



# the PIPER

CMU'S NEWS SOURCE FOR FACULTY & STAFF NOV-DEC/15 ISSUE

Carnegie Mellon University

2 SPEEDING UP STARTUPS

3 VOICES HEARD

6 GIANT STEPS

12 BIKE LANE STUDY

## Signature Project



PHOTO BY TIM KAULEN

PROVOST FARNAM JAHANIAN SIGNS A REPURPOSED CHURCH PEW DURING A TOPPING OUT CEREMONY AT THE NEW LOCATION FOR PROJECT RE\_, A COLLABORATIVE EFFORT IN WHICH ARCHITECTURE STUDENTS WORK WITH COMMUNITY PARTNERS TO RECYCLE MATERIALS, REBUILD NEIGHBORHOODS AND RESTORE LIVES. LOOKING ON ARE (L-R) ALLEGHENY COUNTY EXECUTIVE RICH FITZGERALD; STEVE LEE, HEAD OF THE SCHOOL OF ARCHITECTURE; AND PITTSBURGH MAYOR BILL PEDUTO. READ MORE ABOUT THE PROJECT ON PAGE ELEVEN.

## Pumped Up

### Trumble Gets Funding To Help Heart Patients

■ Daniel Tkacik

Heart pumps, which assist more than three million Americans with congestive heart failure each year, lead to a staggering number of infections — many of which are deadly.

To be exact, one in three patients with heart pumps develop an infection.

The National Institutes of Health (NIH) is keenly aware of the problem, as they just awarded a \$1.2 million grant to Dennis Trumble to make a better, safer heart pump.

An assistant research professor of biomedical engineering, Trumble thinks he has a solution to the problem. Because the vast majority of heart pump

CONTINUED ON PAGE FOUR

## RoboTutor Team Eyes XPRIZE

### Educational Software To Fill Teacher Gap in East Africa

■ Byron Spice

Can children learn to read, write and do basic arithmetic without a teacher or classroom, relying only on tablet computers, each other and some intelligent software? A team of educational researchers from Carnegie Mellon aims to find out in the \$15 million Global Learning XPRIZE competition.

CONTINUED ON PAGE EIGHT

## “The Rambling Irishman”

### John Carson Releases CD of Songs From His Homeland

■ Kelly Saavedra

When John Carson was introduced as the new head of the School of Art at his welcome reception in 2006, instead of making a few remarks, he sang a song.

He sang “The Rambling Irishman,” with lyrics that tell a hopeful story about an Irishman like himself, emigrating to America in search of a better life.

“I just felt at that point in time that it conveyed my feelings better than any speech I might give,” Carson said. “In conjunction with the narrative, the tune has an optimistic and uplifting feel to it.”

Riccardo Schulz, a teaching professor in the School of Music, was in the crowd that evening, listening intently. Schulz has been recording opera singers for decades and knew immediately that he wanted to record Carson singing.

“Although John is not formally trained, his voice has an exceptionally good quality and carries well for the same reasons that trained opera singers’ voices carry, so I was impressed with that,” Schulz said. “But I was even more impressed with the fact that he could introduce himself with song — that’s quite unconventional!”

He invited Carson to be a guest artist in his Sound Recording class, which Schulz conducts in the Vlahakis Recording Studio in the basement of the College of Fine Arts.

Carson accepted.

Their first session took place in late November 2006. Carson recorded 20

CONTINUED ON PAGE NINE



# Picking Up the Pace

## “NoWait” Entrepreneur To Speed Up Startups

■ Kelly Saavedra

Robb Myer was just a guy waiting in line at a San Francisco restaurant when the idea occurred to him for an app that lets you get on a restaurant’s waitlist — or choose not to — before you even arrive.

“I wanted to know what was happening at the restaurant without having to go there first,” said Myer, a 2006 graduate of the Tepper School of Business.

Myer is the creator of the NoWait app, which allows walk-in guests the freedom to leave and get notified by text when their table is ready. And it enables users to get on the list to be seated before they arrive, allowing them to avoid the wait all together.

From humble beginnings in its hometown of Pittsburgh, NoWait is now in the hands of diners and restaurant owners across the U.S. and in Canada, including a slew of popular chains such as Buffalo Wild Wings, Chili’s and T.G.I. Friday’s.

Todd Sapet, managing partner of Texas Roadhouse in Monaca, Pa., is one of many restaurant operators praising the app’s ability to improve bottom-line earnings.

“NoWait seats guests faster, so we can serve more guests,” Sapet said.

Given the success of NoWait, it’s no wonder CMU looked to Myer when the university sought experienced entrepreneurs to help guide students with their startup ideas.



COMPUTER SCIENCE STUDENT XUNJIE ZHANG (LEFT) AND ENGINEERING STUDENT ANAND KAPADIA ARE GETTING ADVICE FROM ENTREPRENEUR-IN-RESIDENCE ROBB MYER (RIGHT) ON BUILDING A BUSINESS AROUND THEIR ELECTRONIC SHOE, WHICH CAN ACCELERATE YOUR WALKING SPEED.

The Entrepreneur-in-Residence role was launched by the Center for Innovation and Entrepreneurship, and Myer said he is thrilled to be among the first tapped to participate.

“I’ll be working with a variety of teams across campus looking to get real-world startup advice. I will also be holding biweekly office hours at Project Olympus,” he said.

Among his first advisees are computer science student Xunjie Zhang and engineering student Anand Kapadia, who want to build a business around Nimbus, intelligent electric shoes that double a pedestrian’s walking speed.

Nimbus is their answer to reducing commute time, a major pain point for

today’s workforce.

“The average American commuter spends over half of their time walking to and from mass transit stops during their commute,” Zhang said.

Zhang points out that existing solutions in this space have limited uptake due to the inconvenience and skill required.

“Bikes require risky travel in the street and are too large to bring on most mass transit or cars. The Segway doesn’t fit well on sidewalks and also is too large to bring on mass transit or cars, and is too expensive. Skateboards and rollerblades — powered and not — are difficult to learn, somewhat unsafe, and can’t be used on high-density sidewalks,” he said.

Myer called Nimbus “an amazing combination of technology, innovation and design that approaches a common problem in a new way,” and said his role is to help Zhang and Kapadia think through all the aspects of starting and building a business.

“In this case,” he said, “we are starting with identifying a target market and building the right team.”

For Myer, the enjoyment of his work comes from creating a new product or service experience that improves the lives of those who use it.

“The customer experience,” he said, “is what wins today.”



# the PIPER

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**PUBLISHER**  
Ken Walters

**EDITOR**  
Bruce Gerson

**MANAGING EDITOR**  
Kelly Saavedra

**WRITERS**

Bruce Gerson	Byron Spice
Kelly Saavedra	Daniel Tkacik
Abby Simmons	Pam Wigley

**DESIGN & PHOTOGRAPHY**  
Digital & Creative Services

To contact *The Piper* staff, call 412-268-2900 or email [bg02@andrew.cmu.edu](mailto:bg02@andrew.cmu.edu).

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## Talkin’ Turkey

SAM VENTURA, A VISITING ASSISTANT PROFESSOR OF STATISTICS AND A CONSULTANT FOR THE PITTSBURGH PENGUINS, PARTICIPATED IN THIS YEAR’S MORTAR BOARD TURKEY FOR A DAY PHILANTHROPY EVENT. THE FRIENDLY COMPETITION ASKS PROFESSORS TO SEEK DONATIONS FROM STUDENTS, FACULTY AND STAFF FOR A CHARITY OF THEIR CHOICE. VENTURA WON THE COMPETITION BY RAISING \$1,000 FOR THE MARIO LEMIEUX FOUNDATION, AN ORGANIZATION DEDICATED TO RAISING FUNDS FOR CANCER RESEARCH AND PATIENT CARE. THE CATCH? HE HAD TO SPEND A DAY TEACHING IN A TURKEY SUIT!





# Distinctively CMU

## Strategic Plan Lives, Evolves on the Web



PHOTO BY TIM KAULEN

■ Bruce Gerson

Carnegie Mellon's strategic plan is unlike any other. It's not bound. And it's not in a slick and glossy publication.

Instead, CMU's Strategic Plan 2025, the result of a yearlong, university-wide conversation about future ambitions, will live and breathe on an innovative website that allows users to see the connections across a rich web of goals and strategies. The web presentation will change and evolve over time, reflecting plans for realizing these ambitions, and progress toward goals.

### VISIT THE STRATEGIC PLAN

2025 WEBSITE AT

[WWW.CMU.EDU/STRATEGIC-PLAN/](http://WWW.CMU.EDU/STRATEGIC-PLAN/)

CMU's Board of Trustees approved the plan at its Oct. 30 meeting.

"This plan has engaged the community in an unprecedented way," said President Subra Suresh at the celebration launching the plan. "I'm deeply grateful to all of you for your ideas and your commitment to making sure

Carnegie Mellon takes the next step to realize our aspirations."

President Suresh, who noted that more than 1,200 students, faculty, staff and alumni participated in more than 100 committee and town hall meetings, called the interactive web-based plan dynamic, creative, thoughtful, pragmatic, ambitious and very distinctive.

"The 2025 plan is a product of your dedicated work. It has CMU culture and CMU DNA all over it," he said.

Suresh specifically thanked Rick Siger, director of Strategic Initiatives

PROFESSOR JOE MERTZ (CENTER) MAKES A POINT DURING A STRATEGIC PLAN MEETING THIS FALL.

and Engagement, for leading the development of the plan. He commended Siger for his leadership and diligence in guiding the effort over the past 12 months. Siger deflected the praise.

"Enormous thanks are due to the more than 150 individuals who have served as committee members, to the

CONTINUED ON PAGE NINE

## Voices Heard

### Planning Process a "Remarkable Effort in Transparency"

■ Bruce Gerson

The university's new strategic plan has the CMU community's fingerprints all over it.

Strategic Plan 2025 was developed in large part from issues, concerns and objectives discussed at length in the many working group sessions that focused on the CMU experience.

Professors Todd Przybycien, Scott Sandage, Joel Greenhouse, Kristen Kurland and Ronald Placone led the Faculty Working Group that organized and conducted focus groups in all seven colleges and one for University Professors.

"We asked faculty what was on their mind. We realized problems and concerns would be the first things that came to mind, but we felt by information gathering we could reverse engineer the information and feed it back up into an overall goal. We felt problems, issues and concerns would be emblematic of some larger goals we could tackle," said Przybycien, a professor of chemical and biochemical engineering and chair of Faculty Senate.

Bubbling to the top were topics that centered around six themes — education,

collaboration, governance, community, diversity and sustainability.

Focus group sessions included six to 12 faculty members, representing various faculty ranks and tracks in addition to gender and race. In all, 69 faculty members participated.

Many hours and more than 60 pages of meeting notes were digested and synthesized with the help and expertise of Elizabeth Monaco, manager of the Organizational Effectiveness Group at the SEI, and Beth Whiteman, director of Accreditation and Strategic Initiatives.

The result is a report titled "Faculty Voices," which includes six goals and 34 recommended tactics. The report was distributed to all faculty.

Przybycien said there are similarities and "nice reflections" between "Faculty Voices" and the overall strategic plan.

"There's a lot of overlap. It says that what the faculty are thinking is in resonance with what other groups across campus are thinking. It's encouraging that we're all pulling in the same direction," he said.

Sandage, an associate professor of



READ "FACULTY VOICES" AT [HTTP://BIT.LY/1MzROMw](http://bit.ly/1MzROMw)

history and immediate past chair of Faculty Senate, agrees.

"We were really gratified to see that just about everything on our list had made it into the overall planning document. This is as much a tribute to the overall process and campus-wide conversations having generated and identified the same ideas, as it is a result of the faculty being clearly heard.

"Either way, the yearlong inclusive process was a remarkable exercise in transparency and building consensus," Sandage said.

"Faculty Voices" also provides a blueprint for Faculty Senate.

"Todd [Przybycien] very clearly saw the opportunity for the focus group report to invigorate the work of the Faculty Senate, by becoming a living document that provides several years' worth of important agenda items for the Senate to work on and pursue," Sandage said.

Przybycien identified "low-hanging fruit," including making the faculty evaluation process and promotion criteria more transparent and consistent across campus.

CONTINUED ON PAGE EIGHT



# Pumped Up: Trumble Gets Funding To Help Heart Patients

CONTINUED FROM PAGE ONE



DENNIS TRUMBLE'S MUSCLE-POWERED HEART PUMP WOULD BE AN ALTERNATIVE TO CARDIAC ASSIST DEVICES CURRENTLY ON THE MARKET.

to get blood clots forming inside the pump, they can grow, break off and migrate elsewhere in the body to cause things like kidney damage, stroke or heart attack," Trumble explained. "With the muscle-powered device that I am

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**THIS MUSCLE-POWERED HEART PUMP WILL NOT COME INTO CONTACT WITH BLOOD, REMOVING THE NEED FOR ANTI-COAGULANT MEDICATION THAT PATIENTS WITH TRADITIONAL HEART PUMPS ARE REQUIRED TO TAKE.**

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infections occur at the spot where the pump's power cord exits the body, Trumble believes the power cord should never exit the body, and instead draw power from an internal source. That power source, Trumble believes, could be a muscle in the patient's back.

"The idea is to collect energy generated by the latissimus dorsi, a large muscle in the back. Then we can convert that energy into hydraulics that

can be used to activate the heart pump," Trumble said.

This muscle-powered heart pump would be an alternative to cardiac assist devices currently on the market, which are powered by external batteries or portable air compressors that patients have to carry around. In those pumps, drive lines typically pass through an area on the patient's chest to connect the external power source to the pump

inside the body.

"Drive lines for cardiac assist devices are fine for short-term applications, but in the long term they're likely to cause infection, which is really bad news," Trumble said. "These infections are very difficult to treat and can be very serious."

What's more, this muscle-powered heart pump will not come into contact with blood, removing the need for administering anti-coagulant medication that patients with traditional heart pumps are required to take.

While anti-coagulation medication reduces the chances of harmful blood clot formation, it can also cause patients to have a higher tendency to bleed.

"And if you don't give patients enough anti-coagulants and you start

proposing, though, you avoid the need for anti-coagulants altogether."

Apart from the risk of infection or complications associated with anti-coagulation therapy, heart pumps with external power require a lot of maintenance, which is a disruption to patients' lives. In addition to carrying around a power source, patients with traditional heart pumps have to regularly clean drive lines and have all of the external hardware checked regularly.

Trumble says his muscle-powered device will not require much maintenance at all.

"The goal is to free the patient from having to do anything to maintain the device," Trumble says. "Ultimately, I'd like this heart pump to be something that patients can forget they even have."

## Leading the Blind

### App Is Helping Sight-Impaired Navigate Campus

■ Byron Spice

Scientists from IBM Research and Carnegie Mellon have developed the first open platform designed to support the creation of smartphone apps that can enable the blind to better navigate their surroundings.

The IBM and CMU researchers used the platform to create a pilot app, called NavCog, that draws on existing sensors and cognitive technologies to inform blind people on the CMU campus about their surroundings by "whispering" into their ears through earbuds or by creating vibrations on smartphones.

The app analyzes signals from Bluetooth beacons located along walkways and from smartphone sensors to help enable users to move without human assistance, whether inside campus buildings or outdoors. Researchers are exploring additional capabilities for

future versions of the app to detect who is approaching and what is their mood. NavCog is now available online and will soon be available at no cost on the App Store.

The app draws on indoor and outdoor sensors to inform blind people about their location.

The first set of cognitive assistance tools for developers is now available via the cloud through IBM Bluemix. The open toolkit consists of an app for navigation, a map editing tool and localization algorithms that can help the blind identify in real time where they are, which direction they are facing and additional surrounding environmental information. The computer vision navigation application tool turns smartphone images of the surrounding environment into a 3-D space model to help improve localization and naviga-



IBM FELLOW AND VISITING CMU FACULTY MEMBER CHIEKO ASAKAWA USES A NEW APP FOR THE BLIND TO NAVIGATE AROUND CAMPUS.

PHOTO COURTESY OF IBM

# Powered Prosthetics

## Amputees To Test CMU's Balance Recovery Technology

■ Byron Spice

Trips and stumbles often lead to falls for amputees using leg prosthetics, but a robotic prosthesis being developed at CMU promises to help users recover their balance.

How? By using techniques that simulate human reflexes.

Hartmut Geyer, assistant professor of robotics, said a control strategy devised by studying human reflexes and other neuromuscular control systems has shown promise in simulation and in laboratory testing, producing stable walking gaits over uneven terrain and better recovery from trips and shoves.

Over the next three years, as part of a \$900,000 National Robotics Initiative study funded through the National Science Foundation, this technology will be further developed and tested using volunteers with above-the-knee amputations. Joining Geyer on the research team are Steve Collins, associate professor of mechanical engineering and robotics, and Santiago Munoz, a certified prosthetist orthotist and instructor in the Department of Rehabilitation Science and Technology at the University of Pittsburgh.

“Powered prostheses can help compensate for missing leg muscles, but if amputees are afraid of falling down, they won’t use them,” Geyer said. “Today’s prosthetics try to mimic natural leg motion, yet they can’t respond like a healthy human leg would to trips, stumbles and

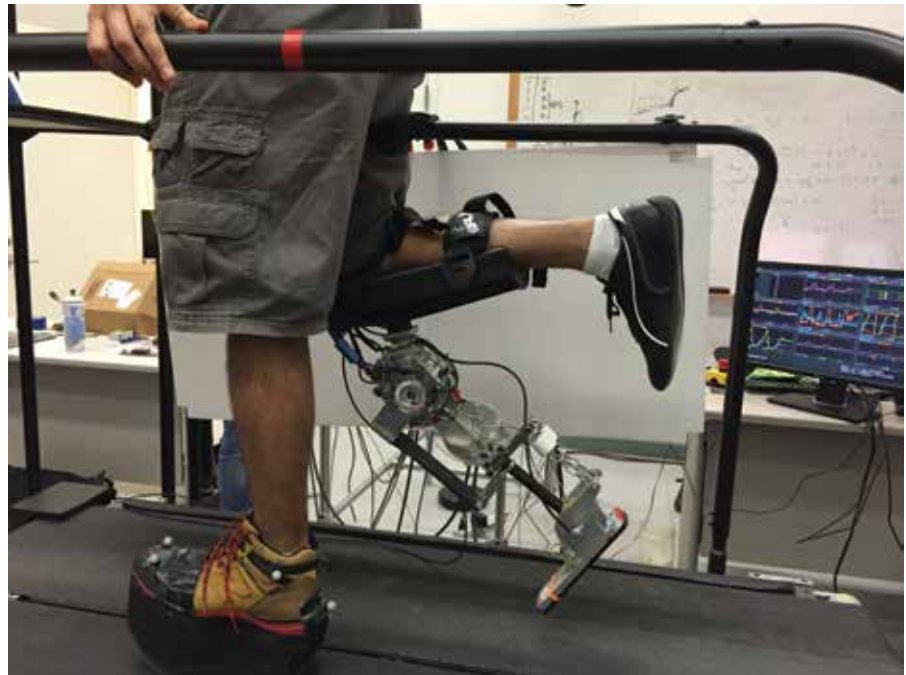
pushes. Our work is motivated by the idea that if we understand how humans control their limbs, we can use those principles to control robotic limbs.”

Those principles might aid not only leg prostheses, but also legged robots. Geyer’s latest findings applying the neuromuscular control scheme to prosthetic legs and, in simulation, to full-size walking robots, were presented recently at the IEEE International Conference on Intelligent Robots and Systems in Hamburg, Germany. An upcoming paper in IEEE Transactions in Biomedical Engineering focuses specifically on how this control scheme can improve balance recovery.

Geyer has studied the dynamics of legged walking and motor control for the past decade. Among his observations is the role of the leg extensor muscles, which generally work to straighten joints. He says the force feedback from these muscles automatically responds to ground disturbances, quickly slowing leg movement or extending the leg further, as necessary.

Geyer’s team has evaluated the neuromuscular model by using computer simulations and a cable-driven device about half the size of a human leg, called the Robotic Neuromuscular Leg 2. The leg test bed was funded by the Eunice Kennedy Shriver National Institute of Child Health & Human Development.

The researchers found that the neuromuscular control method can repro-



POWERED PROSTHETICS HAVE MOTORS THAT CAN ADJUST THE ANGLE OF THE KNEE AND ANKLE DURING WALKING, ALLOWING A MORE NATURAL GAIT.

duce normal walking patterns and that it effectively responds to disturbances as the leg begins to swing forward as well as late in the swing. More work will be necessary, he noted, because the control scheme doesn’t yet respond effectively to disturbances at mid-swing.

Powered prosthetics have motors that can adjust the angle of the knee and ankle during walking, allowing a more natural gait. These motors also generate force to compensate for missing muscles, making it less physically taxing for an amputee to walk and enabling them to

move as fast as an able-bodied person.

More than a million Americans have had a leg amputation and that number is expected to quadruple by 2050, Geyer said. About half of the amputee population reports a fear of falling and large numbers say the inability to walk on uneven terrain limits their quality of life.

“Robotic prosthetics is an emerging field that provides an opportunity to address these problems with new prosthetic designs and control strategies,” Geyer said.

tion for the visually impaired.

“While visually impaired people like myself have become independent online, we are still challenged in the real world. To gain further independence and help improve the quality of life, ubiquitous connectivity across indoor and outdoor environments is necessary,” said IBM Fellow Chieko Asakawa, a visiting faculty member at Carnegie Mellon.

“I’m excited that this open platform will help accelerate the advancement of cognitive assistance research by giving developers opportunities to build various accessibility applications and test non-traditional technologies such as ultrasonic and advanced inertial sensors to assist navigation.”

The combination of these multiple technologies is known as “cognitive assistance,” an accessibility research field dedicated to helping the blind gain information by augmenting missing or

weakened abilities. Researchers plan to add various localization technologies, including sensor fusion, which integrates data from multiple environmental sensors for highly sophisticated cognitive functioning, such as facial recognition in public places. Researchers also are exploring the use of computer vision to characterize the activities of people in the vicinity and ultrasound technology to help identify locations more accurately.

“From localization information to understanding of objects, we have been creating technologies to make the real-world environment more accessible for everyone,” said Martial Hebert, director of the Robotics Institute at Carnegie Mellon. “With our long history of developing technologies for humans and robots that will complement humans’ missing abilities to sense the surrounding world, this open platform will help

expand the horizon for global collaboration to open up the new real-world accessibility era for the blind in the near future.”

IBM has been committed to technology innovation and accessibility for people

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**“WHILE VISUALLY IMPAIRED PEOPLE LIKE MYSELF HAVE BECOME INDEPENDENT ONLINE, WE ARE STILL CHALLENGED IN THE REAL WORLD. TO GAIN FURTHER INDEPENDENCE AND HELP IMPROVE THE QUALITY OF LIFE, UBIQUITOUS CONNECTIVITY ACROSS INDOOR AND OUTDOOR ENVIRONMENTS IS NECESSARY.”**

— CHIEKO ASAKAWA

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with disabilities for more than 100 years, helping to ensure that employees, customers and citizens have equal access to information they need for work and life. Some early innovations for the blind include a Braille printer, a talking typewriter and the first commercially viable screen reader.



# Giant Steps

## CMU Leaps Forward With Tepper Quad



PRESIDENT SUBRA SURESH PRESENTS DAVID TEPPER WITH A FRAMED ARTIST'S SKETCH OF THE TEPPER QUAD DURING THE GROUNDBREAKING CEREMONY. THE SKETCH WAS SIGNED BY CMU'S BOARD OF TRUSTEES. AT RIGHT ARE TEPPER MASTER'S DEGREE STUDENT O'BRIAN HUNTER AND ENGINEERING FRESHMAN SANCHITHA BALASUBRAMANIAN.

### ■ Bruce Gerson

Carnegie Mellon is walking the walk, says David Tepper.

The largest expansion on campus since the university's founding in 1900 officially got underway on Oct. 30, when the university broke ground for the David A. Tepper Quadrangle, a new centerpiece of campus that will bring the CMU community together, fostering its interdisciplinary culture and advancing its research, education, entrepreneurship and campus life.

"This is a culmination of a vision that [President] Subra [Suresh] and I share of a new way of education," said Tepper, a 1982 alumnus and investor whose charitable foundation provided a lead gift of \$67 million for the project, the largest single gift to the school by an alumnus.

"This is not just a new building or a quad, but a vision of education. And that vision of education on the college and graduate school level is to bring all the schools together and have them interact.

"This is Carnegie Mellon not just talking the talk, we're going to walk the walk," said Tepper, who in 2004 donated \$55 million to rename the business school.

President Subra Suresh called the groundbreaking a momentous occasion that begins one of the most important and inspiring chapters in CMU history, and one that will transform the university physically and metaphorically.

"The Tepper Quad will embody the distinctive academic vision of Carnegie Mellon, how different disciplines come together in new and unique ways ... to create new intellectual domains and new disciplines," Suresh said.

He said the Tepper Quad also will be the anchor point of the new Innovation Corridor and will become the geographic epicenter of the university.

The first structure to be built on the Tepper Quad, located in the old Morewood

parking lot, will be a stunning five-story, 305,000 square foot structure that will house the Tepper School of Business, the Swartz Center for Entrepreneurship, and a technology-enhanced learning center that will be home to the Simon Initiative.

It also will include a 600-seat auditorium — the largest at the university —

a welcome center for visitors, collaborative meeting spaces, state-of-the-art classrooms, dining areas, and fitness and recreation facilities. There will be underground parking for 135 vehicles.

The building is being designed by Moore Ruble Yudell Architects and Planners of Santa Monica, Calif.

The exterior will consist of the traditional campus cream-colored brick and glass with porches and bays. Interior spaces will be flooded with natural light, warm fabric furnishings and wood to promote collaboration and interaction.

## GROUNDBREAKING PUTS CMU IN NATIONAL SPOTLIGHT



PRESIDENT SUBRA SURESH, SCHOOL OF COMPUTER SCIENCE DEAN ANDREW MOORE AND TEPPER SCHOOL DEAN ROBERT DAMMON (L-R) WERE AMONG UNIVERSITY LEADERS THAT APPEARED ON CNBC DURING ITS DAYLONG COVERAGE AT CMU.

The Tepper Quad groundbreaking ceremony brought the financial news cable network CNBC to campus to interview several university leaders throughout the day.

From its remote studio in the Gates Center, CNBC anchor Kelly Evans interviewed David Tepper and CMU Chairman of the Board James Rohr during the network's morning show "Squawk Box." During "Power Lunch," Evans interviewed Tepper School Dean Robert Dammon about CMU's MBA program.

In the late afternoon "Closing Bell" program, Evans spoke with Trustee Ray Lane about CMU's autonomous driving technology, and with President Subra Suresh and School of Computer Science Dean Andrew Moore about academic-industry partnerships.

The CNBC broadcast also included taped segments with Professor Howie Choset and his snake robot and Professor Sanjiv Singh, who discussed the technology for drones being developed at the Robotics Institute. Catch the CNBC video clips at [cmu.edu/news/stories/archives/2015/october/breaking-new-ground.html](http://cmu.edu/news/stories/archives/2015/october/breaking-new-ground.html)





SHOVELS HIT THE DIRT FOR THE CEREMONIAL GROUNDBREAKING.

## Construction Ahead

### A Flurry of Activity Lines Forbes Avenue

■ Bruce Gerson

The Tepper Quad is one of seven prominent construction projects — five along Forbes Avenue — that are either nearing completion, in progress or just getting underway.

Chief Financial Officer Amir Rahn-amay-Azar said the projects represent more than 800,000 square feet of new construction and an investment of more than \$500 million.

Nearing completion is the six-story, 13-legged north wing of Scott Hall, which overlooks the hollow between Hamerschlag Hall and the Carnegie Museum of Art. Scheduled for completion this January, the glass-enclosed north wing will be home to the Wilton E. Scott Institute for Energy Innovation, the Biomedical Engineering Department, the Institute for Complex Engineered Systems and a café. The Claire and John Bertucci Nanotechnology Laboratory will be completed later in 2016, after commissioning and the installation of the cleanroom tools.

Scott Hall also will serve as a conduit, connecting classrooms, labs and offices in buildings along the west end of campus at the end of what's commonly referred to as "the mall."

Also nearing completion is the Hamburg Hall renovation project. A new 150-seat auditorium, modeled after Rashid Auditorium in the Hillman Center, has been constructed between Smith and Hamburg halls and an ADA-compliant Forbes Avenue entrance has recently opened. The auditorium was completed for the start of classes this past August.



THE COHON CENTER ADDITION WILL BE COMPLETED THIS MAY.

Work is now underway to convert Hamburg Hall 1000, the large lecture hall commonly called the "rotunda," into a grand entrance and lobby area where students, faculty, staff and visitors can network and collaborate on projects. The lobby should be completed sometime in January 2016. Additional work in the west wing of Hamburg is scheduled to be completed for classes next fall.

The much-anticipated Cohon University Center addition will be completed this May. The 62,000-square-foot expansion will consist of new fitness and recreation facilities, a new studio theater for student performance groups and an elegant university presence along Forbes Avenue.

The glass-enclosed fitness component facing Forbes will include a weight room, a large area with more than 70

cardiovascular machines, two exercise studios for group classes and a dedicated cycling, or spinning classroom. Additional locker rooms also are being installed as part of the project.

Projects that are in the works, but have not yet broken ground are the Gateway Development Project, the Tata Consultancy Services (TCS) Building and the Forbes/Morewood Project.

The 425,000-square-foot Gateway Project, earmarked for the south corner of Forbes and Craig Street adjacent to the Carnegie Museum of Art, will be a new hub for entrepreneurship and industry partnerships. The private, third party development, on land leased from the university, will include office space for industry partners, retail space, a hotel and conference center, and parking. CMU has received development

proposals for the project, and expects approval from the board of trustees in February. The construction of this project is expected to take more than three years to complete.

The TCS Building, a result of the CMU-TCS partnership announced earlier this year, will be a five-story, 40,000-square-foot structure on the site of the current Electric Garage on Forbes. TCS researchers will occupy the top floor. Floors two, three and four will be flexible space where TCS researchers and CMU faculty and students can collaborate. The ground floor is designated for retail.

Existing occupants of the Gateway Project and TCS Building sites will move to alternative locations.

The Forbes/Morewood project has three components — creating a town square between the Cohon Center and the Tepper Quad, upgrading the Warner Hall infrastructure and adding 25,000 additional square feet to the building.

"We want the Cut to talk to the new Quad," said Ralph Horgan referring to the connection the town square would create between the two landmarks.

Horgan, associate vice president for Campus Design and Facility Development, said the project would take about two and one-half years to complete. He said about 200 employees in Warner Hall must be relocated while the infrastructure is upgraded. Relocation of existing building occupants is expected to take place after the 2016 Commencement.



# RoboTutor Team Aims to Fill Educational Gap in East Africa

CONTINUED FROM PAGE ONE

The question is a pressing one in much of the developing world, where teachers and schools are in short supply, if they exist at all, said Jack Mostow, a research professor emeritus in the Robotics Institute and the leader of CMU's "RoboTutor" team.

"At Carnegie Mellon, we take pride in solving big problems, and the lack of formal schooling is a truly immense problem in many parts of the world," Mostow said. "If we can develop educational technology to fill that gap, we can significantly improve the lives of the 250 million children who today can't read, write, or do basic math."

The Global Learning XPRIZE, announced last year, will award a grand prize of \$15 million to the team whose open source software proves best able to help children learn basic literacy and math skills during a field test in East Africa. Almost 200 teams from 40 nations have registered.

Carnegie Mellon, with its expertise in data-driven learning science, is uniquely suited to such a challenge, Mostow said. Researchers have a long history of developing computerized tutors, such as a Reading Tutor developed by Mostow that listens to students read aloud and helps them with pronunciation. Likewise, cognitive tutors pioneered by Ken Koedinger, professor of human-computer interaction and psychology, teach algebra to hundreds of thousands of U.S. students each year. Educational computer games, another CMU strength, will be an important part of the RoboTutor software.

The teams have until November 2016 to develop their solutions. An expert panel will select five finalists in 2017, with each of those teams receiving \$1 million as they prepare for the critical field test in at least 100 African villages in 2017-2018.

A gift of \$250,000 from an anonymous donor will enable the RoboTutor team to complete the initial development of its software package, Mostow said, "though we still are seeking funding for additional components that we believe



AMONG THE CONSULTANTS TO CMU'S ROBOTUTOR TEAM IS JOASH GAMBARAGE, SHOWN HERE WITH CHILDREN FROM THE MUGETA CHILDREN'S SCHOOL, A SCHOOL HE FOUNDED IN TANZANIA.

are important." The team was launched with seed funding from the Simon Initiative, a university-wide effort to measurably improve student learning outcomes by harnessing CMU's learning research and engineering ecosystem.

Students and post-doctoral researchers across campus "have come out of the woodwork in droves" to work on the project, Mostow said, with more than two dozen actively involved so far.

"Part of the appeal is the possibility of having an impact on society," said Ran Liu, a post-doctoral researcher in CMU's Human-Computer Interaction Institute and Department of Psychology. But part of it has to do with the immensity of the challenge. "A lot of my research involves small iterations to improve a curriculum, but not designing a curriculum from

scratch," she explained. "It's just not like anything else I've been involved in."

A unique challenge for the team is testing the educational software, Mostow noted, which targets children, ages 7-10.

"We don't have an ideal proxy for that population," he said. "It's hard to find American kids who have no access to formal schooling." So the team is testing its software at the Children's School, CMU's laboratory school that provides early childhood education for children, ages 3-5. Children of that age are at a different developmental level than the target population, he acknowledged, but their responses will help determine if the curriculum designs are valid.

In anticipation of making the finals and mounting a field test in East Africa, the team already is working with experts



RESEARCHERS ARE USING A REPURPOSED BINGO TRAY TO KID-TEST A MATHEMATICAL CONCEPT AT CMU'S CHILDREN'S SCHOOL.

in Swahili and CMU faculty members who study cultural differences in learning, as well as consulting with Joash Gambarage, founder of the Mugeta Children's School in Tanzania.

"I'm excited as I can be about this project and the students are too," Mostow said. "This is the most excited I've been in years."

## Voices Heard

CONTINUED FROM PAGE THREE

Another was seeking to balance the technical and creative aspects of the university in its marketing and branding efforts.

Like the Faculty Working Group, staff also played an integral role in the strategic planning process.

A nine-member Staff Working Group, co-chaired by Denise Fazio and Matt D'Emilio, gathered input from staff through a town hall meeting hosted by Staff Council, and through a grassroots effort that sought feedback from divisions

and departments via Staff Council reps.

The Staff Working Group identified three themes — The Staff Experience, Civility/Civil Discourse, and Transparency and Innovation Infrastructure.

Staff expressed interest in enhancing diversity, personal and professional growth, staff status, and compensation and advancement. They also suggested that supervisors attend management and sensitivity training.

Transparency in governance and improved campus-wide policies for areas such as parental leave, child care, senior care, parking and a healthy campus also were presented to strategic plan leaders.

"All aspects of the Staff Work-

ing Group plan made the cut," said D'Emilio, director of the University Contracts Office and this year's chair of Staff Council. "I can say with certainty that issues raised by staff are addressed in the Strategic Plan 2025."

D'Emilio said the next step is implementation and assessment.

"Denise [Fazio] and I both believe that the key is to maintain the momentum of the plan. Now is the time for all staff to look at the plan and forward ideas on how to achieve the goals," he said.

Students also informed the strategic plan.

Onur Albayrak, a Ph.D. candidate in

the Physics Department, attended several meetings with Carolyn Commer, a Ph.D. student in English and president of the Graduate Student Assembly.

Albayrak said highlights of discussions focused on apprenticeship and mentorship, and innovative and interdisciplinary encounters for students.

"This whole process where we would meet and brainstorm about issues was very enlightening," Albayrak said. "I think at the end we were quite happy with the result as how we can form a strategic plan where we can guide the way for future students and everyone that is part of CMU."



# Rambling Irishman: Carson Releases CD of Songs from His Hometown

CONTINUED FROM PAGE ONE

songs during the three-hour class, mostly from his vast treasure trove of traditional Irish songs.

“All unaccompanied — no instruments, just voice,” Schulz said. “And most were recorded with just one take, straight through, one after the other.”

Afterward, Carson came out of the studio and joined Schulz and his class in the control room, where students were brimming with questions.

Schulz had a few questions, himself.

“Why were so many of them sad songs?” Schulz wanted to know. “Love, lost or forbidden. Going off to war. Longing for the homeland. Songs of celebration and revelry. They were popular songs, parlor songs, pub songs, and John knew the history and provenance of every one of them,” Schulz said.

“Even the titles are fascinating: ‘Mary and the Soldier,’ ‘Ae Fond Kiss,’ ‘True Love Knows No Season.’ Then you have ‘The Banks of Sicily,’ ‘The Lakes of Pontchartrain.’ What was an Irishman doing on the banks of Sicily? Or the lakes of Pontchartrain?” Schulz wondered.

Carson entertained them with stories about his life and the importance of music in Irish culture. The root of his attachment to Irish and Scottish music lies in having grown up on the northeast coast of Ireland in Carrickfergus, 22 miles across the water from Scotland.

“Across those 22 miles is a shared Scots and Irish culture,” Carson said. “At one point in time, the two regions were ruled as one kingdom named Dalriada.”

During his childhood, Carson said, there was always singing in the house.

“And there would frequently be get-togethers with relatives, friends and neighbors, where everybody would have to sing a song, play a tune or tell a story,” he said. “It didn’t matter whether you were any good or not. Everybody had to take a turn. From an early age you had to start building a repertoire, as children were expected to have a ‘party piece.’”

While admittedly fond of “The Rambling Irishman,” Carson says he couldn’t single out just one song as his favorite because he likes different songs for different reasons.

He likes to sing “Kishmul’s Galley” because it’s a “rousing tune that always lifts the spirits.”

For “Freedom Come All Ye,” the Scottish poet Hamish Henderson put words to an old bagpipe tune. Written in Scottish dialect on the topic of racial equality, Carson calls it a joy to sing.

“Even if people do not understand the dialect, the spirit of the song comes through,” he said.

Carson returned to the Vlahakis Recording Studio eight more times, and the numbers grew. In February 2008, he recorded 30 songs during one session. The total number of tracks he’s recorded stands at 172 — mostly traditional Irish



PHOTOS BY ERICA DILGER



FRIENDS OF JOHN CARSON (ABOVE CENTER AND LEFT) JOIN HIM ON STAGE IN KRESGE THEATER TO PERFORM SONGS FROM HIS NEW CD.

songs, but some popular American songs as well.

“It became clear,” Schulz said, “that over and above any individual song, it’s really the growing collection that is astonishing as an important archive of Irish folk music, happening here in Pittsburgh, at Carnegie Mellon.”

After some persuading, and plenty of time spent listening to the recordings,

the modest head of the School of Art agreed to choose an hour’s worth of the songs and put them on a CD.

The collection, “Traditional Songs Across the Water,” is now available through the University Store.

Carson has done only a few public performances in Pittsburgh.

“More usually, I perform at home, as I have happily continued the party tradition known as a ‘come all ye,’ which I grew up with, by inviting people round for an improvised musical evening,” he

said. “I make sure I have a core of local musician friends to guarantee a good evening, but I like to invite new people each time to add an element of unpredictability.”

Schulz said he enjoyed every session and looked forward to the treasures Carson would bring with him to the studio.

“John enriched my life and the lives of more than a hundred students,” Schulz said. “They thought they would be learning about recording equipment, but instead went way beyond the technical aspects of recording, as they met and worked with a true artist.”

## Distinctively CMU

CONTINUED FROM PAGE THREE

more than 1,200 people that attended town hall meetings, and to countless other members of CMU’s global community who offered thoughtful input to the strategic planning process this past year,” Siger said.

The plan’s 12 goals and 24 strategic recommendations are focused on the connections between the individual experience, the university community and societal impact.

For the individual experience, the university is committed to cultivating an active, technology-enhanced, “know how to learn” environment in which each individual can grow and thrive.

For the university community, CMU will continue to focus on attracting a diverse and inclusive community willing to cross academic boundaries in a culture where innovation, entrepreneurial thinking, and action are valued and fostered.

For societal impact, CMU will expand its leadership in knowledge creation for the 21st century and continue

to pursue strategic partnerships focused on solving societal challenges.

Goals for the individual experience are: Deep Disciplinary Knowledge; Leadership, Communication and Interpersonal Skills; Knowing How to Learn; and Personal Development, including Physical and Emotional Health and Well-Being.

Goals for the university community are: A Diverse and Inclusive Community; A Concentration of World-Class Talent; A Culture of Interdisciplinary Approaches to Problem-Solving; An Interconnected Network for Research and Creativity; and A Destination of Choice for Innovation and Entrepreneurship.

Goals for societal impact are: Leadership in Research and Creativity; Regional Impact; and Engaging and Impacting the Global Community.

“Each goal has very specific, concrete action items, and each strategic recommendation supports several goals,” said Siger, who noted that many university plans are not as detailed.

Siger said existing measures and new metrics will be established to track progress on the website. Senior leadership will meet annually to evaluate progress, and implementation efforts will seek to engage the entire CMU community.

“Each of us must now work to make these aspirations real, to hold ourselves accountable for our parts of this dynamic plan, and to embrace our individual and collective responsibility to the university,” said President Suresh in an email to the university community.

“These are not additional tasks or extraneous duties. This is intrinsic to the way we conduct our work and life every day. The success of the plan will require a commitment from the university community to work together to implement the plan, and to help make this aspirational vision a reality,” he said.



# CMU Community Steps Up To Stop Hunger Now



MORE THAN 700 STUDENTS, FACULTY, STAFF AND FAMILY MEMBERS PACKAGED 125,000 MEALS FOR STOP HUNGER NOW.

BELOW: DIRECTOR OF DINING SERVICES PASCAL PETTER AND HIS FAMILY TAKE A BREAK FOR A PHOTO.



GREG BILLY, DIRECTOR OF CAMPUS SERVICES AND PATTYE STRAGAR, OPERATIONS MANAGER OF FITNESS AND AQUATICS, WORK THE ASSEMBLY LINE.



DIRECTOR OF FACILITY OPERATIONS STEVE GUENTHER AND HIS DAUGHTER SEAL A BOX OF MEALS.



## ■ Abby Simmons

Partners Allied in Civic Engagement (PACE) hoped to recruit 400 volunteers as it led CMU in becoming the first university to host a Stop Hunger Now meal-packaging event in partnership with The Kraft Heinz Company.

When registrations surpassed 700 a week prior the event, leaders of the student-staff initiative knew they had found a cause that resonated with the university community's commitment to addressing and solving real-world problems.

"Students are eager to participate in large-scale events because they create a sense of momentum and purpose," said PACE's Educational Programming Chair Mikaela Wolf-Sorokin, a sophomore in the Dietrich College of Humanities and Social Sciences.

Students, faculty, staff, alumni and their families, including children as young as age four, packaged more than 125,000 meals in two hours on Saturday, Nov. 7. As volunteers danced and sang along assembly lines in the Cohon University Center, a loud gong crashed and clanged in celebration of every 12,000 meals packaged.

Pascal Petter, director of Dining Services, volunteered with his wife, Heather Stupak-Petter (DC 1997), and children, Naia (12), Eli (8) and Ali (6).

"We truly saw the Stop Hunger Now food-packaging event as an opportunity to teach our kids that even a small amount of time and effort can make a large impact," Petter said.

Steven Guenther's children had helped to make bagged lunches for a local homeless shelter with their church just prior to the CMU event. When the scale of their next service experience came up at the dinner table, his daughter wondered how volunteers could make so many peanut butter and jelly sandwiches in two hours.

"That question generated some giggles and a trip to the Stop Hunger Now website, where we all learned about the challenge of world hunger and what this great organization is doing," said Guenther, director of facility operations.

According to Stop Hunger Now, which has provided food, essential aid and disaster relief to individuals in 71 countries, approximately 795 million people in the world are

chronically malnourished.

PACE chooses a theme for its educational and service programs each year, and this year's focus on food insecurity made the partnership with Kraft Heinz and Stop Hunger Now a natural fit. Elizabeth Vaughan, director of Student Activities, and Kristine Kengor, house-fellow for The Residence on Fifth and coordinator of residential service learning, are PACE's staff representatives and support a steering committee of seven students.

"Elements of food insecurity touch upon a wide range of academic disciplines," Vaughan said. "We are able to engage conversations around the complex causes and repercussions of food insecurity including climate change, fair labor practices, food waste, power imbalances that control agricultural and food practices, and preventable deaths related to malnutrition."

As a global food company, Kraft Heinz has embraced Stop Hunger Now as part of its signature corporate social responsibility program. Each dehydrated Stop Hunger Now meal comprises rice, soy, vegetables and a micronutrient packet developed by Kraft Heinz

food scientists and donated through the company's Micronutrient Campaign. The packet, known as the "heart of the meal," includes 19 essential vitamins and minerals, which are mixed into the rest of the ingredients after they are cooked.

"Our employees have been involved with meal-packaging, and we wanted to expand this with a community partner. We know that college students are eager to address social change, and many of our employees went to CMU, said Jenece Upton, Kraft Heinz manager of corporate affairs.

"We hope to engage more colleges and universities in this program in the future."

In addition to the meal-packaging event, PACE has hosted discussions with Pittsburgh nonprofits such as Just Harvest and is collecting donations for Thanksgiving meals for area families. CMU's annual Staff Council Food Drive ran through Monday, Nov. 16. Now in its 22nd year, the campus community has donated more than 300,000 meals to the Greater Pittsburgh Community Food Bank.



# Rebuilding Communities, Restoring Lives

## “Project RE\_” Opens at Construction Junction



■ Kelly Saavedra

A new workspace at Construction Junction in Pittsburgh’s East End is giving materials — and people — a second chance.

The 10,000 square-foot area, which features a design studio, fabrication lab and workshops for wood, metal and masonry, is now home to “Project RE\_,” a collaboration between three local non-profits leveraging their assets to rebuild communities and restore lives.

Project RE\_ got its start at the Urban Design Build Studio (UDBS) in CMU’s School of Architecture. UDBS students utilize materials from deconstruction projects completed by Construction Junction and, through design and prototyping, reimagine ways they can be reused.

Once a plan is in place, the construction is carried out in collaboration with Trade Institute of Pittsburgh (TIP) apprentices, who are benefitting from skilled trade education as a means to re-enter society.

“It’s about using materials that are already available and diverting them from landfills. For both undergraduate and graduate students in the UDBS, it’s about preserving the environment by re-training people to think about repurposing vs. wasting precious resources,” said John Folan, professor of architecture.

It’s also about seeing urban communities overcome challenges through empowerment and helping individuals to earn living wages.

“This is a rare opportunity,” said Jermaine Gadsden, a TIP masonry instructor. “Unless you work your way up in the ranks, you really don’t get to communicate and have relationships

with architects.”

Chantz Thomas, a TIP laborer, agreed.

“A lot of people that I’m around don’t go to college, don’t even get to communicate with a lot of people that go to college,” Thomas said. “It’s really great for me getting the work experience from people who are going to be bosses one day in my field.”

Folan had been involved in a similar effort years ago while running a design-build program at the University of Arizona. His undergraduate students worked side-by-side with teens emerging from a juvenile discipline program. Through day-to-day contact, working side by side with university students, the teens began to understand that they had opportunities available to them and that circumstance had been the only thing separating them from their ability to succeed. The undergraduate students also gained a greater understanding of the social context in which they were working.

“They accomplished things that were perceived as unattainable to them in the past,” Folan said. “And we’re seeing similar results through Project RE\_ and the collaboration with TIP.”

One of the collaboration’s recent projects is a wall made of repurposed church pews that lines one section of the Project RE\_ workspace. Church pews are the most common building components handled by Construction Junction. They called on the UDBS to explore new uses for the pews and the students worked with Construction Junction and TIP to develop a method to process the material and integrate it into the project.

The result is as beautiful as it is functional.

Jay Gilbert, a TIP counselor and case manager, likes seeing the students from TIP and the students from UDBS all working together toward a common goal.

“It’s not even just the project itself. I think it’s neat to see two walks of life coming together, collaborating, and seeing the fun that they have,” Gilbert said.

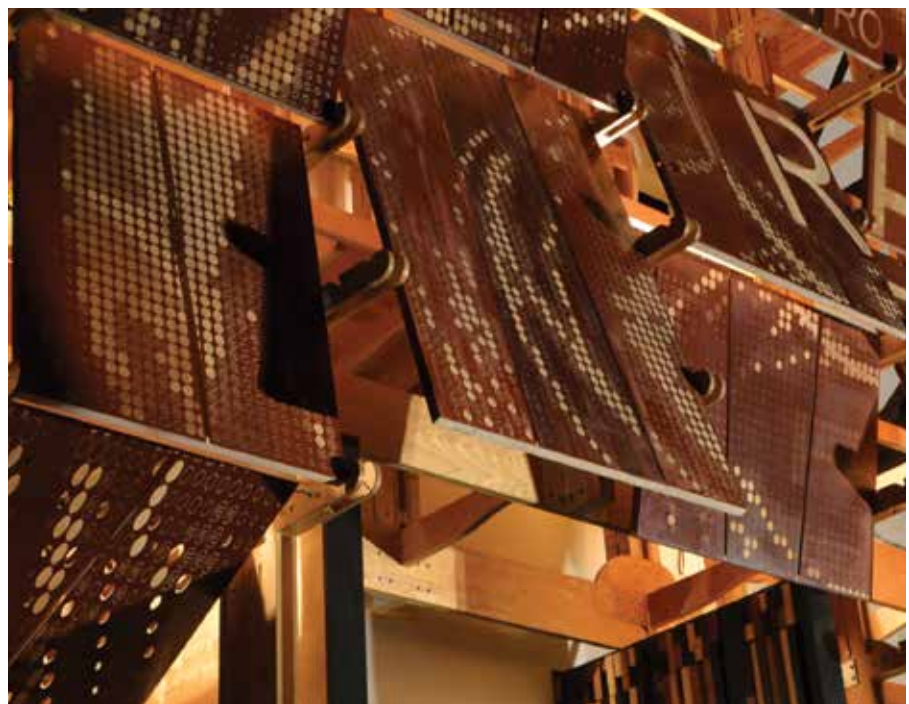
And while they’re building walls, they are breaking walls down at the same time, according to Gadsden.

“Coming from a city that’s really segregated as Pittsburgh is, I think that we gain a lot of understanding. A lot of beliefs that are stereotypical are dispelled when we work together on a

JOHN FOLAN (CENTER) DISCUSSES NEXT STEPS FOR THE PROJECT RE\_ WORKSPACE WITH STUDENTS FROM CMU’S URBAN DESIGN BUILD STUDIO AND LABORERS FROM THE TRADE INSTITUTE OF PITTSBURGH.

project that we both believe in,” he said. “And every individual that walks away can walk away and say, ‘We did that.’”

On hand at the November dedication ceremony to give Project RE\_ their blessings were Pittsburgh Mayor Bill Peduto; Allegheny County Executive Rich Fitzgerald; CMU Provost Farnam Jahanian; Head of the School of Architecture Steve Lee; and several other officials who played a role in the project.



THE PROJECT RE\_ ENTRY FEATURES ETCHED PANELS MADE OF HOLLOW-CORE DOORS DIVERTED FROM A LANDFILL.



# City's Counting on CMU

## Study To Measure Bike Lane Usage in Pittsburgh

■ Bruce Gerson

With more dedicated bicycle lanes and its new Healthy Ride bicycle-sharing program in place, Pittsburgh has become much more bike-friendly. But are bike enthusiasts really using the new resources?

Pittsburgh wants to know. So, city leaders have come to Carnegie Mellon to help them find out.

The Technologies for Safe and Efficient Transportation group in the University Transportation Center — a partnership between CMU and the University of Pennsylvania — and CMU's Traffic21 have put Bernardo Pires on the job.

Pires, a project scientist in the Robotics Institute, and his team have been working to collect data on how much the bike lanes are actually being used with a portable, computer-vision device they've built that records and counts individual users. They're also tracking pedestrian behavior in relation to the bike lanes.

"The city made a big investment into bike lanes. We want to make sure the effort put into this has a proportionate benefit," said Pires, who earned his Ph.D. in electrical and computer engineering at CMU. "The city has done some manual counting but we wanted to go the extra step and do video-based counting."

The video-recording device made of off-the-shelf parts sits in a metal weatherproof box linked to a 28-foot-tall pole. Inside the box is a camera connected to a Panasonic Toughpad computer, a converter for video and a battery that can last for 10 hours. The sturdy, "military-grade pole" is strapped to a street light post.

Pires and his team — postdoctoral fellow Mehmet Kocamaz, electrical engineer John Kozar, and electrical and computer engineering master's degree student Jian Gong — have collected 50 hours of data thus far monitoring the bike lane at the intersection of Frew Street and Schenley Drive in front of Phipps Conservatory.

Pires explained that it's not as simple as just recording video. He said the video must be labeled, a labor-intensive manual process to differentiate between bicyclists and pedestrians, so the computer algorithm learns how to count correctly. He said of the 50 hours, 10 hours have been labeled. In that time period 541 pedestrians and 111 cyclists were counted.

"Sometimes people look at it, but most of the time they don't even notice it, which is exactly what we want," Pires said.

"It seems like everyone is behaving pretty well. It can be a dangerous intersection because cars can turn in while a bike is driving by."



BERNARDO PIRES (SECOND FROM RIGHT) AND HIS TEAM HAVE BEEN WORKING TO COLLECT DATA ON HOW MUCH BIKE LANES ARE ACTUALLY BEING USED. TEAM MEMBERS ARE (L-R) MEHMET KOCAMAZ, JOHN KOZAR AND JIAN GONG. AT LEFT: A PORTABLE, COMPUTER-VISION DEVICE THEY'VE BUILT RECORDS AND COUNTS INDIVIDUAL USERS.

Pires and his team will soon be moving their operation to other locations including the bike lane on Penn Avenue downtown, which has generated some opposition from automobile drivers.

Pires said the city has asked his team about tracking the use of Healthy Ride bikes. He said he believes they would be able to do so because of the bike's white color and other unique markings.

While the project will be beneficial for Pittsburgh city planners, Pires hopes that in the future it will have implications worldwide.

He aims to expand his project to track automobiles and trucks in relation to bike lanes.

"A lot of bike advocates argue that if you have a bike lane, cars actually go slower, so it's safer all around. When we track cars we'll be able to tell. That information could be useful for policy-makers," he said.

Pires also is looking to implement his prototype to collect pedestrian data in relation to the "smart" traffic signals that have been deployed in East Liberty to assist with traffic flow.

"The smart signals only see cars, but with this device they're looking at what effect they have on pedestrians. We hope to give some input to their smart algorithms to decide when the green light goes on and off. This could help with pedestrian wait times," he explained.

**"WE HOPE TO USE THIS KIND OF TECHNOLOGY TO BETTER UNDERSTAND WHERE PEOPLE ARE CURRENTLY WALKING AND BIKING IN PITTSBURGH IN ORDER TO PLAN FUTURE ROUTES AND BIKESHARE STATIONS." —KRISTIN SAUNDERS**

"Downtown will be most relevant for the city," he said. "There's a lot of contention there. The city has installed counters, but they are not vision based. There's a lot more information you can glean from visual data rather than just counters."

Demographics — whether the person is biking to work or riding for recreation — is information video can gather. Whether or not the bicycle is a Healthy Ride bike is another data point.

Kristin Saunders, Pittsburgh's Bicycle and Pedestrian Coordinator, is looking forward to the results of the project.

"We hope to use this kind of technology to better understand where people are currently walking and biking in Pittsburgh in order to plan future routes and bikeshare stations," Saunders said. "With data from Bernardo's project, we can also watch pedestrian patterns to be better informed and to improve safety conditions."