track experiment this fall.

Researchers were testing an AI-powered cruise control system designed to increase fuel savings and ease traffic using 100 specially equipped vehicles comprised of Nissan Rogues, Toyota RAV4s and a Cadillac XT5.

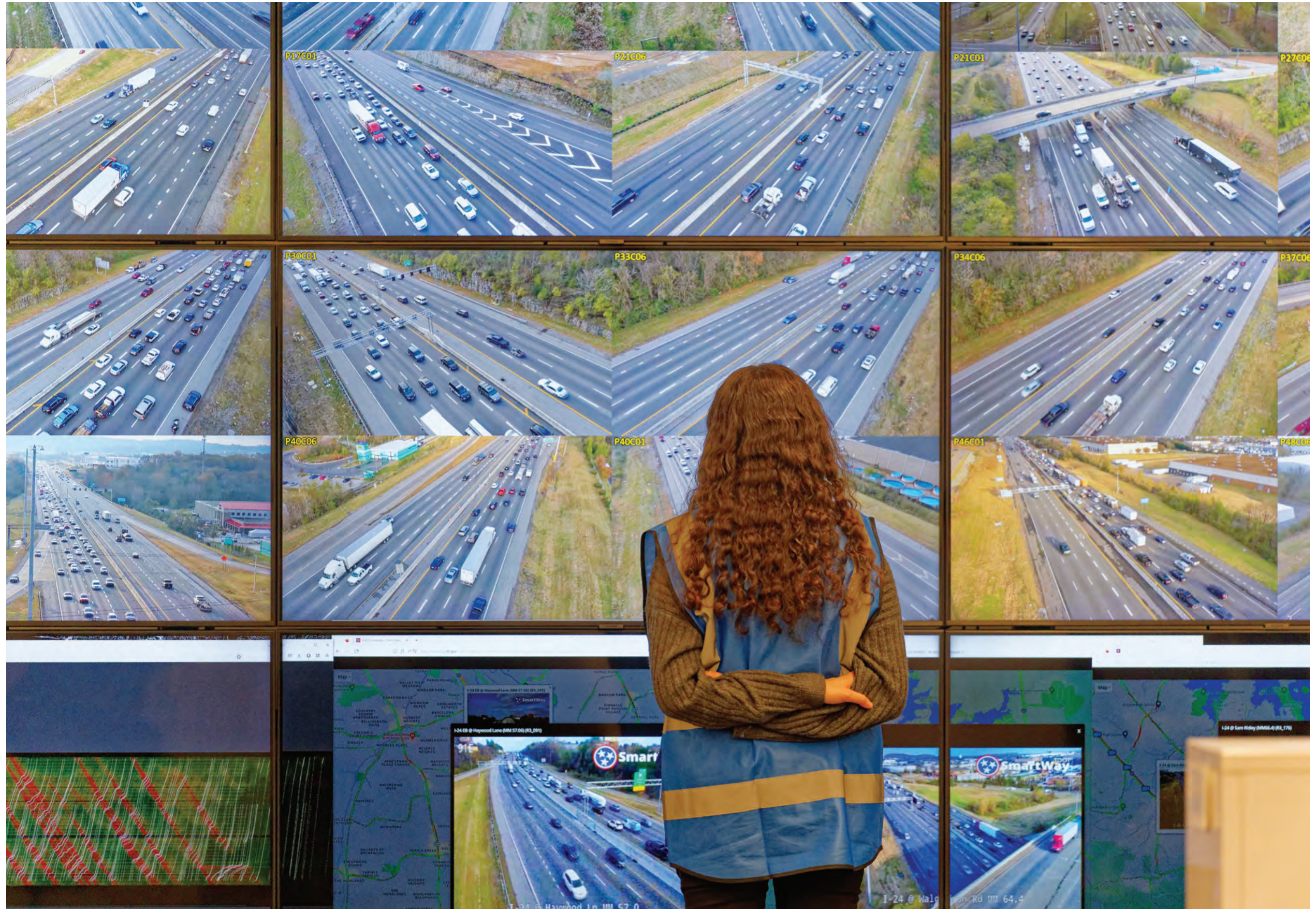
The experiment—which ran from Nov. 14 through Nov. 18 on a sensor-filled portion of U.S. Interstate 24—aimed to replicate results from an earlier, closed-track study where a single AI-equipped vehicle smoothed human-caused traffic congestion, leading to a 40 percent fuel savings.

The test was conducted on the recently opened I-24 MOTION testbed, the only real-world automotive testing environment of its kind in the world. Stretching for four miles southeast of downtown Nashville, the smart highway is equipped with nearly 300 4K digital sensors capable of logging 260,000 vehicle-miles of data per year.

“In this most recent test, we wanted to understand how well our earlier results fared in real-world conditions and on a larger scale,” said Daniel Work, professor of civil and environmental engineering at Vanderbilt University. “The concept we’re hoping to demonstrate is that by applying artificial intelligence technology to existing cruise control systems, we can ease traffic jams and improve fuel economy.”

Other contributions Vanderbilt re-

ONE OF THE CIRCLES CONSORTIUM RESEARCHERS WATCHES REAL-TIME TRAFFIC VIDEO ALONG A STRETCH OF THE I-24 SMART CORRIDOR. THE SYSTEM WAS BEING USED TO TRACK A FLEET OF MORE THAN 100 AI-EQUIPPED VEHICLES OVER THREE DAYS IN NOVEMBER, 2022 AS PART OF A FIRST-OF-ITS-KIND TRAFFIC EXPERIMENT.



100

searchers made to the experiment include integration into the cars to field experimental controllers that could be safely deployed; development of the I-24 MOTION measurement system; driver recruitment and training; and the partnership with Nissan to get 100 cars.

“Nissan has always been a pioneer in automotive innovation, and with our long-term vision, Nissan Ambition 2030, we know our future is autonomous, connected and electric,” said Liam Pedersen, deputy general manager at the Nissan Alliance Innovation Lab in California’s Silicon Valley. “CIRCLES shares our common goal of building a safer, cleaner world by empowering mobility.”

Work explained that just one AI-equipped vehicle could change the driving behavior of up to 20 surrounding cars, causing a kind of positive ripple effect in day-to-day traffic. He and colleagues will spend the next several months analyzing data collected on the AI-equipped vehicles and their impact on the flow of traffic over the duration of the experiment.

According to INRIX, Inc., a world leader in mobility analytics and connected car services, the typical American driver last year lost 51 hours in congestion, up 15 hours from 2021. As a result of the return to the office, higher fuel prices and inflation, congestion cost the average driver \$869 in time lost, up \$305 from last year, and higher fuel costs saw an average increase of \$129 more being spent at the gas pump to commute.

When it comes to transportation and mobility in Tennessee in particular, Deputy Governor and TDOT Commissioner Butch Eley said, “we are at a critical juncture.”

“Traffic congestion is now becoming



JONATHAN SPRINKLE (TOP LEFT), PROFESSOR OF COMPUTER SCIENCE, AND DANIEL WORK, PROFESSOR OF CIVIL AND ENVIRONMENTAL ENGINEERING (BOTTOM RIGHT), LEAD GROUPS OF VOLUNTEER DRIVERS THROUGH INFORMATION SESSIONS ABOUT THE TRAFFIC EXPERIMENT. RESEARCHERS USED A SPACE OWNED BY METRO NASHVILLE AT THE FORMER HICKORY HOLLOW MALL IN ANTIOCH, TENNESSEE AS ITS OPERATIONS CENTER DURING THE THREE DAY TRAFFIC TEST.

16, 2022
 Training & Training

ing more prominent throughout Tennessee, and not just in urban areas,” he said. “Addressing these challenges will force us to think critically about solutions, as transportation infrastructure projects traditionally are not identified nor completed before traffic congestion more dramatically affects our quality of life. One of these solutions is greater use of technology to enhance mobility. We are confident that this project and others like it will further strengthen Tennessee’s reputation for being a hub of automotive excellence.”

Meredith Cebelak is an adjunct instructor in civil and environmental engineering at Vanderbilt and Tennessee transportation and transportation systems management and operations department leader at Gresham Smith. She said the I-24 MOTION testbed is key component of the experiment that will allow researchers to “study in real time the impact connected and autonomous vehicles have on traffic in an open road setting.”

“The permanent infrastructure has been designed and installed, meaning the testbed will always be ‘on’ and available to researchers,” she said. “By unlocking a new understanding of how these vehicles influence traffic, vehicle, infrastructure, and traffic management strategies, design can be optimized to reduce traffic concerns in the future to improve safety, air quality and fuel efficiency.”

Vanderbilt Vice Provost for Research and Innovation, Padma Raghavan, said the CIRCLES Consortium experiment demonstrates the power of research collaboration and partnership.

“Technological progress does not happen in a vacuum,” Raghavan said. “From its earliest inception, all the participants in this research have played vital roles.”

THE GROUP LEASED 97 VEHICLES FROM NISSAN NORTH AMERICA TO USE FOR THE TEST, WITH ADDITIONAL CARS MADE AVAILABLE BY TOYOTA AND GM. LEAD RESEARCHERS ALEXANDRE BAYEN FROM THE UNIVERSITY OF CALIFORNIA, BERKELEY, SPRINKLE AND WORK (UPPER RIGHT) ENJOY A BRIEF RESPIRE FROM THE NEARLY AROUND-THE-CLOCK WORK TO COORDINATE THE TEST.



Visionary App

When Chris Webb (above) graduated from Vanderbilt University in 1990, he was not sure how he would use his electrical engineering degree. But after a friend’s accident, the School of Engineering alum found his purpose through the creation of cutting-edge technology that is helping visually impaired people get around independently.

Webb is the CEO/co-founder of Foresight Augmented Reality (FAR) based in Atlanta, Georgia. His system utilizes ultra-wideband technology and audio messages to assist visually impaired individuals with everyday activities such as locating a car, hailing or getting into a rideshare vehicle or arriving at an exact location, like a particular gate at a stadium.

He was inspired to start the company after a friend, who is blind, was struck by a car while walking with his service animal.

“Too many technologies are developed and then, as an afterthought, they are made accessible to people with disabilities,” says Webb, whose UWB technology was a recent semifinalist in the U.S. Department of Transportation’s Inclusive Design Challenge.

“Things need to be accessible to people with disabilities from the start.”



Vanderbilt Supercharges Its Computer Science Program.

BOOM

Story __ LUCAS JOHNSON

Illustration __ GREG MABLY

In the early months of 2020, just as the COVID-19 pandemic was scrambling university budgets and hiring plans across the country,

Vanderbilt saw a golden opportunity to catapult its rapidly growing computer science program into the upper ranks of this booming field.

In September of that year, the university launched Destination Vanderbilt, a \$100 million initiative to recruit new faculty over and above normal hiring. The initiative targeted several key growth areas, with computer science being a primary focus.

Since Destination Vanderbilt launched, the computer science department has hired 14 new tenure-track faculty members—nearly doubling its ranks—and it continues to experience record undergraduate and graduate enrollments each year. The department has also launched several successful online programs, including a CS Master of Science program that was ranked No. 1 by *Fortune* in July 2022.

But the department is hardly a silo. As data science and computational methods reach into fields spanning everything from the life sciences to law and business—even the humanities—faculty members are working across a variety of disciplines.

“For over a decade, but especially in the last two years, Vander-

bilt’s computer science department has experienced incredible growth that is drawing the attention of top-ranked faculty and students,” says department chair Xenofon Koutsoukos, the Thomas R. Walters Chair of the Department of Computer Science. “We plan to continue to build on that momentum by showcasing the innovative research produced by those special faculty and students who selected Vanderbilt as their destination.”

According to the Computing Research Association, which tracks computing degrees at about 200 universities, the number of undergraduates majoring in computer science more than tripled from 2011 to 2021, to nearly 136,000.

Enrollment figures in Vanderbilt’s CS department reflect those trends. In the fall of 2011, the School of Engineering had an enrollment of 95 (including double majors) undergraduates in computer science. By fall 2022, that number jumped to 757 (including double majors). At the graduate level, Vanderbilt’s MS program had an enrollment of 11 in 2011, and 56 Ph.D. students. By 2022, those numbers rocketed to 173 and 127, respectively. The biggest increases occurred after 2020, when Vanderbilt start-

ed its online CS master’s program. In 2020, there were 67 students enrolled. Two years later, it jumped to 173.

“We’re seeing a healthy growth in the enrollment in our MS and Ph.D. programs in computer science, especially over the last three years,” says E. Duco Jansen, senior associate dean for Graduate Education and Faculty Affairs in the School of Engineering. “In the MS program, our No. 1 ranked online CS master’s degree program is largely responsible for this growth. The Ph.D. program has seen significant growth, as we nearly doubled out CS faculty, and thus our research portfolio over the past three years.”

New Faculty

The goal of Destination Vanderbilt is to hire 60 new faculty university-wide. Of that number, 20 are to be hired in computer science. James Weimer is one of the 14 new faculty members who have joined the department through the hiring initiative. He runs the internet-of-medical-things (IoMT) lab at Vanderbilt and was recently recognized by *Time* magazine for developing an algorithm that powers Neuralert, a non-invasive wearable bracelet that detects strokes. *Time* called it one of the top inventions of 2022 and the FDA designated it as a breakthrough device. Weimer says part of the reason he chose to come to Vanderbilt was because of its top-rated medical center next door.

“My research and what I work on in the intersection of computer science and medicine and cyber physical systems (CPS) requires basically those things to be in place,” says Weimer, an assistant professor of computer science who came to Vanderbilt from the University of Pennsylvania. “Vanderbilt has one of the strongest CPS groups and a world-class medical center. It was a great opportunity, and I took it.”

The multi-year faculty recruitment and hiring initiative seeks to fill tenure-track positions at the assistant, associate, and full-professor levels, but with preference at

“Our students are well-rounded. They’re not only strong technically, but they have a strong education in the liberal arts and social science. They know how to communicate, how to lead.”

XENOFON KOUTSOUKOS,
THE THOMAS R. WALTERS
CHAIR OF THE DEPARTMENT
OF COMPUTER SCIENCE



early-career appointments. “Hiring computer science professors in this economy is extremely competitive and we work to attract the most qualified candidates,” says Julie Johnson, associate chair of the Computer Science Department. “The fact that five of our recent hires are women demonstrates the depth of qualified women candidates in a field where their total number is in decline. I’m pleased that Vanderbilt’s CS Department is seen by women as a place where they can thrive as academics.”

Peng (“Dana”) Zhang, assistant professor of the practice of computer science, is another one of the new hires in the department. Zhang, whose expertise includes blockchain research, healthcare interoperability, and data science education, says the department’s interdisciplinary collaborations is one of the main reasons she is at Vanderbilt.

“I am most impressed with the broad range of research expertise of the CS department and its trans-institutional collabo-

ration opportunities to further enhance students’ learning as well as research experience,” Zhang says. “Since I joined Vanderbilt as faculty, I have had the opportunity to instruct graduate students and mentor them in research at the data science institute and in the online MS CS program. Additionally, I have been mentoring undergraduate students in applied research to help facilitate data sharing for rare disease communities through VU immersion projects and research courses. I plan to contribute to the enrichment of the undergraduate research experience here in addition to creating advanced courses that focus on cutting edge topics that are in use or currently being explored in the industry.”

Jie Ying Wu, assistant professor of computer science who specializes in medical robotics, joined the faculty in 2022 and says she was also attracted to Vanderbilt because of its collaborations and the fact that there are already established researchers working on surgical robotics.

“I plan to work on making surgical tools and robots smarter; I want tools to have better models of the surgeon’s intent and thus be better able to support them,” Wu says. “I’m also looking to use surgeon metrics such as eye-gaze and pupillometry to improve surgical training so that novices acquire skills faster and retain them longer.”

Interdisciplinary Collaboration

Vanderbilt’s computer science program has long been supportive of interdisciplinary work, but in recent years has increased collaboration with departments across the university. The research and teaching activities range from artificial intelligence and cyber security to clean energy and medical devices.

One collaboration that is becoming more typical at Vanderbilt is something like the work of Catie Chang, a multidisciplinary Vanderbilt scientist who holds faculty appointments in electrical and computer engineering, computer

science and biomedical engineering. She has several Vanderbilt collaborators – including researchers from Peabody College, the Department of Psychology, the Institute for Imaging Science, and the Department of Biostatistics – to research new computational methods for understanding how the brain works.

“Neuroimaging research is definitely enriched by collaboration with scientists from a range of backgrounds,” Chang says. “Through our collaborations, we also become aware of scientific questions that may benefit from the development of new data analysis methods, inspiring directions of work in our lab.”

Doug Schmidt, associate chair of the Computer Science Department, says such collaborations are also attractive to funding agencies.

“The days of purely disciplinary work, while not entirely gone, are certainly less emphasized in funding agencies nowadays than they used to be 10, 20, 30 years ago,” says Schmidt, who is also a computer science professor at Vanderbilt. “If

you want to continue to be competitive as an academic, it’s helpful to team up with people in other disciplines. And Vanderbilt’s really been a leader in this.”

The collaborations also provide enhanced research and teaching opportunities that further help prepare students for a competitive global job market.

Workforce Demand

Between 2021 and 2031, employment for software developers is expected to grow 25 percent, according to projections from the Bureau of Labor Statistics. In Vanderbilt’s CS program, nearly 80 percent of the students who graduated in May 2022 received job offers from companies like Amazon, Capital One, Facebook, Google, and Microsoft, just to name a few, with average starting salaries around \$180,000.

“Our students are well-rounded,” Koutsoukos says. “They’re not only strong technically, but they have a strong education in the lib-

eral arts and social science. They know how to communicate, how to lead.”

It is these types of students that draw the attention of tech business partners and Vanderbilt alumni Andrew Kerr, BA ’00 and M.Ed. ’03 and Logan Buchanan, BS ’09. They own a Nashville-based company called FortyAU, which specializes in custom application development, such as websites, mobile apps, enterprise software, and data analytic solutions.

In the last two years, they have hired at least 10 CS Vanderbilt graduates. In addition to being well-rounded, Kerr says graduates usually have some type of hands-on experience.

“One of our best developers that came out of Vandy, we met him on a startup when he was an undergrad,” Kerr says. “He was getting hands-on experience solving real-world problems. Anybody that we hire nowadays directly out of school, I’m looking for something else on their resume that shows they’ve taken that technolo-

gy and used it in real-world situations; we’re looking for that applicability.”

Buchanan recalls one computer science class at Vanderbilt his senior year in which the professor made sure he and his fellow classmates knew how to apply their knowledge to real-world situations.

“He said, ‘I think a lot of you don’t quite understand how to really write an actual piece of code or an application.’ So, he walked us through it,” Buchanan says. “He reinforced the previous three years. He was able to relate what we had learned, how it should be applied. And I think everyone I graduated with in 2009 came out with a pretty strong understanding of actually how to write code right when they got into the workforce.”

Vanderbilt doctoral student Sam Hays strongly believes in workforce readiness. He got a master’s through the university’s CS online program and is a year into his doctorate. Even though he has years of experience in his field, he says Vanderbilt instructors are providing him with tools that will

help in preparing students for the workforce.

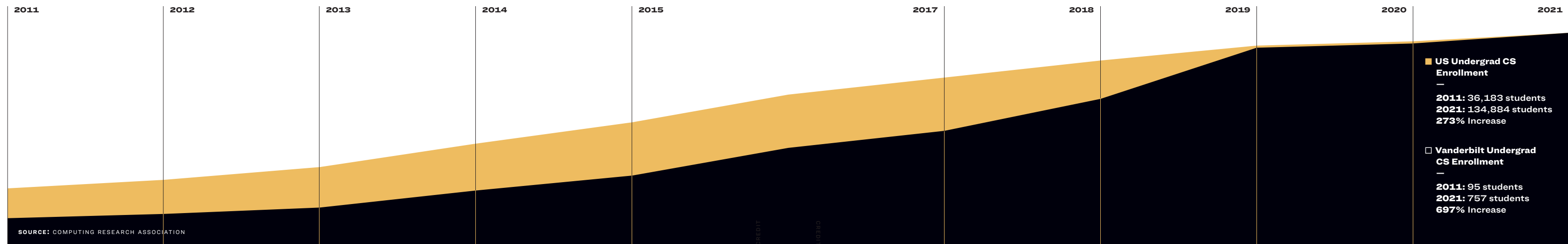
“I really appreciate the opportunity Vanderbilt has given me,” says Hays, who has close to 20 years of experience in the security field. “I’ve spent a lot of time in the business world. Going through school a little bit later in life, I’ve got a perspective about the delta between the world you see in industry and the world you see in academia.”

Rajay Freddie of Winter Garden, Florida, is a junior in Vanderbilt’s accelerated BS/MS computer science program studying to become a software engineer. He says he appreciates the hands-on experiences the instructors provide and feels he’ll be ready to make a mark when he graduates.

“Having professors that are able to express the nuanced importance of various concepts in CS helps me to see how each portion of CS comes together to form the bigger picture in software engineering,” Freddie says. “I’m building the foundation I need to be the best at what I want to do.”

Undergrad Enrollment in Computer Science

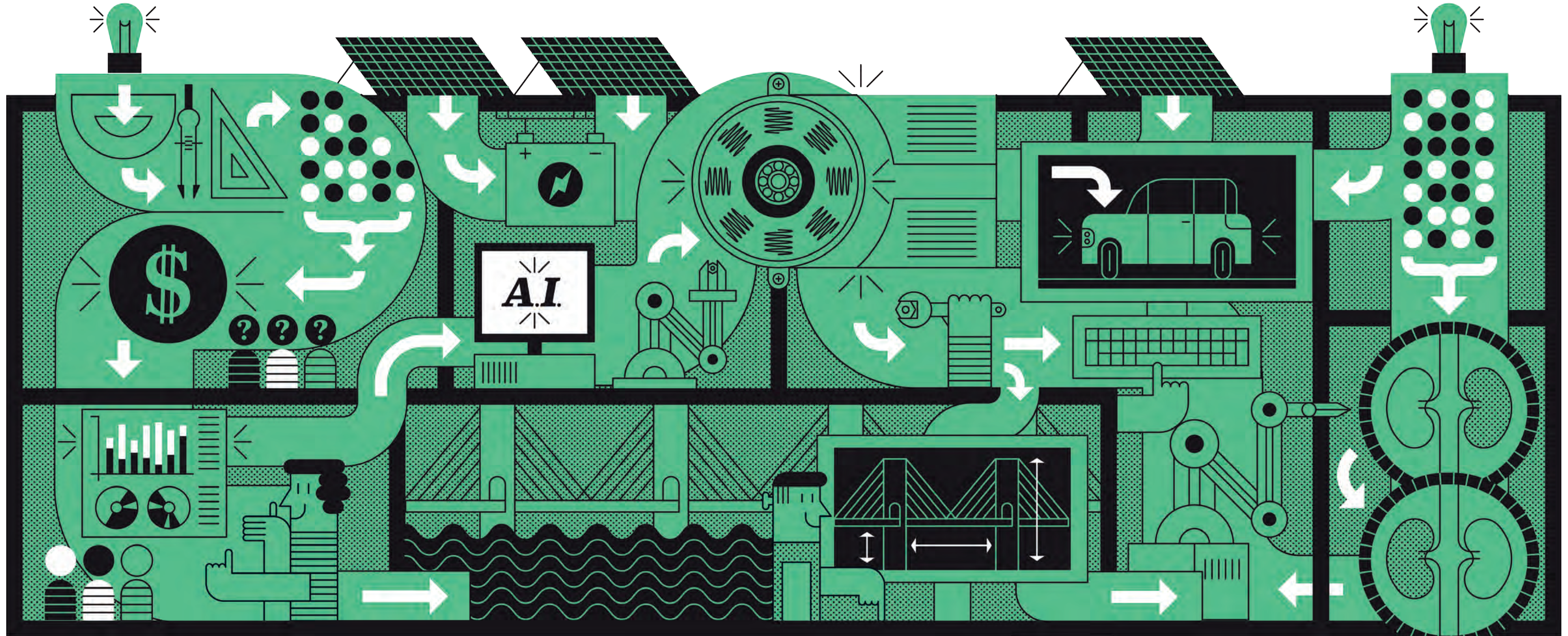
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DESIGN DAY '23

Text — LUCAS JOHNSON

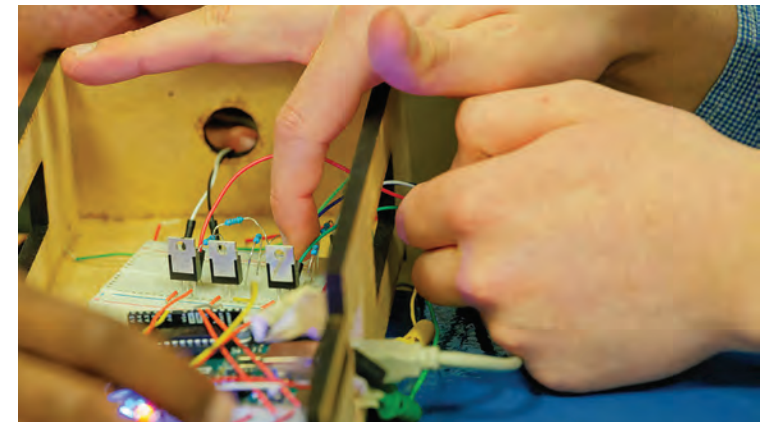
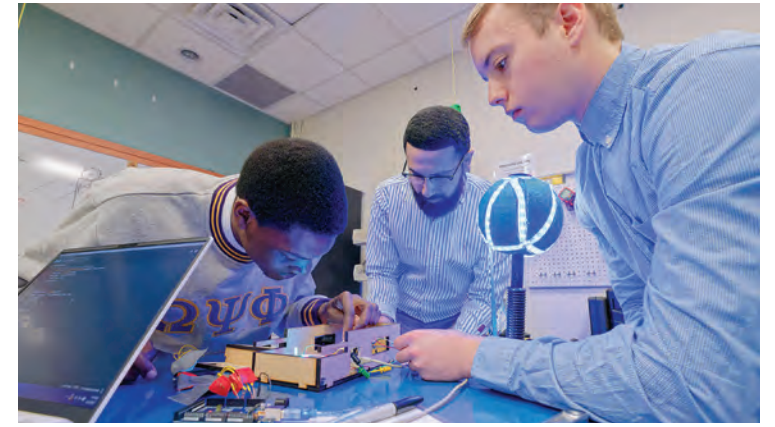
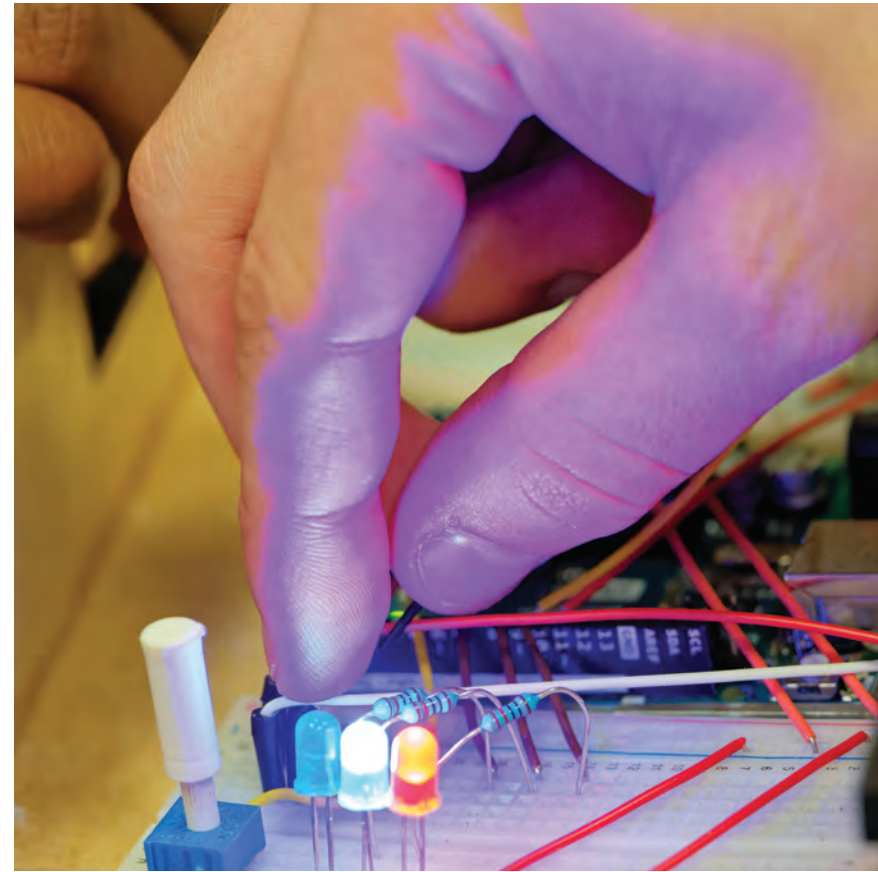
Illustration — JOHN DEVOLLE



GRADUATING ENGINEERING STUDENTS PRESENT THEIR FINAL CAPSTONE

PROJECTS TACKLING A RANGE OF REAL-WORLD TECHNICAL CHALLENGES.

For several years now, the end of the spring term has been a time for Vanderbilt's School of Engineering to showcase students' excellence. Design Day has come to be known as a celebration of all the lessons students have learned over four years of their engineering education. There were 54 senior design engineering capstone design projects for 2023. They were completed in partnership with sponsors including Capital One, Nissan North America, BASF, NASA Marshall Space Flight Center, Gresham Smith, Sterling Ranch Development Company, Booz Allen Hamilton, Vanderbilt University Medical Center, and many more. Design courses provide students with experience working on real-world projects that involve design constraints, budgets, reviews, and deadlines. Students learn about professionalism, teamwork, entrepreneurship, and resilience. As their projects take form, student teams interact with their industry and faculty advisers, hold meetings, write formal documentation, and present their work. By the end of the academic year, the teams produce design processes, systems, prototypes, simulations, or virtual demonstrations. Here's a look at three of those projects. To see this year's catalog of projects visit vu.edu/design.



LIGHT-BASED TRAINER

Mechanical Engineering

A critical component of boxing is reaction time and being able to read an opponent. Normally, you could practice this with a coach or a sparring partner. But if you're training at home that becomes more challenging. Mechanical engineering students Gehrig Abbattista, Paul Abdelmessih, Andy Haworth, Randy Kim, and Tre Sands developed a light-based training tool. The LED-equipped device flashes random colors that correspond to certain moves, such as red for a jab and blue for a hook. This lets boxers train against an opponent rather than on their own. Additionally, the device can sense the punches, providing instant feedback on the boxer's timing and speed.



KIDNEY QUICK-CONNECT DEVICE

Biomedical Engineering

Failure in kidney transplants is often rooted in the cellular damage that occurs while the donor kidney is separated from a blood supply. Students Lauren Babb, Morgan Butts, Jordyn Herrington, Addison White, and Qinzhe Xing want to shorten this time period. To do so, they designed a blood vessel quick-connect device to allow for a faster connection between the donor kidney and recipient vessels. The design consists of a single T-shaped scaffold. Small, zip-tie-like fasteners can then be used to secure vessels to the scaffolding externally for quick anastomosis formation.



EDUCATION TECHNOLOGY

Engineering Science

Students Tariq Bolden, Lorena Cruz, Imad Faqih, and Joe Homrigh want to help their peers become better learners. The group is working with alumni Casey and Andrew Ward who founded the EdTech start-up Notewardy, which is being redesigned as StudyCommon. The tool provides students with customized learning tools and interactive, neuroscience-backed study techniques. It leverages artificial intelligence and machine learning to improve students' level of knowledge absorption and preparedness while building communities of learning. The company is looking for recommendations on the redesign process.

METADATA

ALUMNI & FACULTY NEWS

ALUMNI NEWS

Success, Service, Character: Alumni and Friends Honored

Two business leaders and a retired Navy Vice Admiral will join the School of Engineering's Academy of Distinguished Alumni, and two business professionals associated with the school have been named a Distinguished Friend of the school. They were recognized in an induction ceremony at an April 20 Engineering Celebration Dinner.

The five honorees are School of Engineering alumni Douglas Chope, Vice Admiral (Ret.) William French, and Bob Higgins. Teresa Chope and Winston Hoy, both Vanderbilt alumni, will join the School of Engineering's Circle of Distinguished Friends.

"The newest members of the Academy of Distinguished Alumni and the members of our Circle of Distinguished Friends are leaving their marks on our world," said Philippe Fauchet, Bruce and Bridgitt Evans Dean. "Their achievements are truly worthy of our recognition and we are grateful for their interest in the School of Engineering and its mission."

The Distinguished Alumnus Award recognizes notable achievement, significant service and excellent character. The Distinguished Friends



FROM LEFT: VICE ADMIRAL (RET.) WILLIAM FRENCH, WINSTON HOY, DEAN PHILIPPE FAUCHET, TERESA CHOPE, BOB HIGGINS AND DOUGLAS CHOPE

Award recognizes individuals associated with the School of Engineering, but who are not alumni, whose professional, civic and philanthropic pursuits reflect the high standards and values associated with the school. Honorees are chosen by an awards committee that comprises the dean, faculty members and alumni representatives.

2023 DISTINGUISHED ALUMNI

Douglas Chope BOSTON

Douglas Chope BS'86, MBA'88 graduated from Vanderbilt's School of Engineering in 1986 and two years later earned his MBA at the Owen Graduate School of Management. He is currently Principal Solutions Engineer for Tableau, a data-visualization software company that

is now part of Salesforce. Over a 35-year career in the big-data industry, working for companies including Oracle and MicroStrategy, Chope has served in roles at the leading edge of data integration, analytics and visualization. In his position at Tableau, Chope helped develop innovative public health applications for New York City, as well as the states of Massachusetts, New York and New Hampshire. An active philanthropist, Chope serves on the boards of Brookline Music School and Excel Academy Charter. He and his wife, Teresa Ford Chope, BA'87, live in Boston and have three children, two of whom are current Vanderbilt undergraduates.

William French WOODBIDGE, VIRGINIA

Vice Admiral (Ret.)

William French BE'79 graduated from Vanderbilt University's School of Engineering in 1979 and was commissioned through the Naval Reserve Officers Training Corps program. Before retiring from the Navy in 2014, French served as an officer and commander on numerous submarines, including as commander of Submarine Squadron Three at Pearl Harbor, Hawaii. His final assignment was leading Navy Installations Command, where he was responsible for the Navy's 72 bases with oversight of all shore support operations worldwide. French earned a Master of Science from Naval Postgraduate School and a Master of Arts from the Naval War College. Following his Navy retirement, he served as the President and CEO of the Armed Services YMCA. He also serves as

a member of the National Advisory Committee for the Military Child Education Coalition and is a member of the Vanderbilt University NROTC Alumni Board.

Bob Higgins NASHVILLE

Bob Higgins BE'97 graduated from Vanderbilt's School of Engineering in 1997 and currently serves as president and CEO of Barge Design Solutions, where he launched his career. In his leadership role, Higgins has led the firm through a successful re-organization into core business units and has directed the development and implementation of key technical, project management, and leadership programs. Higgins currently services as vice chair of the School of Engineering's Board

JOE HOWELL

of Visitors. He recently helped establish a civil engineering scholarship that is funded through Barge by matching employee contributions, which will lead to two \$100,000 endowments. Higgins serves on the board for the Nashville Downtown Partnership is chair of the Nashville Area Chamber of Commerce. Additionally, he is a member of both the National and Tennessee Society of Professional Engineers (TSPE) and the American Society of Civil Engineers (ASCE).

2023 CIRCLE OF DISTINGUISHED FRIENDS

Teresa Ford Chope
BOSTON

Teresa Ford Chope BA'87 graduated with a degree in economics from Vanderbilt's College of Arts and Science in 1987 and holds an MBA from The Wharton School of the University of Pennsylvania. For more than 15 years, Chope held senior roles in pharmaceutical and biotechnology commercialization at Merck & Co., later consulting to companies including Genzyme and Biogen. In 2016, she changed her career focus and founded BOOST Journeys, a travel design firm committed to enriching lives through discovery and connection. As CEO, she and her team of experts work with families and executives to deliver personalized travel services. A longtime supporter of Vanderbilt, Teresa served as the 2022 General Chair for Vanderbilt's triple

reunion along with her husband, Douglas Chope, BS'86, MBA'88, and is co-chair of the Campaign Cabinet for the School of Engineering. She is also the former president of the Philadelphia Vanderbilt Alumni Chapter. The Chopes live in Boston and have three children, Clasby, Ford, class of 2023 and third generation engineering student; and Sallie, Peabody, class of 2024.

Winston Hoy, Jr.
MYRTLE BEACH, SOUTH CAROLINA

William Winston Hoy, Jr. BA'64, a native of Rutherfordton, North Carolina, entered Vanderbilt's School of Engineering as an undergraduate in 1957. He transferred to the College of Arts and Science where he received his BA degree in 1964. After graduation, Hoy returned to work in his family business in Rutherfordton. He moved to Myrtle Beach, South Carolina, in 1977 and continued to work in his family business until he retired in 2003 as Chief Executive Officer and Chairman of the Board of The Jackson Companies. In 1968, Hoy married Laura Chapman Jackson of Tryon, North Carolina. They have three children and eight grandchildren.



ÇAĞLAR OSKAY

Winston Hoy has been a loyal supporter of Vanderbilt as a member of the Oak Leaf Society since it began and has long supported the School of Engineering as a member of the Fred Lewis Society. In 2018, the Hoy Family Lecture in Biophotonics was endowed. In cooperation with Vanderbilt University, the Hoy Family Faculty Fellowship was established in the School of Engineering in 2020 by Laura and Winston in honor of their son, Thomas Nelson Hoy, BE'05, and daughter-in-law, Alanna Marie Patsiokas, BE'06, MD'10, as well as Alanna Patsiokas' service on the school's Board of Visitors.

FACULTY NEWS

Mark Abkowitz was named Distinguished Professor of Civil and Environmental Engineering. Abkowitz specializes in enterprise risk assessment, management and communication; the impacts of natural hazard events on community and infrastructure resilience; smart

cities technologies and applications, and freight transportation safety and security.

Hiba Baroud, associate professor of civil and environmental engineering, was named A. James and Alice B. Clark Foundation Faculty Fellow for her work on critical infrastructure systems modeling and risk analysis.

Brett Byram, associate professor of biomedical engineering, has been named the inaugural Hoy Family Faculty Fellow in recognition of his advances in medical ultrasound imaging.

Catie Chang, assistant professor of electrical and computer engineering, computer science, and biomedical engineering, has been named the inaugural Sally and Dave Hopkins Faculty Fellow for her highly collaborative and interdisciplinary research in developing computational approaches for investigating the human brain.

Christos Constantinidis was named as Stevenson Chair. Constantinidis is a professor of biomedical engineering, investigating how the electrical activity of neurons in the cerebral cortex gives rise to cognitive functions such as attention, short term memory, and decision making.

Taylor Johnson, associate professor of computer science and electrical and computer engineering (CS) was named A. James and Alice B. Clark Foundation Faculty Fellow in recognition of his work developing formal verification techniques and software tools for

cyber-physical systems.

Gábor Karsai was named Distinguished Professor of Computer Science. Karsai conducts research in the model-based design and implementation of cyber-physical systems, domain-specific languages, programming tools for visual programming, and the theory and practice of model-integrated computing.

Çağlar Oskay, chair of the Department of Civil and Environmental Engineering, has been named to an endowed Cornelius Vanderbilt Chair, in recognition of his work on multi scale computational modeling and simulation of material and structure systems in extreme environments.



CATIE CHANG



Padma Raghavan, Vanderbilt University's vice provost for research and innovation, has been named a Distinguished Professor of Computer Science in the School of Engineering.

Cynthia Reinhart-King has been named a University Distinguished Professor, Vanderbilt's highest faculty distinction, in recognition of her cutting-edge research and leadership in the field of biomedical engineering.

Pamela Wisniewski, associate professor of computer science, has been named a Flowers Family Chancellor's Faculty Fellow. She is an expert in the interplay between social media, privacy, and online safety for adolescents.

CLASS NOTES

1980-1989

Melissa Wert, BE'85, MBA'91, PhD'02, of Nashville is in her 10th year working at Thistle Farms, a nonprofit that serves women with histories of prostitution, trafficking, and addiction. As director of Innovation and Training, she

works at Body and Home, the social enterprise side of the business, developing new products and processes, and training the workforce. She went on a two-week rafting trip through the Grand Canyon summer of 2022 with six college friends. "It was the trip of a lifetime. Put it on your bucket list," she writes.

Robert Black, BE'86, of Moorpark, Calif., for the second consecutive year has had one of his books named to the "Best STEM Books" list sponsored by the Children's Book Council and the National Science Teaching Association. *Edward Lorenz and the Chaotic Butterflies* tells the story behind the discovery of Chaos Theory, more popularly known as "the Butterfly Effect." It follows last year's book, *Benoit Mandelbrot: Reshaping the World*, which recounts the discovery of fractal geometry. Both books are part of his Mathematical Lives biography series for teens published by Royal Fireworks Press.

W. Scott Lynn, BE'89, was promoted to major general and took command of Army Reserve Medical Command on June 26, 2022, in Pinellas Park, Fla. There are approximately 8,200 soldiers assigned to AR-MEDCOM's more than 110 units located throughout the United States. Lynn is a neuro-radiologist in private practice in Huntsville, Ala.

1990-1999

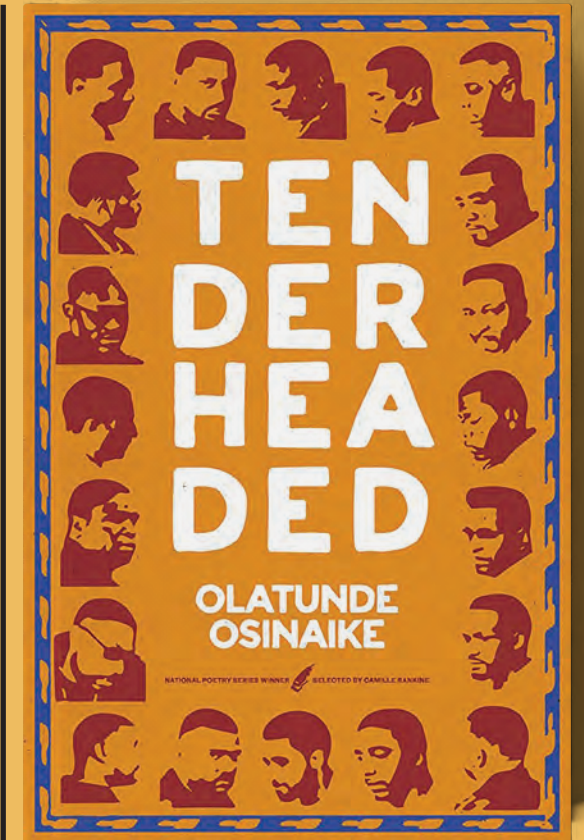
Shari Walter, BE'90, of Wilmington, Del., writes to announce that her

daughter, Alaina, has earned the rank of Eagle Scout in Scouts BSA, the first young woman to do so in her school district. Alaina is a founding member of Troop 5508 in Wilmington, where her father, Seth, serves as Scoutmaster.

Shay Ralls Roalson, BE'93, of Austin, Texas, began Jan. 1 as director of Austin Water.

Lewis Lipscomb Jr., BE'94, of Winston-Salem, N.C., is senior vice president, system physician executive of the Novant Health Women's and Children's Institute. He most recently served as the physician market leader of the greater Winston-Salem market, medical director of minimally invasive gynecologic surgery and medical director of midwifery services. Novant Health is a nonprofit, integrated network of physician clinics and hospitals in North Carolina with markets centered around tertiary care centers in Charlotte, Winston-Salem and Wilmington, N.C. The Women's and Children's Institute includes 10 maternity hospitals performing approximately 26,000 annual births, 313 employed physicians in 44 general Ob-Gyn and women's subspecialty clinics, and 48 general pediatric and pediatric subspecialty clinics.

Natalie Monroe, BE'98, of Alexandria, La., was named vice president of environmental, safety and sustainability operations in August 2022 for RoyOMartin Lumber Co.. She also serves as a member of the Strategic Action Leadership Team and as corporate



'TENDER HEADED,' A NEW BOOK OF POETRY, AND WINNER OF THE 2022 NATIONAL POETRY SERIES, BY OLATUNDE OSINAIKE, BS'15

secretary for the Martin Sustainable Resources Board of Directors. She began her career at RoyOMartin as an intern during the construction of the company's plywood facility in 1995-96. She later joined the organization as the corporate environmental manager in 2003.

2000-2009

Viral Patel, BE'02, ME'04, of New York has founded Radish Health, an employer add-on concierge health platform that puts dedicated primary care physicians, mental health therapists and dietitians on speed dial for each employee.

Mike Croley, BS'05, of Crossville, Tenn., recently was selected as a finalist

in the 2023 Presidential Management Fellowship program. As a fellow, he will be appointed to a two-year, full-time Federal position with salary and benefits, where he will engage in leadership development training that includes experiential learning, cohort-based interactive training and optional rotational experiences.

Kristina Kitko, BE'08, PhD'18, recently joined Eli Lilly and Company as associate director of Venture Science, where she focuses on early-stage biotech investment. She is based in the San Francisco area.

2010-2019

Amy Shaw, BE'10, MS'12, PhD'18, and Sam

Rubinstein, former house officer at Vanderbilt University Medical Center, announce the birth of their daughter, Margot Opal Rubinstein, June 28, 2022. The family resides in Durham, N.C.

Kevin Bush, BE'14, of Renton, Wash., in January was named a Breakthrough Energy Fellow, a program of Breakthrough Energy, the network founded by Bill Gates that aims to accelerate innovation in sustainable energy and in other technologies to reduce greenhouse gas emissions. Bush is CEO at Molten Industries, a company developing a process to create low-cost hydrogen that avoids carbon emissions while consuming seven times less renewable electricity.

Seth Friedman, BS'14, of New York, recently joined Stripe, a financial technology company, as engineering manager of their mobile payments organization. He has previously held roles as senior engineering manager and staff engineer at Cash App, and senior engineer at Amazon.

Olatunde Osinaike, BS'15, of Atlanta was named winner of the National Poetry Series with his manuscript, *Tender Headed*. His debut book will be published through Akashic Books in 2023. The National Poetry Series is the nation's premier literary awards program that sponsors the publication of five books of poetry each year. Manuscripts are selected by poets of national stature and published by a distinguished group of trade, university

and small presses. His first full-length collection was also runner up for the 2022 Cave Canem Poetry Prize and was a finalist for the 2021 Alice James Award and 2021 CAAPP Book Prize.

Lana Stilger, BE'15, and **Zachary Eagleton**, BE'13, were married Sept. 24, 2022, in Louisville, Ky.

John Biffi, BE'18, and **Daria Berstell**, BA'18, were married Jan. 20 in Washington, D.C.

IN MEMORIAM

ALUMNI

Jerry Niles Jordan, BE'49, of Dallas, Nov. 20, 2022. Jerry entered Vanderbilt at 16 to study electrical engineering. He was a member of Kappa Alpha fraternity, co-editor of *The Commodore* yearbook in 1947, president of the Student Council, president of the Engineering Senior Class, band, and Honor Council. After graduation, Jerry earned a law degree from Southern Methodist University before becoming a JAG officer in the U.S. Air Force and then entered private practice in Dallas. Jerry was active in the Dallas Bar Association and the Dallas Committee on Foreign Visitors. He also spearheaded fundraising for the construction of the Kappa Kappa Gamma house at Vanderbilt. His wife, Mary, survived him for one month. His other survivors are his daughters, **Jill Jordan**,

BE'79, and **Jan Jordan Altman**, BA'81; his son-in-law **William Altman**, BA'81; his grandsons **Linkon Altman**, BS'11, **Austin Altman**, BS'13, and Andrew Hanson; his granddaughters, Jordan and Alison Hanson; and two great-grandchildren.

James Scott Grigsby Jr., BE'59, of Leesburg, Va., Aug. 15, 2022. Upon graduating from Vanderbilt, he was commissioned as an officer in the U.S. Navy and served in the nuclear weapons program. Scott was secretary-treasurer of the Southern States Industrial Council, later owned Tennessee Metal Works, and retired in 2005. He was a member of the Nashville Rotary Club, Fellowship of Companies for Christ, Fellowship of Christian Athletes and the Gideons. He is survived by his wife, Glenda; two sons, James Scott Grigsby III and Glenn Garrett Grigsby; and six grandchildren.

Benjamin Clay Dysart III, BE'61, MS'64, of Brentwood, Tenn., July 9, 2022. Ben earned his bachelor's and master's degrees at the Vanderbilt School of Engineering and his doctoral degree at Georgia Tech. He worked as a civil engineer at Union Carbide and was a distinguished professor of environmental engineering at Clemson University until he retired from teaching in 1990. While president and chairman of the National Wildlife Federation, he lectured widely and testified before the U.S. Congress on important environmental issues. He is survived by his wife, **Betty Walthall Dysart**, BS'75.

Fred D. Hall, '61, of Brentwood, Tenn., Oct. 8, 2022. Fred studied engineering at Vanderbilt. He served in the United States Air Force and became an electrical engineer with the Department of Defense, living and working all over the world. He is survived by his sister, five nieces, a nephew, and sister-in-law **Janell Glasgow-Hall**, BA'72.

Herbert William Hamilton, BE'69, of Columbia, S.C., May 16, 2022. After earning his undergraduate degree in engineering at Vanderbilt, Herb enlisted in the Navy and was stationed in South Carolina, where he met and married Ellen Smith, earned his law degree at the University of South Carolina, and began his career in construction law. After more than 20 years in Columbia, he and his family moved to Rock Hill, S.C. Herb mentored many young lawyers and supported those newly diagnosed with Parkinson's disease, which he himself battled more than 20 years. He is survived by two sons, his sister and a nephew.

George William Schlossnagle Jr., BE'69, MS'72, PhD'75, of Baltimore, Md., April 21, 2022. He graduated from Vanderbilt in uniform as an ensign in the U.S. Navy and served as an engineering officer on the USS *Warbler* during the Vietnam War and later as the engineering officer of the USS *Norton Sound*. He returned to Vanderbilt to earn his master's and Ph.D. in bioenvironmental engineering and then transferred to the U.S. Air Force to continue his military career as an

environmental engineer. He was a graduate of the Industrial College of the Armed Forces. George retired from the Air Force as a colonel after 32 years of decorated military service and went on to work for the Department of Energy where he was awarded the Distinguished Career Service Award. Survivors include his wife **Sherry Ezell Schlossnagle**, BA'69, sons George William Schlossnagle III and Theo Ezell Schlossnagle, and five grandchildren.

James E. Anderholm, BS'76, of Alexandria, Va., Aug. 29, 2021, and **Lynn Strother Davis Anderholm**, of Encinitas, Ca., BS'75, MA'78, July 10, 2022. Jim and Lynn met at Vanderbilt, where she earned a bachelor's and master's in economics, and he earned his bachelor's in biomedical engineering. Jim went on to earn a master's in systems management from the University of Southern California and a master's in national security strategy from the National War College. Jim and Lynn married in 1974 and raised their two children mostly in Mt. Vernon, Va., where Jim worked at the Pentagon and Fort Belvoir before retiring as a major from the U.S. Army in 2013. He continued as a civilian with the Department of the Army, eventually serving as the deputy assistant secretary. He received multiple Meritorious Service Medals, the Army Achievement Medal and the Commander's Award for Civilian Service. Lynn retired from the Department of Defense as a planning analyst. Jim and Lynn are survived by their children,

Drew Anderholm and **Anna-Leigh Anderholm Heath**, BA'02, and their granddaughter, Fiona Heath; Lynn's brother, W. Hull Davis, and nephew, **William Hull Davis Jr.**, BA'94.

Ronald Jay Thomas, BE'91, of Leoma, Tenn., Aug. 15, 2022. Jay studied mechanical engineering at Vanderbilt and was active in Army ROTC. He lived in Reinke Hall, Carmichael Tower, Morgan Hall and Chaffin Place, and made many lifelong friends. After graduating, Jay worked in the manufacturing and technology industries for companies including Boeing and Signalink, and he retired as vice president of Signalink after 12 years. Upon his retirement, a building on the Signalink campus in Madison, Ala., was named after Jay. He served on the Parish Council/Finance Board of the St. Joseph Catholic Church for more than 20 years and was a member of the Lawrenceburg Rotary Club. Jay was a proud Vanderbilt alum and a passionate Commodores fan—a passion he shared with his children—attending football and basketball games and declaring his allegiance with a VU license plate on his car and a VU mailbox at his home. He is survived by his wife of 26 years, Katy King Thomas; his children, Jude, Luke and Lily Thomas; his parents and two brothers.

FACULTY

James H. Clarke, retired professor of civil and environmental engineering, of Brentwood, Tenn., Oct. 31, 2022. Clarke

earned a Ph.D. in theoretical physical chemistry in 1973 from Johns Hopkins University. Before joining Vanderbilt, he was chairman, president and CEO of Eckenfelder Inc., an environmental engineering and consulting firm focused on hazardous waste management and remediation. He joined the Vanderbilt engineering faculty in 1980 as an adjunct assistant professor. From 2000 to 2019 he was a professor of the practice of civil and environmental engineering. He continued as an adjunct professor of engineering until fall 2022. Clarke was a member of the former Nuclear Regulatory Commission Advisory Committee on Nuclear Waste and Materials. In 2011, he was elected to the executive committee of the American Nuclear Society's Decommissioning, Decontamination and Reutilization Division for a three-year term. He served on the executive board of the Environmental Science Division of the ANS, was a member of the 2012 inaugural class of the American Academy of Environmental Engineers and Scientists, and in 2021 was awarded the Stanley E. Kappe Award by the AAEEES. Clarke was predeceased in 2020 by his wife, Ann, who had been an adjunct professor in the Department of Civil and Environmental Engineering in the 2000s.

George Thomas Hahn, professor of mechanical engineering and materials science, emeritus, of Nashville, June 7, 2022. Hahn served the Vanderbilt School of Engineering for 18 years with distinction until his retirement in 1998. He was born in Vienna, Austria, in 1930.

When he was 8, his family left Austria for New York City to escape Hitler's persecution. He earned a bachelor's degree in mechanical engineering from New York University in 1952 and served in the U.S. Air Force from 1953 to 1955 as a project engineer at Wright Patterson Air Force Base in Dayton, Ohio. He earned a master's in metallurgical engineering from Columbia University in 1955 and a Ph.D. in metallurgy from MIT in 1959. Before joining the engineering faculty at Vanderbilt, he worked for 19 years at Battelle Laboratories in Columbus, Ohio, where, in his last position, he was the division chief and manager of the Metal Science Section. He was a fellow in the American Society of Metals, an honor recognizing distinguished contributions to the field of materials science and engineering. He published approximately 200 papers in the fields of fracture mechanics, rolling contact and riveted connections and was listed in Who's Who in Engineering Academia. He is survived by his wife, his two daughters, two grandchildren and his stepdaughter. He was preceded in death by his first wife.

Frank L. Parker, Distinguished Professor Emeritus of Environmental and Water Resources Engineering and professor emeritus of civil and environmental engineering, of Nashville, Aug. 10, 2022. Parker enlisted in the U.S. Army at 17. In 1946 he left the Army and earned a bachelor's in civil and environmental engineering from MIT in 1948, and a master's and Ph.D.

from Harvard University in civil engineering. Over the next 11 years he held positions at Oak Ridge National Laboratory and the International Atomic Energy Agency. In 1967, already an internationally recognized expert in nuclear waste management, Parker joined Vanderbilt's engineering faculty. At Vanderbilt he initially concentrated on thermal pollution and water resources problems, but later focused on radioactive and hazardous chemical waste, particularly in the former Soviet Union. As a nuclear waste remediation expert, Parker consulted with the governments of the U.S., Sweden, Japan, Germany, India, Russia and others. He was a consultant at the Chernobyl nuclear station after the 1986 accident and chaired an inquiry into the Three Mile Island accident for the National Council on Radiation Protection. Parker was elected to the National Academy of Engineering, was a fellow of the American Association for the Advancement of Science and was the first engineer elected by eminence to the American Academy of Environmental Engineers. At Vanderbilt he received the Alexander Heard Distinguished Service Professor Award and the Harvie Branscomb Distinguished Professor Award. He is survived by his four children, including **Stephan A. Parker**, MS'94; five grandchildren, including **Jessica Frances Brenner**, BA'09, and **Gavin James Parker**, BA'12; three great-grandchildren and a brother.

Kevin M. Warren, MS'97, MS'99, PhD'10, research

associate professor of electrical engineering, of Franklin, Tenn., June 22, 2022. After earning his bachelor's degree in chemistry at Tennessee Tech, Warren earned a master's degree in chemistry and a master's and doctorate in electrical engineering at Vanderbilt. He joined the Vanderbilt Institute for Space and Defense Electronics as a senior research engineer in 2003 and assumed his faculty role in 2020. At ISDE he performed extensive research into the development and application of novel radiation effects related to prediction methods for microelectronics in terrestrial, atmospheric and space environments. He served as primary author or co-author on numerous papers related to the analysis of semiconductor devices and their response to radiation environments and delivered short courses for conferences and private and corporate entities. Before joining ISDE, Warren worked as a component engineer for Raytheon ITSS at NASA's Marshall Space Flight Center during early development phases of the International Space Station, providing radiation effects support for the Microgravity Research Program. He was a component test engineer and radiation effects engineer at the Johns Hopkins University Applied Physics Laboratory, primarily supporting the Messenger and Contour spacecraft programs. He also was a licensed pilot and a highly respected flight instructor at Wingman Flight Academy in Dickson, Tenn. He is survived by his wife, two sons, his parents, a brother and a sister.

Iteration

Engineering Dept.

06

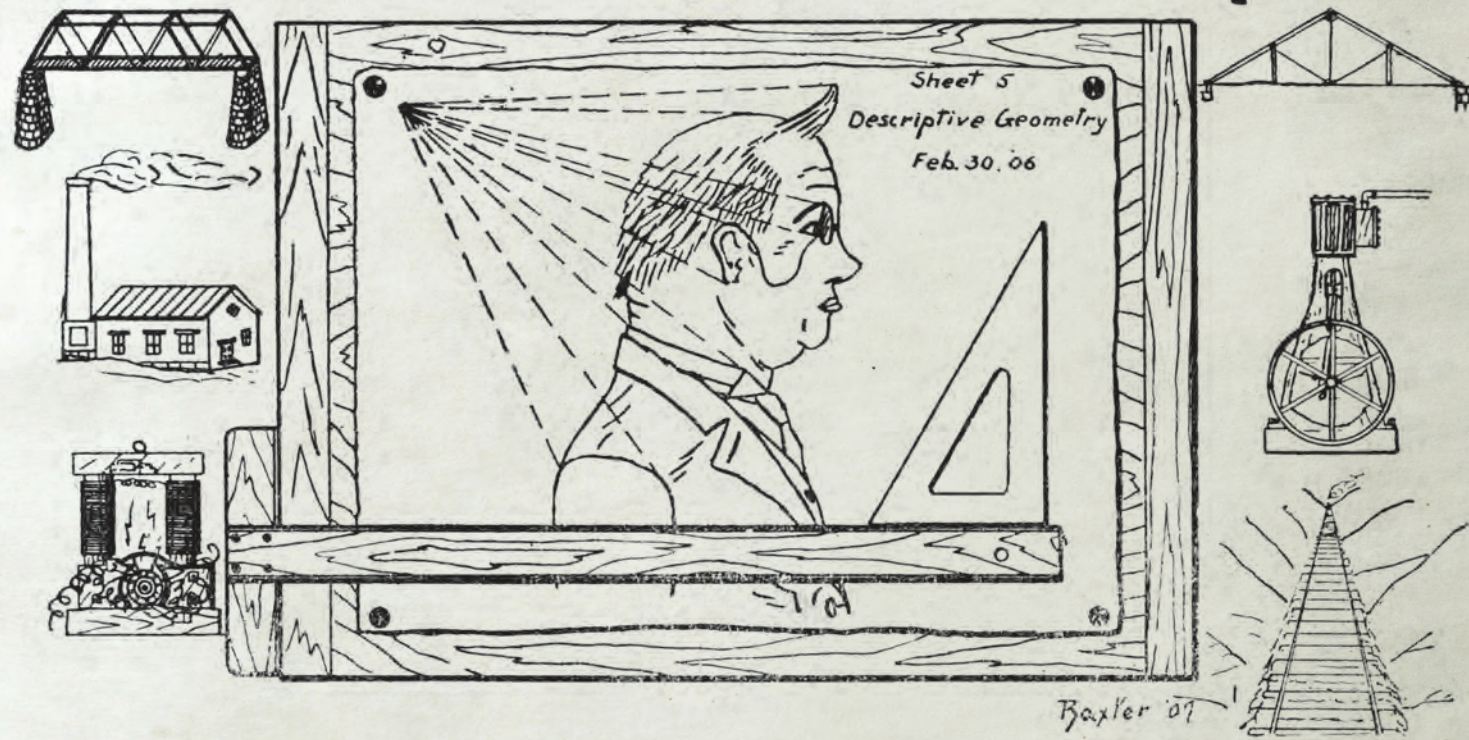


Illustration by Committee

As sure as the end of the spring semester brings final exams, end-of-the-year parties, and Commencement, there's also the age-old tradition of receiving a yearbook after classes end. Prior to the establishment of the *Commodore* in 1909, Vanderbilt students marked each year with a publication called the *Comet*. And while later issues of the *Comet* included a handful of photos, the editorial staff relied on a four-person illustration committee to add visual enhancements, such as the one featured above introducing members of the "Engineering Department" as it was called then. The total engineering student population in 1906 was 82, with a clear pattern of attrition: the freshman class stood at 27, sophomores at 25, juniors at 18, and only 12 graduating seniors that year. The faculty roll included three members, one professor each for civil engineering, mechanical engineering and drawing/surveying.

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