

LEARNING TO ATTACK THE CYBERATTACKERS

Can't Happen Fast Enough

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DISRUPTING OPIOID ADDICTION

Heinz College Students Help Government Combat Opioid Crisis

By Lauren Prastien

OCTOBER 2018

A GROUP OF CMU STUDENTS HAS FOUND A WAY TO IDENTIFY INDIVIDUALS WITH HIGH-RISK PATTERNS OF OPIOID USE BEFORE IT'S TOO LATE

There is no universal picture of addiction. Prescribers strive to make informed decisions in order to prevent opioid dependence while still treating a patient's pain, but they cannot always determine who is at a high risk of misuse. Few current tools exist to screen for patients at high risk of opioid use disorder outside of pain clinics, possibly delaying time-sensitive interventions. A new quantitative approach based on opioid prescription trajectories developed at Carnegie Mellon University's Heinz College of Information Systems and Public Policy may help clinicians intervene before an addiction even develops.

"Our goal is to use data to try to find people before they have a problem," explains Wilson Mui (HNZ 2019). Mui is one of the three CMU students selected for this project, which was funded by the Deloitte Foundation. His teammates were Nikita Setia (HNZ 2020) and Riccardo Fogliato, a Ph.D. candidate in the Department of Statistics

and Data Science, Dietrich College of Humanities and Social Sciences. Under the guidance of Heinz College Professor Daniel Nagin and Dr. Jonathan Elmer, an assistant professor of emergency medicine, critical care medicine and neurology at the University of Pittsburgh, these CMU students developed a data-based approach to identify potentially problematic opioid users as early as possible.

Using prescription data provided by the Allegheny County Department of Human Services (DHS), the team created a predictive model that could project an individual's trajectory after just a few months of observation. This tool has the potential to save lives, especially in counties like Allegheny, where the rate of opioid-related overdoses exceeds both the state and national averages.

"While other strategies allow us to identify people who are already addicted or actively in need of treat-



ment, the fact that this method is preemptive is particularly valuable," says Erin Dalton, deputy director for the Office of Data Analysis, Research and Evaluation at DHS and an alumna of Heinz College.

The students synthesized eight years of DHS data into three distinct opioid user profiles: low users; heavy users; and "desisters," or individuals whose prescription opioid usage starts high, but quickly diminishes over time. These profiles were based on the number and dosage of prescriptions filled on a monthly basis, as well as the changes in this data over time.

“Addiction is a disease, and like any other disease, prevention is always better than treatment,” explains Dr. Elmer. “By predicting future patterns of opioid use, our hope is to bring clinicians the tools they need to intervene early, modify high-risk behaviors and save lives.”

Nagin, whose group-based trajectory modeling algorithm served as the foundation for the team’s opioid user profiling methodology, maintains that this technique epitomizes the mission of Heinz College.

“This isn’t the sort of problem that can be accurately captured from purely a policy perspective or an informatics perspective. Its complexity necessitates Heinz’s interdisciplinary approach,” says Nagin.

NOVEL APPROACH CAN TRIGGER EARLY INTERVENTION

The White House Council of Economic Advisers found that 2.4 million Americans currently have an opioid use disorder, and nationally, opioid-related drug overdoses claim the lives of 115 people each day.

With better than 80 percent accuracy after just a few months of prescription opioid-use data, the students’ model could help clinicians on the frontlines of the opioid crisis by flagging many high-risk individuals before they develop an opioid use disorder and facilitating interventions before the issue escalates.

“We’re only looking at their prescription data over time. We’re not looking at things like gender or race. We are only looking at prescription use to establish a pattern,” says Setia. “The model not only gives you

nationally. The DHS dataset at the heart of this study is Medicaid data, meaning that every state has access to the same information. While there is no substitute for a clinician’s presence and discretion, this

“This isn’t the sort of problem that can be accurately captured from purely a policy perspective or an informatics perspective. Its complexity necessitates Heinz’s interdisciplinary approach.”

— Professor Daniel Nagin

the likelihood that a person is going to fall into one of the three groups for any given month; it gives you a picture of where the person is likely to fall in the long term.”

This is a big deal, because the “desister” group and the “heavy” group are practically indistinguishable to a human in the first few months of use, making interventions difficult, if not impossible. But the algorithm can spot differences. According to Elmer, early identification of individuals who are likely to follow a trajectory of long-term use or dependence provides clinicians with a greater window of opportunity to intervene before patterns of opioid misuse become entrenched.

One particularly promising aspect of this work is that it could scale

work provides a more standardized benchmark for high-risk opioid usage.

“This isn’t the end-all, be-all of the drug problem. It’s not a one-stop solution,” says Setia, “but there’s bias that enters into clinicians’ decision-making. One clinician’s definition of ‘heavy usage’ may not match another’s. This approach takes that out of the picture, giving standard definitions and letting the clinician handle it from there.”

By targeting opioid misuse at such an early stage, rather than after users have developed an addiction, this groundbreaking model would help clinicians take a preemptive, intervention-based approach to opioid addiction.

These Glasses Give Teachers SUPERPOWERS

By Tara García Mathewson

OCTOBER 4, 2018

AUGMENTED REALITY GLASSES FOR CLASSROOMS SEEM STRAIGHT OUT OF SCIENCE FICTION

Robert Mawhinney's math students each sat at their own computers, solving equations. As he looked around the room, he saw some students had smiley faces floating above their heads, some had question marks or exclamation points, and a few had Zzzs. He tapped the air in front of him and up popped a view of a student's computer screen.

Mawhinney is not an actor in a science fiction movie. He is a teacher at Hopewell Junior High School in Aliquippa, Pennsylvania, near Pittsburgh. A pair of augmented-reality glasses offers him those visual cues and the power to conjure up more information with an outstretched hand.

The glasses, called Lumilo, are powered by an app that works with "cognitive tutor" programs, which use artificial intelligence to offer students feedback as they attempt problems, hints when they struggle and an adaptive set of questions based on their performance.

When Mawhinney tested out the glasses, he could scan the room and the icons would tell him who was on track, who was stuck and who seemed to have abandoned the assignment altogether. If a student had an exclamation point



Augmented reality glasses give educators insights into how students are performing on an assignment.

"The focus has been on how can we make personal tutors to enhance student learning. A major stakeholder that has been left out of the equation was the teacher."

— Ken Holstein, Carnegie Mellon University doctoral candidate

above his head, the app had reason to believe that student might be abusing the program's "hints" function.

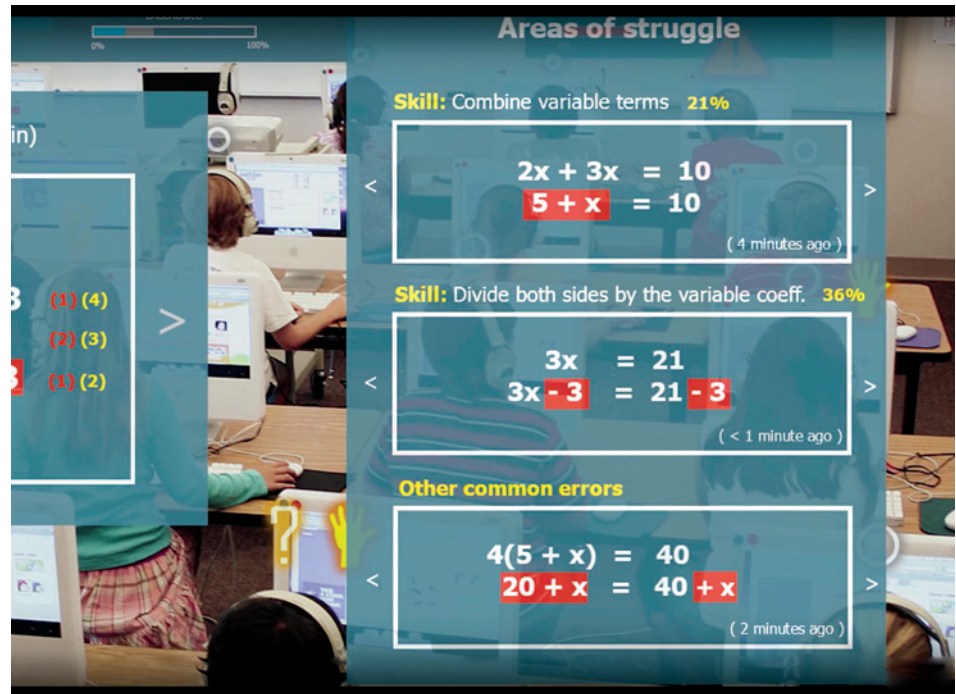
Mawhinney could also look at the classroom wall and see what portion of students had mastered a given topic. If the floating percentage indicated few

had succeeded with a particular skill, Mawhinney could stop everyone and offer a group lesson. If it suggested several students were struggling with the same skill, he could pull those students aside while everyone else continued to work on their own computers.

“There were times I wouldn’t even have to walk up to the student,” Mawhinney said. “I’d say, ‘You’re not using the negative. Make sure you do that to both sides.’ I could help them from across the room.”

Lumilo is the brainchild of a team at Carnegie Mellon University. Ken Holstein, a doctoral candidate at the university, designed the app with significant input from teachers like Mawhinney who use cognitive tutors in their classrooms. The project treads new ground for the use of artificial intelligence in schools.

“The focus has been on how can we make personal tutors to enhance student learning,” Holstein said. “A major



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stakeholder that has been left out of the equation was the teacher.”

Holstein started by talking to teachers who were early adopters of artificial intelligence software. They liked that it let students move at their own pace through certain content, and they were in a position to talk about areas for improvement.

Common complaints were about the analytics that teachers could get from these programs. The built-in dashboards offered useful information, but it wasn’t always easy to access or inter-

pret. Teachers said some of the most useful feedback came from students’ faces or body language. But if teachers missed these cues, they might not get another timely signal of a student’s confusion.

“There’s generally an assumption that students who need help the most are least likely to raise their hand,” Holstein said.

This story (<https://hechingerreport.org/these-glasses-give-teachers-superpowers/>) was produced by *The Hechinger Report*, a nonprofit, independent news organization focused on inequality and innovation in education.

Teachers told him they liked the idea of getting real-time information about student performance while still keeping their heads up and being able to look around the classroom.

Enter Lumilo, augmented reality glasses that make those analytics appear in the air in front of them.

The glasses aren’t ready for market — Mawhinney says they’re still too heavy to want to wear for an extended period of time — but preliminary research suggests students using cognitive tutors end up learning more overall when teachers use the glasses. Those results are driving industry interest that could bring Lumilo to classrooms in just a few years.

Alumna, Writer, Director Named **MARSHALL SCHOLAR**

— DECEMBER 3, 2018 —

Kaytie Nielsen, an alumna of Carnegie Mellon University and international filmmaker, is the fourth CMU student to earn the highly selective international Marshall Scholarship, which funds up to two years of graduate study in the United Kingdom.

Nielsen, who graduated in 2016 with a bachelor's degree in humanities and arts with concentrations in creative writing and drama, plans to study screenwriting at the National Film and Television School in Beaconsfield or the Royal Central School of Speech and Drama in London. The award covers a year of university fees, tuition, books, a thesis grant, research and daily travel, including airfares.

"I hope this experience will teach me what I bring to the table as a storyteller that may be unique from other writers," Nielsen said. "I want to know what my strengths and weaknesses are, and become more confident in going after the stories that may seem too ambitious."

FRENCH CONNECTION

Nielsen's portfolio is broad and includes creating films in France and India. As part of the Dietrich College of Humanities and Social Sciences Honors Fellowship Program, she worked with Mame-Fatou Niang, an associate professor in French and francophone studies at CMU, to create a documentary investigating Afro-French womanhood. They explored the lives of seven influential women of African and Caribbean heri-



Alumna Kaytie Nielsen has earned a prestigious international Marshall Scholarship.

tage from diverse professions and socioeconomic backgrounds to shed light on a multicultural France.

Nielsen took French courses from Niang throughout her CMU experience.

"I was immediately taken by that freshman from Texas who approached our discussions in class with a maturity and an energy that was rarely seen," Niang said. "Kaytie was curious to learn, but also curious to understand how our world functioned."

In "Mariannes Noires," seven different French-born women of African descent confront their own unique identities and challenge the expectations of French society.

The documentary premiered in Paris in March 2017; has been screened in more than 10 countries; and appeared in a number of film festivals, including the black film festivals in Toronto, Montreal and San Francisco. Niang said that other universities have incorporated the film into their teaching and research materials, and the footage has been an important part of Niang's CMU courses.

"I can say without a doubt that this film would have been very different without Kaytie's intuition, her drive and her soul," Niang said. "Kaytie has a natural ability to listen and craft her message to reach a wide audience. In that sense, her work as a filmmaker and a social justice advocate is extremely impactful, because she can reach to the heart and

soul of very different audiences, without altering the strength of her initial message.”

HELPING DELHI BREATHE

As a senior at CMU, Nielsen was awarded a national competitive fellowship from the Henry Luce Foundation, which provides stipends, language training and individualized professional placement in Asia for individuals from various fields and backgrounds who have limited exposure to Asian culture. She worked with Jamun, a New Delhi-based creative production company run by Ayesha Sood, director of “The Dewarists,” and Udayan Baijal, assistant director of “Zero Dark Thirty.”

“Those two are truly amazing mentors and welcomed me to the team immediately and wholeheartedly,” Nielsen said. “With them, one of my main projects was a series of campaign videos I shot and edited for Help Delhi Breathe, an organization fighting for policy action against the city’s deadly pollution levels.”

“It was at Jamun, too, that I had my first experience in a writers’ room, as I helped them develop original fiction and non-scripted concepts for their slate,” she said.

As a freshman, Nielsen was one of six students nationwide chosen for the Fulbright Commission’s Queen’s University Belfast Summer Institute. She spent a month studying Northern Irish history. She put the research to use in her junior year when she created “Éire,” a musical featuring the songs of Irish artists from old folk tunes to U2 that followed the lives of two women immersed in different periods of the 20th century Irish conflict — one in 1916 Dublin, the other in 1972 Belfast.

“In a history that’s so often told through a male perspective, I wanted to explore how women were both affected by, and active participants in, the violence of the time,” Nielsen said. “A group of School of Drama students and I, working with a full band from the School of Music, produced the show as a part of Playground, our annual festival for student work.”

For these awards, she worked closely with Carnegie Mellon’s Fellowships and Scholarships Office. Stephanie Wallach, assistant vice provost for undergraduate education and head of the Undergraduate Research Office, has known Nielsen since her freshman year.

“It was clear even then that she was unusually talented, self-directed, fearless and, I might add, so much fun to be around,” Wallach said. “I have enjoyed every opportunity to work with her, whether it was her application for a Fulbright Summer Institute or the Luce Scholarship. At every point, I saw her maturing and discovering new sides to her multifaceted talents.”

“The Marshall Scholarship is the next stage of Kaytie’s artistic and personal self-discovery. She will take every advantage of this unique opportunity in the U.K. not only to hone her writing and production skills but also to absorb and understand British culture.” Wallach added, “She is someone I feel privileged to know and to work with, and I think that she will be an important creative force in the future.”

Nielsen said she owes much to Wallach.

“Stephanie Wallach and I formed a close bond in undergrad, and I really do owe so much to her,” Nielsen said. “She pushed me on this application in

particular, but because I trust her so innately, I knew that the ways she was challenging me were always to make the best application possible.”

CHALLENGING SOCIAL NARRATIVES

Nielsen also is an entrepreneur. During her junior year, she co-founded Round Room Image with CMU alumnus Joe Hill, now an associate producer at Vice News. Their creative production company challenges social narratives with honest representations that aim to provide a platform for unheard and misunderstood stories.

“Our inaugural project was a series of documentaries shot in Tamil Nadu, India, for Visions Global Empowerment, a nonprofit focused on providing educational opportunities and leadership training to marginalized women and girls around the world,” Nielsen said.

Since then, Round Room has produced short and feature-length documentaries, news pieces, music videos, educational series and social campaigns.

Other projects include “Quiero,” a talk-show web series about Latinx ambition and success, co-produced with CMU alumna Priscila García-Jacquier (A 2014). As executive producer, director of photography and editor, Nielsen is involved in every facet of the production. The second season was shot this summer in Los Angeles and is in post-production.

This past fall, she worked as an intern at Pretty Matches Productions (Sarah Jessica Parker’s production company) and is currently an assistant in the writers’ room for the third season of HBO’s “Divorce.”

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SATURDAY, OCTOBER 27, 2018

CMU receives \$80M in gifts as president is inaugurated



Darrell Sapp/Post-Gazette

Carnegie Mellon University President Farnam Jahanian and CMU Board of Trustees Chairman James E. Rohr listen to Ramayya Krishnan, Heinz College dean, speak during inauguration ceremonies on Friday Oct. 26, 2018 on the CMU campus. Dr. Jahanian is CMU's 10th president.

By Bill Schackner
Pittsburgh Post-Gazette

Carnegie Mellon University is receiving two major gifts totaling \$80 million - one for scholarships and student academic support, and the other toward a new and enlarged engineering hall on campus, CMU president Farnam Jahanian said Friday.

The donations of \$50 million and \$30 million were announced by Mr. Jahanian in a speech during his

inauguration as the school's 10th president.

The 57-year-old computer scientist, entrepreneur and former provost at Carnegie Mellon was elevated from interim to permanent president in March. Friday's ceremony was held inside the Jared L. Cohon University Center's Wiegand Gym on campus.

The \$50 million pledge toward student aid comes from alumni Cindy and Tod Johnson and is the largest single gift

toward scholarships in Carnegie Mellon's history. It will be added to an endowment that also will support persistence initiatives to keep students on track to graduate, officials said.

Mr. Johnson is executive chairman of The NPD Group Inc., a global market-research firm. He is a long-serving member and vice chair of CMU's board of trustees and he chaired the Centennial Campaign for Carnegie Mellon, university officials said.

The \$30 million construction grant made by the Allegheny Foundation is its largest ever and will enable the university to build a new Scaife Hall for its College of Engineering.

The existing hall will be demolished and a \$75 million facility will rise in its place, constructed on an expanded footprint along Frew Street, near Flagstaff Hill on the campus.

The grant toward Scaife Hall comes amid a building boom on and near Carnegie Mellon's campus, evidenced most recently by last month's formal opening of a \$201 million home for its Tepper business school, the David A. Tepper Quadrangle.

In prepared remarks, Mr. Jahanian discussed the importance of both gifts in fulfilling aspects of the university's mission.

"We are awestruck by Cindy and Tod's generosity and thrilled at how their support will greatly expand our ability to ensure a CMU education is within reach of all students," he said.

The university has upped student aid by 84 percent over the past decade. Nevertheless, cost to attend is cited as the single greatest obstacle by parents and students, said Michael Steidel, dean of admission.

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CMU, FROM WA-1

The Johnsons' commitment is expected to aid low- and middle-income students.

Mr. Jahanian said the new Scaife Hall will better position the university to continue groundbreaking research and world-class teaching.

"We are grateful to the Allegheny Foundation for making the lead grant to jump-start this project, which will further strengthen our dynamic and growing mechanical engineering program," he said.

The building will be next to a planned engineering quad that includes recently renovated Hamerschlag Hall and the ANSYS hall, now under construction. The development will have a "focus on expanded, technology-rich labs; modern, flexible classrooms; and spaces that facilitate formal and informal collaborations," according to a university statement.

The largest gift in Carnegie Mellon's 118 years is \$265 million from William Dietrich II. Mr. Tepper and the Richard King Mellon Foundation are the second- and third-largest, both totaling more than \$100 million.

Friday's announced gifts will rank among the larger displays of philanthropy benefiting a university that competes for students and faculty with older institutions, including some in the Ivy League, that have endowments many times larger than Carnegie Mellon's.

Mr. Johnson is a managing director of the Metropolitan Opera. Ms. Johnson is co-chair of the board of directors for St. Mary's Healthcare System for Children in New York.



Darrell Sapp/Post-Gazette

Marlene Behrmann, a professor of cognitive neuroscience at Carnegie Mellon University, speaks during the inauguration of President Farnam Jahanian on Friday, Oct. 26, 2018.

The Johnsons met and married while studying at what was then known as Carnegie Institute of Technology, which became Carnegie Mellon while they were enrolled. Mr. Johnson received a bachelor's degree in graphic arts management in 1966 and a master's degree in industrial administration a year later. Ms. Johnson received a bachelor's degree in art in 1968.

"Carnegie Mellon has meant so much to Tod and me from our very first days as undergraduates," Ms. Johnson said. "Financial aid played a key role as we began our lives together, and we look forward to many generations of students seeing how their world opens up because of something so simple yet important as a scholarship."

During the ceremony, speeches were delivered by Cornell University president

Martha Pollack, a former colleague of Mr. Jahanian's at the University of Michigan, and by Salesforce co-CEO Keith Block, a CMU alumnus and trustee.

After a procession into the gym by individuals dressed in academic regalia - all serenaded by the sound of bagpipes - Mr. Jahanian and other speakers addressed the crowd of several hundred.

He called the event "a truly humbling experience" and spoke of the power of education to change lives.

The Iranian-born scholar recalled advice his mother gave him when he left home for a college education abroad. "Pack light. Whatever you need, you will find."

He also made light of himself, noting that he was losing his voice. "I didn't realize the speech was this long," he said to laughter.

Mr. Jahanian came to CMU in 2014 and served as vice president for research and later provost. He became interim president after Subra Suresh resigned effective June 30, 2017, after four years in the job.

Mr. Jahanian's career covers three-plus decades in academia, industry and the public realm, among them 21 years at the University of Michigan. He came to Carnegie Mellon from the National Science Foundation, where he led the Directorate for Computer Information Science and Engineering from 2011 to 2014.

Bill Schackner: bschackner@post-gazette.com, 412-263-1977 and on Twitter: @Bschackner

Carnegie Mellon Names JAMES H. GARRETT PROVOST

— NOVEMBER 16, 2018 —

Carnegie Mellon University named James H. Garrett Jr. as the university's next provost and chief academic officer in November 2018 after a rigorous, comprehensive and international search. Garrett was dean of the university's College of Engineering and the Thomas Lord Professor of Civil and Environmental Engineering. He is a three-time alumnus of Carnegie Mellon and began his duties as provost on January 1.

Garrett reports directly to President Farnam Jahanian, serving as a key member of his leadership team and with primary responsibility for ensuring academic excellence across the university. As the university's chief academic officer, Garrett oversees academic activities across CMU's campuses and programs around the world and is instrumental in long-range institutional and academic planning and implementation.

"Jim is a visionary and collaborative leader and a highly respected scholar with more than three decades of experience in academia," Jahanian said. "He brings unique insights and a strong foundation to this key leadership position and plays a critical role in fostering collaboration across colleges and departments, promoting the interdisciplinary approach that is at the heart of Carnegie Mellon's culture. I look forward to working with him to lead



As the university's provost and chief academic officer, James Garrett, Jr. will oversee academic activities across CMU's campuses and programs around the world and will be instrumental in long-range institutional and academic planning and implementation.

the university to even higher levels of academic distinction and international recognition."

As dean, Garrett leveraged partnerships both regionally and globally to advance research and educational opportunities with a deep commitment to the integration of research and teaching across engineering, science, arts and business. He broadened the impact of campuses in Kigali, Rwanda, and Silicon Valley, California, and through his fundraising efforts has transformed the environment for the College of Engineering and increased

the college's connectivity with the rest of the university. The College of Engineering is currently ranked sixth for both graduate and undergraduate education, according to *U.S. News & World Report*.

"I am deeply honored to serve Carnegie Mellon as its next provost," Garrett said. "I am committed to working across the entire university and to partner with students, faculty and staff to better understand the challenges and opportunities that lie ahead. Together, I know we can continue to make an extraordinary difference in the world."

CARNEGIE MELLON UNIVERSITY

— A M B A S S A D O R S —

Garrett was chosen from an international pool of candidates. The search was led by a committee composed of representatives from each of Carnegie Mellon's schools and colleges. Richard Scheines, dean of the Dietrich College of Humanities and Social Sciences, chaired the search, and Mary Jo Dively, Carnegie Mellon's vice president and general counsel, served as co-chair.

port for cross-cutting research and educational collaborations, such as Metro21, CyLab and Science@CMU," said Roberta Klatzky, the Charles J. Queenan Jr. University Professor of Psychology in the Dietrich College of Humanities and Social Sciences and a member of the search committee. "And his dedication to increasing women and underrepresented minority

teaching interests focus on the use of sensor systems in civil and environmental engineering.

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— President Farnam Jahanian

"After an exhaustive six-month search process that involved dozens of highly qualified candidates with diverse backgrounds from across the globe, we were delighted to have found someone who, according to virtually all of the faculty, student, staff and leadership constituencies we involved in the search, truly stood out," Scheines said. "Jim's integrity, sincere enthusiasm for collaboration, success as a leader within Carnegie Mellon, vision for CMU's future and devotion to the whole institution all impressed the committee. We were unanimously delighted with the choice, and we all look forward to working closely with him."

"The committee was very impressed with Dean Garrett's record of sup-

port for cross-cutting research and educational collaborations, such as Metro21, CyLab and Science@CMU," said Roberta Klatzky, the Charles J. Queenan Jr. University Professor of Psychology in the Dietrich College of Humanities and Social Sciences and a member of the search committee. "And his dedication to increasing women and underrepresented minority

Garrett received his bachelor's, master's and doctorate degrees in civil engineering from CMU's College of Engineering. He joined the faculty in 1990 and has served as dean of the college for the past six years.

Previously, Garrett was the head of Carnegie Mellon's Department of Civil and Environmental Engineering from 2006 to 2012. He served as the College of Engineering's associate dean for graduate and faculty affairs from 2000 to 2006. An elected fellow of the American Association for the Advancement of Science, Garrett's research and

"I have great confidence that Jim understands the challenges and opportunities facing the whole university," said Charlie White, head of CMU's School of Art and member of the provost search committee. "He is a strong partner and advocate for the arts at CMU. Jim is keenly aware of the importance of creative process, the value of cultural activity and the necessity of experimental practice across the five schools within the College of Fine Arts. Most importantly, he understands the paramount role that the arts will play when envisioning the future of Carnegie Mellon University."

Laurie R. Weingart, the Richard M. and Margaret S. Cyert Professor of Organizational Behavior and Theory at the Tepper School of Business, served as interim provost since July 2017.

"I am profoundly grateful to Laurie Weingart for her exceptional service as interim provost," Jahanian said. "Over the past year and a half, Laurie has been an invaluable partner for me and the entire executive management team, advancing academic priorities of the university during a time of extraordinary momentum."

Weingart, a renowned expert in organizational behavior, will return to the faculty and plans to launch an initiative focused on applied research on collaboration and conflict.

The university appointed an interim dean for the College of Engineering and launched a search for Garrett's successor in this critical position.