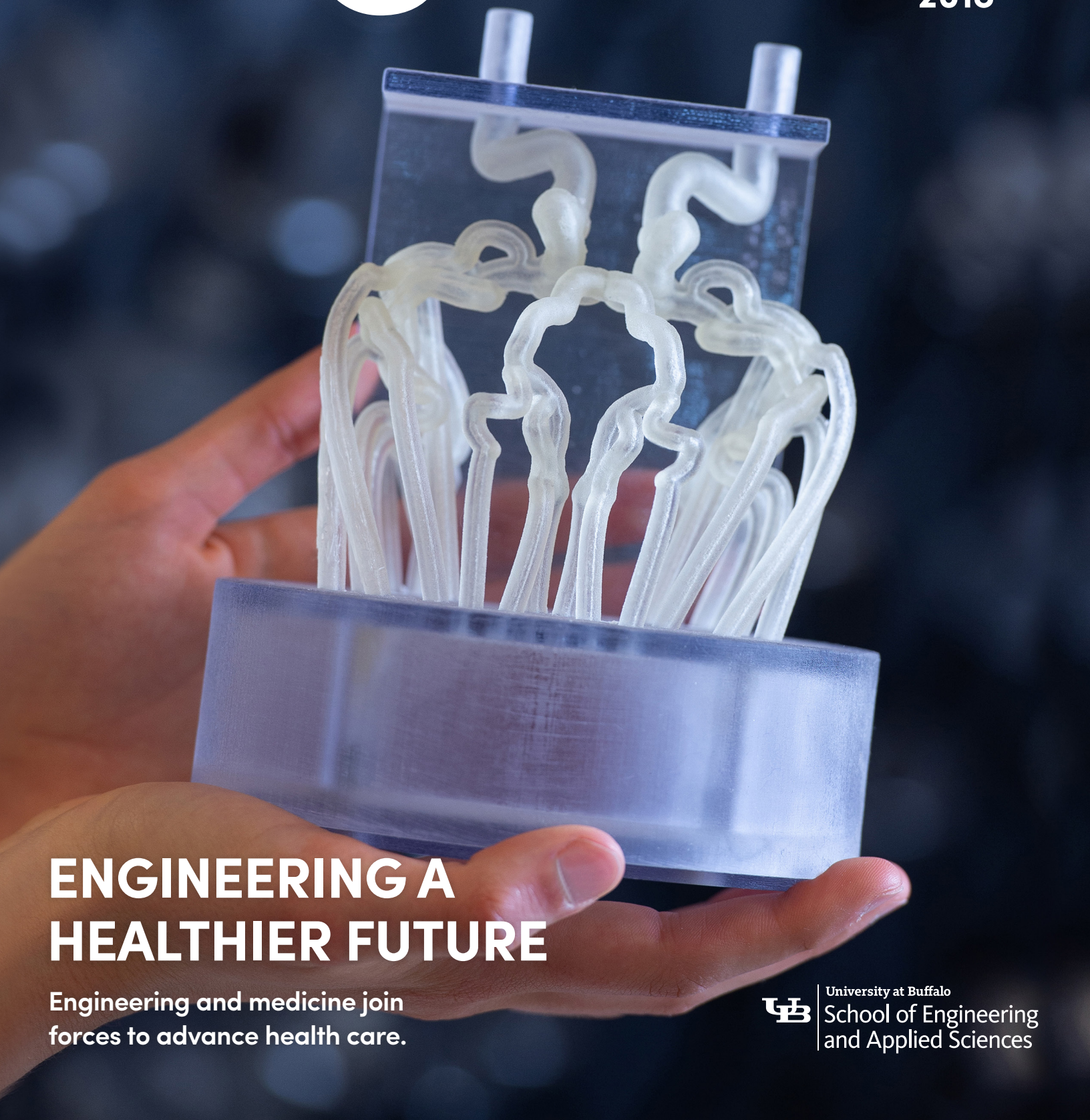
BUFFALO Engineer

2018



ENGINEERING A HEALTHIER FUTURE

Engineering and medicine join forces to advance health care.

University at Buffalo
School of Engineering and Applied Sciences

Onion Studio, Inc.

Liesl Folks, PhD, MBA
Dean, School of Engineering and Applied Sciences

POWERING RESEARCH FOR SOCIAL BENEFIT

Dear Friends of UB's School of Engineering and Applied Sciences,

One of the great advantages of a research university is the wide variety of opportunities it affords our students, faculty and alumni. We have a breath-taking array of research underway at any point in time, and we are working every day to both solve real-world problems and deepen our understanding of fundamental phenomena.

We take great delight in pursuing the kind of interdisciplinary advances that are only possible when you can collaborate with people across many topics. This, when combined with our robust ecosystem for entrepreneurship, encourages and supports the development and commercialization of new technologies across disciplinary boundaries.

In this issue, you will read about how our commitment to discovery is being applied to improve the practice of medicine. We are the only institution in the world to use 3-D modeling to build replicas of patient-specific aneurysms for surgeons to study and train on before delicate surgery is attempted. This trail-blazing project is just one of many that involve interdisciplinary teams of faculty and students from across the university.

The connections made here at UB go with our alumni into the world, empowering them to create new products, new processes and new systems. Our most recent inventions include promising technologies that will benefit society by developing new energy technologies, improving health care and providing broader access to clean water.

All of this rich tapestry of activity will be boosted by the fundraising for our School of Engineering and Applied Sciences as part of UB's newly launched comprehensive campaign, Boldly Buffalo. We are all in this together, on a quest to improve the quality of life for all through research and education!

BUFFALO ENGINEER

Buffalo Engineer is published by the UB School of Engineering and Applied Sciences to showcase the excellence of our faculty, staff, alumni and students.

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University at Buffalo
School of Engineering and Applied Sciences

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ENGINEERING A HEALTHIER FUTURE

Learn how UB engineers and applied scientists are providing game-changing solutions for many of health care's intractable challenges. Cover photo by the Onion Studio, Inc.

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AMPLIFYING UB'S INDUSTRY 4.0 EXPERTISE WORLDWIDE

SEAS marks completion of the nation's first comprehensive specialization on digital manufacturing for the Coursera online learning platform.

ENCORE:

CANOE COMPETITION MEMORIES

In our last issue in "Canoe creations through the years," we asked you to share your memories of the American Society of Civil Engineers (ASCE) Concrete Canoe Student Design Competition during your time at UB. Below are some of your recollections.

"I was an ASCE member and treasurer during my time at UB. The concrete canoe team competed in 1977 in New Jersey. However, the canoe was not very seaworthy and came apart after the race. In 1978, UB competed at the University of Toledo. The canoe was constructed of metal mesh, built on a form. It weighed approximately 200 pounds. At the time, the canoe was constructed in Parker Hall on South Campus."

BOB MICHALSKI | BS 1979, Civil Engineering

"UB's civil engineering students made the first concrete canoe in the Spring of 1973. The fire engine red canoe was a tad bit heavy at approximately 500 pounds. At the competition in Indianapolis, most canoes ranged from 150 to 200 pounds. Needless to say, this was not a handicapped competition, so the odds were against us to make it to the awards stand. We did, however, not finish last in all of our heats. Stopping the canoe did take a lot of effort and it held up admirably, with no cracking, to the few "crashes" we had with the other schools' canoes. One or two of them did not fare so well. Hence, the name 'Red Rammer' seemed appropriate for our canoe."

CARMEN M. PANUCCIO | BS 1973, MS 1975, Civil Engineering

"I enjoyed reading the article on ASCE student competition projects in the Buffalo Engineer. As a graduate student, I was a member of the team the first year that UB civil engineers teamed up with ASCE to construct a concrete canoe. The first UB concrete canoe was red in color and weighed over 500 pounds. Frank Frandina was the designer. A lot was learned since that first year, but you had to start somewhere. We took the first UB concrete canoe to Indianapolis to compete in the regional competition. It was later used as a flower pot in an unnamed faculty member's yard."

JONATHAN KOLBER | BS 1972, MS 1974, Civil Engineering

"I was the faculty advisor many years ago in the late 80's and early 90's. In 1991, our team scored what I think is still the best in the national competition — we got third nationally. The canoe had a "flame" design at the front (one of the students worked at an auto body shop), and we had installed what we called a "turbulator" to generate a turbulent boundary layer to reduce drag. I drove to Orlando with the team in a van and my six year old came with us. He became a sort of unofficial mascot and the team insisted that he go up and collect the trophy when the awards were given out."

JOE ATKINSON | Professor and Chair, Department of Civil, Structural and Environmental Engineering and former faculty advisor to the concrete canoe team

1 The Red Rammer, circa 1973. Photo provided by Carmen Panuccio.

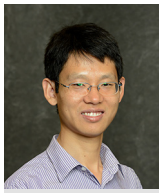
2 UB ASCE Concrete Canoe Team in 1977. Photo provided by Bob Michalski.

Do you have a favorite memory or photo to share about the school?
Please send an email to seascomm@buffalo.edu or contact us at 716-645-5157.

SETTING WORLD RECORDS

Materials developed by UB researcher cited by Guinness World Records

The world's lightest 3-D printed structure is so lightweight that it can be placed on top of a cotton ball or the petals of a flower.



Chi Zhou

The record-breaking material is 3-D printed graphene aerogel and it was developed by Chi Zhou, assistant professor of industrial and systems engineering at UB, together with colleagues from Kansas State University (KSU) and Lanzhou University in China.

At 0.5 milligrams per cubic centimeter, the graphene aerogel was named "the least dense 3-D printed structure" by Guinness World Records. The 3-D printed graphene aerogel, fabricated at UB and KSU, weighs 0.5 milligrams per cubic centimeter.

Graphene has been notoriously difficult to use to create three-dimensional shapes. This new printing method is an improvement because it uses fewer ingredients and only requires graphene oxide and frozen water. Additionally, the two nozzles on the modified printer enable the researchers to create complex shapes with less material, which makes it the lightest material in the world.

The graphene aerogel has numerous possibilities, from flexible batteries to better semiconductors, and it could even be used to make better insulation in the construction of buildings.

"We didn't plan on setting a record, but it's certainly a nice recognition of our work," Zhou said. "I think this helps show the enormous potential that graphene aerogel has in our daily lives."

Kansas State University

A square sample of 3-D printed graphene aerogel is so lightweight that a wheat plant's individual awn can hold it without bending.

HOSPITAL ALARMS BLEND TOGETHER, **FAIL TO ALERT** CAREGIVERS OF EMERGENCIES

A new tool, based in part upon MP3 audio coding, could alleviate the problem

The failure of hospital caregivers to respond to medical alerts is often attributed to "alarm fatigue" — the idea that nurses or doctors can become desensitized to the nonstop cacophony of beeps that patient-monitoring devices make.

Matthew Bolton

A growing field of research suggests another possible explanation: alarms sounding simultaneously can blend together, making one or more of them inaudible. The phenomenon, known as masking, can make it difficult for caregivers to differentiate alarms, including those that signal life-threatening emergencies.

Alarm fatigue, which along with other alarm system failures, was linked to 138 reported deaths between 2010 and June 2015, according to the Joint Commission, a nonprofit that accredits hospitals.

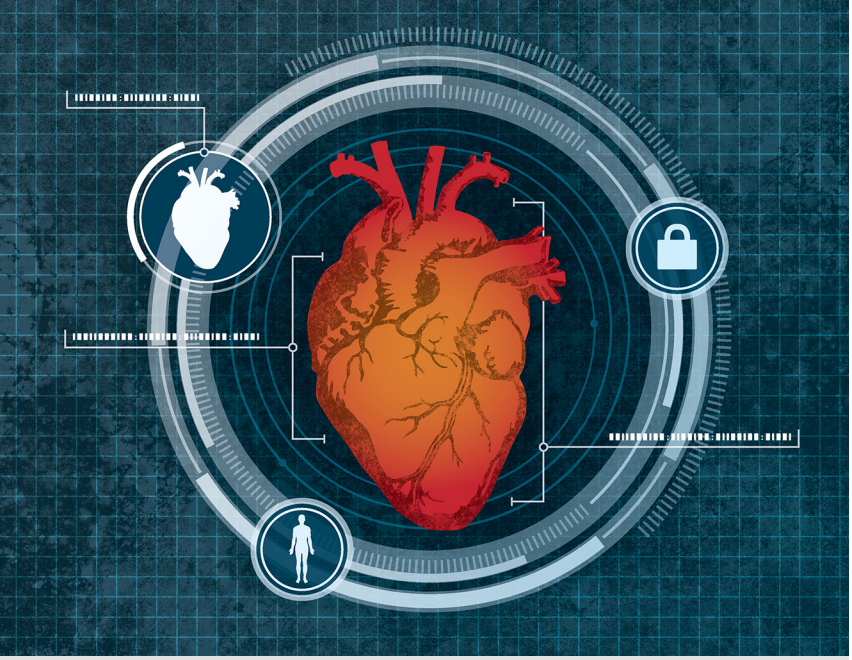
Now, a research team led by Matthew Bolton, an assistant professor in the Department of Industrial and Systems Engineering, is developing a computer-based tool — using the same principles as MP3 audio files — to identify these auditory blind spots. The effort, which is funded by a $750,000 U.S. Department of Health and Human Services grant, may help reduce preventable deaths associated with alarm system failures.

Analyzing an alarm system can take days. However, Bolton is refining the method to shorten that time period to roughly 20 minutes to run a typical alarm system masking audit.

Bolton will use the tool to analyze and make recommendations for improving the international medical alarm standard (IEC 60601-1-8).

He is working with the Association for the Advancement of Medical Instrumentation Foundation, which is responsible for revising the standards for alarm sounds to reduce masking.

The research is described in detail in the journal of Applied Ergonomics, in a paper titled "A formal approach to discovering simultaneous additive masking between auditory medical alarms."



GOODBYE, LOGIN. HELLO, HEART SCAN.

Forget fingerprint computer identification or retinal scanning. Researchers have developed a computer security system using the dimensions of your heart as your identifier.

The system uses low-level Doppler radar to measure your heart, and then continually monitors it to make sure no one else has stepped in to run your computer. It is a safe and potentially more effective alternative to passwords and other biometric identifiers, and may eventually be used for smartphones and at airport screening barricades.

"We would like to use it for every computer because everyone needs privacy," said Wenyao Xu, the study's lead author, and an assistant professor in the Department of Computer Science and Engineering.

The signal strength of the system's radar "is much less than Wi-Fi," and therefore does not pose any health threat, Xu said. "The reader is about 5 milliwatts, even less than 1 percent of the radiation from our smartphones."

The system, which was three years in the making, uses the geometry of the heart, its shape and size, and how it moves to make an identification. "No two people with identical hearts have ever been found," Xu said. And people's hearts do not change shape, unless they suffer from serious heart disease, he said.

Xu plans to miniaturize the system and have it installed onto the corners of computer keyboards. The system could also be used for user identification on cell phones. For airport identification, a device could monitor a person up to 30 meters away.

Other team members from the Department of Computer Science and Engineering are Feng Lin, now an assistant professor at the University of Colorado Denver; Chen Song, a PhD student; Yan Zhuang, a master's student; and Kui Ren, SUNY Empire Innovation Professor; and from Texas Tech University, Changzhi Li.

The research was supported, in part, by the National Science Foundation.

NEW MAPPING TECHNIQUE CAN HELP FIGHT EXTREME POVERTY

For years, policymakers have relied upon surveys and census data to track and respond to extreme poverty.

While effective, assembling this information is costly and time-consuming, and it often lacks detail that aid organizations and governments need in order to best deploy their resources.

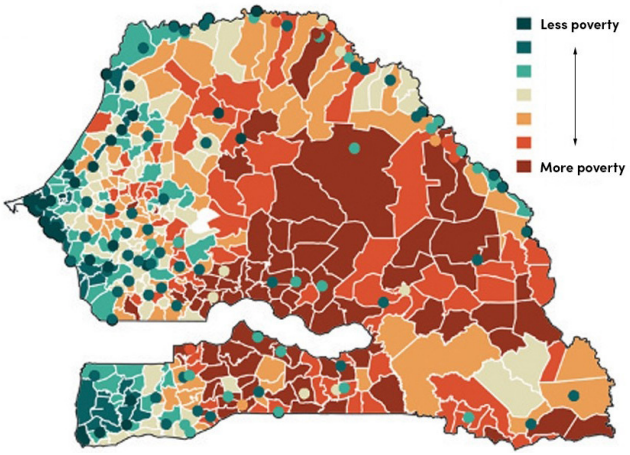
Neeti Pokhriyal

That could soon change with a new mapping technique being developed by Neeti Pokhriyal, a PhD candidate in the Department of Computer Science and Engineering.

The study focuses on Senegal, a sub-Saharan country with a high poverty rate. Pokhriyal is combining cellphone records with data from satellites and geographic information systems using a machine learning-based framework.

The data was used to create maps detailing the poverty levels of 552 communities in Senegal. Unlike surveys or censuses, which can take years and cost millions of dollars, these maps can be generated quickly and cost-efficiently. And they can be updated as often as the data sources are updated. Plus, their diagnostic nature can help assist policymakers in designing better interventions to fight poverty.

The study, authored by Pokhriyal and Damien Jacques, a PhD candidate in the Earth and Life Institute — Environment, Universite Catholique de Louvain, Belgium, is entitled "Combining Disparate Data Sources for Improved Poverty Prediction and Mapping." It appeared in the Proceedings of the National Academies of Sciences, and is supported by the Bill and Melinda Gates Foundation.



UB researchers created a detailed poverty map of Senegal by harnessing big data.

UB-SIGFOX PARTNERSHIP BRINGS IoT NETWORK TO BUFFALO

Buffalo has joined a list of cities nationwide that have a wireless network tailored specifically for the Internet of Things (IoT) — the tech industry's buzzword for connecting everyday physical objects to the internet.

The network — a partnership between Sigfox, a global IoT connectivity provider, and the School of Engineering and Applied Sciences — puts Buffalo in company with San Francisco, Boston and a few dozen other high-tech hotbeds.

Sigfox employs a unique device-to-cloud communications approach to put simple objects online. The approach, which uses radio frequencies ideal for sending small amounts of data over long distances, is known as a low-power wide-area (LPWA) network. It reduces the cost to connect to the Internet, and it limits battery consumption.

The network is ideal for systems that track whether a parking spot is vacant or occupied, if a public recycling bin is empty or full, whether or not a shipment has arrived, or if a door is open or closed — virtually any modest-sized bits of information.

The range of a Sigfox network is greater than most cellular providers, too. For example, its network at UB provides coverage to the Buffalo Niagara region.

"It's really cutting-edge technology for UB researchers to conduct groundbreaking experiments that could lead to great societal benefits," said Josep Jornet, assistant professor of electrical engineering, whose research attracted Sigfox to Buffalo. "We'll also be able to implement the network into our classrooms, offering students an immersive, hands-on course specifically about the Internet of Things."

As part of that course, UB is working with the City of Buffalo to identify how students can apply the technology to improve services.

One of the projects features a "smart" recycling tote that City of Buffalo officials lent to the class. Students attached electronics to the underside of the lid that monitors when the tote is full, its location and other information. The electronics then send that data over a wireless network to whomever is in charge of the totes.

The technology could be used to improve the efficiency of recycling routes. It also could alert officials that someone's tote is full, thereby presenting an opportunity to pick up the recyclables a day or two early.

Buffalo's tech sector, startup community and hobbyists will benefit too. The Internet of Things is a segment of the world's economy that could be worth more than $11 trillion by 2025, according to management consultant firm McKinsey & Company.

— CORY NEALON

"We'll also be able to implement the network into our classrooms, offering students an immersive, hands-on course specifically about the Internet of Things."

-Josep Jornet, assistant professor of electrical engineering

Sarah D'Iorio

SCREENING FOR AUTISM

Douglas Levere

Assistant Professor Wenyao Xu (left) and Kun Woo Cho (right) are working on an app to screen children for autism.

The smartphones parents use to snap adorable photos of their children may soon become a powerful tool for early autism detection, one as effective as it is easy to use.

A new mobile application being developed by Kun Woo Cho, a computer science and engineering major, will be able to track and analyze the eye movements of a person looking at images on-screen. Because the gaze patterns of children with autism spectrum disorder (ASD) tend to differ starkly from those of typical developing children, the results provide an immediate and reliable indication of a child's risk. In a pilot study, the analysis had an accuracy rating of 93.96 percent.

Cho and the developer of the application's computational metric, known as Gaze-Wasserstein, grabbed top honors late last year while presenting her work at the IEEE Wireless Health Conference. She has even gained the attention of tech giant Apple. With the help of her research adviser, Wenyao Xu, an assistant professor in the Department of Computer Science and Engineering, and lab co-workers and study co-authors, Cho continues to work on researching and developing the prototype app, and getting it ready for distribution. Once in the hands of parents, this biofeedback breakthrough will hopefully lead to easier and earlier diagnoses — and better outcomes — for children with ASD.

GRANT AIMS TO IMPROVE SCREENING METHOD FOR BREAST CANCER

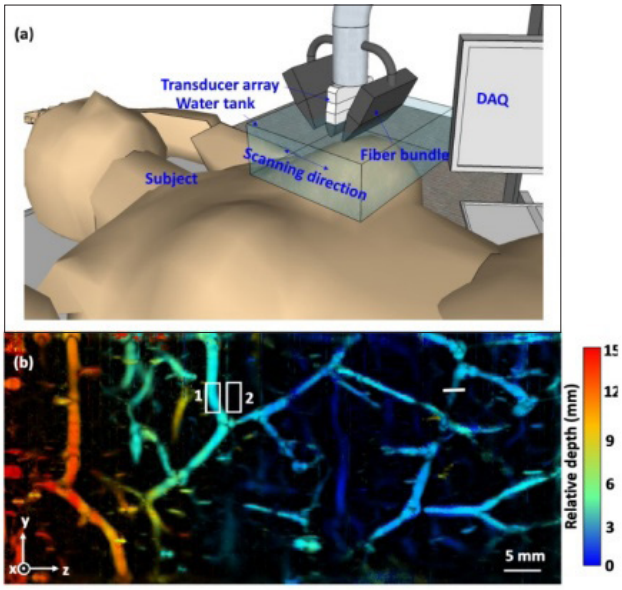
Soon, more women will have access to screening that can detect breast cancer earlier, thanks to an imaging tool being developed by Jun Xia, an assistant professor in the Department of Biomedical Engineering.

He was awarded a $450,000 grant from Susan G. Komen to further his research on photoacoustic computed tomography, a noninvasive imaging technique that combines light and ultrasound technology. It has the potential to better identify breast cancer and address an unmet clinical need of patients with dense breast tissue.

"More than 40 percent of women have dense breast tissue. The dense tissue reduces the ability of mammograms to identify cancer from 87 percent to as low as 30 percent. It's also associated with a higher risk of breast cancer," Xia said. "We are advancing the photoacoustic technology to solve these problems, thereby identifying cancer earlier and improving the quality of life for people diagnosed with this disease."

This research has also received support from the two largest breast screening centers in the Buffalo area: Roswell Park Cancer Institute and Windsong Radiology. Xia plans to image 200 patients in these two clinics over three years and develop a photoacoustic cancer scoring system.

The Department of Biomedical Engineering is a joint program of the School of Engineering and Applied Sciences and the Jacobs School of Medicine and Biomedical Sciences.



The rendering, above, on top, shows one configuration of breast imaging systems developed in Jun Xia's lab. The image below is color coded to show breast vessels at different depths.

SEEING DRONES AS MORE THAN EYES IN THE SKY

FOR DISASTER RESPONSE


Meredith Forrest Kulwicki

From left, Souma Chowdhury, Sanchit Gupta and Arun Sunil demonstrate collaborative UAV flight during a full-scale emergency exercise conducted on UB's South Campus.

Within hours after a 7.8 magnitude earthquake struck Nepal in April 2015 killing and injuring thousands of people and destroying thousands of homes, foreign governments and aid agencies began sending relief workers, medical equipment, food and clean water supplies to the Nepalese government.

The following year, international aid agencies sent food rations, and medical and relief supplies to Ecuador after an equally strong earthquake struck in April 2016.

Government workers and emergency responders in both disasters also received something more: drones.

"In Nepal, unmanned aerial vehicles — UAVs — were used for search and rescue missions and to map out buildings, homes and other structures destroyed by the quake," says Souma Chowdhury, assistant professor of mechanical and aerospace engineering.

"UAVs were also useful in evaluating infrastructure, including roads, that were damaged in the Ecuador earthquake to help determine whether they were safe to use or not."

Chowdhury sees UAV technology playing an increasingly critical role in emergency responses and disaster-relief operations around the world.

"UAVs are increasingly coming to the forefront of humanitarian technology innovation," he explains. "While their application in disaster-relief situations is still in the embryonic stage, recent tests have yielded encouraging results and are also demonstrating the versatility of the drone as a platform for other technologies."

Some of those results are coming from Chowdhury's Adaptive Design Algorithms, Models and Systems (ADAMS) laboratory.

His research pioneered a way to program teams of UAVs — swarming drones — to quickly and efficiently map out oil spills.

Chowdhury devised a method for UAVs to quickly record whether they are over water, oil or the edge of the spill. With multiple drones making observations every five seconds, the size of the spill can be determined quickly. Moving point to point over the spill, they avoid going over space previously covered by other drones.

UAVs' applications for emergency and disaster response can vary from mapping an environmental hazard to saving lives during such events as hurricanes, wildfires, tornadoes and floods by detecting victims or transporting critical payload — including medical or communication supplies — into hard-to-reach regions.

Chowdhury's research is focused on networking UAVs, providing them with the technology to talk to each other, make decisions and move where they are needed without someone on the ground having to synchronize the activity.

"To actualize this, some UAVs might be collecting imagery data, others taking infrared readings — air quality readings in a fire or hazmat event — and a third set of UAVs in that team could be carrying a payload of medical supplies or communications equipment to be dropped off at critical locations as identified by their imaging teammates," he says.

"There is also growing interest in designating a UAV that would serve as a communication drone, and through that UAV, the others could talk to each other — thus creating what we call a flying ad hoc network, or FANET," he says.

"Each drone might be performing a different task, but also collaborating with each other, all on the same team."

"In a flood, for example, if there are people stranded on top of a house, the UAV can take images, recognize them as human beings and communicate with other drones, then tell them to go and drop a package there, such as food rations or first-aid supplies," explained Chowdhury.

"As the versatility of UAVs increases, and extreme weather becomes more severe, they will play a larger role in disaster monitoring and response at different scales," he said.

— MICHAEL ANDREI

CHRISTCHURCH SHIFTS FROM CONCRETE TO STEEL IN POST-EARTHQUAKE REBUILD

The switch may help minimize damage to buildings and enhance the city's resilience in future earthquakes

Michel Bruneau, a professor in UB's Department of Civil, Structural and Environmental Engineering, co-authored a report with potential significant impacts on how modern cities may be reconstructed following earthquakes.

"Reconstructing Christchurch: A Seismic Shift in Building Structural Systems" details the reconstruction of Christchurch, the largest city in the South Island of New Zealand, following the 2010-11 earthquake series that shut down the city's central business district for years.

The report examines the types of structural systems used during the reconstruction of the city, and some of the technical, sociological and political choices associated with those decisions. The authors found that following the earthquakes, the number of buildings with steel structures increased substantially, and they attribute the shift to a number of factors, including the belief that steel is easier to repair than reinforced concrete.

Co-authored with Greg MacRae, a professor at the University of Canterbury in Christchurch, the report was developed as a resource for other urban areas that experience natural disasters. The research was funded by the Quake Centre, located at the University of Canterbury in New Zealand.

Michel Bruneau

A hospital being constructed with a ductile moment resisting steel frame on top of base isolators in New Zealand.

Lori DuVall-Jackson

DUVALL-JACKSON'S HEART IS ELEPHANTINE

Four years ago, when Lori DuVall-Jackson picked up the book "Behemoth: The History of the Elephant in America" by Ronald Tobias, she was already an elephant lover. She had no idea then, however, that she would become an elephant awareness ambassador, a world traveling conservation advocate, and an inspiration to her students.

On August 10, 2017, in celebration of World Elephant Day, DuVall-Jackson, graduate secretary in the Department of Chemical and Biological Engineering (CBE), shared her love of elephants with UB students who gathered together to complete an important mission: to transform UB's bull statue outside of the North Campus Student Union into an elephant.

The focus of the event was to raise awareness of elephant endangerment, but it came with a side benefit — a chance for graduate students, faculty and staff to get out of the lab and join together for an extraordinary cause.

DuVall-Jackson began rallying her students to join the celebration weeks before. "They were very enthused and offered to help, encouraging me to put out a call for volunteers. The department was also incredibly supportive," she said.

To learn more about elephants, visit *elephants.com*.

Did you know?

20+ People from CBE helped construct, paint and transport the bull/elephant.

27 Flags were printed on signage to represent CBE student, faculty and staff backgrounds.

60+ CBE students, faculty and staff posed for group pictures on World Elephant Day.

NEW PROGRAM TO HELP **WOMEN IN STEM** OVERCOME GENDER DISCRIMINATION

A novel educational program, called The NAVIGATE Project, is underway at UB. The program aims to provide female graduate students with skills to recognize and overcome gender inequality.

"We're great at teaching women science and engineering, but we've done a poor job equipping them with skills to overcome gender discrimination, bias and inequity," says Liesl Folks, a principal investigator of the research team, and dean of UB's School of Engineering and Applied Sciences.

The U.S. has made progress addressing the gender gap in the STEM workforce. But problems persist. For example, women fill 47% of all U.S. jobs but only 24% of STEM jobs, according to the U.S. Census Bureau. And gender inequality has roiled Silicon Valley in recent years, from Ellen Pao's highly publicized discrimination lawsuit to scandals involving Uber, Google and other tech giants.

The research team, which has received nearly $500,000 in National Science Foundation grants, will address the problem by utilizing the case study teaching method, which presents content in a narrative format accompanied by questions and activities that promote group discussion and the solving of complex problems.

Coleen Carrigan, Department of Social Sciences, California Polytechnic State University, is also a principal investigator. Co-principal investigators (all from UB) include Glenna Bett, Department of Obstetrics and Gynecology and Laurene Tumiel-Berhalter, Department of Family Medicine, both in the Jacobs School of Medicine and Biomedical Sciences; Xiufeng Liu, Graduate School of Education; and Nancy Schiller, University Libraries.

Douglas Levere

> "Our goal is not only for them to understand the complexity of barriers to women's success and advancement in STEM workplaces, but also learn the knowledge and skills needed to combat bias, discrimination, and inequities that persist in their fields."
>
> **—Coleen Carrigan, California Polytechnic State University**

Holly Acito

John Crassidis (left), Samuel P. Capen Professor, with Major General Charles Frank Bolden Jr. (USMC-retired), former astronaut and NASA administrator.

FORMER NASA ADMINISTRATOR KICKS OFF SPACE WEEK

Major General Charles Bolden Jr., who led NASA for more than seven years during Barack Obama's presidency, touched down at the University at Buffalo on September 18, 2017, as part of the School of Engineering and Applied Sciences' Space Week.

Over 100 people gathered in Davis Hall to hear the former NASA administrator speak. Students packed the room, filling every seat, spilling into aisles and crouching in back corners. The retired astronaut and decorated Marine Corps veteran discussed his career, met students and administrators, and learned about the region's rich aerospace and aviation history.

Junior aerospace engineering major Maura Sutherland helped organize the event through Students for Exploration and Development of Space (SEDS). She also believes it is important to support NASA and learn about space exploration.

"So much of the science and technology we have today has either directly or inadvertently come from NASA's work. Anything from the electronics that are in your phone to cancer research — across the board there has been so much advancement because of NASA," Sutherland said.


Brittany Sandor

Two-time Pulitzer Prize winning photojournalist and aerospace engineering alumnus Marcus Yam (left) talked about his career path with current mechanical and aerospace engineering students, sharing stories about his travels and experiences as a photojournalist. The talk was hosted by Kemper Lewis (right), professor and chair of the Department of Mechanical and Aerospace Engineering. While visiting his alma mater, Yam also took part in a panel discussion on building a successful career during the annual SEAS Career Perspectives and Networking Conference for graduate students, and gave several talks to the UB community about his career.

UB PARTNERS WITH COVANTA
TO STUDY NIAGARA FALLS WASTE-TO-ENERGY PLANT

A team from UB's Department of Civil, Structural and Environmental Engineering and the RENEW Institute is partnering with Covanta to study the company's waste-to-energy facility in Niagara Falls. The plant, called the Niagara Resource Recovery Facility, turns municipal solid waste into steam and electricity.

Led by John Atkinson, an assistant professor in the Department of Civil, Structural and Environmental Engineering and a member of UB's RENEW (Research and Education in eNergy, Environment and Water) Institute, the team will independently quantify the facility's environmental and economic impacts on the Buffalo Niagara region and compare it to landfilling.

They will consider everything from waste collection, processing and transport to the combustion process, including greenhouse gas emissions, metals recovery, ash management and steam generation.

The study — expected to be completed in late 2018 and published in peer-reviewed academic journals — will be one of the most comprehensive and quantitative comparisons between municipal waste combustion and landfilling.

Michael Shelly, an environmental economist at RENEW, will serve as co-principal investigator.

SAFER MANUFACTURING THROUGH MATERIALS SCIENCE

Imagine a thriving community built around manufacturing jobs where the production methods and processes not only minimize waste and mitigate negative environmental impacts, but also address health risks posed to residents and workers.

How do we get there? Who needs to have a seat at the table?

A new partnership, facilitated by The JPB Foundation, aims to address these questions and more through the formation of the Collaboratory for a Regenerative Economy (CoRE). Led by UB's Department of Materials Design and Innovation (MDI), CoRE is a collaboration with Clean Production Action and Niagara Share.

CoRE will bring together scientists, manufacturers, community partners and other key stakeholders to understand the challenges in building a self-sustaining economy in rapidly expanding and evolving industries.

While the initial focus of the project is on solar panel manufacturing, the findings will serve as a testbed that can later be scaled and used for other industries.

"Our project seeks to lower the barriers to the adoption of production processes that are environmentally friendly and offer the potential to improve community health," says Krishna Rajan, Erich Bloch Endowed Chair of MDI.

"We will use cutting-edge discoveries in materials science and engineering to develop innovative and transformative approaches to design data-driven, green-manufacturing processes that will reduce the use of toxic chemicals and/or those derived from fossil fuels in the solar panel manufacturing industry," he says.

Since low-income families make up a significant portion of the frontline communities that are impacted by industrial and energy production, the project aligns closely with The JPB Foundation's focus on health and poverty.

Key features of the CoRE initiative include industry and community-targeted workshops, an MDI Summer Institute and a traineeship program that links MDI students with community organizations and other constituencies.

UB's Department of Materials Design and Innovation is a collaboration between the College of Arts and Sciences and the School of Engineering and Applied Sciences.

Learn more at *corebuffalo.org*.

THE END OF PNEUMONIA?
NEW VACCINE OFFERS HOPE.

In 2004, pneumonia killed more than 2 million children worldwide, according to the World Health Organization. By 2015, the number was less than 1 million.

Better access to antibiotics and improved nutrition account for part of the decline. But scientists say it's mostly due to vaccines introduced in the early 2000s that target up to 23 of the most deadly forms of the bacterium that causes pneumonia, Streptococcus pneumoniae.

Now, a new vaccine under development at UB could deal another blow to the disease, lowering the number of deaths even further by targeting dozens of additional strains of S. pneumoniae, and anticipating future versions of the bacteria responsible for the disease.

The vaccine provoked an immune response to 72 forms of S. pneumoniae — including the 23 mentioned above — in lab tests on animals, according to new research published in the journal Science Advances. The study represents the "most comprehensive" coverage of pneumococcal disease to date, researchers say.

"We've made tremendous progress fighting the spread of pneumonia, especially among children. But if we're ever going to rid ourselves of the disease, we need to create smarter and more cost-effective vaccines," says Blaine Pfeifer, professor of chemical and biological engineering and the study's co-lead author.

"Traditional vaccines completely remove bacteria from the body. But we now know that bacteria — and in a larger sense, the microbiome — are beneficial to maintaining good health," says Charles Jones, the study's other co-lead author.

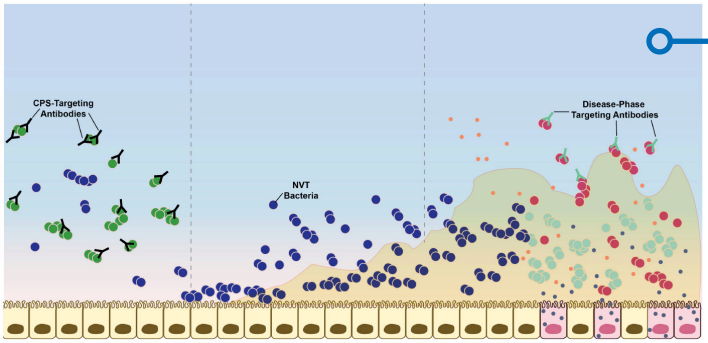
"What's really exciting is that we now have the ability — with the vaccine we're developing — to watch over bacteria and attack it only if it breaks away from the colony to cause an illness. That's important because if we leave the harmless bacteria in place, it prevents other harmful bacteria from filling that space."

Jones, who earned a PhD while working in Pfeifer's lab, has formed a company, Abcombi Biosciences, to bring the vaccine and other pharmaceutical products to market. The company, part of the START-UP NY economic development program, was a finalist for the 43North business plan competition in 2016 and has received seed funding and other support from UB.

Co-authors of the study from UB's School of Engineering and Applied Sciences include Guojian Zhang, Roozbeh Nayerhoda, Marie Beitelshees (also of Abcombi), Andrew Hill (also of Abcombi) and Yi Li; Bruce A. Davison and Paul Knight III, both faculty members from the Jacobs School of Medicine and Biomedical Sciences at UB; and Pooya Rostami of New York University's Langone Medical Center.

The research was supported with funding from the National Institutes of Health and by UB's Arthur A. Schomburg Fellowship Program.

— CORY NEALON



This image shows how the new vaccine under development works. The circles represent strains of Streptococcus pneumoniae, the bacteria that causes pneumonia. The left side of the image shows the immune system attacking bacteria before it colonizes the body. The middle section shows forms of S. pneumoniae not covered by current immunizations settling in the body. The right portion shows the new vaccine attacking those bacteria only after they become problematic.

Roadmap for future growth: This past fall, the School of Engineering and Applied Sciences formalized a strategic plan to guide and manage its tremendous growth and to ensure that the school continues to deliver extraordinary research impacts and world-class education. The plan represents the views of the entire school community — faculty, students, staff, alumni and the university's leadership team. Read the plan online at **engineering.buffalo.edu/strategy.html** or email **seascomm@buffalo.edu** to request a hard copy.

TWO SPIN-OFFS RECEIVE FEDERAL FUNDING

To advance technologies in health care and water purification

Two startups have received six-figure awards from the National Science Foundation to support the commercialization of promising technologies that could benefit society by improving health care and providing broader access to clean water.

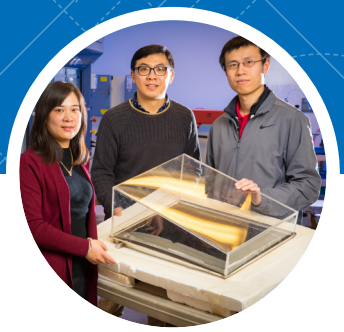
Neurovascular Diagnostics Inc.

Founded by professor of mechanical and aerospace engineering Hui Meng, biomedical engineering PhD graduate Vincent Tutino, and entrepreneur Jeff Harvey, Neurovascular Diagnostics Inc., has received a $224,000 Phase I Small Business Innovation Research (SBIR) award from the NSF. The company is developing a blood test for detecting unruptured brain aneurysms. This advancement could save lives by enabling doctors to identify and provide preventative treatment to patients who have such aneurysms but exhibit no symptoms.

Neurovascular Diagnostics was founded based on research by Meng and Tutino, who discovered differences in gene expression within the neutrophils (a type of white blood cell) of people who have intracranial aneurysms.

The work has been supported by multiple awards from the Brain Aneurysm Foundation, with the majority of the funding coming from the Carol W. Harvey Memorial Chair of Research, which remembers Jeff Harvey's wife. The project was funded through this memorial fund before Jeff Harvey and the UB team ever met — Harvey had been giving to the Brain Aneurysm Foundation for many years and found Meng and Tutino's research extremely interesting. This relationship later led to the formation of the company.

The company is partnering with DxTerity, a Los Angeles-based genomics company, to design further studies and develop a From-Home blood test that can detect these variations.



Sunny Clean Water LLC

Founded by associate professor of electrical engineering Qiaoqiang Gan and UB researcher Zongmin Bei, and University of Wisconsin-Madison assistant professor of electrical and computer engineering Zongfu Yu, Sunny Clean Water LLC has received a $225,000 Phase I SBIR award from the NSF. The company is developing a solar-powered water purification device, which could help alleviate drinking water shortages in developing areas and regions affected by natural disasters.

The company's current prototype — about the size of a mini fridge — uses sunlight and dark nanofabric materials to evaporate water, leaving behind salt, germs, dirt and other foreign matter. Then, the water condenses back into a liquid state in a clean container.

This patent-pending system is able to evaporate water three times faster than the natural evaporation rate, says Gan.

Sunny Clean Water's technology could help solve two global market needs: first, the device could broaden access to drinking water, including in developing areas and regions facing temporary shortages due to causes including natural disasters. In addition, the technology could be of interest to the salt industry, enabling producers to accelerate the evaporation of water from brine ponds that generate salts that provide materials for high-tech uses.

Sunny Clean Water will use the new SBIR funding to develop additional prototypes of the company's system for field testing.

STARTUP WINS $50,000

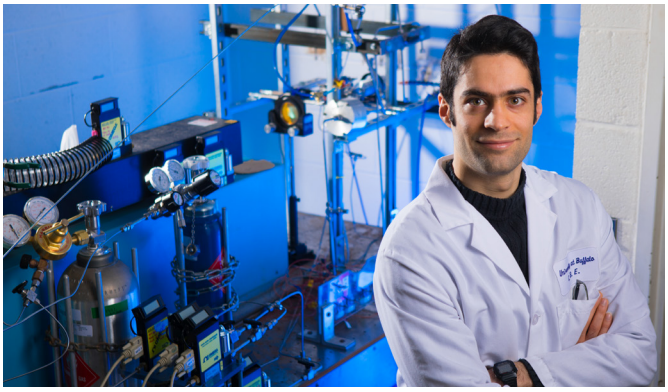
in FuzeHub commercialization competition

NanoHydroChem LLC, co-founded by chemical and biological engineering PhD candidate Parham Rohani and UB Distinguished Professor Mark Swihart, was one of five startups to win $50,000 in a statewide commercialization competition organized by FuzeHub, a nonprofit organization responsible for assisting small- to medium-sized manufacturing companies in New York State.

The company is developing a method of creating hydrogen fuel on demand. The technique involves mixing specially designed boron nanoparticles with water at room temperature to generate hydrogen gas.

Potential applications for this technology range from powering backup generators for remote cell phone towers to dramatically extending the run-time of underwater and aerial drones used in industrial applications like oil pipeline inspection.

"On-demand hydrogen generation is very safe because it eliminates the challenge of storing hydrogen in gas form. Also, there is no need for hydrogen infrastructure support. As long as you have water and the material cartridge, hydrogen gas can be generated," said Rohani, who delivered the company's pitch at the competition.



Douglas Levere

PhD candidate Parham Rohani created a company, NanoHydroChem, to commercialize hydrogen-energy related products.

The company will use the FuzeHub prize money on prototyping and researching alternative methods of producing boron nanoparticles that will lower the cost of large-scale manufacturing, said Swihart, who is also the executive director of UB's New York State Center of Excellence in Materials Informatics.

NanoHydroChem previously won UB's 2017 Henry A. Panasci Jr. Technology Entrepreneurship Competition for student entrepreneurs.

POP BIO PARTNERS WITH INTERNATIONAL PHARMA COMPANIES

The UB spinoff's biotechnology boosts immune responses against diseases

Douglas Levere

Jonathan Lovell (right) and Kevin Carter are among the co-founders of POP Biotechnologies.

University at Buffalo spinoff POP Biotechnologies (POP BIO), a Buffalo-based biopharmaceutical startup, recently inked research agreements with two international pharmaceutical companies, signed a manufacturing contract with a regional drug development firm and moved into new digs at the UB Technology Incubator at Baird Research Park.

POP BIO has developed a vaccine adjuvant called SNAP, an abbreviation for Spontaneous Nanoliposome-Antigen Particleization. Adjuvants are immunological agents, often used to enhance the efficacy of vaccines and drug treatments.

"Essentially, it can make existing vaccines' responses more powerful and longer-lasting, and open the door to creating vaccines for diseases that so far have evaded a vaccination," said Jonathan Lovell, an associate professor in the Department of Biomedical Engineering, whose lab developed the technology.

Previously, the company won the 2015 Henry A. Panasci Jr. Technology Entrepreneurship Competition, and attracted the interest of America Online co-founder Steve Case, who along with local investors awarded POP BIO $100,000 in 2015 during Case's Rise of the Rest business plan contest.

FACULTY AWARDS

Biomedical Engineering: Albert Titus received the SUNY Chancellor's Award for Excellence in Faculty Service.

Chemical and Biological Engineering: Paschalis Alexandridis was named a Fellow of the American Institute of Chemical Engineers; Stelios Andreadis was named a Fellow of the Biomedical Engineering Society; Blaine Pfeifer was named a Fellow of the American Institute for Medical and Biological Engineering.

Civil, Structural and Environmental Engineering: Michel Bruneau was named a Fellow of the Canadian Academy of Engineering, and received the Moisseiff Award from the American Society of Civil Engineers and the Chancellor's Award for Excellence in Scholarship and Creative Activities from SUNY; Andrew Whittaker received the Stephen D. Bechtel, Jr., Energy Award and the Walter P. Moore Jr. Award, both from the American Society of Civil Engineers; Teng Wu received the Robert Scanlan Award from the American Association for Wind Engineering, and the Junior Award from the International Association for Wind Engineering.

Computer Science and Engineering: Chunming Qiao was named a SUNY Distinguished Professor; Kui Ren and Jinhui Xu received the SUNY Chancellor's Award for Excellence in Scholarship and Creative Activities; Aidong Zhang was named a Fellow of the Association for Computing Machinery.

Electrical Engineering: Weifeng Su was named a Fellow of the Institute of Electrical and Electronics Engineers.

Industrial and Systems Engineering: Ann Bisantz received the Paul M. Fitz Education Award from the Human Factors and Ergonomics Society, was elected to the Board of Trustees of the Institute of Industrial and Systems Engineers and was named Dean of Undergraduate Education at the University at Buffalo; Warren Thomas was named a Fellow of the Institute of Industrial and Systems Engineers; Jun Zhuang received the Koopman Prize from the Military Applications Society of INFORMS.

Materials Design and Innovation: Quanxi Jia was named a Fellow of the Institute of Electrical and Electronics Engineers.

Mechanical and Aerospace Engineering: John Crassidis was named a Samuel P. Capen Professor and received the J. Leland Atwood Award from the American Institute of Aeronautics and Astronautics; Kemper Lewis received the Design Automation Award from the American Society of Mechanical Engineers; Hui Meng was named a Fellow of the American Society of Mechanical Engineers; Rahul Rai received the Computers and Information in Engineering Division Young Engineer Award from the American Society of Mechanical Engineers; Tarun Singh received the NAGS Graduate Teaching Award from the Northeastern Association of Graduate Schools.

AMIT GOYAL ELECTED TO NATIONAL ACADEMY OF ENGINEERING

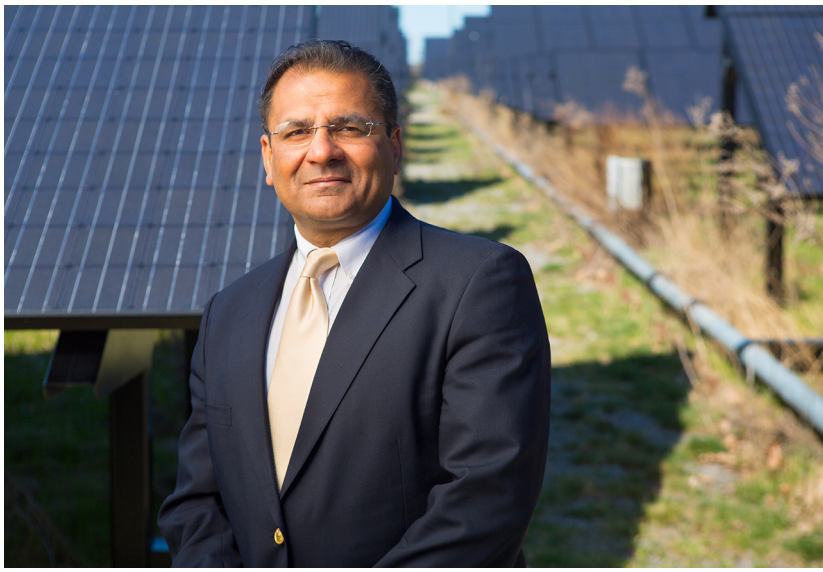
Amit Goyal, an internationally recognized materials scientist and director of the University at Buffalo's RENEW Institute, has been named a member of the National Academy of Engineering.

Goyal, who was elected based on "materials science advances and contributions enabling commercialization of high-temperature superconducting materials," arrived at UB in January 2015 as the founding director of RENEW, an interdisciplinary institute dedicated to research and education on globally pressing problems in energy, environment and water.

His research has had a profound impact on the field of high-temperature superconductivity, both in fundamental materials science and in the transition of scientific discoveries from the laboratory to the marketplace. In 2014, he was elected to the National Academy of Inventors.

Goyal has authored or co-authored more than 350 technical publications, including 45 invited book chapters and papers, and has co-edited six books. He has 87 issued patents comprising 70 U.S. and 17 international patents, and more than 20 patents pending. He was the most cited author worldwide in the field of high-temperature superconductivity from 1999-2009.

He is an elected fellow of eight professional societies: the American Association for the Advancement of Science, the Materials Research Society, the American Physical Society, the World Innovation Foundation, the American Society of Metals, the Institute of Physics, the American Ceramic Society and the World Technology Network.



Douglas Levere

Goyal is also the founder and president of TapeSolar Inc., a private-equity funded solar photovoltaics company, and TexMat, an intellectual property holding and consulting company.

Goyal joins Michael Lockett, Eli Ruckenstein and Charles Zukoski as the fourth faculty member affiliated with the Department of Chemical and Biological Engineering to be named a member of the National Academy of Engineering.

EDWARD FURLANI NAMED FELLOW OF NATIONAL ACADEMY OF INVENTORS

Onion Studio, Inc.

Edward P. Furlani, whose pioneering work in microfluidics, inkjet systems, optoelectronics and other fields is recognized worldwide, has been named a Fellow of the National Academy of Inventors.

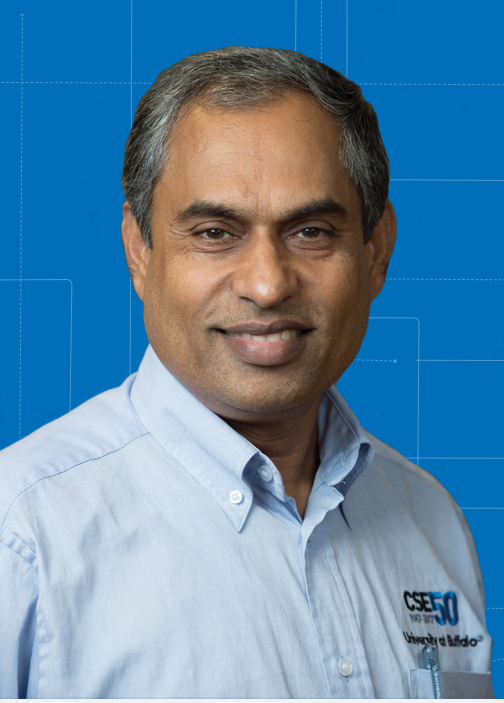
The academy cited Furlani for a "highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development and the welfare of society."

Furlani, who holds appointments as a professor in the Departments of Chemical and Biological Engineering and Electrical Engineering, is among 155 fellows named this year.

Prior to joining UB in 2011, Furlani was a principal scientist at Eastman Kodak Company in Rochester, where he was awarded 152 U.S. patents and 40 foreign patents.

Since joining UB, he has established a research program that develops computational methods and models to create next-generation materials and devices with features and functionality designed at the nano- to micro-scale.

Furlani is a graduate of UB, where he received his PhD in theoretical physics in 1982.



MEET SHAMBHU UPADHYAYA

Associate Dean for Graduate Education and Research and Cybersecurity Expert

Shambhu Upadhyaya has joined the school's leadership team as Associate Dean for Graduate Education and Research, succeeding Gary Dargush, professor and former chair of the Department of Mechanical and Aerospace Engineering.

An expert on protecting the United States from cyber threats, with a focus on infrastructure — electric power grids, transportation systems, financial networks, military assets and water supplies, Upadhyaya is also a professor in the Department of Computer Science and Engineering, and director of UB's Center of Excellence in Information Systems Assurance Research and Education (CEISARE).

We caught up with Upadhyaya to get an expert's view of today's cyber threats, and how to prevent their damaging effects from striking.

Question: It seems like news of large-scale data breaches and cyber attacks are no longer a rare exception, but becoming the norm. Why?

Upadhyaya: With the advent of technology and software come new vulnerabilities. People are slow in adopting security best practices. So, the attack surface is not shrinking. Moreover, there are determined hackers outside and inside of the country who like to disrupt operations and cause damage.

Question: What security controls should companies have in place to help decrease their risks?

Upadhyaya: First and foremost, companies should have a chief information security officer (CISO) who can set up a security policy, and make sure that policies are implemented and security breaches can be investigated. Using some modern security tools — such as firewalls that provide perimeter defense, virus and spyware detectors that protect against malware, and intrusion detection systems that protect against unauthorized access to company assets — will help mitigate risks.

Question: How can individuals better protect themselves?

Upadhyaya: Adopt security best practices. Use strong passwords. Update your software and apply patches periodically. This is pretty easy because today's computer systems can be programmed to apply security updates automatically.

Question: As an expert in cybersecurity, hacking, encryption and cyberattacks, how can you assist companies that either want to increase their safeguards or find themselves ensnared in a cybersecurity problem?

Upadhyaya: By way of education — via cybersecurity awareness classes — or by introducing concepts that would help to assess an organization's security posture. I can help by making recommendations on how to harden your network. Our current focus at CEISARE is on research methodologies, but we are available to train individuals on how to perform penetration tests on an organization's network and assess the risks.

Question: CEISARE is certified by the National Security Agency and the Department of Homeland Security as a national center of excellence. What is its mission?

Upadhyaya: CEISARE supports efforts to meet the challenges and threats to the National Critical Information Infrastructure, which includes the financial sector, energy, health and transportation. Essential to that is elevating higher education in Information Assurance (IA) and Cybersecurity, and the presence of a greater number of professionals with IA expertise. The goals of CEISARE are to provide graduate education and coordinated research in computer security and information assurance by faculty members from several schools and departments at the University at Buffalo.

Question: What are some emerging security issues that are on your radar screen?

Upadhyaya: I am looking at ways to enhance the authentication of users with strong passwords that you don't need to remember. I am also examining how to keep individuals authenticated all of the time by using behavioral biometrics, such as typing rhythm on a keyboard or mouse movements. I am also looking at security solutions for attacks that are unconventional, spread over long periods of time, multi-stage and more damaging.

— TRACY PUCKETT

ZODIAC AEROSPACE

NAMED CORPORATE PARTNER OF THE YEAR

Onion Studio, Inc.

Zodiac Aerospace employees Robert Hyjak, Ashok Jain (member of the Dean's Advisory Council), and Kim Helmer (BS '02, ME '05, MBA '15) accept the Corporate Partner of the Year award.

Every year, the School of Engineering and Applied Sciences celebrates the contributions of its alumni and corporate partners with an award ceremony, networking event and dinner.

This year, Zodiac Aerospace, a world leader in aerospace equipment and systems for commercial, regional and business aircraft, as well as helicopters and space applications, received the Corporate Partner of the Year Award.

The award is given annually to a "corporation that has invested significant time and resources toward the advancement of our school and our students."

For the past three years, Zodiac Aerospace has served as a Gold Level Engineering Partnership member, contributing over $10,000 to support engineering student clubs and events.

In addition, they provided support that allowed the Students for the Exploration and Development of Space's (SEDS) rocket design team to attend an international competition.

Employees have volunteered numerous hours to school events by speaking with students, sitting on panels and attending networking receptions to help prepare students for the workforce. In addition, Zodiac Aerospace has hired many University at Buffalo graduates over the years.

PRAXAIR GIFT ALLOWS WiSE TO EXPAND SUPPORT FOR WOMEN IN STEM

It can be challenging to be a woman in a STEM field, where men still outnumber their female counterparts by large numbers.

But at UB, female students have the WiSE (Women in Science and Engineering) program to support them and celebrate their successes.

And that support will expand dramatically, thanks to a five-year, $15,000-a-year grant to WiSE from Praxair Inc.'s Global Giving Program.

Cynthia Hoover, executive director of R&D at Praxair and a member of the SEAS Dean's Advisory Council, notes WiSE is "in line with Praxair's commitment to diversity and inclusion. We are committed to ensuring that the best talent is at the table and every voice is heard," she says.

The funding from Praxair will be used to create an advisory board comprised of UB alumnae who work in STEM fields. The board's goal is to better inform WiSE programming and ensure that students receive the training and opportunities they need to navigate careers in these exciting fields.

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ENGINEERING A HEALTHIER FUTURE

Engineering and medicine join forces to advance health care.

By Colleen Karuza

THE GREAT GROWLING ENGINE FOR CHANGE

If technology is indeed the "great growling engine for change" — as futurist Alvin Toffler once described — then there's a joyful noise resonating from the engineering labs at the University at Buffalo.

UB engineers and applied scientists, joining ranks with those on the frontlines of medicine and the life sciences, are providing game-changing solutions for many of health care's most intractable challenges. Within their labs, ideas — both big and small — are incubated, shared, supported, tested and ultimately translated into real-world applications that benefit both patient and the biomedical community alike.

The retooling of 21st century medicine — with its tectonic shift to developing patient-tailored diagnostics and therapies, and its greater reliance on data sharing and interdisciplinary teamwork — is shaping the new health care landscape where the demand for simpler, better, smaller, less expensive, more convenient and more efficient technology is both unrelenting and urgent.

SHOOT, EDIT, PRINT, MATERIALIZE

Ciprian "Chip" Ionita, director of the Endovascular Devices and Imaging Lab at the Toshiba Stroke and Vascular Research Center, and an assistant professor in the Department of Biomedical Engineering, is more than up to the challenge.

A pioneer in the testing and development of endovascular medical devices, Ionita has, in fact, created some of the world's most sophisticated models of the brain's highly complex vascular system using 3-D printing, a computer-assisted technology that has found limitless possibilities in the fields of engineering, biomedicine, art, architecture, and countless others over the last 15-20 years.

Ionita begins by taking radiographic images from a patient's CT or MRI brain scans, and isolating the areas of interest in a process called segmentation. Using special software, the data is then converted to a stereolithographic (STL) file format — "the highest quality representation of a 3-D geometric image," he says — and sent to a 3-D printer, which creates, layer by layer, a life-sized 3-D model made of a photopolymer material that mimics the texture of human tissue.

The end result is an elegant illustration of a precision medicine tool — one that is far superior to more conventional approaches to device testing and treatment planning. "Cadavers lack the appropriate mechanical properties because of their collapsed systems," said Ionita, "and frankly, there is no way that a pig's geometry resembles that of a human." The 3-D models work because they not only offer the look and feel of human tissue, but they capture even the subtlest variances in the vascular architecture.

Ask Ionita how many models his lab has created over the years and he admits that he has "lost count," but it's likely a number "somewhere in the thousands."

THINKING ALIKE

It's not a stretch to say that surgeons and engineers share an affinity for problem solving, making any collaboration a natural fit.

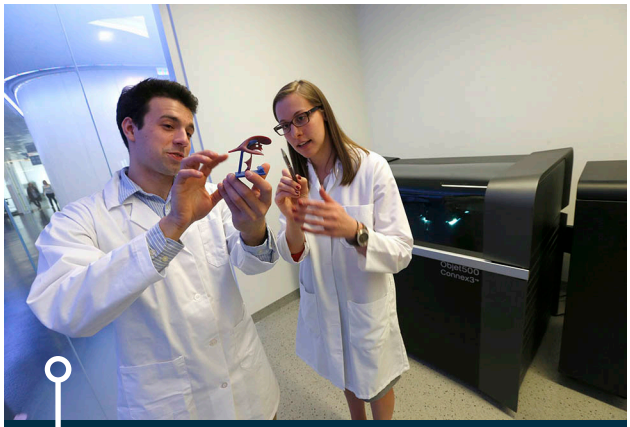
Ionita, who holds appointments in bioengineering, radiology and neurosurgery, recalls his early work with Adnan Siddiqui, MD, PhD, vice chair of neurosurgery and the director of the Toshiba Stroke and Vascular Research Center.

"We started by building 3-D printed brain arteries to test treatment devices for certain endovascular conditions, such as blood clots and aneurysms," said Ionita. But as the number of more challenging neurosurgeries grew, so did requests for more nuanced models. "Each time, Dr. Siddiqui motivated us to raise the bar — asking *Can you add this? Can you do this?* until we arrived at a point where we created a 3-D model of the brain's entire vascular system."

Up until then, it had never been done — no small feat either, considering its intricacies.

Such teamwork led to more patient-specific 3-D models that Siddiqui and other neurosurgeons use to steer treatment plans. "It's a win-win situation for everyone," said Ionita. " For the surgeon, it better informs decision-making and validates with greater confidence the surgical plan. For us, it expands our knowledge base and what we as engineers have to offer."

Treatment strategies are sometimes revised and devices reconsidered based on the critical information the 3-D models



Robert Kirkham, The Buffalo News

Biomedical engineering student Richard Izzo discusses a printed 3-D model of part of a brain with Karen Meess, a biomedical engineer at the Jacobs Institute.

provide. Unknowns become givens, as neurosurgeons simulate the actual experience of a complex procedure before he/she even enters the OR.

What's more, says Ionita, "the models are created on demand, allowing us to deliver just what the doctor ordered in a timely fashion."

UNDERSTANDING THE CLINICAL REALITY

To put their stamp on the biotechnological advances of tomorrow, "our engineers, and especially our trainees, must be completely immersed in the daily clinical reality of health care today — and that's the mindset we encourage in our graduate and undergraduate students," said Ionita.

In December of 2016, in collaboration with the Jacobs Institute, Richard Izzo, one of Ionita's biomedical engineering graduate students who also holds a UB bachelor's degree in biomedical engineering and chemistry and is one of 25 Western New York Prosperity Scholars at UB, had a unique opportunity to test firsthand just how powerful 3-D printing technology — with the surgical muscle behind it — could be.

UB's Chair of Surgery Stephen Schwaitzberg, MD, whose own research interests include device development, needed help on a particularly daunting case.

"One of his patients had come to the ER complaining of severe abdominal pain and the inability to keep food down," said Izzo. A review of the patient's medical history revealed that he had been in an accident 20 years earlier, but the full force of that trauma had only now come to light.

CT scans confirmed that his stomach had folded in on itself and that most of the organs in his abdominal cavity had shifted upwards into the lungs. "Anatomically, nothing was where it should've been," said Izzo, "and Dr. Schwaitzberg was looking for us to create a 3-D model of this patient's internal organ system."

It took about a week to design, edit and print the model. "We wound up with a 3-D replica of the patient's internal organ system from his pelvis to his neck bone," said Izzo. Organs were labeled and colored, and the model, which had moveable parts, was used as a teaching tool for the delicate surgery to correctly reposition the patient's organs.

And how is the patient today?

"I am told he's doing just fine," said Izzo, who presented this unique case — and garnered one of the top honors — at the 2017 Graduate Student Poster Competition, sponsored by UB's School of Engineering and Applied Sciences.

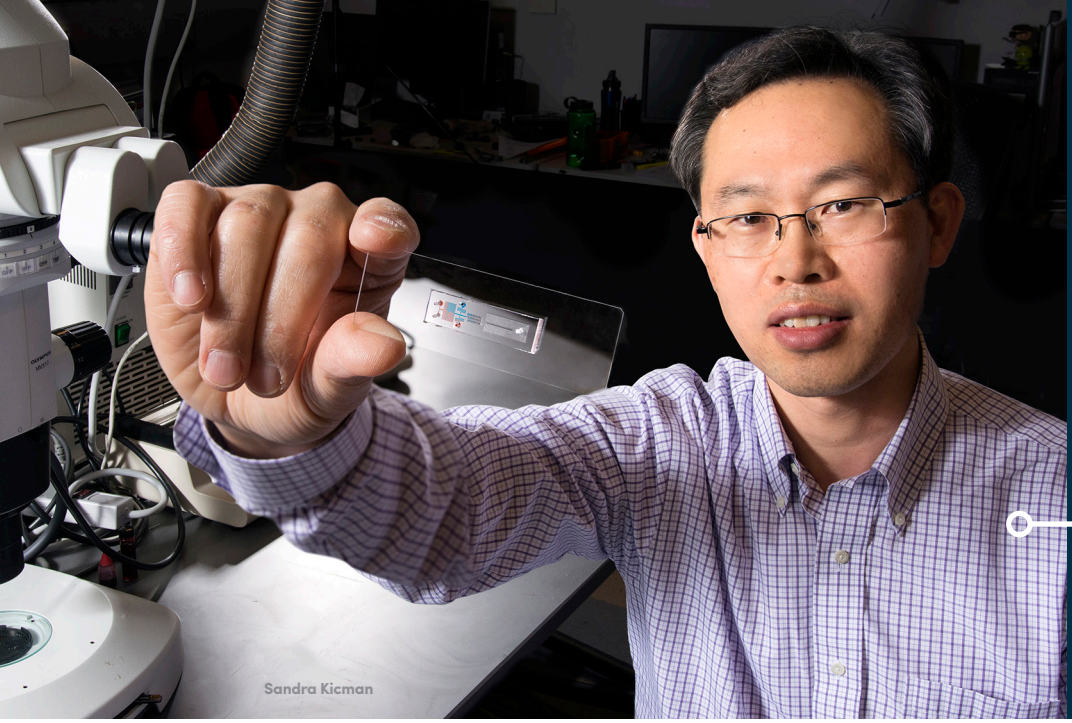
"My lab is located just one floor above the operating room and the possibilities that this proximity brings to the real-life application of our research is nothing short of mind-blowing," he said.

Hoping to complete his graduate training in 2020, Izzo is currently exploring the uses of 3-D printing in cardiac care — developing heart valves in collaboration with Vijay Iyer, MD, an interventional cardiologist in the Jacobs School.

"We've only just scratched the surface in this technology's application in heart surgery," says Ionita. "A new clinical trial is underway in which we are making customized models for all our cardiac patients to validate the software we use for coronary disease. We predict that this will lead to the development of implant devices so that we will no longer have to rely on one-size-fits-all models."

Sandra Kicman

Ciprian "Chip" Ionita is the director of the Endovascular Devices and Imaging Lab at Toshiba Stroke and Vascular Research Center, where he and his team have developed complex 3-D printed vascular patient-specific phantoms based on 3-D imaging.


Sandra Kicman

Kwang Oh is the director of the Sensors and MicroActuators Learning Lab, known as SMALL, which focuses on biomedical microfluidic devices, sensors and actuators.

BIG IDEAS ORIGINATING FROM SMALL

Kwang W. Oh is director of UB's Sensors and MicroActuators Learning Lab (SMALL), a place, he says, where big things stem from micro- and nanotechnology, the science of manipulating matter at micro, molecular and atomic scales. Focusing on micro- and nanotechnology-based biological micro-electro-mechanical-systems (BioMEMS), Oh provides life scientists and physicians with the right tools "to solve problems in their own fields."

Oh came to UB in 2006 from Samsung, where he served as a member of its senior research and development team. "I was exposed to the very real problems facing the life sciences and subsequently developed a keen interest in applying engineering tools to the fields of biomedical research," he said. At UB, he found other like-minded individuals who understood the important interplay of biology and technology.

Oh, who holds appointments in the Departments of Electrical Engineering and Biomedical Engineering, explains that the science behind BioMEMS has played a significant role in ushering in recent advances in genomics, proteomics, single cell analysis and point-of-care diagnostics. BioMEMS research encompasses lab-on-a-chip technology, in which one or more laboratory functions are integrated onto a single chip using trace amounts of fluids, such as blood. Microfluidics forms the basis for much of Oh's research, including the building of phantom models to test wearable medical devices.

In 2015, he received funding from Qualcomm, a multinational semiconductor and telecommunications equipment company headquartered in San Diego, to develop a phantom arm to test a new blood pressure monitor. To be effective, the limb would need to mimic the physiological and acoustical properties of a human arm, he said.

Phil Schneider, one of six graduate students in SMALL and also a Western New York Prosperity Scholar and 2018 SUNY Chancellor's Award winner, worked on this project. "I had done an internship with Qualcomm where we worked on creating a new type of wearable sensor that can be worn on an arm to measure different types of vascular compliance features like heart rate and blood pressure. We took this research a step further by developing a creative way to test the sensor."

"We wound up developing a workable arm with artificial blood vessels, but it lacked certain subdermal properties," said Schneider, who will complete his doctorate in electrical engineering in May. "With additional funding from the National Science Foundation, "we designed and created a phantom finger that had all the dermotographic features necessary for device testing — digital arteries, bone, fat, muscle, fingerprints and a fully functioning 3-D blood capillary network."

The technology used to create these phantom models has important health care applications, said Schneider. "Imagine a time in the not-too-distant future where individuals can pick up a wearable blood pressure or heart monitoring device at their local drugstore. It could be that simple and convenient."

TRADITIONAL NOTIONS CHALLENGED

In Oh's lab, the traditional notions of problem solving are routinely challenged, and sometimes solutions to stubborn problems really do require MacGyver-like resourcefulness. "You have to think out of the box and wear the hat of a scientist," said Schneider, whose grandfather and father are both engineers. "Some people say that I'm not a real electrical engineer because I don't do circuits, but the truth is that the electrical engineers of today are far more diverse in their talent and areas of interest."

When Oh's team was looking at ways to build capillaries for their phantom finger, "we discovered that all it took was $60 and an Amazon Prime membership," jokes Schneider, who purchased a cotton candy machine online. "A human capillary is roughly the

> **"Imagine a time in the not-too-distant future where individuals can pick up a wearable blood pressure or heart monitoring device at their local drugstore. It could be that simple and convenient."**
>
> *—Phil Schneider, UB Graduate Student*

same size as a single cotton candy fiber so we used these strands to successfully build a small vascular network."

And what do Easter eggs have to offer bioengineering research? "Quite a lot," says Oh. Inspired by the traditional Ukrainian Easter egg painting technique called "pysanky," in which elaborate miniature wax designs are printed on the surface of an egg, "we applied a paraffin wax-based approach to low cost, rapid prototyping of microfluidic devices."

Oh is also investigating new ways to harness vacuum-driven energy to create more reliable microfluidic components, such as micropumps and microvalves, to facilitate lab-on-a-chip commercialization. "We have devised a manual, syringe-assisted, vacuum-driven micropump for plasma separation from a tiny drop of finger-prick blood and believe it has the potential to lead to practical biomedical lab-on-a-chip devices that can screen for glucose levels, cancer cells, viruses, DNA molecules and other applications."

HAPPY MARRIAGE

Because technology provides the tools and biology the problems, the two should enjoy a happy marriage.

Oh likes to share his favorite quote, which he came across in a journal article, with his colleagues and trainees. "It pretty much sums up the relationship our engineers have with clinicians and life scientists," he says.

Ionita concurs, maintaining that this culture of collaboration has been UB's modus operandi for as long as he can remember. "There's always been a wealth of talent across disciplines here, and good ideas — whoever brings them to the table — make for meaningful teamwork and compelling results, " he says.

It's "the coolest place for a biomedical engineer to be right now," says Izzo.

Onion Studio, Inc.

Students in SMALL

From left, Brett Bosinski, Phil Schneider and Adam Trimper are working to create a test phantom arm that replicates key physiological functions of a human arm. When integrated with a series of implanted sensors, the test phantom will enable a wide variety of health care-related wearable technologies to be tested, validated, and baselined.

AMPLIFYING UB'S INDUSTRY 4.0 EXPERTISE WORLDWIDE

Ari Cohen's role as director of business and trade development for the Israel Economic Mission in Chicago is a natural fit for his background. With a bachelor's degree in international relations and master's degree in microbiology, he introduces expansion-seeking Israeli life sciences startups to American companies and helps them navigate the business landscape.

The 30-year-old was less than thrilled when his matchmaking duties were broadened to assist manufacturing-related suppliers.

"I was a little out of my comfort zone," he admitted.

Cohen knew that having a grasp on the advanced manufacturing sector, and where it is heading, was paramount to sparking any meaningful conversations with Israeli clients and their potential American partners. He found the antidote to his unease in a "101" level series of massive open online courses, aka MOOCs, that explore manufacturing's shift to a fourth industrial revolution — often called "Industry 4.0" — which uses data to make factories more efficient and competitive.

Cohen's learning vehicle is the Digital Manufacturing and Design Technology specialization, a 10-course bundle created by the University at Buffalo (UB). It is backed by funding from the Chicago-based Digital Manufacturing and Design Innovation Institute (DMDII), part of the Manufacturing USA network of public-private institutes developing manufacturing technologies and workforce solutions.

The specialization developed through the UB School of Engineering and Applied Sciences is one of the largest available on the Coursera platform. The online educational company serves 25 million registered users with courses from 50 of the world's top universities and educational institutions.

In the words of Lisa Stephens, liaison to Coursera for the State University of New York (SUNY), and assistant dean for digital education in the School of Engineering and Applied Sciences, the specialization is further proof that UB and SUNY "can be players in a new, innovative style of educational delivery."

At center, Rahul Rai discusses analysis techniques of a manufacturing process with employees of Staub Machine Company in Hamburg, N.Y.

As of early May, there were just over 16,130 total enrollments across the specialization, representing learners from 85 countries. The first three courses debuted in January 2017, with subsequent courses released one per month. The final course went live in August 2017.

Engineering school marks completion of nation's first comprehensive specialization on digital manufacturing for the Coursera online learning platform

By Tracy Puckett

"Broadening education by making it available to people all over the world is a powerful concept," said Liesl Folks, dean of the School of Engineering and Applied Sciences. "It really can't be overemphasized what this can mean for helping people to manage their careers in a modern economy."

CREATING MOOCS

UB entered the land of MOOCs in 2013 when Coursera and SUNY agreed to a system-wide contract enabling all 64 campuses access to the delivery platform. Several SUNY campuses have since contributed to the platform. Career Services was the first UB unit to make a splash with "How to Write a Resume" in March 2016.

UB seized the opportunity to widen its Coursera presence when DMDII released a project call to support its workforce development strategy of training and educating the current and future workforce in digital manufacturing and design applications. UB is a Tier 1 academic member of DMDII, a public-private partnership aimed at transforming American manufacturing through the digitization of the supply chain.

"Recognizing it's a broad technology space, the potential impact [of digital manufacturing and design] can't be summed up in a single hour or a single article," said Michael Fornasiero, program manager of workforce development at DMDII. "It really takes effort to dive into the content and introduce the topics. We see this specialization as a way of getting someone up to speed very, very quickly, and establishing their understanding of the breadth of technologies and their interactions in this space."

The university's submission was masterminded by The Center for Industrial Effectiveness (TCIE), which is the business outreach arm of the School of Engineering and Applied Sciences, with support from UB's SMART (Sustainable Manufacturing and Advanced Robotic Technologies) Community of Excellence.

DMDII and its parent organization UI LABS chose the proposal, leading to a U.S. Department of Defense grant of $380,000.

Course creation spanned one year under the direction of TCIE's project management team. Expertise from engineering faculty, as well as partners Accu-Solve and Siemens PLM, was leveraged. Feedback of local and national industry partners was solicited. Extensive production and editing were provided by UB's Center for Educational Innovation and Full Circle Studios.

The result? Forty hours of video instruction, complemented by reading materials, assessments and peer interaction opportunities. Topics range from the digital thread and the Internet of Things to big data and cybersecurity.

Courses are delivered by five UB faculty: Kenneth English, SMART deputy director; Rahul Rai, associate professor of mechanical and aerospace engineering; Sara Behdad, assistant professor with joint appointments in mechanical and aerospace engineering and industrial and systems engineering; Chi Zhou, assistant professor of industrial and systems engineering; and Shambhu Upadhyaya, professor of computer science and engineering and associate dean for graduate education and research in the School of Engineering and Applied Sciences.

"The approach that UB took was very efficient for both curriculum development and feedback," Fornasiero said. "It was not completely dictated by an academic institution; they have done the work to make sure the content was resonating well with industry."

James van Oss, aerospace and defense product lifecycle management strategist, architect for Moog's Space & Defense Group and its Aircraft Group, and former member of the school's Dean's Advisory Council, was among the industry representatives tapped for their feedback. He called the development process a "cutting-edge experience." The group included Lockheed Martin, the Association for Manufacturing Technology, SAE International, Society of Manufacturing Engineers (SME), Buffalo Manufacturing Works, and the Commonwealth Center for Advanced Manufacturing (CCAM).

"It's an interesting area. It's the thing that companies will be focusing on as the near future unfolds," he said. "More and more companies are thinking about how to create a digital thread... many are in transition from a drawing-based paradigm to this more modern-based paradigm."

The change to Industry 4.0 is already here, as mentioned during the specialization's introductory course.

"We deal with it every day as we listen to music and take pictures with our ever-present phones, and share information via social media," English said. "Large organizations have already made the shift, and in the end smaller organizations are going to need to shift as well, whether required to as a condition of a contract or by realizing the competitive advantage they can gain."

LEARNER STORIES

"The courses are helping me develop a holistic understanding of manufacturing and where it needs to go in the future."

Omar Infante | Fort Drum, NY
Sergeant, Field Artillery Branch, U.S. Military

"The way each course has mixed lecture with video and interviews of leaders in industry has been extremely engaging and compelling."

Jay Stephens | Fairview Heights, IL
Salesman, Sandvik Coromant

"I wanted to gain a broader understanding of all the implications of the digital revolution and this course really serves my needs."

Silvio Pietro Monticelli | Milan, Italy
Senior Advisor, Hirtos Consulting

THE LEARNERS

Technologies of the 21st century demand greater accessibility to flexible education, as workers are expected to continuously adapt and acquire new skills. Thought leaders in higher education realize that students — especially those of the post-traditional sector — want autonomy in learning. After all, adult learners are busy people.

Coursera is available 24/7 to anyone with an internet connection. Learners can freely view videos and reading materials of any course, including those of the specialization. There is a charge to access an entire course, which includes all assignments. Successfully completing the whole series earns a Digital Manufacturing and Design Technology certificate.

> **"More and more companies are thinking about how to create a digital thread... many are in transition from a drawing-based paradigm to this more modern-based paradigm."**
>
> *—James van Oss, Moog, Inc.*

Folks views the courses as a springboard for small and medium enterprises (SMEs) to keep pace with opportunities. Before her engineering dean role, she worked in large corporations where scientists armed with knowledge and data were just a phone call away. Now as a university leader, her relationship-building initiatives with SMEs have fully exposed her to the struggles of staying current with a much smaller budget.

"I hope that courses like these, and the DMDII itself, will bring to SMEs the kind of intellectual resources that large corporations have had in their research divisions traditionally — the forward thinking, forward planning, and strategic analysis," Folks said.

van Oss believes the courses are appropriate for entry-level engineers discovering career routes, like Mohammad Shahbaaz of Visakhapatnam, South India.

The 23-year-old has a bachelor's degree in mechanical engineering. He is voluntarily working as a design engineer for a manufacturing company — a common practice in his country — while searching for his first full-time job after college. He signed up for the specialization because it aligns with his plan to pursue a master's degree.

Shahbaaz hopes that the knowledge he gains will support his cause for landing a permanent, paid position. The company for which he is donating his services has invested in new infrastructure and machinery, and will require a team to implement digital technologies.

And then there are learners such as Cohen, who were never captivated by or involved in manufacturing, but recognize a professional need to invest in the subject.

"It's given me a lot of things to think about in terms of how the life sciences industry is going to change when Industry 4.0 mechanisms start getting adopted outside of heavy industry," Cohen said. "And I'm looking forward to having the skills and know-how to help the industry navigate that changing landscape."

He characterizes the courses as being accessible. "You don't necessarily need to be very well-versed in manufacturing lingo to understand these courses. And you don't need to have copious amounts of time to devote."

THE OPPORTUNITIES

The specialization is opening UB SEAS to new audiences, and allowing it to move beyond the traditional university model of solely offering degree programs to one that encompasses certificates.

"As the economy shifts more rapidly, people need access to training on an ongoing basis, to allow them to stay current and competitive," Folks said.

SMART Director Kemper Lewis foresaw the transformational potential of the courses not only for UB, but the entire field.

"Everything I've heard — wherever I go — only confirms that," said Lewis, the principal investigator of the project as well as professor and chair of the Department of Mechanical and Aerospace Engineering.

Through speaking engagements across the country, he receives positive feedback from both academic and industry sectors. The courses are catching the attention of different groups, catalyzing conversations and developing relationships:

- Last fall, Lewis addressed the SUNY Research Council, which influences strategic and operational planning at SUNY and the SUNY Research Foundation. Council members acknowledged UB's leadership in digital manufacturing and design, and indicated that state investment is integral to expanding impact.

Sara Behdad is filmed at Cummins Jamestown Engine Plant for the Advanced Manufacturing Enterprise course.

- A binational nonprofit organization and technical college in Querétaro, Mexico contacted TCIE to guide development of similar Industry 4.0 courses targeted for manufacturing company employees and university students. Moreover, news of the relationship traveled 350 miles across the country, reaching a coalition of companies and a technical university in Durango, Mexico. The group has approached TCIE for assistance to establish a training center for manufacturing courses.

"When you think of the thought leaders in digital manufacturing, hopefully UB is the top tier of institutions that come to mind," Lewis said. "Some of that national recognition is definitely happening."

To learn more about the specialization and register, visit *coursera.org/specializations/digital-manufacturing-design-technology.*

COURSES & SPONSORS

1 Digital Manufacturing & Design
2 Digital Thread: Components
3 Digital Thread: Implementation
4 Advanced Manufacturing Process Analysis
5 Intelligent Machining
6 Advanced Manufacturing Enterprise
7 Digital Manufacturing Commons (opendmc.org)*
8 Cyber Security in Manufacturing
9 MBSE: Model-Based Systems Engineering
10 Roadmap to Success in Digital Manufacturing & Design

CREATED BY: UB SUNY

INDUSTRY PARTNER: DMDII a UI LABS Collaboration

*Note: At the time of publication, the Digital Manufacturing Commons (opendmc.org) course was closed for new learner enrollment. It will no longer be offered.

ENGINEERING STUDENTS GET RESULTS FOR LOCAL NONPROFIT

Meals on Wheels for Western New York (WNY) produces and delivers between 5,000 and 6,000 meals a day — including hot and cold meals for a range of medically appropriate diets.

The meals are delivered through a multi-stage process to dozens of sites and, ultimately, 1,800 homes. Home-delivery clients receive a hot meal, cold meal, friendly conversation and well-being check daily.

"Our top priority is delivering a healthy, safe, medically appropriate meal to each client every day — our logistics, operations and workflows are absolutely crucial," says Meals on Wheels for WNY Chief Operating Officer Chris Procknal.

So when Meals on Wheels was contacted in January by three UB industrial engineering graduate students who wanted to talk about including the organization in a project centered on advanced analytics and organization science, Procknal and other Meals on Wheels executives agreed.

"We called our project 'Pro Bono Analytics,'" says Vineet Payyappalli, a fourth-year industrial engineering PhD student specializing in operations research. "We are in the student chapter of UB INFORMS — the Institute for Operations Research and Management Science."

Nationally, INFORMS has a division for pro bono analytics, so the UB graduate students started a plan to do their own project here.

"I went online and went to Yelp, looking at different non-profits, how they were rated and what people had to say," says Jessica Dorismond, who is also in the fourth year of a PhD program in industrial engineering.

"For Meals on Wheels, deliveries are key to what they do," she explains.

Payyappalli and Dorismond were joined by Prabakar Theivaraaj on the project's first phase during this past spring semester. Theivaraaj holds an MS from UB in industrial engineering.

The trio met with members of the Meals on Wheels leadership to learn details about their delivery process, their challenges and to see if there was a way they could help.

The team decided to focus on optimization of the pack-out process for delivering meals. Every Meals on Wheels home-delivery route changes daily, so the counts and daily diet types are in constant flux. There is a strict two-hour safe window between final plating in the commissary and delivery at the last client's home.

"We have five diets — regular, renal, ground, bland and diabetic — and when each new client comes on we work with their doctor to determine what diet they should have," Procknal says. "As you can imagine, incorrect deliveries of any meals can have a serious consequence for our clients."

After a hot meal is sealed at the end of the assembly line, it is checked against a list — sorting the meals against different routes and sites by the recipients' addresses, ensuring that meals go into the correct ovens for delivery.

Payyappalli's team found the checklist did not have the different types of meals supplied to clients. The list did have the total quantity for each route and for each car for delivery — but did not have the sub-quantities of the meal categories.

Theivaraaj says analytics conducted over the mid-portion of the semester enabled the UB team to create new lists for consideration by Meals on Wheels for WNY leadership.

"We set them up by order of delivery — as the meals came off the assembly line — as opposed to alphabetically listing the neighborhoods and communities," Theivaraaj says.

Procknal notes that after a two-week trial with the new pack-out template, "the analytics are a very good fit with our operations systems," allowing for more accurate tracking that will enable staff and volunteers to serve clients more efficiently.

"The food and friendship we bring to these homebound individuals is absolutely crucial in ensuring that they can live with dignity and independence," continued Procknal.

"Our thanks go out to this group of UB engineers for their passion and dedication in helping us optimize our meal pack-out process."

"Our thanks go out to this group of UB engineers for their passion and dedication in helping us optimize our meal pack-out process."

-Chris Procknal, Meals on Wheels

Ann Bisantz, professor and former chair of the Department of Industrial and Systems Engineering, says that in the department, "We directly connect research with learning and societal impacts. We support student-led, hands-on learning activities," she says. "Our experiential learning programs help students develop professionalism and a practical perspective by connecting the classroom to the real world."

— MICHAEL ANDREI

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Page 28 top image: Meals on Wheels for WNY Chief Operating Officer Chris Procknal (second from left) with engineering students Prabakar Theivaraaj, Vineet Payyappalli and Jessica Dorismond in the hot meal assembly area at Meals on Wheels for WNY.

All photos by Meredith Forrest Kulwicki

1 Meals are being prepared and packaged for delivery.

2 The packaged meals await distribution at Meals on Wheels for WNY.

3 This tag describes the type of meals to be delivered.

STUDENTS

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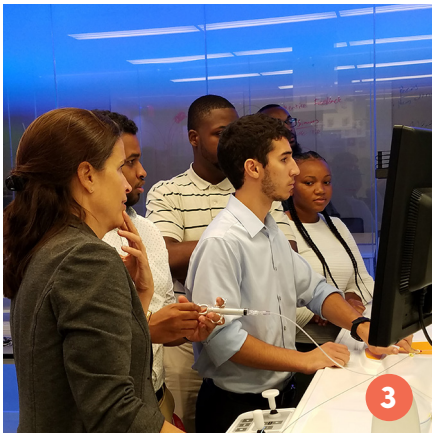
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1. Electrical engineering students took second place at the Erie Hack finals in Cleveland, Ohio. From left are Konstantinos Tountas, Song-Wen Huang, George Sklivanitis, Sarankumar Balakrishnan, Nan Zhang and Yi Cao.

2. Fifteen students from Scientista went to the Grace Hopper Celebration in Orlando, Florida. The Engineering Partners program funded some travel expenses.

3. UB Louis Stokes Alliance for Minority Participation (LSAMP) Summer Research interns performed a simulated "surgery" at the Jacobs Institute.

4. Mechanical engineering PhD student Phil Odonkor won the Three Minute Thesis competition for his research on net-zero energy smart buildings.

5. Ryan Jaquin and Shane Nolan won the 2018 Henry A. Panasci Jr. Technology Entrepreneurship Competition for their company, Bitcrusher.

6. Mary Canty and Seamus Lombardo were chosen to deliver the student speeches at this year's commencement ceremonies. Both also received SUNY Chancellor's Awards for Student Excellence, along with Devashish Agarwal, Walker Gosrich and Phillip Schneider.

7. SAE Baja took to the road in April to compete at Baja SAE Maryland. They earned third place in the cost event and scored 48th overall.

8. Students for the Exploration and Development of Space participated in the Intercollegiate Rocket Engineering Competition in Las Cruces, New Mexico. The Engineering Partners program helped finance the team.

9. Ramla Qureshi (civil engineering), Zhasmina Tacheva (operations management), and Manjusha Choorakuzil (computer science and engineering), took first place in UB's World's Challenge Challenge for their project, ElevateHer.

ON THE ROAD AGAIN

Two mechanical engineering students design trike to help former UB staffer return to a favorite pastime

Austin Powers and Caleb Walters did more than just engineer something spectacular — they created something that deeply impacts someone's life.

For Powers and Walters, both mechanical engineering students who graduated this past May, what went from signing up to get three credit hours turned into a major project they became passionate about — making an accessible tricycle for Curtis Senf, which has become known as "Curt's Trike."

Several years ago, Senf got into a serious biking accident on his way to his job at the Center for Research Education and Special Environments on UB's South Campus. He broke his neck, and was paralyzed from the neck down.

"I could barely move," said Senf. "But, I worked my way back. I can walk now, but I can't ride a two-wheeler anymore. Bike riding has always been a passion of mine, so I got a hold of Dr. Mollendorf to see if he could build one for me."

Joseph Mollendorf, a SUNY Distinguished Professor in the Department of Mechanical and Aerospace Engineering and director of the Engineering Machine Shop, made the project possible.

Mollendorf, who has been a professor at UB for 43 years, received a grant from the National Science Foundation 30 years ago to make devices for people with disabilities.

While dozens of universities across the nation received this grant, UB created many more devices than the other schools. "Over the years, we took on 500 or 600 projects, and they're everything you can imagine," said Mollendorf.

Even after the grant finished, Mollendorf has continued to supervise senior design projects that focus on every day devices for people with disabilities. "What could be better than helping a person to live their life and do what they want to do," he said.

"Between myself, Dr. Mollendorf, Austin, Caleb, and the machine shop staff, we worked together and accomplished building the trike," Senf said.

When asked about how it feels to ride the trike, Senf said, "Riding it has given me a certain amount of freedom. I can get up to 12 miles an hour. Because I'm low to the ground, it feels like 20 miles per hour. It's nice to get out there and see the world from a different perspective."

The project was an uplifting and touching learning experience for everyone involved.

"Working on a project like this shows you that all of the long nights and stressful times while studying formulas and ideas that seem somewhat disconnected and unmanageable have a purpose. It gave me the opportunity to take all that I have learned and use it to make a positive impact on someone's life," said Walters.

"Although there were some frustrating moments with delayed parts and parts that didn't fit, seeing Curt's wife Melissa's reaction to him riding the finished trike was priceless. I don't think I'll ever forget it," added Powers.

"I can't thank Dr. Mollendorf, the staff, Austin and Caleb enough for what they have given me. They went above and beyond to get me back on the road again," said Senf.

Senf closed with a message to students, "Give back to society, and make the world a better place if you can."

— EMILY SUGARMAN

Curt Senf shows off his new trike designed by mechanical engineering students Caleb Walters and Austin Powers for their senior design project. Also shown are machine shop staff William Macy, Gary Olson and Xinnan Peng.

CELEBRATING 50 YEARS OF COMPUTER SCIENCE

In 1967, most people knew nothing about computers.

Not so at a small, rented office on Ridge Lea Road in Amherst, where five University at Buffalo professors were creating one of the nation's first academic departments to study the emerging field of computer science.

The professors — including founding chair Anthony Ralston and Patricia James Eberlein, who often advocated for more women in computer science — laid the groundwork for what has become one of the university's largest and most dynamic academic departments.

Now, after producing thousands of graduates, some of whom are world-renowned innovators, UB's Department of Computer Science and Engineering (CSE) celebrated its 50th anniversary with a four-day event Sept. 28-Oct. 1, 2017.

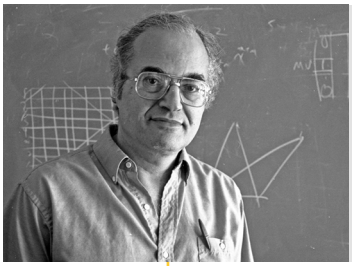
"At 50 years, the Department of Computer Science and Engineering is stronger than ever. Our student body is growing. We have more faculty members than ever before. Our research funding is rising. We have an incredible relationship with our alumni, many of whom play pivotal roles at some of the world's leading technology companies," says Chunming Qiao, SUNY Distinguished Professor of Computer Science and Engineering and department chair.

The event comes as CSE is experiencing tremendous growth. The number of faculty members is approaching 50, up from 40 seven years ago. Meanwhile, research funding is up from $2.1 million in 2013-14 to $8.6 million in 2016-17, according to Qiao.

The celebration brought together alumni from around the world, including graduates who work for Google, Microsoft, Bloomberg and other household names. It provided an opportunity for alumni, as well as faculty, students and staff, to reflect on the department's first 50 years and look toward the future.

Ed Goit (MS '69), former program manager at Leidos, Inc. now retired, talks with Roger Choplin (BA '72), an independent consultant formerly with Oracle Corporation.

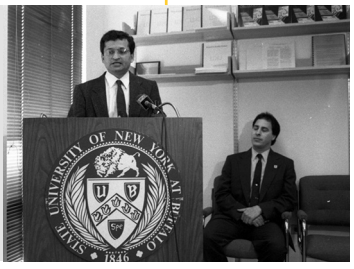
The celebration included undergraduate research demonstrations, a graduate research conference, tours of Buffalo and Niagara Falls, and an alumni symposium.



1967 — The Computer Science Department is formed and Anthony Ralston is named founding chair.

1983 — Jim Geller (PhD '88) organizes the first annual graduate student conference as a forum to show off current research. Most exhibits were related to artificial intelligence.

1986 — Faculty member Sargur (Hari) Srihari and collaborators win their first contract with the U.S. Postal Service to develop handwriting recognition algorithms to expedite mail delivery.

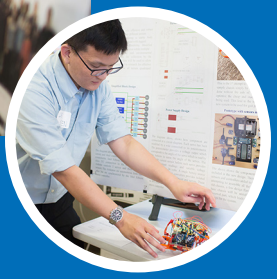


1998 — Six computer engineering faculty from the Department of Electrical and Computer Engineering (ECE) join 13 computer science faculty to form the Department of Computer Science and Engineering.

cse@buffalo

CSE50
1967-2017

Undergraduate students explained their research projects during the welcome reception.



Alumni and CSE faculty reconnected at the Alumni Symposium.

Linda Ambrosiak-Miskell (BS '85), Marc Katchay (BS '87), Carla Calucci (BS '86), John LoVerso (BS '85), and Tom Siracusa (BA '85, MS '87) at the 50th Anniversary Banquet.

Faculty member Shambhu Upadhyaya founds the Center of Excellence in Information Systems Assurance Research and Education (CEISARE) with funding from the National Security Agency.

Local dignitaries gather to cut the ribbon at the entrance of Barbara and Jack Davis Hall.

2002 **2003** **2012** **2017**

Faculty member Venu Govindaraju founds the Center for Unified Biometrics andSensors (CUBS) to advance biometric technologies by integrating pattern recognition and machine learning algorithms with sensors.

CSE Distinguished Professor and chair, Chunming Qiao, SEAS Dean Liesl Folks, UB Provost Charles Zukoski and UB President Satish Tripathi celebrate the unveiling of a signboard for the CSE 50th anniversary celebration.

See the entire timeline at *timeline.cse.buffalo.edu*

IEEE History Center

LEGACY OF ERICH BLOCH

UB alumnus, IBM pioneer and former director of the National Science Foundation

Erich Bloch (BS '52, electrical and computer engineering), who pioneered the development of IBM's mainframe computer and later served as director of the National Science Foundation, was a strong supporter of UB's School of Engineering and Applied Sciences (SEAS) throughout his illustrious career.

His most recent gift of $1.5 million in 2014 enabled the creation of UB's Department of Materials Design and Innovation and the hiring of Krishna Rajan as the Erich Bloch Endowed Chair.

"Erich Bloch's commitment to higher education, specifically his support of UB in this emerging field of research, was exemplary. Philanthropy such as this is instrumental in helping to recruit outstanding faculty to UB," said Tim Siderakis, UB assistant vice president for advancement, principal gifts.

But this was just the most recent contribution Bloch made to SEAS and the UB community. Back in 1994, SUNY Distinguished Professor Emeritus George C. Lee, who was SEAS dean at the time, asked Bloch to chair the school's first strategic advisory committee.

He agreed, but with some conditions. Bloch wanted to be sure that the committee would be able to delve deep into the inner workings of the school, and that its recommendations would be heard at the top levels of university administration. He put forward a 1.5 day program, which included an agenda provided by the school with two or three major topics for discussion.

The result was the development of an advisory format that is still in effect today.

According to Mark Karwan, who served as dean after Lee, having Bloch as the chair made it easier to recruit members to the new committee, which today is called the Dean's Advisory Council.

Karwan, who is now Praxair Professor of Operations Research in the Department of Industrial and Systems Engineering and a SUNY Distinguished Teaching Professor, helped Bloch reconnect with the university in the 1990s.

"He was looking for ways to make a change," said Karwan. "He wanted to invest in people — the undergraduates, the graduates and the faculty members who could lead the university."

The result was a $1 million endowment from Bloch to support the SEAS Dean's Scholarship fund, which has supported over 50 students to date and continues to benefit students in the school.

"He was a remarkable individual, scientist and engineer who remembered his university, contributed to it and to Western New York and, truly, to the country and the global economy," Karwan added. "He was a real giant."

Bloch's long and celebrated career began when he joined IBM to work in the company's laboratory in Poughkeepsie, N.Y., upon graduating from UB in 1952.

In 1964, he made his greatest achievement at the company when he transformed computing by introducing the System/360, the foundation for the modern concept of an operating system that would host a variety of computer programs.

After 32 years at IBM, Bloch was appointed director of the National Science Foundation by President Ronald Reagan. In his six-year term, from 1984 to 1990, he was a strong advocate for research and championed funding for high-risk, revolutionary projects. He played an integral role supporting the National Science Foundation Network (NSFNET), a "network of networks" that gave rise to today's Internet.

He also fostered closer collaboration between industry and universities and helped establish engineering research centers on their campuses. UB's National Center for Earthquake Engineering Research, now known as MCEER, was one of the centers created as a result of this initiative.

A recipient of numerous awards and recognitions, Bloch received the National Medal of Technology in 1985, and was a member of the National Academy of Engineering as well as a Fellow of many prestigious engineering professional societies. He received an honorary doctorate from UB in 1985.

Bloch passed away on November 26, 2016 at age 91.

— JANE STOYLE WELCH

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Several keynote speakers, moderators and panelists at the 2017 Erich Bloch Symposium. From left are **Krishna Rajan**, Erich Bloch Chair and Empire Innovation Professor, UB Department of Materials Design and Innovation, **C. Daniel Mote, Jr.**, President, National Academy of Engineering, **William C. Harris**, President and CEO, Science Foundation Arizona, **Rita R. Colwell**, Distinguished Professor, University of Maryland at College Park and Johns Hopkins University Bloomberg School of Public Health, President and Chairman of CosmosID, Inc., and former director of NSF, and **Robert W. Corell**, Principal, Global Environment Technology Foundation.

ANNUAL SYMPOSIUM HONORS ERICH BLOCH

Some of the most innovative thinkers in the country participated in the inaugural Erich Bloch Symposium in Materials Design and Innovation, which was held last year on May 31-June 1 at UB. The Symposium brought together some of the top minds in the field of science and engineering, many of whom were colleagues of the late Erich Bloch. Discussions were focused on innovative strategies for research and education in the field of materials and related sciences, with the overarching goal of identifying accelerated solutions to address a broad range of societal needs.

Presented by UB's Department of Materials Design and Innovation, the annual event honors Bloch's legacy and embodies the essence of his philosophy that "....science is changing, the tools of science are changing, and that requires different approaches."

The theme of the second annual Erich Bloch MDI Symposium was "Accelerating Innovation for a Regenerative Economy." The Symposium was held on June 4-5, 2018.

Learn more at *mdi.buffalo.edu*.

IN MEMORIAM **FRANK COZZARELLI**

Frank Cozzarelli, a longtime faculty member in the Department of Mechanical and Aerospace Engineering, died Jan. 25, 2018, in his Buffalo home. He was 84.

Cozzarelli joined UB in 1962. He served as director of graduate studies in the department in the 1970s and as acting chair in 1975-76. He was named Professor of the Year in 1965-66 by the UB honor society Tau Kappa Chi, now Tau Beta Pi.

His research interests included viscoelasticity, a property of polymers like the ones in Silly Putty and memory foam mattresses. He also studied inelastic wave propagation and damping with shape-memory materials.

Although Cozzarelli retired in 1996, his presence is still felt here at UB. Some of his former students and colleagues shared their remembrances of him.

"As a professor and researcher, he expressed complex problems elegantly and in ways that were understandable," said Edward Graesser, a mechanical engineer at the Naval Surface Warfare Center, who earned his PhD under Cozzarelli in 1990.

"Frank was a reliable and devoted colleague. He taught some of our most demanding courses and his teaching was consistently well received by our students," said Roger Mayne, Distinguished Teaching Professor Emeritus and former chair, Department of Mechanical and Aerospace Engineering.

Cozzarelli was a member of the American Society of Mechanical Engineers, the Engineering Science Society, American Academy of Mechanics, Sigma Xi and Tau Beta Pi. He earned a PhD in applied mechanics from the Polytechnic Institute of Brooklyn, now part of New York University, in 1964.

He is survived by six children, a brother and eight grandchildren. A longer obituary is on the SEAS website.

CSEE ALUMNI BREAK GUINNESS WORLD RECORD FOR WORLD'S LONGEST HOCKEY GAME

and raise $1.2 million to fight cancer

Bill Wippert

Bill Wippert

11-Day Power Play broke the record for the World's Longest Hockey Game and raised over $1 million. Above, in the center are Amy and Michael Lesakowski.

UB civil engineering alumni Michael Lesakowski (MS '08) and Peter Merlo (BS '93, MS '98), together with their team of 40 hockey players, helped raise $1.2 million for cancer research at Roswell Park Cancer Institute (RPCI). The event also broke the Guinness World Record for the longest hockey game ever.

Lesakowski, his wife Amy, and several dedicated volunteers, organized the 11-Day Power Play that took place between June 22 and July 3, 2017, in Buffalo.

The Lesakowskis started thinking of ways to give back in 2009, after Amy overcame breast cancer with treatment from RPCI. After Michael's mother died in 2016, the couple "put their efforts back in earnest and started planning," he said.

Merlo also received treatment from RPCI. "If Roswell Park wasn't there, I would be dead," said Merlo. "I had a golf-ball sized tumor between my brainstem and cerebellum. It was benign, but once Roswell found it, they removed it right away."

Merlo and Michael Lesakowski met eight years ago when they began playing hockey together.

Lesakowski knew about the record for the world's longest hockey game, previously held by a team in Alberta, Canada. He contacted the group and asked how they did it.

"Groups have been setting and breaking this record for almost 10 years, and what we found was that each group did it differently," Lesakowski said. "My engineering mind came through. We had to figure out how to most efficiently use all the players."

During the game, skaters went on the ice in non-stop shifts: a group of seven (five skaters, one substitute and a goalie) from each team would stay on the ice for four hours at a time. Players would then be off the ice for eight hours, where they could eat, ice or bandage themselves and sleep.

"Physically we dealt with it. It was tougher to deal with it mentally. There were these moments of stress within the first few days. We really had to use each other — our teammates — to overcome the mental toll this took on us," Merlo said.

Over 300 volunteers worked to successfully execute the event and exceed fundraising expectations.

Lesakowski is a principal at TurnKey Environmental Restoration, and Merlo is the principal engineer for the City of Buffalo water division.

The Lesakowskis and other volunteers are organizing another event in 2018. The 11-Day Power Play Community Shift will feature more players and more involvement from the community, and will be held July 5-15, 2018.

— PETER MURPHY

ALUMNUS STEPHEN STILL DONATES $4 MILLION

{ to support Institute of Sustainable Transportation and Logistics

A graduate who said the University at Buffalo changed his life has given $4 million to the UB School of Engineering and Applied Sciences.

Stephen Still graduated with a bachelor's degree in civil engineering in 1976, then earned master's and doctoral degrees at Princeton University. While his passion has always been in transportation planning, he said, he spent most of his career in the aviation industry.

Still, who lives in Reston, Virginia, co-founded, managed, then sold two successful companies: Seabury Airplane Planning Group LLC and Diio LLC. He considers the education he received at UB to be the foundation for his success.

Douglas Levere

UB President Satish K. Tripathi (right) expresses his gratitude to Stephen Still on behalf of the university for his gift.

"This university changed my life," Still said. "I have been blessed far beyond my expectations and the origins can be traced back to this very place. From the committed faculty who taught with passion and commitment to the lifelong friends made here, this place was truly transformational."

Still's gift will create an endowment to support the Institute for Sustainable Transportation and Logistics (ISTL), a center that unites the Schools of Engineering and Applied Sciences and Management to address the growing new field of transportation, logistics and supply-chain management.

In recognition of Still's generosity, UB will rename the institute the Stephen Still Institute for Sustainable Transportation and Logistics.

Still serves on the SEAS Dean's Advisory Council and on the Department of Civil, Structural and Environmental Engineering Advisory Board. He has volunteered and made gifts to the school, particularly to support scholarships and student clubs, for over 17 years.

Still also serves on the ISTL advisory board, and said he directed his gift to the institute because "I'm a child of the 1970s environmental movement."

"UB opened my eyes to the great impact that transportation can have on this planet," he said. "To be a viable, efficient society, we need skilled planners to work with civic and business leaders, to create livable, connected communities. When I arrived here in 1973, UB already had world-class academic leaders in transportation studies dedicated to these principles. It takes engineers of all types to design transport systems, but just as important, it takes visionaries in city planning, business administration, political science and nearly every field UB offers to produce a meaningful impact."

Liesl Folks, SEAS dean, said Still's gift will support the institute in many ways, allowing investments in research, program initiatives, equipment costs, and funding the work of graduate students studying transportation.

"We are fortunate to have such a truly remarkable alumnus and friend," Folks said. "And we look forward to watching all that Stephen Still's gift will bring to our students. Thanks to his generosity, the Stephen Still Institute for Sustainable Transportation and Logistics can offer the best in research programs and more meaningful collaborations with industry. It will serve as an even bigger umbrella that unites faculty across the university with interest in transportation, logistics and supply chain management."

— MARY COCHRANE

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INSIDER'S LOOK

AT BUFFALO MANUFACTURING WORKS

Buffalo Manufacturing Works President and UB Department of Industrial and Systems Engineering Board Member Michael Ulbrich, and Brendan Lewis, BS '15, hosted a behind the scenes look at Buffalo Manufacturing Works. The exclusive tour included a peek at state-of-the-art 3-D printers, cutting-edge robotics and a STEM-focused learning lab serving local high school students. The alumni-only event, held on June 20, 2017, included dinner and drinks.

From left: Tim Siderakis, UB assistant vice president for advancement, principal gifts; R. Sridar, associate professor in the UB Department of Computer Science and Engineering; and Ram Kumar Krishnamurhty, senior principal engineer at Intel.

UB Alumni Association honors 3 from SEAS

Three engineers were among the 12 outstanding UB alumni and friends recognized for their achievements at the 2017 UB Alumni Association Achievement Awards celebration.

James Smist
(BS '80, chemical engineering)

SAMUEL P. CAPEN AWARD

James Smist is president and co-founder of Dean & Company, a management consulting firm that works with large and small corporations. In 2005, Jim and his wife, Mary, established the Felix Smist Scholarship, which pays up to six years of tuition for a part-time student in SEAS. Jim's father attended UB part-time and weekends while working and raising a family, and earned his engineering degree in 1965 after 16 years. Thus far, 15 students have been supported by the award. Jim was the recipient of the 2012 SEAS Dean's Award. He also earned an MBA from Harvard Business School.

Ram Kumar Krishnamurthy
(MS '95, electrical engineering)

DISTINGUISHED ALUMNI AWARD

A senior principal engineer and research director of the High Performance Research Group at Intel Labs, Ram Kumar Krishnamurthy leads research in high-performance, energy efficient and low-voltage circuits for next generation microprocessors and systems-on-chip. He holds 108 U.S. patents and has more than 50 patents pending, has published over 150 conference and journal papers, and is a fellow of IEEE. He has twice received Intel's highest technical award, and numerous honors from the Institute of Electrical and Electronic Engineers (IEEE) and the MIT Technology Review, among others. He serves on the Department of Electrical Engineering's advisory board, and as chair of the Semiconductor Research Corp. technical advisory board.

Hratch Kouyoumdjian
(MS '70, civil engineering)

CLIFFORD C. FURNAS AWARD

In the 1970s, Hratch Kouyoumdjian worked for several companies before moving to San Francisco to join Cygna Consulting Engineers, and later became its president and COO. He began his own structural engineering practice in 1987, Hratch Kouyoumdjian and Associates (HKA), later adding architectural services. In 1995, he cofounded KPA Consulting Engineers. The two companies merged in 2005 into the KPA Group, which completed commercial and institutional projects, including academic facilities, airports and bridges, as well as innovative seismic retrofit designs for historic structures. A former member of the SEAS Dean's Advisory Council, he retired in 2015 to consult and teach.

SEAS honors alumni, corporate partners and students for giving back

Mark Karwan, Robert Hanley, Jr., and Liesl Folks.

Eileen, David, Catherine and Michael Cadigan.

James A. Wehrfritz, James J. Wehrfritz, and Mary Johnson.

Robert and Gilda Harrison.

About 75 people gathered at the Fourth Annual School of Engineering and Applied Sciences Awards Night to celebrate the school's alumni and corporate partners in an evening event that featured an award ceremony, networking opportunities and dinner. The honorees were as follows.

1. Robert Hanley, Jr. (BS '90, industrial engineering), a member of the Delta Society for over 20 years, received the Delta Award. He set up the Karwan/Thomas Industrial Engineering Fund in honor of the two professors, Mark Karwan and Warren Thomas, who were most influential during his time at UB. To date, it has supported 20 undergraduate industrial engineering students. An expert in Systems Applications and Products (SAP), Hanley has held a range of SAP positions, including Platinum Consultant and Director of Platinum Consulting and has worked with Quaker Oats (PepsiCo), Kimberly-Clark and Wrigley.

2. A leader among his peers, David Cadigan (BS '08, electrical engineering) was named Outstanding Young Alumnus. He currently chairs the SEAS Young Alumni Board and is a member of the Delta Society. He also serves on the Young Alumni Experiential Learning committee, working with students and school representatives to improve experiential learning at UB. Cadigan is an advisory engineer with IBM in Poughkeepsie, N.Y.

3. James J. Wehrfritz (BS '78, civil engineering) frequently donates his time to students — mentoring graduate students, participating in networking events and panels, and playing a key role in the Career Perspectives and Networking Conference. He was instrumental in helping launch the SEAS 360° Professional Development Program, a training series for graduate students. Wehrfritz started Erie-Niagara Consulting LLC, an international energy industry consulting firm, in 2014 after a long career with Exxon Corporation.

4. Robert Harrison, PE (BS '83, mechanical engineering) has served as a valuable mentor to students at UB, most recently mentoring civil, mechanical and chemical engineering students on an interdisciplinary design project. Harrison's guidance provided the students with the skills needed to work through a real world project. Harrison is vice president of engineering and construction at Transmission Developers, Inc.

5. UB Engineering and Applied Sciences Alumni Association board member John Coles and president Kurt Bessel (far left) presented the Leaders in Excellence Scholarship to Madeleine Dewey, BS, environmental engineering; Lawreen Latif, BS, computer science; Ladan Golshanara, PhD, computer science; Jessica Evans, BS, mechanical/aerospace engineering; Kellsi-Amber Ellis, BS, mechanical engineering; Mostafa Sabbaghi, PhD, industrial engineering; and Lavone Rodolph, PhD, computer engineering; together with UBEAA committee member Dan Muffoletto. Not shown are Sravanika Doddi, BS/MS, computer science, who also received the Professor Howard Strauss Memorial Scholarship Award, and Seamus Lombardo, BS, aerospace engineering.

Zodiac Aerospace received the Corporate Partner of the Year award. See the story on p. 17.

All photos by the Onion Studio, Inc.

delta society

We thank our donors for their support in fiscal year 2016-2017
(July 1, 2016 - June 30, 2017)

Delta Society Chair:
Mr. Norman Hayes, '80

Delta Society Dean's Club (annual gift of $10,000+)

Anonymous
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Dr. Mohan A. Bhalodia, '73
Dr. Joseph M. Bracci, '92, '89, '87
& Mrs. Kathleen A. Bracci, '91
Mr. Michael J. Cadigan, '79
& Mrs. Eileen Cadigan
Mr. Roy R. Carter
& Ms. Frances A. Cecere
Dr. Joe Y. Chuang, '72
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& Mrs. Elfriede I. Ferguson, '57
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& Mrs. Nurit Fischer, '13
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& Mrs. Stephanie Wilde
Mr. Kenneth O. Young, '54
& Mrs. Marilyn Young

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& Ms. Kathleen A. Ratcliffe
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Mr. Henry E. Stone, '49
Mr. Mark J. Zirnheld, '90
& Dr. Jennifer L. Zirnheld, '04, '97, '93

1

2

3

Delta Society (annual gift of $1,000 - $4,999) | Gold (Graduates of the last decade $500+)

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& Ms. Martha Copello
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& Mr. Joe Gomez
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& Ms. Pavitra Kandadai
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& Mrs. Padma Govindaraju
Mr. William Grappone
& Ms. Anna M. Stave
Mr. Brian P. Gregory, '96
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& Reverend James A. Hammond
Mr. Robert Francis Hanley Jr., '90
Mr. Robert G. Harrison, '83
& Mrs. Gilda T. Harrison, '86, '84
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& Dr. Akram S. Talhouk
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& Dr. Mark H. Karwan
Mr. Thomas S. Katra, '68
Mr. Pat J. Kennedy, '78
Mr. Joseph F. Kessler, '10, 00, 93
& Mrs. Lisa Kessler
Mr. John A. Kirchgraber, '11, '09
Mr. Krishna S. Kolluri, '88
Mr. Hratch H. Kouyoumdjian, '70
Mr. Anil L. Kshirsagar, '79, '77
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& Mr. Carl J. Lehman, '78
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Mr. Michael J. Madonia
& Mrs. Linda S. Madonia
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& Mrs. Bonnie Martin
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Mr. James F. May, '49
Mr. James W. McLernon, '50
& Mrs. Brigitta McLernon
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Mr. Todd V. Minnella, '95
Dr. Charles F. Zukoski
& Ms. Barbara J. Morgan

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Robert Hanley Jr. (left, BS '90 industrial) and Mark Karwan; Hanley set up the Karwan/Thomas Industrial Engineering Fund in honor of the two professors who were most influential during his time at UB.

Mr. Edward C. Morris, '73
Mr. Michael R. Nowicki, '90
& Mrs. Susan R. Nowicki
Mr. Thomas A. Occhino, '07
Mr. Michael C. Orlovsky, '85
Mr. Bradley D. Otto, '02
& Mrs. Julie J. Otto, 01
Mr. Jeffrey H. Peck, '86
& Mrs. Catherine M. Peck, '87
Mr. Lawrence L. Peckham, '74, '69
& Mrs. Nancy Peckham
Mr. John V. Pilitsis, PE, '75, '70
& Mrs. Lois Pilitsis
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Mr. Frank J. Puskar, '79
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Mr. Thaveesinn Vasavakul, '93
Mr. George J. Vlay Jr.
Mr. Mi Wang, '13
Dr. A. Scott Weber
& Mrs. Jo Ann J. Weber
Mrs. Ann M. Wegrzyn, '90, '85
Mr. James J. Wehrfritz, '78
Mr. William G. Weppner, '59
Mr. Shyh-Guang Yen, '89
Dr. Atif Zafar, '94, '89
Mr. George Z. Zhu, 97

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John Crassidis (PhD '93, MS '91, BS'89, mechanical), center, celebrates with Matthew Whittaker, Adonis Pimienta-Penalver and Matthias Schmid, who all earned PhDs in aerospace engineering.

We strive to ensure that gifts are listed accurately. If any information listed is incorrect, please call Todd Brooks in the School of Engineering and Applied Sciences' Office of Philanthropy and Alumni Engagement at (716) 645-2133 or email *toddbroo@buffalo.edu.*

1 Larry Mathews (BS '69 civil) poses with his wife Anne at the spring alumni awards night.

2 UB president Satish Tripathi poses with Ann Wegrzyn (BS '85, industrial; MBA '90), who received the 2017 Dean's Award for Achievement.

3 James van Oss (MS '83, BS'81, mechanical) was named 2018 Engineer of the Year by the UB Engineering and Applied Sciences Alumni Association.

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James Wehrfritz (left, BS '78 civil) talks with engineering graduate students at the Fourth Career Perspectives and Networking Conference.

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class notes

[1950s]

Jack B. Walters (BS 1954, electrical and computer engineering) was one of nine people to be named a Distinguished Alumni of Lockport High School by the Lockport High School Foundation. A retired Iowa state public servant and the author of four books, he enjoyed a lengthy career, starting with Firestone and eventually as director of general services for the state of Iowa. His most notable efforts included starting exterior restoration of the Capitol building and design and construction of the $25 million Historical and Library Building.

[1970s]

Kannankote S. Govindaraj (PhD 1976, MS 1974, BS 1971, electrical engineering) was profiled in the Buffalo News about a company he formed with fellow UB alumnus Tom Pleban. The company, called Mesha Inc., helps people, mostly poor and in underserved areas, to get better access to electrical power.

Christopher Scolese (BS 1978, electrical and computer engineering) received the 2018 van Karman Lectureship in Astronautics Award from NASA. He will receive the award at the 2018 AIAA Space and Astronautics Forum and Exposition in Orlando, Florida in September 2018. Scolese is the director of NASA's Goddard Space Flight Center.

Joel Adams (BS 1979, nuclear engineering) was among four people honored as the first class of Graduates of Distinction from Midlakes High School, located in Clifton Springs, N.Y. He was named to the Top 50 "Most Influential People in Pittsburgh" in 2015, and received a Lifetime Achievement Award from Pittsburgh Venture Capital Association. In 2016, he received the Distinguished Alumni Award from Carnegie Mellon's Tepper School of Business.

[1990s]

Ann Bisantz (MS 1991, BS 1989, industrial engineering) was named dean of undergraduate education at the University at Buffalo. She previously served as chair of the Department of Industrial and Systems Engineering.

Kevin R. Farrington (BS 1992, civil engineering) joined AES Northeast, a provider of civil engineering, land surveying and architectural services, as director of the Civil Engineering Division.

Juan Carlos Bosacoma (BA 1993, computer science) and Hernan Silva, founder and cofounder of CIO Landing IT, have teamed up with other leading cyber security experts to release a new book entitled "Sitting Duck," which will serve as a resource for business owners and professionals to take the necessary precautions to protect their critical information from online threats.

John Crassidis (PhD 1993, MS 1991, BS 1989, mechanical engineering) was named Samuel P. Capen Professor at the University at Buffalo. Crassidis is a professor in UB's Department of Mechanical and Aerospace Engineering and Director of the Center for Multisource Information Fusion.

Leslie G. Boulton (MS 1996, environmental engineering) was named acting commissioner of public works of Broome County. She will also continue in her role as deputy commissioner of engineering.

Yanhong "Robin" Li (MS 1994, computer science) was profiled in the January 29, 2018 issue of Time magazine. Li, founder of Baidu, a popular Chinese search engine similar to Google, discusses the impact of AI in China.

Simon (Xiaoming) Yang (PhD 1995, MS 1993, mechanical engineering) was named Asia-Pacific president of Aptiv (formerly Delphi). Yang will continue his current responsibilities as the managing director of connection systems, Asia-Pacific.

Richard Helgeson (PhD 1998, civil engineering) has been named interim provost and vice chancellor for academic affairs at the University of Tennessee. He previously served as dean of the Martin College of Engineering and Natural Sciences.

Sissy Nikolaou (PhD 1998, MS 1995, civil engineering), PE, was elected to the Board of Governors of the Geo-Institute, a specialty institute of the American Society of Civil Engineers focused on geoprofessionals and the geo-industry. Nikolaou is currently a principal in the Geotechnical & Tunneling Technical Excellence Center of WSP USA.

[2000s]

Patrick Merewether (BS 2002, civil engineering) has joined Clark Patterson Lee's Buffalo team as a civil engineer. He will serve as a senior project engineer with a focus on highway design projects.

Zhiyong Gu (PhD 2004, chemical engineering), was promoted to full professor in the Department of Chemical Engineering at the University of Massachusetts, Lowell.

Matthew J. Plizga (BS 2004, civil engineering) joined Fall Protection & Strut Systems as a senior project manager. A professional engineer, Plizga was formerly with SJB Consulting, a geotechnical design company, and the Watson Bowman and Hatch Mott MacDonald civil engineering firms.

Nora E. Eberl (BS 2005, civil engineering) started a new company called Fall Protection & Strut Systems, headquartered in Buffalo, N.Y. The company offers a local resource for construction products and expertise in the specific area of fall protection and prevention.

Ken Tye Yong (PhD 2006, BS 2001, chemical engineering) is the winner of the Beilby Medal and Prize 2017, which is awarded annually by SCI's Materials Chemistry Group, the Royal Society of Chemistry and the Institute of Materials, Minerals and Mining. Yong is an associate professor of electrical and electronic engineering at Nanyang Technological University in Singapore, and is also the director in the Centre of Bio Devices and Signal Analysis.

Dayle Hodge (MS 2008, BS 2006, mechanical engineering) was profiled by the Associated Medical School of New York for his work to increase awareness of STEM careers for underrepresented students. Hodge is enrolled in the Albert Einstein College of Medicine and is on track to graduate with his MD and PhD in 2019.

[2010s]

Akash Narani (MS 2010, chemical engineering) received a 35 under 35 award from the American Institute of Chemical Engineers. Narani is a senior bio-process engineer at Lawrence Berkeley National Lab in Berkeley, Calif.

Raheeb Kased (BS 2012, civil engineering; BA mathematics) was named project manager at OnQGlobal, a construction management company specializing in the high tech, data center and manufacturing markets.

Richard Linares (PhD 2014, MS 2010, BS 2009, aerospace engineering), an assistant professor at the University of Minnesota, received a prestigious Young Investigator Program award from the US Air Force. The grant will support his research, which aims to design an intelligent system for measuring the location of thousands of manmade objects in space.

Michael Moskal (PhD 2016, MS 2013, BS 2011, industrial engineering) was named a 2018 "Face of Technology" by the Florida High Tech Corridor. Moskal is a senior data scientist at an information technology company called OSTHUS in Melbourne, Florida.

Zhisheng Yan (PhD 2017, computer science) accepted a tenure-track assistant professor position at the Georgia State University Department of Computer Science.

Zhan Qin (PhD 2017, computer science) accepted a tenure-track assistant professor position at the University of Texas at San Antonio Department of Electrical and Computer Engineering, where he will continue his work in the areas of data privacy and data computation security.

Andrew Bodratti (PhD candidate 2018, MS 2012, BS 2010, chemical engineering) won the Product Innovation Award for 2016 from Unifrax (together with Master Technician Mark Stahlman), where he is currently employed as a Senior Development Engineer.

Guojian Zhang, a postdoctoral associate in the Department of Chemical and Biological Engineering, has been appointed as an associate professor at Ocean University of China School of Medicine and Pharmacy.

Keep in touch and network with fellow alums from our school. Join your department's LinkedIn group.

UB AND NSBE HELPED DILLARD

"JUST DO IT"

For Brian Dillard (BS '92, industrial engineering), a conversation at a National Society of Black Engineers (NSBE) convention led to a decades-long career with the largest sneaker manufacturer in the world.

Dillard was first exposed to the field of engineering in high school through BEAM (Buffalo Engineering Awareness for Minorities), an organization founded in 1982 to help build diversity in STEM fields. After high school, he completed the engineering science program at Erie Community College and transferred to UB's Department of Industrial and Systems Engineering.

While at UB, Dillard joined NSBE and attended one of its career fairs. "The NSBE career fairs were the largest on campus," he says. "They provided me with exposure to huge corporations and job opportunities that wouldn't have been available otherwise."

A few years later, while working at Motorola, Dillard attended another career fair at NSBE's national convention. He connected with representatives from Nike, and landed a job as a senior engineer.

During his two decades with the sneaker giant, working at their distribution hub in Memphis, Tenn., he designed and planned a 1.2 million sq. ft. distribution facility, redesigned a half-million-dollar conveyor system that doubled the product throughput needed to meet holiday demand, and developed a test regimen that ensured that Nike's new, more sustainable packaging functioned exactly like the previous design, yet produced less waste.

He has also helped improve Nike's dot com business, specifically, the reverse logistics of returned products. Previously, if someone ordered sneakers in three different colors, and sent two pairs back, the returns would go to different facilities. Dillard and his team transformed an old, empty building on Nike's property into what is essentially a return depot. He then redesigned the process to bring all returns to this one location, at the relatively low cost of $100,000.

When asked to provide advice for students and recent graduates, he underscores the importance of not just being an engineer, but understanding how a particular business works. "You need to understand what's important to your company's key accounts and end customers," he says. "Don't be in a vacuum. If you understand the business from a broad perspective, you'll be a better designer."

— REBECCA RUDELL

WHY CAN'T WE **FIX OUR OWN** ELECTRONIC DEVICES?

Traditionally, when a car breaks down, the solution has been to fix it. Repair manuals, knowledgeable mechanics and auto parts stores make car repairs common, quick and relatively inexpensive.

But when a computer or smartphone breaks, it's hard to get it fixed, and much more common to throw it away. Even small devices can add up to massive amounts of electronic waste.

Bigger equipment can be just as difficult to repair. Today's farmers often can't fix the computers running their tractors. Companies argue that specialized software running tractors and other machines is protected by copyright and patent laws.

Users' right to repair — or to pay others to fix — objects they own is in jeopardy. However, in our surveys and examinations of product life cycles, my colleagues and I are finding that supporting people who want to repair and reuse their broken devices can yield benefits — including profits — for electronics manufacturers.

At least eight states — Nebraska, Kansas, Wyoming, Illinois, Massachusetts, Minnesota, New York and Tennessee — are considering laws that would require companies to let customers fix their broken electronics.

Seen one way, these regulations put manufacturing companies in a tough spot. Manufacturers can earn a lot of money from selling authorized parts and service. Yet to remain competitive, they must constantly innovate and develop new products. To keep costs down, they can't keep making and stocking parts for old and outdated devices forever. This leads to what's called "planned obsolescence," the principle that a company designs its items to have relatively short useful lives.

However, our research suggests that companies can take a different approach — designing and building products that can be refurbished and repaired for reuse — while building customer loyalty and brand awareness. By analyzing surveys of hobbyists and the repair industry, we've also found that there are barriers that impede the growth of the repair industry that can be improved upon.

Even as machines and devices have become less mechanical and more electronic, we have found that customers still expect to be able to repair and continue using electronic products they purchase. When manufacturers support that expectation, by offering repair manuals, spare parts and other guidance on how to fix their products, they build customer loyalty.

Specifically, we found that customers are more likely to buy additional products from that manufacturer, and are more likely to recommend that manufacturer's product to friends.

Our research also shows that the failure of most electronic devices is due to simple accidents such as dropping a device or spilling water on it. The most common problem is a broken screen. There are other issues, too — such as batteries that no longer hold their charges or circuit boards that just stop working.

Technology manufacturers should take steps to promote customers' right to repair their broken devices, which helps cut down on electronic waste and boost brand loyalty. But if they won't, laws and regulations can help.

In France, for example, a 2015 law requires manufacturers to tell customers — before they purchase an item — for how long repair parts will be available. That lets consumers decide how much they want to factor in the possibility for repairs when deciding whether to buy something new.

Supporting repair rights can also bring economic benefits to more than just the technology sector. There were 4,623 consumer electronic repair and maintenance companies in 1998 in the U.S. By 2015, that number had dropped to 2,072. Independent vendors are creating online marketplaces where people can buy and sell used and repaired gadgets.

Companies shouldn't fear people taking too much into their own hands, though. While it's been possible for a few years to 3-D print and hand-assemble entire computers, they're not very good. People are much more likely to buy corporate-made devices; they just want to be able to repair them when they break down.

— Sara Behdad

Sara Behdad is an assistant professor with a joint appointment in the Departments of Industrial and Systems Engineering, and Mechanical and Aerospace Engineering. She directs the Green Engineering Technologies for Community of Tomorrow Lab and is affiliated with UB's Sustainable Manufacturing and Advanced Robotic Technologies (SMART) Community of Excellence.

BOLDLY BUFFALO

THE CAMPAIGN FOR UB

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"The trip reinforced what I want to be doing in my life. There's nothing like getting out of the classroom, being in a gorgeous place and learning about super-interesting topics."

-Kaitlyn Alcazaren, a senior environmental engineering major

Photo: Douglas Levere

WITNESSING SUSTAINABILITY ABROAD

Winter break is usually a time to catch up with friends and fit in some winter activities. But for 16 engineering and science students, it was a time to immerse themselves in sustainability practices in the beautiful Central American country of Costa Rica. The bonus? Earning three credits applicable towards their bachelor's degree.

The group was the first to take "Costa Rica: Sustainability in Latin America," a course created and led by environmental engineering professor John Atkinson. The trip enabled the students to fit a study abroad experience into their densely packed schedules and explore a nation that regularly ranks in the top 5% of the most sustainable countries in the world.