



the PIPER

CMU'S NEWS SOURCE FOR FACULTY & STAFF 4/16 ISSUE

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Midway on the Move



PHOTO BY TIM KAULEN

Spring Carnival's Midway moves to the College of Fine Arts parking lot and lawn this year, putting all of Carnival's main festivities in one central location on campus. Find out the details on page 3.

CMU Helps Pittsburgh Become Smart City Contender

■ Kelly Saavedra

The U.S. Department of Transportation imagines a city where gridlock is a thing of the past. Red lights turn green when you approach. Traffic flows smoothly as cars talk to each other to avoid crashes.

And that's not all. How about your driverless taxi showing up just as your train pulls into the station? Or arriving home from work to find your grocery list delivered just in time for dinner, from the farm to the table?

That's their plan, and with traffic light sensors in some local neighborhoods that are already reducing congestion and mitigating pollution, Pittsburgh, in partnership with CMU and the University of Pittsburgh, is well on its way to realizing the vision.

Building on existing work done by CMU's Traffic21 and Metro21 initiatives, the Pittsburgh team applied for the U.S. Department of Transportation's "Smart City Challenge" grant, which will award the winning city \$50 million to build technology-based systems for addressing mounting transportation problems.

In March, Pittsburgh was named one of the top seven finalists, along with Austin, Columbus, Denver, Kansas City, Portland and San Francisco.

At a press conference at CMU, Mayor Bill Peduto and CMU's Raj Rajkumar, director of Metro21 and the Center for Technologies for Safe and Efficient Transportation (T-SET), said Pittsburgh has a good chance at winning the challenge.

Peduto said Pittsburgh's bid is different from the others because it includes components in energy,

CONTINUED ON PAGE FOUR

Check It Out

CMU To Make Air Quality Monitors Available at Public Libraries

■ Byron Spice

Learning about the quality of the air you breathe should be as easy and inexpensive as borrowing a book from a library, and that's why Carnegie Mellon researchers plan to provide free Speck air quality monitors to 100 public libraries nationwide.

The Speck sensors, which detect particulate air pollution in the home, already have been used by hundreds of patrons of Carnegie Library of Pittsburgh. CMU's CREATE Lab, which developed Speck, and spinoff company Airviz, which makes and markets the device, are now offering three free Specks, informational materials and training to public libraries that agree to make them available to their patrons.

"We have too many communities where the air is hazardous from time to time, yet people can't readily find out what they are breathing in their own homes," said Illah Nourbakhsh, professor of robotics and head of the CREATE Lab, which develops innovative robotic technologies for the public good. "This

is the air quality you can actually do something about — if you know that a hazard even exists. That's why it is so important that people of all income levels have access to a sensor such as Speck."

Interested libraries can apply for the National Speck Library Program

CONTINUED ON PAGE SIX

“Fastball” Premieres in Pittsburgh

Film Stars CMU Scientists and Hall of Famers

■ Shilo Rea and Jocelyn Duffy

“Fastball,” the baseball documentary that celebrates the sport’s signature pitch and aims to answer the question of who threw the fastest fastball of all time, is premiering in Pittsburgh.

Narrated by Kevin Costner and directed by nine-time Emmy-Award winner Jonathan Hock, the film includes interviews with more than 20 Hall of Fame players, including Hank Aaron, Johnny Bench, Goose Gossage and Bob Gibson.

It also has several connections to Pittsburgh, also known as The City of Champions. Three Carnegie Mellon scientists — physicist Gregg Franklin and neuroscientists Michael J. Tarr and Timothy Verstynen — are prominently featured. CMU Trustee and Steelers minority owner Thomas Tull produced the documentary. And the Pittsburgh Pirates’ superstar center-fielder Andrew McCutcheon appears in it.

Fastball speeds can reach close to — and sometimes surpass — 100 miles per hour, requiring baseball players to make split-second decisions. Tarr and Verstynen talk about how a batter’s brain races to process an incoming fastball.

“Baseball is perhaps the ultimate test of neural abilities,” said Verstynen, assistant professor of psychology and member of CMU’s BrainHub neuroscience initiative. “A fastball can

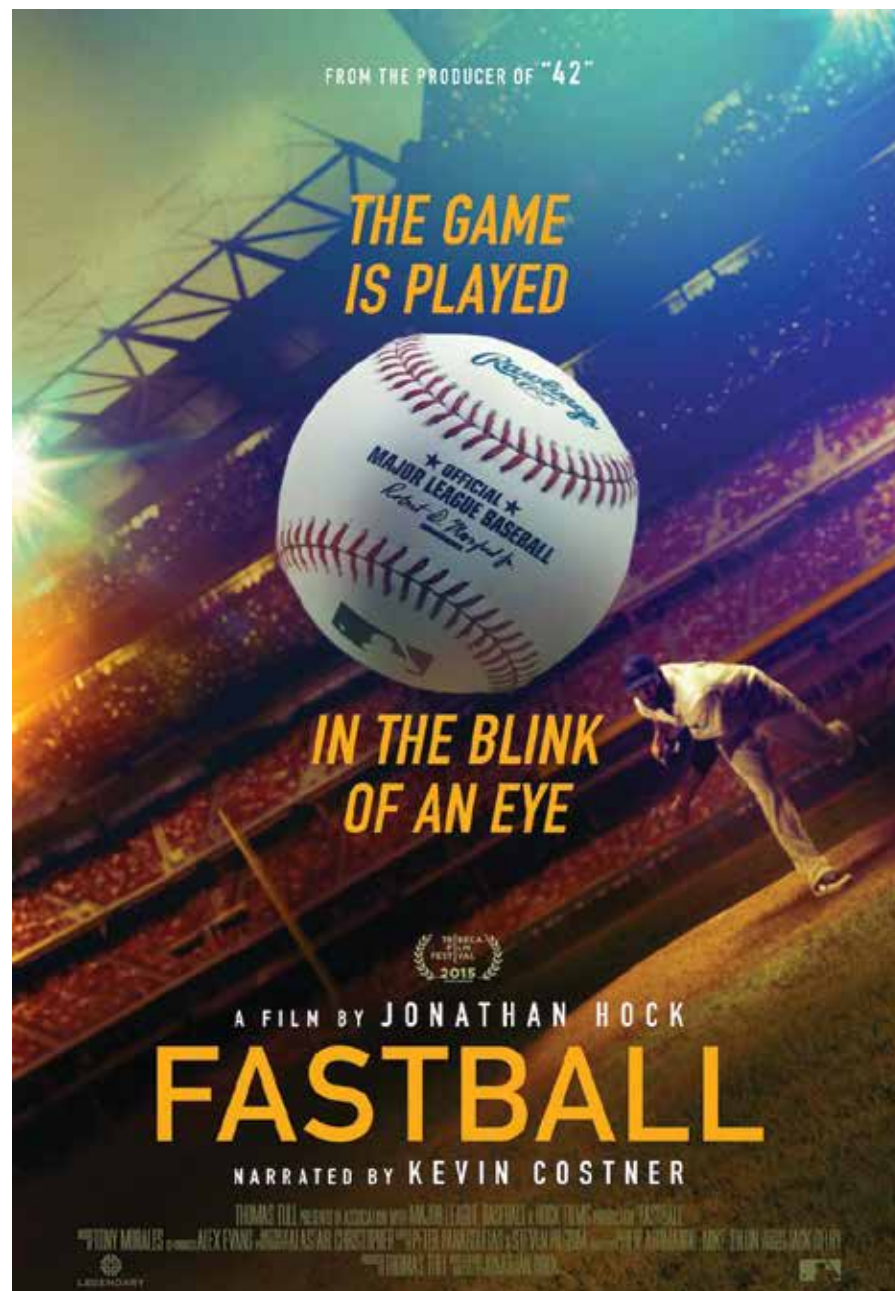
travel so fast that the batter’s brain may not even have the time to make a decision based on what he sees.”

Franklin talks about the physics of the fastball, addressing some of the most controversial questions in baseball: Is there such thing as a rising fastball, and who really threw the fastest pitch? For the latter, Franklin uses physics calculations to compare the speeds of fastballs throughout history.

“Not to spoil the movie, but the fastest pitch on record might not really be the fastest pitch,” said Franklin, a professor of physics. “A fastball is fastest immediately after being thrown, and it loses speed as it approaches the plate. So recordings taken using today’s technology, which measures a pitch’s speed close to the mound, will appear faster than pitches measured using older technologies that recorded speeds closer to the plate.”

Carnegie Mellon will screen the documentary at 8 p.m., Friday, April 15 in Kresge Theater.

Franklin, Verstynen and Tarr, professor and head of the Department of Psychology, will join Hock and Pittsburgh Pirates Director of Performance Chris Johnson for a panel discussion following the screening. The event is part of CMU’s Spring Carnival weekend, and tickets must be purchased in advance.



Spike Lee Screens Film at CMU



Award-winning filmmaker Spike Lee attended the screening of his latest film “Chi-Raq” and also interacted with audience members at a Q&A session prior to the screening last month.

Part of the 2016 CMU International Film Festival “Faces of Conflict” lineup, “Chi-Raq” is a modern-day adaptation of the ancient Greek play “Lysistrata,” set against the backdrop of gang violence in Chicago. The title combines the city’s name with Iraq, equating Chicago to a war zone.

Lee, who has been nominated for two Academy Awards and won an Emmy, is known for using film to express his political beliefs and to examine race relations, the role of media in contemporary life and urban crime.

“Many people associate ‘conflict’ with war, but fortunately for most Americans, war remains an abstraction. Spike Lee has never been one to shy away from conflict here, on American soil,” said Jolanta Lion, director of the film festival and assistant director of the Humanities Center in the Dietrich College of Humanities and Social Sciences.

the PIPER

4/16 ISSUE

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Produced by Digital & Creative Services, April 2016, 16-428.

CARNIVAL CENTRAL:

BUGGY, BOOTH & MIDWAY COME TOGETHER IN ONE LOCATION



■ Kelly Saavedra

All bets are on for a fun-filled Spring Carnival Weekend, April 14-16, with a slight twist in this year's festivities.

The Spring Carnival Committee has rolled the dice, relocating Midway and Booth onto the College of Fine Arts (CFA) Parking Lot and rides to the CFA Lawn. Construction for the new Tepper Quad in Morewood Parking Lot prevents Spring Carnival from occupying its usual real estate.

"I think having the new venue could add a positive spin on Spring Carnival, having one central location for all of the weekend's activities," said Andrew Greenwald, Spring Carnival's adviser.

The theme this year is Game Night, requiring booth-builders to choose a board game or video game theme on which to base their creative structures. Some of the themes already claimed are Candy Land, Battleship, Pac-Man and Mario Kart.

"Twenty-five booths will be constructed on the lot, which is considerably smaller than Morewood. Rides will be set close to the sidewalks to minimize

foot traffic on the lawn. Build Week, when organizations construct their booths, will present a number of new challenges as we work with the organizations to work with the limited space," said Patrick Koenig, Spring Carnival chair.

In previous years, Midway was far from the Sweepstakes start line at the corner of Margaret Morrison and Tech St., the finish line on Frew St., and the Mobot Races in front of Wean Hall.

"Hopefully having everything in one location will make visitors more aware of all the events going on during the weekend and allow them to be more engaged with Spring Carnival as a whole," Koenig said.

Check the schedule for dates and times of your favorite traditions, including Buggy and Mobot races, Scotch 'n' Soda performances, Kidzone, the Staff Council Ice Cream Social, a Zero Waste All Campus lunch and the University Store sidewalk sale.

See the full schedule at www.alumni.cmu.edu.

Smart City Contender CONTINUED FROM PAGE ONE

sustainability and information sharing. And it also incorporates an education component that will train workers who will install the sensors throughout the city.

“Number one, we don’t look at just transportation, we are looking at transportation and energy,” Peduto said. “Number two, they want to see ways sustainability is a factor, and we have that baked right in. We’re also creating an open platform, so the information that’s created from this will be able to be shared with cities around the country, which would be a benefit to the Department of Transportation. And fourth, we have the technology, because of the talent we have in the city, to be the leaders.”

Rajkumar noted the plan will use many types of sensors.

He said the Pittsburgh team’s plan calls for “smart spines” or corridors through the city that will use intelligent transportation systems and smart city technologies. He said, among other aspects, these technologies will:

- make traffic flow smoother;
- enable vehicles to communicate with one another and with traffic signals to improve safety;
- make travel information services available to the public so that citizens can be involved and engaged;
- support vehicle electrification to begin having a positive impact on the climate; and
- deploy pilot studies of automated vehicles.

“The City of Pittsburgh and the mayor are very forward-looking and are



A top contender in the U.S. Department of Transportation’s Smart City Challenge, Pittsburgh has the opportunity to create a new model for cities around the world, said Mayor Bill Peduto.

very accepting of using technologies to help make Pittsburgh one of the smartest cities not just in the nation but also in the world,” Rajkumar said.

As a finalist, the team was awarded \$100,000 to finalize its application, which is due this month.

“The solutions we propose must be sustainable, scalable to larger cities and adoptable by other similar-sized cities,” Rajkumar said. “Active support

and participation from partners in the public sector, private sector, nonprofit foundations and user communities will be crucial. We expect the competition to be tough, and hope that we can rise to the top.”

Nearly 80 cities applied for the challenge. The winning city will be announced in June.

Peduto said Pittsburgh has the opportunity to create a new model for

cities around the world.

“Cities that start to advance the ability to change transportation will be the ones that will be in the lead, not only in creating more effective and efficient and equitable routes and modes of transportation, but also in leading industry and helping to change the economy,” he said.

An Amazing Ride for the Premier



South Australian Premier Jay Weatherill recently made a visit to Carnegie Mellon to see firsthand the university’s technological innovations in autonomous vehicles, smart cities, robotics and clean energy.

A highlight of his visit was a ride in CMU’s self-driving Cadillac SRX, a product of the General Motors-CMU Autonomous Vehicle program. Under the supervision of Professor Raj Rajkumar (far left), co-director of the GM-CMU program, Premier Weatherill experienced an autonomous test ride under normal traffic conditions.

“At first it was a white-knuckle experience,” Premier Weatherill said, “but the whole ride went smoothly; it was amazing.”

Smartphones Can Be Your Road to a Smoother Ride

■ Ann Lyon Ritchie

Pavement riddled with cracks. Graffiti on stop signs. Icy surfaces that need rock salt. Municipalities must respond to road infrastructure problems that are changing constantly.

“It is essential to get eyes on every road, every year, to stay ahead of what could become costly repairs,” said Jason A. Dailey, director of public works for Cranberry Township, Pa. “Services are available that have on-board tools and sensors, but these are typically out of the price range of the average community.”

Christoph Mertz, principal project scientist at Carnegie Mellon’s Robotics Institute, is researching how a smartphone could be the answer.

Mertz’s project examines ways a device as common as a smartphone can give municipalities a fast and inexpensive method for inspecting roadways. In two basic steps, the technology collects images and then examines the data to identify areas that need care.

“Data collection and analysis could take a matter of days, where it would otherwise take months or even years,” Mertz said.

Using computer vision algorithms, the system analyzes high-resolution images of the road and categorizes them. When looking for road damage, for example, it can quickly discover where the ratio of cracked to uncracked surfaces is high, and flag the locations for repair. In other instances it can find signage that is missing or damaged, or detect snow or slush on the road.

Software displays the data using easy-to-read maps and visuals.

“Mertz demonstrated a viable advancement that may bring inspection technology into the everyday operations, making it not only affordable but practical,” Dailey said.

One appealing aspect of Mertz’s system is the simplicity of integrating it with existing procedures. For example, Mertz suggested mounting smartphones onto garbage trucks to routinely assess the roadways. Similarly, snowplows with smartphones could provide real-time road conditions in winter, which Mertz has already pilot-tested with Pennsylvania’s Department of Transportation.

Carnegie Mellon’s Traffic21 initiative, part of Metro21, helps fund projects like this and others in smart transportation. Its goal is to design, test, deploy and evaluate technology-based solutions to address the problems facing transportation systems. The institute fuels multidisciplinary collaboration in the area of transportation.

Nine students currently participate in the research and specialize in different aspects, from localization to optics. The data the team collects may be useful for other transportation projects, such as research for autonomous vehicles.

“The work of Mertz is an ideal example of Traffic21’s vision of research, development and deployment,” said Stan Caldwell, executive director of Traffic21.

Existing work conducted by Traffic21 and Metro21 was used as part of the City of Pittsburgh’s application for the U.S. Department



Christoph Mertz

of Transportation’s “Smart Cities Challenge.” Pittsburgh was recently named one of seven finalists in the federal initiative, which will provide the winning city \$50 million to build technology-based systems to address mounting transportation and transit challenges facing cities nationwide.

“The exciting stage is deploying the technology in the field, making our region a smart transportation living lab,” Caldwell said.

Mertz’s technology has been deployed by the City of Pittsburgh, Marshall Township, Cranberry Township and the Pennsylvania Department of Transportation.

Although potholes will be blooming along with the spring flowers as they do every year, drivers can look forward to a future with fewer bumps in the road, thanks to emerging technologies.

Carnegie Mellon’s Traffic21 initiative, part of Metro21, helps fund projects in smart transportation. Its goal is to design, test, deploy and evaluate technology-based solutions to address the problems facing transportation systems.



Mertz’s smartphone system for inspecting roadways can quickly identify and flag locations for repair, find missing or damaged signage and detect snow or slush on the road.

Specks To Be Available in Public Libraries

CONTINUED FROM PAGE ONE

at specksensor.com/libraries/apply. In addition to three free Specks, participating libraries also receive a 15 percent discount on purchases of additional Specks.

“Libraries are creating a culture of learning that extends far beyond books,” said Toby Greenwalt, the library’s director of digital strategy and technology integration. “By making Specks available in the library we are helping to start a conversation around how to use data to make better decisions and be informed about home environmental health. Since introducing them to the public last year, we have seen an increasing demand for Speck technology.”

“We also want to build a community of local experts who can work with their neighbors and the libraries to use Speck,” said Bea Dias, project director for the CREATE Lab.

People selected for the Speck Air Quality Advocate Program will receive a free Speck and training in return for providing 10-20 hours of service annually. Individuals can apply at specksensor.com/advocates/apply.

The CREATE Lab and Airviz introduced the Speck personal air quality monitor a year ago at the SXSW Interactive Festival in Austin, Texas. To keep the monitors affordable — they



Carnegie Library of Pittsburgh, which loans Specks at 16 of its 19 branches, is providing advice and support for the national campaign.

retail at \$149 — Speck uses a low-cost infrared sensor to detect pollutants. Though such sensors tend to be imprecise, the CREATE Lab developers employed machine learning algorithms that learn to recognize and compensate for spurious “noise” in each detector, boosting accuracy.

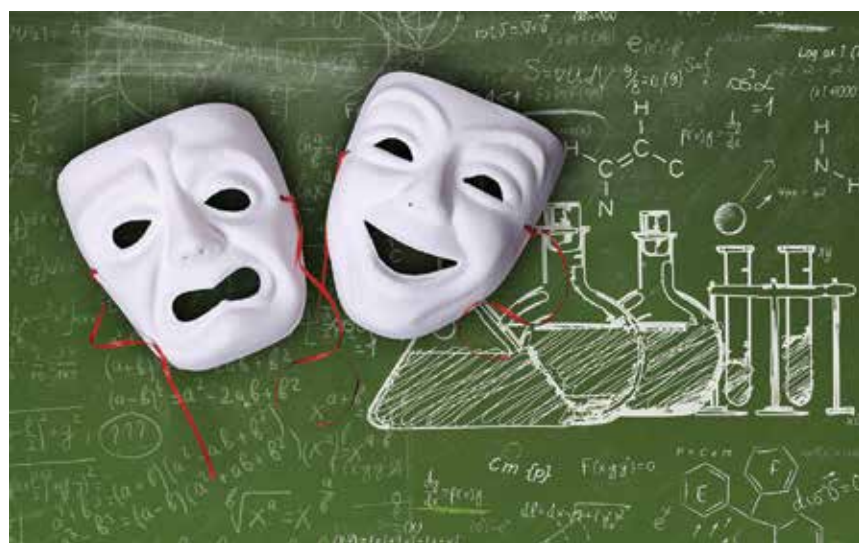
Speck is designed for use indoors, helping users realize when polluted outside air is coming into the house, or to recognize pollution sources within the home. It also is Wi-Fi-connected, so air quality data can be uploaded for analysis and shared, if desired, via the Internet.

Speck was placed in the Pittsburgh library branches with support from the

Heinz Endowments, Fine Foundation and Pittsburgh Foundation. The national library campaign thus far is being supported by CREATE Lab and Airviz in a bid to “pay it forward,” Dias said.

“Providing equitable access to monitoring technology is too important for us not to do this,” Nourbakhsh said.

Murder Mystery Dinner Theater Has Great Chemistry



Drama meets the Department of Chemistry each year thanks in part to Karen Stump.

Everyone on stage is a suspect in the annual Murder Mystery Dinner hosted by the Department of Chemistry.

Created by the department’s Student Advisory Committee more than 10 years ago, science majors come together to present all-original scripts with acting, singing, dancing and audience participation.

“It’s a chance for students to be goofy and outrageous in front of their professors,” said alumnus

Lukas Ronner, now a medical student at Mount Sinai in New York who wrote several scripts while at CMU. “No prior acting experience is needed, and anyone who wants a part, gets a part. I used to say, ‘The less acting or singing experience, the better.’”

One year there was a character reminiscent of Walter White from “Breaking Bad,” and another year featured a spin-off of Dr. Pangloss from “Candide.” Songs from “The Book of Mormon” have been reconfigured with lyrics about



the Chemistry Department.

By 2009, the tradition had caught fire. Chemistry majors wrote original scripts while weaving in plenty of inter-departmental asides. A few years later, singing and dancing was added.

Alumna Callie Jerman, who is now a Ph.D. candidate in bioengineering at the University of California, Berkeley, used her classical dance training to create original choreography.

Though the plays are about creating fun and community, students have found

that the experience helps them in other ways.

“Having some experience with acting has been useful to me as I learn how to behave in a clinical setting. Acting teaches you to have an awareness of your body and face, and the messages you convey with the way you hold yourself,” Ronner said.

Karen Stump, director of Undergraduate Studies and director of laboratories for the department, has acted as an unofficial ringleader for the project. Stump sees the extracurricular activity helpful for a variety of reasons, including enhancing students’ public speaking skills and distinguishing them from other job applicants.

“I think one of the biggest benefits is in being able to take a risk, to step outside of what others, or they themselves, see as their persona and try something that might be very different for them,” Stump said. “Sometimes students become too comfortable in doing the things that they are good at so that don’t appear or feel inexpert at something new.”

Olympic Opportunity

CMU To Host Special Games for Athletes, Campus Community

■ Bruce Gerson

Working with Special Olympics Pennsylvania (SOPA) for the past eight years has been a life-changing experience for CMU Police Lieutenant Joe Meyers. And now, he's helping to share that experience with hundreds of others in the university community.

Special Olympics brings intellectually and often physically challenged athletes, ranging in age from 8 to 60, together to compete in athletic competition. Meyers, along with Athletic Director Josh Centor and the Student-Athlete Advisory Council (SAAC), are partnering with SOPA to host its Western Sectional Spring Games on Saturday, April 30, on CMU's Pittsburgh campus.

Meyers is amazed at the dedication, commitment and sportsmanship he witnesses at the games.

"I watched a 100-yard dash in which a runner fell and a competitor stops, goes back, picks him up and helps him across the finish line. That's what you typically see. It's an emotional experience, something you'll never experience anywhere else," Meyers said.

"You'll walk away at the end of the day and say 'Wow!' It's something you'll never forget."

The Western Sectional Spring Games will include about 400-500 athletes from 15 counties in Western Pennsylvania. Each county, from Greene to Erie, will bring a team to the games.

Meyers leads the university's police force support of SOPA through various annual fundraisers, including the annual Law Enforcement Torch Run and Polar Plunge efforts. CMU's Polar Plunge team has raised more than \$20,000 for SOPA over the last two years.

Centor said NCAA Division III, of which CMU is a member, has a partnership with Special Olympics, so this was a natural fit for the Department of Athletics.

"We were looking for a meaningful way to get involved because community service has been a hallmark of our Student-Athlete Advisory Council mission. When Joe came to me with the idea, I said it was perfect because our student athletes are always looking for opportunities and always enjoy working with other athletes," Cen-



Special Olympics games include track and field and bocce.

tor said.

Centor said he wants to get the general student body involved as well, so he is working with Student Affairs and Student Activities.

"Josh jumped in and it's taken off," Meyers said. "We are reaching out to faculty and staff as well. We want this to be a CMU community event."

The SAAC, led by a pair of swimmers, junior Dustin Ferzacca and sophomore Mary St. John, is busy recruiting students, faculty and staff to volunteer for the various aspects of the games, from the opening ceremony in Gesling Stadium to the competitions in basketball, track & field, swimming, tennis, bocce and golf.

About 400 volunteers are needed.

"We will be working closely with other campus organizations, including Greek life, to get as many volunteers as we can to ensure the event runs smoothly," said Ferzacca, SAAC's community service chair. "This is a daunting task, given how large this event will be, however I cannot overstate how ready and willing the student athletes at CMU are."

"I have full confidence that if any group can pull it off, it is the incredibly involved and proactive athletes here. Everyone I know who has worked with Special Olympics has told me that it is an incredible experience. I look forward to learning that firsthand," he said.

CONTINUED ON PAGE TWELVE

St. John is looking forward

"You'll walk away at the end of the day and say 'Wow!' It's something you'll never forget."

—Lt. Joe Meyers

Facts of Life: Survey Stats Show Need for Fall-Preventing Technologies

■ Tara Moore

Every 13 seconds, an older adult is treated in the emergency room for a fall. Every 20 minutes, an older adult dies from a fall-related trauma. Considering these statistics, it's understandable why a recent College of Engineering survey found that 54 percent of 1,900 U.S. adults are worried about an older parent falling, and why 81 percent of respondents expressed an interest in new sensor technology that can anticipate and prevent falls.

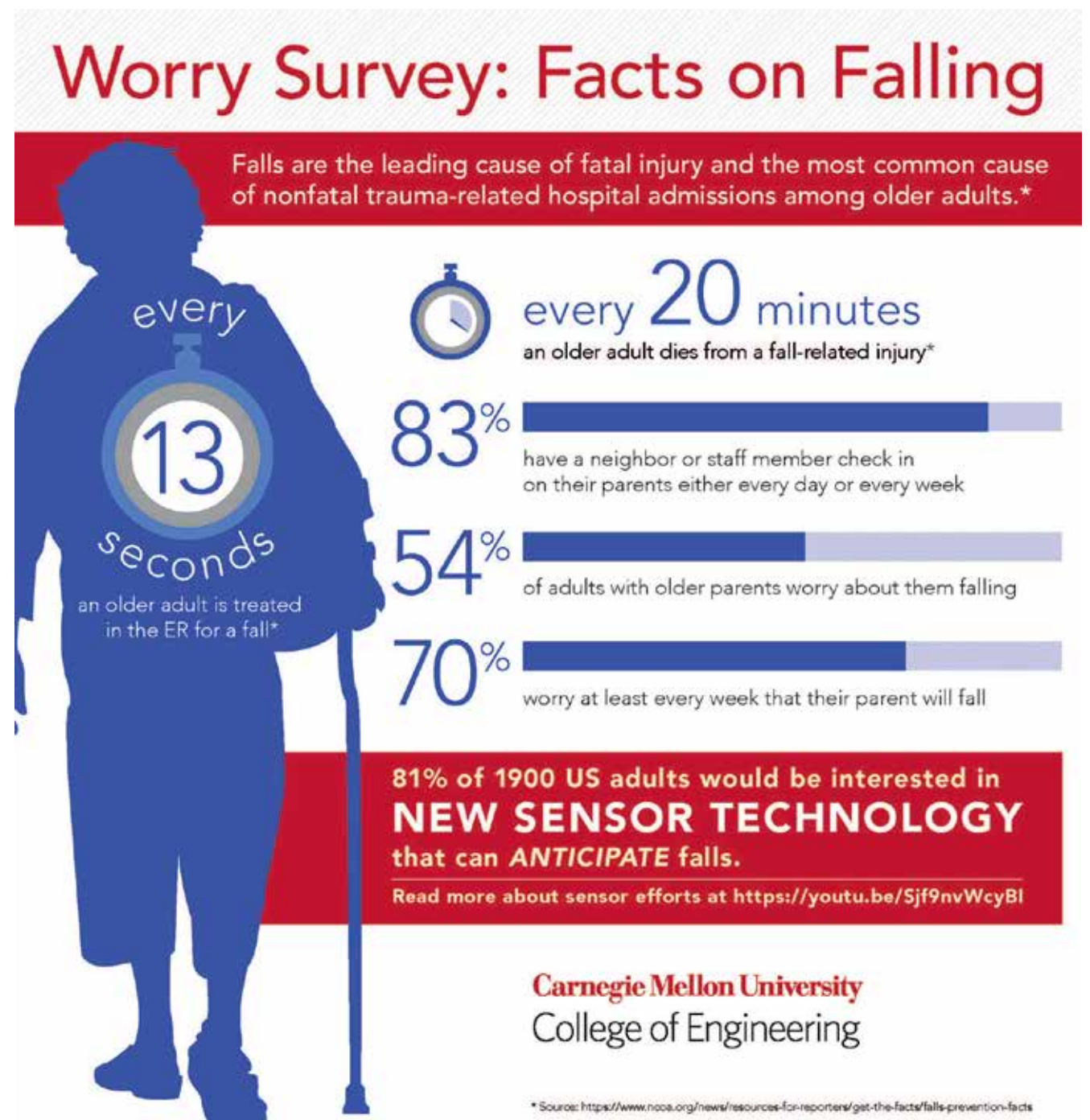
Pei Zhang, associate research professor of electrical and computer engineering, and Haeyoung Noh, assistant professor of civil and environmental engineering, are developing fall-prevention sensors for senior care facilities and private homes that can determine both who is in danger and where. Their technology monitors an individual's gait and can send mobile alerts not only to nurses and caregivers but also to the individual themselves, if their gait becomes dangerous.

While the goal is to anticipate and prevent falls, the technology also is programmed to immediately notify someone, which can include emergency responders, should an individual experience a sudden fall.

"Many older adults in senior care facilities are restricted to wheelchairs when not under the direct care of a nurse, but this technology could allow them to regain some of their independence," said Noh, whose sensors are currently being tested at Vincentian Home in Pittsburgh and Lucas Physical Therapy and Fitness in Sunnyvale, Calif.

"Our sensors are designed to predict and anticipate falls so individuals can worry less about their parents with the knowledge that our technology will discover their parents are not walking the way they normally do, whether because of medication or because they've become fatigued," Zhang said.

Of the 1,900 people surveyed, a little over 1,000 adults are concerned



a parent may experience a fall, and 70 percent of these individuals worry at least every week, if not every day. The frequency and amount that people worry is not influenced by whether or not the parent lives alone, although they are slightly less troubled if the parent lives in an assisted living or senior care facility. Sixty-two percent of those with

parents in assisted living or senior care facilities, however, still worry once a week or every day.

All of this anxiety explains why, according to the survey, people are very responsive about caring for their parents. They frequently visit their parents and also have neighbors or staff who look after them. Forty-four percent of respon-

dents said they or a sibling check in on a parent daily, while 33 percent said they or a sibling check in every week.

Another 12 percent said they stop by as needed. In addition, 56 percent of respondents reported that neighbors or staff physically check on their parent daily, while 27 percent said someone visits every week.

That's How They Roll

Students Design Filtering Water Barrel

■ Adam Dove

For those who take indoor plumbing for granted, it might be difficult to imagine that there are still people on Earth without access to clean water.

For these people, clean water is often miles away from their homes. They are forced to walk for hours, carrying full baskets of water, only to spend a few more hours filtering that water before it is safe for their families to drink.

Researchers around the world are working hard on developing devices to make transportation easier, and ones to make purification quicker.

But what about a single device that could do both?

"We had already seen some ideas out there that filtered water, and others that rolled the water using barrels, but we wanted to create something that filtered while you rolled," said mechanical engineering



The above illustration depicts the potential use of a water transportation and purification system all in one.

New “K”night Watchman

Alum Heads Visionary Security Firm

■ Emily Durham

A new security guard roaming the Silicon Valley campus is causing some passersby to take a second look.

At 5-feet tall, 3-feet wide and 300 pounds, its hulking physical presence and “furrowed brow” command respect, while its rounded figure is “cute” enough not to scare babies. Known as the K5, this autonomous Robocop is just one of an army of data machines built by Knightscope to predict and prevent crime.

Twenty-four-hour, 360-degree data collection cameras and sensors gather every sound and image in its radius in real time, amounting to a total of 90 terabytes of data per year, per machine. Its unique powering capability is scheduled around two- to three-hour patrols with 30-minute autonomous docking recharge periods, playfully referred to as “coffee breaks.”

And the K5 is just one model of many.

William Santana Li is the mastermind behind the technology. An alumnus of the Department of Electrical & Computer Engineering, Li is now chairman and CEO of Knightscope, Inc., an advanced physical security technology company located in Silicon Valley. Li is impassioned when he talks crime; its impact on all of us is tremendous. Not only does society live in constant fear of the worst, but its economic toll on the United States is staggering.

“If you add up all the murders, all the jails, all the lawyers, and everything else,” says Li, “crime is a hidden tax all of us are paying every single year.”

Consider some statistics:

- A violent crime occurs every 26.2 seconds;
- Every 3.5 seconds, a property crime occurs; and
- The private sector security industry has an employee turnover rate of 100-400 percent per year.



CMU alumnus William Santana Li, chairman and CEO of Knightscope, is the mastermind behind the new Robocop security guards roaming the Silicon Valley campus.

“That means you get a new team every three months or every 12 months because you can’t keep the people in the job,” Li said.

“What if you could set up a whole plethora of technologies and be able to integrate them into a solution to cut crime by 50 percent?” asked Li. “How valuable would that be to society?”

Not only do the Knightscope robots promise to quell crime by deterring criminals, but they also make jobs safer for human security personnel by taking on the monotonous, computationally heavy and dangerous aspects of the job, leaving the analysis and decision making to the human professionals.

“So what if you could actually

deliver this level of safety?” asks Li.

“What are the effects on housing prices? What are the effects on insurance rates or the stability of financial markets, the quality of life, the business viability of a small business down the street or the safety of your family? It would be a huge game-changer for society. This is a worthy challenge to take on,” Li said.

senior Deepak Ravi. “Something better than doing the two of them separately.”

Ravi and classmates Anna Mirabella, Jack Kaplan, Veronica Jaime-Lara and Alex Baker put their heads together and designed the Water Transportation and Purification System.

“The design is basically a big barrel with a smaller barrel inside of it, attached to a handle,” Mirabella said. “As you roll the barrel along, the relative motion between the handle and the spinning barrel pulls dirty water from the outer barrel through a filter and into the inner barrel where it stores the newly cleaned water.”

The design uses only a few simple parts and requires no power, only mechanical energy provided by the rolling of the barrel. It uses a Sawyer water filter, which never needs to be replaced, and recycled industrial barrels — food-grade plastic barrels that are normally thrown away. With PVC pipe for the handle, the whole prototype cost only about \$200. When mass-produced, the team estimates the total cost at only \$40 per unit.

“We’ve decided to make this design open source,” Mirabella said. “If someone wants to manufacture our system and get it down to that \$40, none of us would be upset. It would be awesome to have had a small part of

something big.”

Another way this product will keep costs down for the user is its instantaneous filter. Since the water is already purified en route home, users can empty the clean water into a container, then hand the device off to their neighbor. That way, a single device can be shared among an entire community.

The team developed the idea as the final project for their Mechanical Engineering Senior Design course, taught by Associate Teaching Professor Noé Vargas Hernández. The class is required of all mechanical engineering majors for graduation and emphasizes the ability to take a project

from conception to prototype over the course of a semester.

“This wasn’t just a mechanical engineering project for us. Some of us are also design minors, so we thought about how it would be filled, and how it would be made. We thought about the user. That’s why we went with a 15-gallon tank; 15 gallons is about a weekly supply of water for a family in the developing world.” Ravi said.

“I think that’s one of the best things about being able to work here at Carnegie Mellon,” he said. “All of our different disciplines combine to make the best outcome.”

Space Mission

Real Estate Division Launches Campus-Wide Planning Initiative

■ Bruce Gerson

As the university seeks to improve support for students, faculty and staff, administrators have undertaken an initiative to make the best use of the limited space on campus.

At a town hall meeting March 3, members of the Real Estate Division introduced the Space Planning Initiative to members of the campus community. The initiative's sponsors are Provost Farnam Jahanian and Amir Rahnamay-Azar, vice president for Finance and CFO.



The project team toured classrooms and office space in 33 campus buildings.

Over the last nine years, the total undergraduate and graduate student population on the Pittsburgh campus has increased 23 percent, from 9,841 in 2006 to 12,066 in 2015.

Sarah Bush, associate vice president for real estate, said as the university continues to grow at a rapid pace, the project aims to proactively address needs and implement best practices based on a comprehensive inventory and analysis of current classroom and office space.

Emily Blaze, a senior space planner, said the project is about getting more from the facilities we have.

“It’s not about reducing everything to numbers, forcing folks to operate in tiny spaces or mandating ‘do more with less.’ It’s about getting more mileage out of what we have now,” she said.

A look at the numbers reveals CMU’s growing trends. Over the last nine years, the total undergraduate and graduate student population on the Pittsburgh campus has increased 23 percent, from 9,841 in 2006 to 12,066 in 2015. Over that same time period faculty and staff on the Pittsburgh campus have increased 15 percent, from 4,532 in 2006 to 5,359 in 2015.

Academically, new programs and centers have emerged, and partnerships with industry have been forged.

Over the last several months, Bush and her team have met with key stakeholders from across campus, including deans, vice presidents, department heads and unit representatives, and will hold focus groups with faculty, staff and students to gain an understanding of their facility needs.

During the first phase of the project, they spent more than 80 hours touring classrooms and office space in 33 campus buildings to collect information, assess space and understand how spaces are being used. They even counted tables and chairs.

The second phase of the project, set to begin this spring, will include analyzing the data, performing benchmarking activities, developing metrics and discussing the preliminary findings with campus stakeholders.

In the third stage of the project, the findings will be reviewed by an expert advisory group, which will include members of Campus Design and Facility Development, Facilities Management Services, Environmental Health & Safety, Human Resources and Legal Affairs.

In phase four, the project team will work with key stakeholders to develop strategies to present to the university space committee for funding consideration.

Bush and Blaze said some “early wins” to enhance space may be as simple as “thoughtful furniture plans, storage solutions and new tools to enhance how people use their space.”

Phase five will monitor and track progress and explore areas for additional study in future project cycles.

“We have no preconceived notions. This is an open and iterative process,” said Bush, who encouraged those at the town hall meeting to reach out to the project team with their ideas and suggestions. “We don’t know what we don’t know,” she said.

In a question and answer session following the team’s presentation, a question was raised about the classrooms in Posner Hall once the Tepper Quad was completed.

Bush said the 16 classrooms in Posner would be turned over to Enrollment Services, which will increase the number of the registrar’s classrooms to more than 100 in 2018.

“Not only will the Posner classrooms add high-quality instructional space to campus, but they also will address a critical need for additional classroom capacity and availability — a need that is regularly identified by faculty and students across the campus landscape,” said Lisa Krieg, associate vice president for Campus Affairs and director of Enrollment Services.

Bush said what will become of the office space in Posner Hall has not yet been determined, and that time is needed to fully understand how these spaces can be used best.

Faculty Senate Chair Todd Przybycien and Beth Whiteman, director of Accreditation and Strategic Initiatives, encouraged the project team to solicit more input from faculty.

Przybycien, a professor of biomedical and chemical engineering, suggested holding another town hall meeting at 4:30 p.m. when more faculty members would be able to attend. Whiteman urged Bush and her staff to consult the Eberly Center for Teaching Excellence regarding new classroom designs that would enhance teaching.

“We’ll be asking faculty and staff to be part of focus groups that we convene and we’re also engaging faculty and staff as unit representatives,” said Bush, who promised to schedule the next town hall meeting when more faculty could attend.

She also stated that the team is interested in meeting with other faculty members who have expertise in this area.

You can find out more about the Space Planning Initiative and contact the team online at www.cmu.edu/finance/real-estate/space-planning/.

Students Go Digital To Improve Public Safety

■ Katelyn Howard and Chuck Finner

There's nothing like a little competition to bring out the best in people.

In March, MBA candidate Liza Tresser challenged the community to demonstrate how technology, robotics and innovation can bring new ideas to gun safety in CMU's second Idea Space Competition.

The challenge was embraced by CMU, the Pittsburgh Police, the University of Pittsburgh, the Tepper School of Business and others around the community.

The winning team included Tresser's Tepper classmates Randy Cohen and Adrian West; Ryan Farkas, (HNZ 2016); and Eric Duffy, a Carlow University student and art teacher in the Pittsburgh Public Schools.

Their idea — the CRO Digital Community Platform — provides dynamic three-way communications between community resource officers, community groups and community members to improve policing efforts and build trust. The Digital Community Platform collates communications, surveys, data, productivity tools and forums among these groups, making community members more aware of events and initiatives, and helping them voice their concerns.

The system can provide support to community resource officers and improve their productivity. The interface — hosted via mobile applications, websites, cloud services and existing standard messaging platforms — also can be customized to meet the safety needs of school districts, universities or large corporations.

The weekend-long competition impressed officials from sponsor Zero Eight Six so much that they ultimately decided to extend their offer to incubate not only the first-place team in the competition, but also the second.

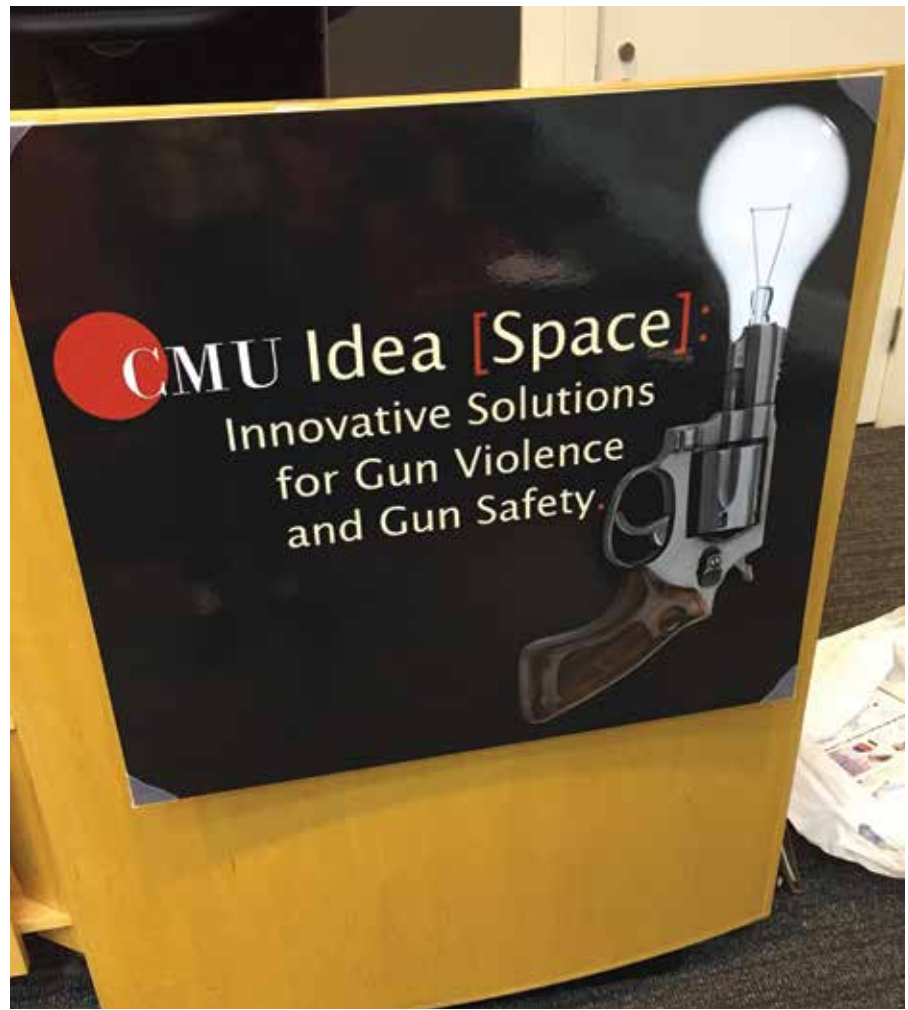
The second-place team, which included Tepper students Jameel Francis, Nikhil Jain, Mallika Khanna, and BXA student and University of Pittsburgh students Andrew Wells and Drew Brumbaugh, used technology to address the issue of lost and stolen firearms. They introduced the concept of Guntrac_r technology, which incorporates a chip that can be attached to a firearm that will transmit signals through a connected wire. This allows owners to access GPS tracking of their gun, including mobile alerts of the gun's location, and the ability to lock the weapon remotely.

"The fact that we were working on potentially life-saving ideas made this feel much different from other competitions that I have been a part of," Tresser said.

Remarks from former Pittsburgh Steeler Charlie Batch, founder of the Best of the Batch Foundation, and Bill Valenta, assistant dean at the University of Pittsburgh Katz Graduate School of Business and former Pittsburgh Police Commander, opened the event.

"Having Charlie Batch and Bill Valenta there to kick off the event brought both an emotional, inspiring side to it, as well as a very experienced side," Tresser said. "Both of them infused the place with a great deal of energy."

Batch spoke candidly about why he started his charity — to pay tribute to his sister, Danyl Lynn Settles, who lost her life to gun violence in 1996 in their Pittsburgh area neighborhood of Homestead, Pa. The Best of the Batch Foundation is a nonprofit organization that offers scholarships, educational assistance and mentoring,



Former Pittsburgh Steelers Quarterback Charlie Batch spoke to the participants about his sister who lost her life to gun violence.

as well as programming that couples sports with learning.

Valenta, who served 22 years on Pittsburgh's police force, shared stories about how he used critical problem-solving to address safety issues in the city. He told the participants about being tasked with cutting back on drug activity in Pittsburgh's Hill District. Valenta and his team spent several weeks observing what factors made the Hill District such a high-traffic area for drug use, and then came up with innovative solutions to eliminate these factors, such as turning a busy thoroughfare into a one-way street heading the opposite direction.

"You could feel throughout the weekend that the participants were really focused," Tresser said. "And the judges and coaches have all said that they were really impressed with the quality of the work and the feasibility of the ideas that came out of the competition."

The CMU Idea Space competition, founded last year by alumnus Alex Brown, is intent on crafting solutions to social issues via innovative technology ideas.

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— Liza Tresser

Drama Closes Curtain With “The Plague in Venice”

Sasha Iliev Directs Performance

■ Erin Keane Scott

Sasha Iliev, a Bulgarian movement, mime and mask expert, has had an impressive, record-breaking career.

In 1992, he won his first entry into the “Guinness Book of World Records” by performing as a mime for 24 hours straight, a record he later broke in 1994. His second Guinness entry came in 1996, after performing in the highest, staged mime concert near Mt. Everest, 17,618 feet above sea level.

Here at Carnegie Mellon he’s not gunning for another world record. Rather, he’s directing his 203rd movement-based production, “The Plague in Venice,” at the School of Drama. The play, which runs through April 23, is

“Movement is at the core of an actor’s profession, because to act is to do something with your body. This art of movement is international. Everyone can understand what’s happening onstage because I’m working with the universal language of human beings.”

— Sasha Iliev

based on a 16th century scenario written by Flaminio Scala and performed in the Commedia dell’arte tradition.

Commedia dell’arte is a form of theater that started in 15th Century Italy as a reaction to political corruption. Performances primarily took place in town squares or other public places, and were based on familiar plot lines or scenarios that allowed performers to improvise and tailor their dialogue to the audience.

The cast of stock characters embodied familiar tropes and fell into three categories: the lovers (innamorati), the elders (vecchi) and the servants (zanni).

“‘The Plague in Venice’ will be a modern take on Commedia,” Iliev said. “Before Commedia was played on the squares. Now, we bring it to theater and we use a few more words as well as many other tools including pantomime, dance, battles, storytelling and music.”

Despite being set hundreds of years ago, the premise of the play sometimes parallels current international politics. The audience will find themselves in a Venice that is made susceptible

to an early type of biological warfare by its corrupt leader, Sasha Iliev, the Doge. During Carnivale, its weakness is exploited when the leader, of the Ottoman Empire plants a plague-infested rat to infect the city.

In addition to bringing this Italian art form to the Chosky Theater, Iliev also has brought with him a new way of working with the students to produce “The Plague in Venice.”

“I fell in love with the way of working here, because it’s a real mutual process,” Iliev said.

Indeed, he and a cast of senior actors created or “devised” the piece in the rehearsal room.

“He gives us the outline and we just go,” said Caroline Pluta (A 2016), the actress playing the character of Plague. “We improvise to see what works and what doesn’t. It’s terrifying,



Sasha Iliev

but also just a huge opportunity and it’s inspiring to work with someone who’s so experienced.”

Having the opportunity to work with an expert such as Iliev is a boon to the students of the School of Drama. Beyond directing “The Plague In Venice,” he’s spent the semester teaching movement classes covering topics from clowning to improvisation.

“Movement is at the core of an actor’s profession, because to act is to do something with your body,” Iliev said. “This art of movement is international. Everyone can understand what’s happening onstage because I’m working with the universal language of human beings.”

Pluta echoes this sentiment.

“I think that, a lot of times, when people think of acting, they think of just saying lines,” she said. “Movement is an

approach from the outside in; you can really find a character through movement and their physical life.”

Working outside of a set script on “The Plague in Venice” has proven to be a worthy challenge for Pluta and her classmates, who are essentially created the production themselves under Iliev’s guidance.

“It’s a different way of communicating,” she said. “It has to be so precise, it has to be just as precise as any language. You can say so much without having to open your mouth. We live in a world where everyone wants to get his or her voice heard. I’ve always been one who likes to listen first and movement is a way to be in tune. It’s another sense, you have to listen with a different part of yourself to understand it.”

Visit <http://drama.cmu.edu/50/> box-office to purchase tickets.

Olympic Opportunity CONTINUED FROM PAGE SEVEN

to meeting and interacting with the competitors and volunteers.

“I got involved with the event because I know large events like this bring the communities together. As students with heavy workloads, it’s easy to get trapped in the CMU community, and we miss events like this happening in Pittsburgh,” she said.

“Since this is happening on campus, it’s a great way for us as students to meet and interact with people we may never have gotten the opportunity to meet otherwise.”

Jessica DiVito, director of development for SOPA, is impressed with CMU’s student participation and the athletic facilities on campus.

“Everyone has been so accommodating and willing to support this effort. We are incredibly lucky to have the chance to work with this group.

“We have toured the campus and it’s completely impressive. Not only beautiful, but everything is incredibly accessible, which is most important for our athletes,” DiVito said.

Meyers said the 30-minute opening ceremony will begin at 9:30 a.m.

Games will follow until a noon lunch break. Following lunch, which is being provided by Sheetz, the games will resume through the afternoon until around 6 p.m.

Olympic-style award ceremonies for individual and team events will be ongoing throughout the day.

This will be the first time CMU hosts this event, but all involved hope it won’t be the last.

“My hope is that this becomes a regular occurrence and tradition at CMU, part of what we are, and also an important experience and opportunity

for our students,” Centor said.

“I’m excited. CMU is the right type of place to be home to something like this. Our facilities, the Cohon Center, the stadium, the pool; if it’s a nice day we’re tailor-made for an event like this.”

“It can’t be more perfect,” Meyers said.

Students, faculty and staff who would like to volunteer should contact the SAAC at SpecialOlympicsCMU@gmail.com.