

CLEVELAND STATE UNIVERSITY

WASHKEWICZ

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COLLEGE OF ENGINEERING

2016-2017 ISSUE

BUILDING A 21st CENTURY HOME

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FENN HALL TRANSFORMATION ON TRACK FOR LATE 2017 DEBUT.

A MESSAGE FROM THE DEAN

Dear Alumni and Friends,

The Washkewicz College of Engineering continues to thrive and grow, and we are *Making An Impact, through the Power of Innovation*. I am really proud to see how our faculty, students, staff and alumni have all made positive impacts on society this past academic year.

Faculty made an impact through their innovative research in areas such as bigdata analytics, additive manufacturing and artificial intelligence, each of which promises to positively impact our Northeast Ohio economy. Moreover, faculty made a difference in areas such as preparing high school teachers to teach computer science, with the hope that one day all students have the skills they need to capitalize on opportunities available in this growing field.

Students made an impact on the CSU campus and beyond, as they achieved great things in the classroom, with one of our own being named co-Valedictorian, in research, in competition against their peers and in advancing the engineering profession.

Our College programs continue to have impact on building the next generation of engineers, preparing students to be "Ready to Go Engineers" upon graduation and unleashing our students' creative potential through our Senior Design Program.

Alumni and friends made a profound impact on the College this past year through their generous gifts of time, talent and philanthropy. Thank you!!!

Finally, perhaps our most impactful project of all, our new engineering building! This endeavor is the result of a tremendously impactful public-private partnership between our alumni, private industry and the State of Ohio that will greatly enhance the way we educate our engineering students and engage with industry. We began construction in May 2016, and the new building's scheduled completion date is December 2017.

Our College is indeed making a tremendous impact on the world around us. It certainly makes me proud to be a Viking. I am sure it will make you proud as well!

Anette Karlsson, Ph.D. Dean, Washkewicz College of Engineering



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See how our faculty are making an impact in the areas of big data analytics, additive manufacturing and artificial intelligence.



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Our students are achieving many great things, both on the CSU campus and beyond. Read all about the great things they have been up to.



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Fenn Academy and the Fenn Co-Op program continue their excellence in developing future engineers.



ALUMNI & DEVELOPMENT IMPACT BUILDING A THRIVING FUTURE

Thanks to many generous alumni, corporate and personal donations, the future of Washkewicz College of Engineering is bright.



NEW \$60 MILLION ENGINEERING BUILDING UNDER CONSTRUCTION

IN MAY 2016, construction began on the 100,000 square-foot, \$60 million dollar Washkewicz College of Engineering annex building, located on Chester Avenue near E. 24th Street.

The project has been financed through a public-private partnership, with support coming from the State of Ohio and generous benefactors including Don and Pam Washkewicz, the Parker Hannifin Foundation, the Estate of Fredrick H. Ray and Dan T. Moore.

The new four-story facility will feature the Parker Hannifin Motion and Control Laboratory and the Dan T. Moore MakerSpace, where students can transform their ideas to reality using state-of-the-art technology. The facility will also include multiple flexible research laboratories, teaching laboratories, simulation labs for computer modeling, student collaboration spaces, a large conference room, general classrooms and office space.

"Our new engineering building will allow us to jumpstart the creation of a new kind of academic environment – one that promotes innovation, discovery and entrepreneurship and facilitates collaboration with industry," said Dean Anette Karlsson, Ph.D. "We believe this is just the kind of preparation that today's students expect and deserve."

The new engineering building is scheduled to open in December 2017.





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Building view from E. 24th, looking west down
Chester Avenue, highlighting the new entry,
landscaping and exterior seating space.

The new south courtyard will feature a newly landscaped quad with pedestrian walks between Fenn Hall, Science and Science Research.

The Dan T. Moore MakerSpace will feature 6,400 square feet of open laboratory space, providing CSU students with access to the latest prototyping and fabrication technology to assist in transforming ideas into practical applications.

First floor entry lobby will highlight current events in the Washkewicz College of Engineering, feature state-of-the-art interactive signage, and display space for student projects.









MAKING A DIFFERENCE THROUGH COMPUTER SCIENCE EDUCATION

DR. NIGAMANTH SRIDHAR

ven though Dr. Nigamanth Sridhar's first day as a computer engineering professor at CSU's Washkewicz College of Engineering was more than 12 years ago, he can still remember it like it was yesterday.

"I WAS FREAKING OUT, even though I had experience in the classroom," said Sridhar. "It was just the overall sense that now I was on my own, which was somewhat overwhelming at first. It didn't help that my laptop crashed the first week on the job."

After a couple of weeks, he was able to recover his hard drive and things settled down considerably. Fast forward to today, and you will find Dr. Sridhar on the cutting edge of education and research at the Washkewicz College of Engineering, carrying on the tradition of excellence in the Department of Electrical Engineering and Computer Science.

"There are many faculty in the department that mentored and inspired me, including Dr. Eugenio Villaseca, who was chairman at the time, as well as Dr. Zhiqiang Gao," said Sridhar. "There was also Dr. George Kramerich. I remember students hated having him as a professor while taking his class, but then loved him afterward. He really pushed students to learn. I have aspired to maintain that high standard of excellence."

Dr. Sridhar has indeed maintained that standard during his tenure at CSU. As Professor of Electrical and Computer Engineering, he was named the Outstanding Computer Engineering Professor by graduating undergraduate students in 2013. He earned CSU's Faculty Merit Recognition Award in 2008, 2011, 2012, 2013, 2014, and serves as Program Director with CSEdOHIO, an organization leading computer science education in Ohio. Dr. Sridhar also serves as President of the Faculty Senate, and as a Faculty Representative to the CSU Board of Trustees.

Dr. Sridhar's research interests lie at the intersection of software engineering and distributed systems, with a special emphasis on small embedded systems such as wireless sensor networks. In 2008, he earned the National Science Foundation's (NSF) CAREER Award for his research in improving the productivity of a sensor network programmer, as well as the Washkewicz College of Engineering's Outstanding Faculty Research Award.

In January 2014, Dr. Sridhar led a team of researchers from CSU and the University of California, San Diego in obtaining a \$1 million "CISS: Computing in Secondary Schools" grant from NSF. The goal of this grant is to provide computer science (CS) education and professional development to high school teachers throughout the State of Ohio. Through their participation in CISS, high school teachers obtain the skills needed to teach the newly designed Advanced Placement (AP) CS Principles course.

"Writing the curriculum was the easy part of the grant," said Sridhar. "Training the teachers was more difficult. One of the challenges is that school administrators don't have a thorough understanding of what computer science is. School administrators don't realize that in the future, all students, regardless of what major they pick in college, are going to need at least some basic level of computer science skills. A second challenge is that the attrition rate of CS faculty in K-12 schools is high, since many teachers leave to work in private industry where they earn more money. Some get training, teach for a few years, then leave."

Despite these challenges, by the end of 2016 (conclusion of the grant term), Dr. Sridhar and his team will have directly trained 45 high school teachers to teach the AP Computer Science Principles course.

While Sridhar is proud of this accomplishment, he is even more excited about a \$125,000 grant he received from the Cleveland Foundation to provide computer science courses in all Cleveland Metropolitan School District (CMSD) high schools within three years. The long-term goal is to expand the classes into the district's middle and elementary schools.

"While preparing teachers to teach the AP CS course is important, its scope is somewhat limited to more affluent school districts," said Sridhar. "I believe this grant can have a greater overall impact in promoting equity and social mobility in the computer science field," said Sridhar.

In January 2016, President Barack Obama launched the Computer Science for All Initiative (#CSforAll), an ambitious \$4.1 billion national effort to increase access to K-12 computer science by training teachers, expanding access to high-quality instructional materials and building effective regional partnerships. President Obama, along with many educators, government officials and philanthropists, believe computer science is a new basic



skill necessary for economic opportunity, social mobility and a strong and secure U.S. economy.

The statistics appear to support this belief. In 2015, there were over 600,000 tech jobs open across the United States, and by 2018, 51 percent of all STEM (Science, Technology, Engineering and Mathematics) jobs are projected to be in computer science-related fields¹.

Today, the application of computer science is not limited to STEM disciplines. You will find CS in virtually every field, from healthcare, to building construction to cab driving (think Uber).

Despite these facts, only one in four schools teach computer programming, and only 30 states allow students to count computer science courses toward high school graduation².

"Yes, CS for All is a game changer, and having an organization with the reach of the White House pushing the program is very important and useful," said Sridhar. However, even with increased levels of awareness and federal support, Sridhar still foresees challenges in expanding access to computer science.

"For example, beginning this fall in CSfriendly Arkansas, every high school student is required by state law to take a CS class," says Sridhar. "The problem is there are not enough certified teachers available to make this a reality, so even though the money and political will is there, it will take several years to implement."

Ohio is in the middle of the pack when it comes to its support of computer science. In 2014, state law changed, increasing the number of high school math credits required for graduation from three to four, and allowing one of those credits to come from a computer science course. Dr. Sridhar's Computing in Secondary Schools team played a role in the effort to get this legislation passed.

Though he has accomplished a great deal as a researcher, Sridhar's true passion

remains in the classroom.

"I am happiest and least stressed when I am in the classroom," said Sridhar. "I truly enjoy working with students, in particular undergrads. I try to gauge the classroom to see if students are "getting it," and it is very gratifying once you see the lightbulb go on. I try to make the classroom an engaging place, one where students feel comfortable asking lots of questions."

In the 12 years since his first day in the classroom as a wide-eyed professor, Dr. Sridhar has observed many positive changes at the College.

"There has been tremendous growth, there are many more people here," said Sridhar (the College's enrollment has grown 150 percent over the past 10 years to 2,500 total students).

"There are also many more students hanging out in the building, seeing the College as their second home. There is always some type of activity going on here, even on the weekends. Students used to just come for class and then head home. Having the students on campus more allows faculty and staff to develop deeper connections with them," said Sridhar.

Other facets of the College have remained the same.

"One thing that hasn't changed is the quality and tenacity of our undergraduate students," said Sridhar. "Our students have grit, which is why employers love to hire them."

So what does the future hold for, Sridhar, and the College?

"As for me, I am just going to keep doing what I am doing," said Sridhar. "As for the College, I see us continuing the same trajectory of growth and quality. We just had our largest graduating class (329 students), and I only see that getting larger." "However, as we get larger, we need to make sure we do not lose the fabric that makes the College special – that small-College, personal approach, where lots of students are engaged and the building is alive and active. Having the Dan T. Moore MakerSpace and other interactive areas in the new building will help."

"I see more in our future - more students, more faculty, more of everything."



DR. STEPHEN DUFFY

ccording to Merriam-Webster, a Renaissance Man is someone who is interested in and knows a lot about many things. Dr. Stephen Duffy, Professor of Civil and Environmental Engineering, fits the textbook definition of an Engineering Renaissance Man, given the many facets of the

engineering profession he has explored and mastered over his 30+ year career at CSU.

DUFFY EARNED HIS BACHELOR'S, and doctoral master's dearees in engineering from the University of Akron. Though his educational focus was almost exclusively civil engineering, his experience as an educator and researcher has been anything but.

Duffy began his career in 1981, working as a grant employee for NASA Glenn Research Center (then NASA Lewis Field), under the direction of one of his early mentors, three time CSU engineering alumnus Dr. John Gyekenyesi. It is here where Duffy

embarked on his career researching the design and reliability of brittle materials such as ceramics, graphite and glass.

"John was one of the best," said Duffy. "Working with him at NASA opened doors to other federal agencies, including the Department of Energy and Oak Ridge National Labs. Working with John helped launch my career."

Indeed, Duffy's contract position with NASA eventually morphed into a full-time faculty position with the civil engineering department at CSU's Washkewicz College of Engineering (then Fenn). As Duffy taught extensively in the classroom while earning his Ph.D. at the University of Akron, the transition from research bench to classroom desk was an easy one.

"The challenges in the classroom haven't been any different since I started teaching in 1980," said Duffy. "You need to get students to understand difficult concepts, and try different methods to make that happen if you need to. It is interesting to see younger students get over the hump and start thinking like an engineer. To visualize

a problem in their own head, using their mind's eye. It is all downhill from there."

While most faculty choose to focus on either teaching or research, Dr. Duffy chose both, and in the process had lots of fun working on projects outside the realm of traditional civil engineering.

One of those projects was a partnership with former Cleveland Clinic researcher Dr. Shuvo Roy to build a Renal Assist Device (RAD), or bio-artificial kidney. Dr. Duffy's involvement with the project focused on the design and reliability of the device's ceramic hemofilters.

"Most projects where metal is swapped out for ceramics are not very successful, due to high reliability requirements and ceramics' brittle nature," said Duffy. "The reliability goals were less stringent for the RAD, as you cannot service the ceramic hemofilters once they are in the body, making them a perfect fit for this project. Every 12-18 months the device would need to be removed via major surgery and the filters replaced. However, patients forced to have kidney dialysis every third day are willing to have a major surgery once a year to avoid it."

"The Renal Assist Device was a true breakthrough, but the amount of testing required held things up. Certain materials needed extensive animal testing before they could be placed in humans. That is the next step," said Duffy.

Another "fun" project for Duffy was the establishment of the University Transportation Center at the Washkewicz College of Engineering.

"Back in 2002-03, College alumnus and President of Great Lakes Construction Company George Palko approached me with the problem of work zone safety. Far too many construction workers were being injured on the job," said Duffy.

"George went on to ask me 'What do you know about running University Transportation Centers?' I said that I knew we would need a champion in Congress to make it go."

Soon thereafter, Duffy and Palko were sitting in the office of late U.S. Representative Steve LaTourette pitching the idea.

"LaTourette really got behind the concept of a Center dedicated to work zone safety. He understood it was all about

G LOVE WORKING ON PROJECTS THAT STRETCH MY ABILITIES. I AM A CURIOUS PERSON BY NATURE.

saving lives. He took us under his wing and made it happen. I am forever grateful for his tremendous support," said Duffy.

Since its establishment in 2005, the CSU University Transportation Center (UTC) has provided training, education, outreach and research to lower the number of accidents associated with roadside work zones.

Duffy recently submitted a new \$1.5 million funding proposal to the U.S. Department of Transportation to support the operation of the CSU-UTC on behalf of a consortium consisting of CSU, Case Western Reserve University, Cuyahoga County Community College, Lakeland Community College and Lorain County Community College.

Duffy has also been very active in promoting STEM (Science, Technology, Engineering, Mathematics) education in the community.

"The original University Transportation Center Grant had an education outreach requirement, so I approached the College of Education's Dr. Debbie Jackson asking if she was interested in partnering with me in doing some outreach in the community on STEM education," said Duffy.

"While I was chair of civil engineering, we embedded graduate students in calculus classes. A few years later, we put this concept of having upperclassmen mentor precalculus and calculus classes into a National Science Foundation grant, which eventually became Operation STEM," said Duffy.

Operation STEM targets STEM majors, primarily freshmen, and provides them with a two-week Summer Institute to help establish a community of peers. In addition, STEM Peer Teachers provide 150 minutes per week of mandatory instructional learning sessions and project-based learning activities in precalculus and calculus classes.

The results of the program thus far have been impressive. Prior to 2013, the passage rates for students in Precalculus I and Precalculus II were 57 percent and 61 percent, respectively. Between 2013 and 2014, OpSTEM boosted passage rates to 71 percent for Precalculus I and 87 percent for Precalculus II.

Dr. Duffy has also worked with the Department of Defense to develop ceramic armor and ceramic gun barrels on Abrams tanks, the Department of Energy on next generation nuclear reactors with graphite core subcomponents, and NASA on the development of a ceramic aeroshell to protect water detection equipment upon impacting Martian soil.

"I love working on projects that stretch my abilities. I am a curious person by nature."

While his curiosity to learn and master new things is important, it is the students that keep him coming back.

"I like working with the students the most," said Duffy. "They still have an ability to make me laugh. As long as that continues, I'll still be around."

Outside of the office, Duffy likes spending time with his family, his wife, three daughters, son-in-law and two grandsons. His two eldest daughters earned their undergraduate degrees at CSU, and his youngest daughter is enrolling in the College's chemical engineering program this fall. In doing so, she will continue the Duffy engineering tradition, as Duffy, his father and his brother and sister, are all engineers.



RICHTER, SIMON, VAN DEN BOGERT AND SPARKS AWARDED NSF GRANTS TOTALING \$1 MILLION

Left to right: Professors van den Bogert, Sparks, Simon and Richter

SU Researchers Awarded Grants Totaling \$1 Million from National Science Foundation to Develop Cyber-Enabled Exercise Machines and Investigate Potential for More Efficient Industrial Robots through Energy Regeneration.

IN SEPTEMBER 2015, Cleveland State University (CSU) researchers Hanz Richter, Ph.D., Dan Simon, Ph.D. and Antonie van den Bogert, Ph.D., of the Washkewicz College of Engineering and Kenneth E. Sparks, Ph.D., of the College of Education and Human Services, were awarded two National Science Foundation (NSF) grants totaling \$1 million: a four-year \$800,000 grant from NSF Cyber-Physical Systems (CPS) to develop and field-test two prototype cyber-enabled exercise machines (CEEMs) and a three-year \$200,000 grant from NSF Sensors, Dynamics and Controls (SDC) to fund research into the design, control and optimization of energy-regenerating robots.

Unlike existing exercise machines, CEEMs will measure and process biomechanical variables and generate adjustments to their own resistance, providing users with cues that will ultimately maximize effectiveness and guarantee safety. The machines will be reconfigurable by software, permitting a wide range of exercises with the same hardware.

The researchers will develop and field-test the machines on CSU student-athletes. They seek to produce foundational research to help invent other machines that will adapt towards optimal exercise and guide users, including machines with purposes beyond athletic conditioning.

"The same foundations and methodologies can be followed to design machines for rehabilitation, exercise countermeasure devices for astronauts, and custom exercise devices for the elderly and persons with disabilities," said Richter, the study's principal investigator (PI). "The project has the potential to improve the health of society members at various levels."

Portions of the research will be conducted in CSU's Parker Hannifin Human Motion and Control Laboratory, which provides motion capture and biomechanical analysis capabilities.

For the NSF SDC grant, the team will use the additional funding to investigate regenerative energy systems as they relate to more efficient mobile, industrial and medical robotic systems.

Many industrial, consumer and medical products – robots, elevators, forklifts and more – involve masses in motion. Those motions are powered from energy sources, and always involve cycles of acceleration and deceleration. Conventional braking, the traditional method of deceleration, is inefficient because the heat generated from braking wastes energy. In contrast, regeneration involves surplus energy capture and storage into the power supply. This area of engineering is advanced and visible in electric and hybrid vehicles, but its understanding and optimal utilization in mobile and industrial robotics remains a challenging area of research. The outcomes of the investigation have the potential for significant energy savings in industrial installations and beyond.

"Mobile biomedical devices powered from electric energy sources such as wheelchairs, prostheses and exoskeletons are another target application of this research," said Dr. Richter. "Optimal energy utilization in these devices will translate into lighter units with a reduced need for frequent recharging. People wearing advanced regenerative prostheses will be able to extend the range of their daily activities, improving their quality of life."



EXPLORING THE WORLD OF ARTIFICIAL INTELLIGENCE AND ROBOTICS

POOYAN FAZLI

ooyan Fazli, Ph.D, assistant professor in the Electrical Engineering and Computer Science Department, joined Cleveland State University in fall 2015. He received his Ph.D. in computer

science from the University of British Columbia. Prior to joining CSU, he was a postdoctoral fellow in the CORAL Research Group at Carnegie Mellon University (CMU), and in the Laboratory for Computational Intelligence at the University of British Columbia (UBC). **DR. FAZLI'S RESEARCH INTERESTS** include artificial intelligence, autonomous robots, multi-robot systems, human-robot teams, cloud robotics, machine learning and robot vision.

"I am the founding director of the People and Robots Laboratory (PeRL) at the College," said Fazli. "My long-term research goal is to develop highly heterogeneous teams of robots, humans, and other agents to collaborate and coordinate in dynamic multi-goal environments."

At CMU, Professor Fazli was involved in the High-Assurance Cyber Physical Systems Project, a multidisciplinary program sponsored by the Defense Advanced Research Projects Agency (DARPA) that aimed to develop secure robotic systems that are resilient to cyber attacks. He also initiated a project on cloud robotics that enables remote and heterogeneous robots to share plans and instructions, and to learn new skills by connecting to other robots that are geographically distributed throughout the world.

Professor Fazli's research at UBC was in the area of multi-robot coverage and patrolling, and involved teams of robots that conducted sensing, monitoring, data collection, search and servicing tasks in a target area. He has extensive experience in building and mentoring RoboCup teams (rescue robots, soccer robots and service robots) which have achieved significant success in national and international competitions. He was also a co-organizer of the 2009 and 2010 Semantic Robot Vision Challenge and a member of the UBC team in the contests, which placed first in the software league.

Dr. Fazli has published more than 20 articles in leading artificial intelligence and robotics journals and conferences. He has also served on several conference program committees and has co-chaired several workshops on autonomous robots.



ADDITIVE MANUFACTURING LEADE

DR. TUSHAR BORKAR

he Washkewicz College of Engineering recognizes the tremendous growth of the additive manufacturing industry and is investing in it.

IN MAY 2014, the College received a \$293,500 grant from the Ohio Board of Regents to establish the Additive Manufacturing Instructional and Training Laboratory. The grant monies were used to purchase seven 3D polymer printers and two electronic 3D printers. The new lab has been heavily utilized by students, faculty and industry to create 3D printed materials for a wide variety of applications.

The College made another major investment in 2015 when it hired Dr. Tushar Borkar as assistant professor of Mechanical Engineering. Dr. Borkar came to CSU from the University of North Texas, where he served as a senior research scientist in the Material Science and Engineering Department. Throughout his career, Dr. Borkar has processed complex shaped functional metallic components; including metals, alloys, and metal matrix composites (MMCs); via techniques such as laser additive manufacturing, to meet the demanding requirements of the aerospace, automotive and biomedical industries.

Dr. Borkar is particularly proud of a project he worked on as a post-doctoral researcher at North Texas. There, he partnered with the Air Force Research Laboratories on the creation of a 3D-printed, functionally graded titanium bone fixation plate with mechanical properties similar to bone, but stronger at the fracture point to promote healing. This innovative product is currently in the process of being patented.

Dr. Borkar has been incredibly busy since his arrival at the College. He has established and taught two new courses for undergraduate and graduate students: additive manufacturing and hybrid manufacturing, which is 3D printing of metal materials combined with CNC machining to create production-quality parts.



He is continuing to build upon his past research with the assistance of several master's degree students, and is managing the day-to-day activities of the Additive Manufacturing Instructional and Training Laboratory.

"I have really enjoyed my teaching and research activities at CSU thus far," said Borkar. "The 3D printing facilities are great and the students are excited to be learning new things. They are creating 3D models on the computer and are doing the printing themselves. They are getting real, hands-on experience that will be very beneficial in the working world."

Borkar and the Additive Manufacturing Lab received more great news in May



Samples of 3D printed objects from the Additive Manufacturing Instructional and Training Laboratory.

when they learned they would be receiving \$250,000 from a \$750,000 Regionally Aligned Priorities in Delivering Skills (RAPIDS) grant from the Ohio Department of Higher Education.

CSU was the lead applicant for the Advanced Manufacturing Proposal, which also included funding requests from Lorain County Community College, Cuyahoga Community College and North Central State College. The goal of the proposal is to address the current and growing regional opportunities within the advanced manufacturing sector.

CSU's portion of the grant will be used to purchase an innovative new 3D printer based on PolyJet technology, which features the ability to print a large variety of materials with flexible colors, as well as mixed materials, in one printing session.

"This new 3D printer will greatly enhance both the educational and research capabilities of our lab," said Borkar. "We are very excited to add this new technology, learn its capabilities and share our new knowledge with students and the community."

One of Borkar's main goals moving forward is to obtain a 3D metal printer for the Additive Manufacturing Lab so they can process metals and focus on the material science and mechanical aspects of new materials. He has already submitted a grant application for the equipment and will receive a response back soon. Another goal is to continue to generate new collaborative research partnerships with local industry in additive manufacturing.

"Parker Aerospace and Swagelok have partnered with us on Master's research creating custom tooling for castings using 3D printing. Local industries are getting more and more interested in the topic – there is a tremendous amount of growth potential."

Ultimately, the College plans to utilize educational, training and research outcomes from Dr. Borkar and the Additive Manufacturing Instructional and Training Laboratory to establish the Center for Innovative Manufacturing at the Washkewicz College of Engineering.

The Center will give faculty, students and local businesses access to the latest in 3D printer technology to develop prototypes and products for this new and growing manufacturing base.

"The Center for Innovative Manufacturing will provide a significant contribution to the regional economy by meeting the demands of the emerging additive manufacturing industry," said Borkar. "I am very excited to be a part of this important effort." MANAGING THE WORLD OF BIG DATA

DR. SUNNIE CHUNG

he amount of data being generated by today's websites and search engines is truly staggering.

FOR EXAMPLE, IN 2015, Google processed more than 30 Petabytes (PB) of data per day. To put that in some context, it takes approximately 1,000 laptop hard drives to store one Petabyte of data. In 2013, Facebook processed over 36 PB of data per day. Yet out of these mountains of data, within milliseconds a company can determine what type of advertisement is most effective to display on our smartphone. How does this magic happen? Welcome to the fascinating world of big data analytics, and the research playground of Dr. Sunnie Chung, college lecturer in the Department of Electrical Engineering and Computer Science.

There are several complex processes involved with "digesting" big data down to manageable bytes where intelligent conclusions can be made. The first step is to clean/transform the data that is captured through Massively Parallel Processing (MPP) Systems, such as Hadoop Based Multi-Node Clusters with Map Reduce parallel programming. Hadoop splits files into large blocks and distributes them across nodes in a cluster.

"In this way, multiple nodes can be used to digest even Petabyte

sized big data at the same time," said Chung. "It is a completely new breed of system, and it is evolving like crazy, getting more complex every year."

Once digested, the data is staged and stored on multidimensional parallel data warehouse systems where it can be mined for information using data mining algorithms, machine learning and many other statistics based methods.

"These data mining techniques have been around for over 20 years, but now we can actually utilize them because of Hadoop and Map Reduce," said Chung.

The final step is data visualization, where the big data appears in a graph, chart or other display that the end-user is able to interpret and draw conclusions from.

Dr. Chung's path to CSU is an interesting one. Upon earning her doctorate from Case Western Reserve University in 2006, Chung landed in Silicon Valley, California, where she spent six years as a research associate at the Database Division of NCR, which in 2007 became Teradata Corporation.

GIT WAS A VERY HARD, DEMANDING JOB, BUT IT WAS WORTH IT, AS I KNEW EVERYTHING I WAS WORKING ON WOULD IMPACT THE REAL WORLD.

adjunct faculty member. In 2015, she joined the College's Department of Electrical Engineering and Computer Science as a college lecturer.

She is currently teaching all undergraduate and graduate level database courses, as well as the data analytics courses she created and is building a graduate curriculum on. She is advising eight master's students, each of whom is conducting research and development on different areas related to big data analytics. In November 2015, Dr. Chung hosted a Big Data Analytics Workshop at CSU, where over 200 people from academia and industry attended presentations from the IBM Watson Research Team, Cleveland Clinic and Progressive. The workshop also provided an excellent platform for internship and job opportunities for CSU data analytics students from the Colleges of Engineering and Business.

Inspiring students to pursue the incredible career opportunities available in the field is a responsibility Dr. Chung takes seriously and enjoys at the same time.

"I feel like I am opening a whole new world to students," said Chung. "I can show them the infinite possibilities available to them in their professional lives. I have had many students come to my office and thank me at the end of the semester for teaching them to find their dream jobs, which is very rewarding."

Two of Dr. Chung's students recently landed jobs at Google and another was hired by Amazon. Many more have been hired by Sherwin Williams, Rockwell Automation and other local companies.

As producer and consumer appetites for big data continue to grow, so too will the field of data analytics and its impact on society.

"We have seen the tremendous impact that big data has on every part of industry, government and our daily lives," said Chung. "Big data can predict an earthquake, a stock's performance or even a terrorist attack. It isn't just in the movies anymore. It is a well-known fact these days that the first priority of every new public company CEO is to build a big data analytic enterprise system."

This is also why Chung believes it is very important for universities to continue to build their data analytics curriculum and research programs. It is also Chung's true passion at CSU.

"Industry has been driving the research in this field for many years, and universities, particularly in the Midwest region, are playing catch-up. We need to continue building good curricula and strong research programs for our students so we can take advantage of the tremendous economic opportunities big data has to offer."

It is here where Dr. Chung had a chance to work on one of the most advanced database engines in the world with prominent researchers from many prestigious universities, and where she achieved her proudest professional accomplishment.

"My research projects were built into the most advanced big data processing system in the world, the Teradata Data Warehouse MPP System," said Chung.

"It was a very hard, demanding job, but it was worth it, as I knew everything I was working on would impact the real world. Today, every industry and end-user is using this technology."

Dr. Chung returned to Cleveland in 2012 and joined CSU's Department of Computer and Information Science as an

ADAMS AND KHAN APPOINTED CHAIRS OF ENGINEERING TECHNOLOGY, CIVIL ENGINEERING

IN JUNE 2016, Dr. Michael L. Adams was named Chair of the Department of Engineering Technology, and Dr. Lutful Khan was named Chair of the Department of Civil and Environmental Engineering. Their terms started July 1, 2016 and August 1, 2016, respectfully.



A NATIONAL SEARCH was conducted for the Engineering Technology Department Chair where Dr. Adams emerged as a strong, innovative leader. He will join the Engineering Technology Department as an associate professor.

Adams earned his Ph.D. in Mechanical Engineering from Case Western Reserve University in 2001. He previously served as a college associate lecturer in the Mechanical Engineering Department at Cleveland State and is an adjunct assistant professor in the Department of Electrical Engineering and Computer Science at Case Western Reserve University. He also owns his own consulting company, Mechanical Vibration Innovations, LLC. His areas of interest include mechanical vibration, sensor development, signal processing, machinery troubleshooting and design. He is an enthusiastic educator, often bringing elements of his research and industrial experience into the classroom.



WITH MULTIPLE potential leaders within the Department of Civil and Environmental Engineering, Dr. Khan emerged as a clear visionary leader for the department and received solid support from faculty and his peers.

Khan obtained his doctoral degree from Lehigh University, Pa., in 1991 and joined the Civil and Environmental Engineering Department at Cleveland State University in the same year. His research interests include deep foundations, retaining walls, soil stabilization, terrestrial and microgravity porous media flow, soil decontamination and reuse of industrial wastes. Some of his innovations include development of a novel soil decontamination process using coupled electric-hydraulic gradient, Kaolinite clay based hydrophilic treatment of non-wetting porous graphite and stainless steel and development of porous media based passive condenser heat exchangers for terrestrial and microgravity environments. Dr. Khan is a registered Professional Engineer in the State of Ohio.

WASHKEWICZ COLLEGE OF ENGINEERING FACULTY PROMOTIONS

The following faculty members received promotions effective for the 2016-17 academic year.

TO ASSOCIATE PROFESSOR WITH TENURE



Chandra Kothapalli, Ph.D., Department of Chemical and Biomedical



Haodong Wang, Ph.D., Department of Electrica Engineering and Computer Science

TO PROFESSOR



Nigamanth Sridhar, Ph.D., Department of Electrical Engineering and Computer Science



Wenbing Zhao, Ph.D., Department of Electrica Engineering and Computer Science



CLAUDINE LACDAO CSU SPRING 2016

CO-VALEDICTORIAN

LAUDINE LACDAO, a senior chemical engineering major from the U.S. Virgin Islands, was named CSU covaledictorian for spring 2016. Lacdao earned a 3.93 GPA and was a member of the University Honors Program. She was also Vice President of the National Society of Black Engineers (NSBE), Secretary of Tau Beta Pi Engineering Honor Society, served as a Presidential Student Ambassador and participated in the College's Fenn Co-op Program.

This marks the second consecutive year that a Washkewicz College of Engineering student was named co-valedictorian for Spring commencement. In spring 2015, Sarah Kay Watkins was named co-valedictorian.

"Being selected Valedictorian of CSU is a clear testimony that with perseverance and hard work, anyone can rise to excellence in the face of numerous challenges," said Lacdao. "I also hope it inspires international women like myself to dare to dream bigger."

Lacdao vividly remembers the telephone call she received from President Berkman, informing her she was selected.

"I recall a moment of stillness as I tried to compose my response over the phone," said Lacdao. "I was working on a project with my best friend Ariel Stiggers at the time and as soon as I hung up, we just screamed with excitement and joy. Then I called my mom who cried tears of joy from the news. I remember visiting my professors to express my deep gratitude because I knew if it wasn't for their support, I would have never received this honor."

Lacdao had a very enriching experience at CSU, as she was exposed to the high-quality classes that prepared her for the challenges of working in the chemical engineering industry. She was also able to apply her academic experiences in the real world as a co-op student.

"The greatest highlight of my CSU career was being able to participate in a research collaboration with the University of Central Florida and the German Aerospace Center at the Argonne National Laboratory in Illinois," said Lacdao. "Working on thermal barrier research on jet engine turbines for commercial airplanes was an engineering experience of a lifetime." Lacdao also cherishes the many relationships she established and life lessons learned during her time at CSU.

"I have met so many amazing individuals through the opportunities provided to me by the College," said Lacdao. "I have made meaningful connections with individuals I never thought I would meet in my lifetime. I also learned to work in a team setting, become more inclusive of others, have fun and value the gift of giving back to the Cleveland community."

Lacdao graduated from CSU on May 14, 2016 and has been accepted into the Washkewicz College of Engineering's "4+1" accelerated Master's Degree program in Chemical Engineering. She is also working for the Lubrizol Corporation and hopes to build a good start for her career with the company.

As far as advice to her fellow students, Lacdao shared the following. "Be a trailblazer. Love learning, love what you do and never give up."

STUDENTS



FEATURED STUDENT ORGANIZATION

IEEE CSU STUDENT BRANCH

THE INSTITUTE OF ELECTRICAL and Electronics Engineers (IEEE) CSU Student Branch is one of the largest and most active student organizations in the Washkewicz College of Engineering. There are more than 200 registered IEEE members from CSU, and this past academic year the organization was led by co-chairs John Sarrouh and Gianfranco Trovato, vice chair Christopher "Alex" Snyder, treasurer Emily Edwards, secretary Brandon Rutledge and 2016 IEEE Region 2 Student Activities Conference (SAC) chair Taylor Barto. Dr. Charles Alexander, professor in the Department of Electrical Engineering and Computer Science, serves as the organization's faculty advisor.

"We are very lucky to have him," said Barto, regarding Dr. Alexander. "He was the 1997 President and CEO of IEEE-USA and is an excellent resource."

The chapter also works closely with Jim Watson, who serves as a communications consultant with the College and previously served as IEEE Region 2 support coordinator.

The mission of the IEEE CSU Student Branch is to supplement the technical and non-technical skills students gain from attending classes at CSU. To achieve this, the branch coordinates large projects such as the SAC and VEX Robotics competitions to provide as many students as possible the opportunity to lead committees that are critical to event success. The branch also hosts smaller events such as SPAx (professional events and meetings) and IEEEXtreme, where this year students participated in a 24 hour computer programming competition.

On April 9, the branch hosted the IEEE Region 2 SAC at CSU. The event had more than 300 participants from 25 schools from the Northeastern U.S., 40 volunteers from CSU, and 20 industry representatives. This event was the largest recorded student conference in the history of IEEE Region 2. It featured a variety of competitions that were designed and hosted by CSU students, including electronics/ hardware design, ethics, sumo robot, micromouse and best T-shirt. The event also featured a completely restructured workshop section and career fair that provided companies with greater access to students at the conference.

"This year's Student Activities Conference was the best organized, best run, student conference ever," said Watson.

He was also highly complementary of the branch.

"As an IEEE National Speaker, I have been to 175 engineering schools, and I have not seen an IEEE student organization that has had the level of long term success CSU has had," said Watson. "Dr. Alexander has built a culture that has allowed the branch to thrive. This branch is really good at mentoring and each year they reload with large groups of new members and officers."

The facts support Watson's assertion, as the CSU IEEE branch hosted 51 professional events as part of the IEEE SPAx program, more than any other school in the U.S. To give some perspective of how strong the numbers are, the number two ranked school, Texas Tech University, has completed only 27 SPAx events.

The IEEE branch also provides valuable leadership experiences for its members.

"Being a leader for IEEE is one of the best experiences I have had as a student at CSU," said Barto. "My involvement as a freshman and sophomore gave me the opportunity to meet some wonderful people and provided a foot in the door for undergraduate research at Cleveland State and an internship at Current, Powered by GE (formerly GE Lighting). As a leader this year, it is great to be able to return the favor and help new students who are involved in IEEE learn about opportunities and help them get their names out there."

Barto plans to remain involved with IEEE after graduation.

"I absolutely see myself continuing to be involved with IEEE as a professional. Through my involvement with the organization, I was recommended for a position as a student representative on the IEEE-USA Student Professional Awareness Committee (SPAC). Through this position, I have been able to influence IEEE programming for university students and have helped students at other schools get started with hosting events and learning about the resources of IEEE. This position reinforces the idea that I would like to continue working with university and high school students to spread knowledge about how IEEE can be a major enhancement to formal education."

Images from the IEEE Region 2 student activities conference, hosted by the IEEE CSU student branch.

STUDENTS ACCOMPLISHING GREAT THINGS



AIAA Region III Conference Participants. Front Row L-R: Dan Cook, Jason Wolf, David Pendleton. Back Row L-R: Aidan Rinehart, Matthew Hamman.

Pendleton Takes First Place, Rinehart Takes Second at AIAA Region III Student Conference

David Pendleton, a recent Electrical Engineering and Computer Science graduate, took first place in the technical paper competition at the American Institute of Aeronautics and Aerospace (AIAA) Region III Student Conference hosted by the University of Illinois Urbana-Champaign April 1-2. Pendleton presented his honors thesis entitled, "Development of a Wind Measurement Tool Using a Hovering Drone." His first place performance qualified him to present at the AIAA SciTech International Student Conference January 9-13, 2017 in Grapevine, Texas. Mechanical Engineering graduate student Aiden Rinehart earned second place at the conference in the graduate category for his presentation "Characterization of Seal Whisker Morphology and Effects on Wake Flow Structure."



Mechanical Engineering Team Takes First Place at AIAA SciTech 2016

A team of recent mechanical engineering graduates from the College took first place at an international student design competition sponsored by the American Institute of Aeronautics and Astronautics (AIAA). For their winning project the team designed, built and tested an engine air particle separator for an Unmanned Aerial Vehicle (UAV) using 3D printing technology.

Jason Wolf, Erick Shelley and Dan Stralka topped teams from the U.S. Air Force Academy, the University of Memphis and Virginia Tech to take first place in the student team category at the AIAA Science and Technology Forum and Exposition's International Student Conference (AIAA SciTech 2016).

AIAA SciTech 2016, held January 4-8 in San Diego, California, is the world's largest event for aerospace research, development and technology. It draws more than 3,500 participants and 2,500 technical presentations from nearly 800 institutions and 39 countries.

"We were excited and somewhat surprised to take first, given the caliber of our competition," said Wolf. "Our performance speaks volumes about the quality of CSU's engineering program. It proves we can compete with any school in the nation."

The purpose of the air particle separator is to keep sand and other airborne particles from negatively affecting the performance of UAV engines that are often used in desert environments. 3D printing could greatly reduce costs and build times for this essential component. The project was sponsored by the Air Force Research Laboratory (AFRL) through the AFRL Student Challenge Program.

The CSU team earned the right to present at AIAA SciTech after their first place performance at the 2015 AIAA Region III Student Conference at Wright State University. Prior to that, the team took second place at the Washkewicz College of Engineering's 2015 Senior Design Symposium.

After graduation, Wolf was hired by the Air Force Research Laboratory and currently serves as an associate mechanical engineer in the Materials and Manufacturing Directorate.



Swapnil Shah Wins First Place at IdeaVikes

Swapnil Shah, a recent Chemical and Biomedical Engineering graduate, won first place at IdeaVikes, a business and innovation competition held at Cleveland State, for his idea of Ustyle, a lightweight and portable touch sreen stylus that can connect to headphones or keys. His top finish qualified him to participate in ideaLabs, a regional business proposal competition presented by a partnership of 11 public and private colleges and universities. There he finished in third place.



Engineering Students Excel at StartupVikes Weekend

More than 20 Washkewicz College of Engineering students participated in StartupVikes, a weekend event that brings together inventors, entrepreneurs and startup enthusiasts providing them with the opportunity to share ideas, form teams, build prototypes and launch a new business within one weekend.

The event, organized by CSU's Monte Ahuja College of Business and supported by the Washkewicz College of Engineering, was staged February 19-21, 2016 in the Fenn Tower Ballroom on the CSU campus. Seventy participants, 30 mentors and eight judges participated in this year's event. The top three teams received cash prizes to help launch their businesses. Vitay, a company led by Washkewicz students that uses smart vending machines to provide healthy snacks, placed second in the competition.



Vikings Racing Had Strong Showings in Tennessee, California

Cleveland State University Vikings Racing, a team of 20+ dedicated mechanical engineering students, had strong showings at the Baja SAE Tennessee Tech (April 14-17, Cookeville, Tenn.) and the Baja SAE California (May 19-22, Gorman, Calif.), finishing 45th (of 96 teams) and 27th (of 94 teams), respectively. Viking Racing is a student chapter of The Society of Automotive Engineers, an international organization that offers many opportunities for students as a part of a Collegiate Design Series.

In Tennessee, the Vikings Racing team finished in fourth place for Suspension and 15th in the Sled Pull dynamic events. In California, the team finished 13th in Suspension and 21st in Endurance.

Vikings Racing hosted fundraising events such as Dinner at the Hanger and a golf outing that allowed students to compete in two competitions this year and improve on their performance.

"I was very happy with our teams performance this year, both on and off the track," said CSU chapter President Jonny Lightfoot. "Everyone came together to do their part. It was a great team effort."



STUDENTS



Mechanical Engineering Team Excels at NFPA Chainless Challenge

A team comprised of Washkewicz College of Engineering mechanical engineering students Steven Rohrer, Jodi Turk, Jose Viera and Christopher Wootan turned in impressive results at the 2016 National Fluid Power Association (NFPA) Chainless Challenge April 29 in Irvine, Calif.

The Chainless Challenge involves redesigning a traditional bicycle by taking off the chain and using hydraulics as the mode of power transmission.

Eight teams; including CSU, University of Akron, Cal Poly San Luis Obispo, University of Cincinnati, University of Illinois, Illinois Institute of Technology, Purdue University and Western Michigan University participated in the competition.

Cleveland Sate finished in fourth place overall, earning second place honors in the cost analysis, sprint and efficiency challenge competitions. Illinois Institute of Technology finished in 1st Place, followed by Purdue University and Cal Poly.

CSU students Steven Rohrer and Jodi Turk shared their thoughts regarding the event.

"I would say there are two things [we learned]," said Rohrer. "Definitely teamwork and project management. Just having a big task given to you and finding a way to overcome it—to really take what your objectives are and either realize them or make them better than what was expected. On top of all that, taking all the theory you learned within your classes from freshman year through your senior year and actually applying them and seeing how it works. It is kind of a big thing to go into a job and say, 'I actually know how to do this,' versus, 'I know how to do math.' It was a really great experience."

"Also, when you have a project, things don't always go how you plan them," said Turk. "Different things break, they don't perform how you expect, your calculations aren't actually how it actually reacts. You have to figure out how to change things and make it work."

Students Place First in Parker Stretch Your Mind Challenge

A team of students from the Washkewicz College of Engineering and the College of Sciences and Health Professions (COSHP) took first place in the national Stretch Your Mind Engineering Challenge sponsored by Parker Hannifin.

Washkewicz students Nattawat Sunpituksaree, Christopher Schroeck, Brianna McKinney and Gianfranco Trovato, along with Michael Hanson from the COSHP, designed a device that utilizes polymer sensors to monitor the flexion and orientation of the knee, which are the main contributors to stress levels on the anterior cruciate ligament (ACL). The device will allow coaches and trainers to detect the motions that increase the risk of ACL injury, and teach athletes to modify their motions to reduce the risk of injury. The team worked under the supervision of faculty advisor Dr. Ton van den Bogert, Professor of Mechanical Engineering at the Washkewicz College of Engineering.

The Stretch Your Mind Engineering Challenge encouraged students at universities across the U.S. to design an original market solution using Parker's electroactive polymer (EAP) sensor technology. Teams were required to identify an application, design a solution and plan for its deployment into the market.

"I think we can go toe-to-toe with any team of students in the country," said Schroeck, a senior mechanical engineering major.

"The team went much farther than I thought possible. It was a pleasure to work with such a motivated, hard-working, and smart group of people," added van den Bogert.

Following the competition, Sunpituksaree was invited to present on the project at EuroEAP 2016, the sixth International Conference on Electromechanically Active Polymer Transducers and Artificial Muscles, in Copenhagen, Denmark. He also carried out additional research to further development of the product at the Intelligent Material Systems Lab at Saarland University in Saarbrücken, Germany.



2015

WASHKEWICZ COLLEGE OF ENGINEERING

ON FRIDAY, October 30, the Washkewicz College of Engineering hosted Research Day at the CSU Student Center Ballroom. The event featured a poster session highlighting the cutting-edge research being conducted by the College and a keynote presentation by Dr. Rickey Shyne, Director of Research and Engineering from NASA-Glenn Research Center.



FIRST PLACE

Activated Microglia Differentially Regulates Neural Stem Cell Phenotype and Neural Outgrowth Within Co-cultures STUDENT AUTHOR Kurt Farell FACULTY ADVISOR Dr. Chandra Kothapalli

SECOND PLACE A Real-time Virtual Muscle System for Prosthesis Control STUDENT AUTHOR Sandra Hnat FACULTY ADVISOR Dr. Ton van den Bogert

THIRD PLACE A Rapid Pressure Swing Adsorption Process for the Improvement of Portable Oxygen Concentrators STUDENT AUTHOR Aaron Moran FACULTY ADVISOR Dr. Orhan Talu



HONORABLE MENTIONS

Ultrasensitive, rapid detection of infectious bacteria student AUTHORS Anup Sam Mathew, Lifeng Luo FACULTY ADVISOR Dr. Siu-Tung Yau

The Response of Anisotropic Colloids to a Polarized Electrode STUDENT AUTHORS Cornelius A. Obasanjo, Sri Harsha Nuthalapati FACULTY ADVISOR Dr. Christopher L. Wirth

CONGRATULATIONS

WASHKEWICZ SCHOLARS





NICHOLAS BRUENING Electrical Engineering, Freshman

DOMINIC CAPRETTA Computer Engineering, Sophomore



ELIZABETH HAMMAN Civil Engineering, Junior



MATTHEW HAMMAN Mechanical Engineering, Senior



MADELYN HEADINGS Engineering Undecided, Sophomore



JEREMY KELLING Mechanical Engineering, Sophomore



KYRA MAYO Mechanical Engineering, Sophomore



JALEN McKINNIE Electrical Engineering, Sophomore

Cleveland State University WASHKEWICZ COLLEGE OF ENGINEERING 23

WASHKEWICZ SCHOLARS PROGRAM

WASHKEWICZ SCHOLARS SCHOLARSHIPS

are provided through the generous support of Donald E. and Pamela Washkewicz.

While all eligible students are encouraged to apply, preference will be given to Parker Hannifin employees' dependent children pursuing an undergraduate degree in engineering at the Washkewicz College of Engineering. This program covers tuition for up to 15 credit hours per semester, and recipients are also considered for a summer internship or co-op within Parker Hannifin.

Up to five scholarships are awarded to undergraduate engineering majors each school year. Current scholarship winners are eligible to receive future scholarships, but they are required to reapply each year. Preference for future awards is given to current scholarship recipients.

For more information on the Washkewicz Scholars Program, visit **www.csuohio.edu/** engineering/scholarships.

Scholarship Impact at a Glance 2015-16

College

152 Total Scholarships Awarded

3,052 Average Scholarship Award

\$463,949 Total Dollars Awarded



JAMMEL McRAE Electrical Engineering, Senior



JULIANA MECASKEY Mechanical Engineering, Junior



IVAN PETRIV Mechanical Engineering, Junior



ANDRES SALDANA Civil Engineering, Junior



MITSI TORRES Electrical Engineering, Senior



JENNIFER WISNIEWSKI Mechanical Engineering, Sophomore



MITCHEL YAKOWEC Mechanical Engineering, Sophomore



FENN ACADEMY RECRUITS FUTURE READY-TO-GO ENGINEERS

ixty-five high schools in Cuyahoga, Lake, Lorain, Geauga, Summit and Portage counties currently belong to the Washkewicz College of Engineering's unique Fenn Academy Program. Established in 2005, the Fenn Academy has helped raise engineering enrollment at CSU to unprecedented levels, expected to be nearly 2,500 students in

the fall of 2016. The academic quality of students entering the College has also improved and the number of underrepresented groups, including women, has risen significantly.

IN FACT, FOR THE 2016 SPRING SEMESTER, there were 511 engineering students on the Dean's list. While these achievements are not solely attributable to Fenn Academy activities, it is clear that overall rising enrollment, due in part to Fenn Academy, has led to a higher number of scholars in the Washkewicz College of Engineering. Indeed, of the 58 high school students receiving engineering scholarships at the College's second annual Scholars' Day event, 64 percent were from Fenn Academy partner schools.

A total of 1,363 students were engaged in 40 Fenn Academy activities during the past academic year, with the majority taking place on the CSU campus. Free events included three-hour Engineering Activity Days that provided team competitions guided by engineering students and staff, along with lab tours led by

engineering faculty. Additional presentations were given by academic advisors and admissions representatives. Inspirational videos on the engineering profession, prize raffles and an opportunity to ride a Segway are additional components of campus visits. Food and bus transportation costs were covered by the Academy.

With generous support from its sponsors, including Lubrizol, Lincoln Electric, Middough, individual philanthropists and alumni, the Academy is also dedicated to encouraging students to live and work in Northeast Ohio after graduation. The program also aims to inform students, parents and educators about engineering degree programs, scholarships, co-op opportunities and the wide range of lucrative careers in the engineering profession.

In 2015-16 new high school partners joined the Fenn Academy,

including Geauga County I-STEM High School, Revere High School and Madison High School. The program continued its outreach to middle schools, including Orchard STEM in the Cleveland Metropolitan School District and Seton Catholic School in Hudson, Ohio.

The newest activity supported by the Fenn Academy occurred in May 2016 in the Fenn Hall outdoor plaza when the Academy hosted the Junior Solar Car Race for the first time. Nearly 130 middle school students from Brecksville, Westlake, North Olmsted and Lake participated in this battle of ingenuity and technology, led by Westlake High School teacher Kurt Thonnings. The half-day event inspired students to think about alternative energy. Participants also received a tour of the Washkewicz College of Engineering and had an opportunity to sit inside alternative fuel vehicles, including an electric-powered Tesla and a Honda Accord hybrid. The event was sponsored by the U.S. Department of Energy.

Partnerships with high schools that routinely sent students to competing institutions are now resulting in an increasing number of students from the districts choosing the Washkewicz College of Engineering. CSU's rising overall stature, a new engineering building underway and the improved physical appearance of the campus, including new housing, have led to greater interest among prospective engineering students. At least six students from the Six District Educational Compact will be attending CSU in the fall of 2016.

Off campus, Fenn Academy staff and engineering faculty, including Dr. Majid Rashidi, Dr. Norb Delatte, Dr. Dan Simon, Gregg Schoof and Dr. Ben Blake, actively participated in the Goodvear Career Dav in Akron, the STEM Career Showcase at the Cuyahoga Valley Career Center (CVCC), and regional college fairs at Kent State and Baldwin Wallace. Further STEM-related activities were led by Fenn Academy staff at partner high schools, including Lakewood High School, Perry High School, New Tech East, Parma High School and Cleveland Heights High School. Two Fenn Academy student recruiting assistants also attended a regional STEM event at Cedar Point.

Other Fenn Academy student assistants served as mentors and hosts for the Believe

in Ohio event held at CSU in December. Nearly 400 students from CMSD schools, as well as Warrensville Heights, Maple Heights, East Cleveland and Richmond Heights, among others, participated in a series of activities focused on team building and entrepreneurship. This outstanding program occurred thanks to the initiative and leadership of Dr. Woodrow Whitlow and Dr. Julian Earls, Executives in Residence within the Colleges of Engineering and Business at Cleveland State.

Corporate sponsors are an important partner in Fenn Academy's success. Twentythree companies provided job shadowing placements for 140 students in grades 9-12 for the annual Engineer For A Day program, held every February. In addition, Hyland, Creator of Onbase, sponsored a coding day, tour and lunch at their Westlake headquarters for about 40 students from the Six District Educational Compact. Hyland's unique work environment includes a campus-like setting, a casual dress code, an indoor volleyball court in the middle of the office space, salon/spa and indoor basketball courts. Students were excited to see this kind of "new age" atmosphere in a Cleveland company.

Providing additional resources for teachers is another focus of the Fenn Academy. The small grants program was developed to provide limited financial help with creative engineering related projects in Fenn Academy schools. In 2015-16 small grants were provided to Orchard STEM Middle School, Perry High School and St. Joseph Academy. Perry used the grant to help modify its Giving Garden to be friendlier to people with disabilities. This included making it wheelchair accessible, changing the design of planters and helping students explore the use of alternate terrain for community members who have been unable to access the garden. Nearly \$10,000 has been distributed to 10 schools for a variety of educational engineering projects in the past three years, enabling students to learn about conceiving, designing and implementing their ideas. Most grants range from \$500 to \$1,500.

Local schools are not the only beneficiaries of Fenn Academy activities. Individual visitors and STEM-related activities in the community also receive Fenn Academy support. These include many underrepresented students in the highly regarded ACE Mentor Program, College Now and Upward Bound programs. Several of these activities occur during the summer, helping students prepare for college and explore career options, including engineering.

Academy staff also gave presentations to students and teachers in the Tech Corp Coding Camps, VEX and FIRST Robotics competitions and the NE Ohio Science and Engineering Fair. A new activity this year was a Washkewicz College tour for Science Fair parents. Thirty-five parents saw a presentation given in the Parker Hannifin Human Motion and Control Lab led by mechanical engineering professor, Dr. Ton van den Bogert. Others visited the Lubrizol Foundation Chemical Engineering Lab, hosted by chemical engineering Chair, Dr. Joanne Belovich. While parents were informed about college opportunities, a team of engineering student recruiting assistants served as judges for Science Fair presentations. Science Fair winners were presented with gifts later that evening.

Interdepartmental cooperation is another key part of the Fenn Academy's success. Since its inception, the Academy has developed a more active relationship with the University's Admissions Office. That relationship now includes an annual engineering training session for admissions recruiters, resulting in the spread of information about engineering beyond our immediate region. Activities in which the Fenn Academy staff participated included Junior Day, fall and spring open houses, Major Exploration Day and personalized visits known as "Green and White" tours.

Fenn Academy staff also used social media, email, targeted phone calls and mailings to reach out to prospective students. In addition, the Academy made use of information provided by the Admissions Office and communicated regularly with a broad base of educators and parents, as well as students.

To learn more about the Fenn Academy, visit www.csuohio.edu/fennacademy or contact Gregg Schoof, Manager, Engineering Student Programs at (216) 687-5272 or g.schoof@csuohio.edu.

FENNCO-OP FENN CO-OP PROGRAM

ONE OF THE MOST important educational components of an engineering college is cooperative education (co-op). There is an essential need to connect engineering students with the real engineering working environment in order to enhance classroom knowledge and understand the profession. Co-op is different than an internship in that the experience the student gains is significantly educational. In addition, engineering co-op programs are traditionally structured, meaning the student spends multiple semesters with one or more companies/organizations in an alternating study/co-op schedule and that the co-op is incorporated into the undergraduate academic curriculum.

As evidenced by the following pages, the Fenn Co-op program continues to grow in size, rigor and quality.

Co-Op Advisory Council

The Co-op Advisory Council was developed in 2013 and currently has 25 members that include faculty, alumni and industry partners. This advisory body has assisted with implementation of an engineering specific career fair known as the Engineering Connections Fair. In addition, the advisory council assists with the implementation of our annual employer and student appreciation event and the ESC 130 co-op orientation course. This advisory body meets three times a year and is fully engaged with College of Engineering initiatives to prepare and place students in experiential learning endeavors. They are committed to our motto of preparing "Ready to Go Engineers."



CO-OP ADVISORY COUNCIL MEMBER SPOTLIGHT

PHIL POLITO

hil Polito knows co-ops. As a student, he participated in two co-op experiences, one of which turned into a full-time job with the Turner

Construction Company in 2007. There he has enjoyed a nine-year career and currently serves as a Project Engineer. For the past four years, Polito has served as Turner's Co-op Coordinator, where he managed the hiring of 2-3 co-op students per semester from the five colleges and universities they recruit from, including Cleveland State.

"CO-OPS ARE ESSENTIALLY OUR FARM SYSTEM," said Polito. "We like to bring in freshmen and sophomores so they can do multiple co-op rotations. That way the students can determine if we are a good fit for them, and we can determine if they are a good fit for us. We hire 90 percent of our co-ops as full-time employees, so our co-op program truly serves as a talent pipeline."

Polito and his colleagues spend considerable time and effort ensuring their co-op students have good experiences. They meet with the students formally at least two times per semester to set goals and evaluate their progress. They also help students feel a part of the larger Turner team by engaging them in community service activities with full-time employees. Some examples of activities include renovating homes in Cleveland through the organization Rebuilding Together, picking up trash at Edgewater and Euclid Beach Parks, and supporting causes such as the Cleveland Food Bank and Habitat for Humanity.

"I wanted to take the lessons learned from my own co-op experiences and apply them to the experiences of our current coop students," said Polito. "I want the students to learn as much as possible."

Polito has served on the Washkewicz College of Engineering's Co-op Advisory Board since its inception three years ago. It is a role he thoroughly enjoys.

"There is a lot of positive momentum coming out of the co-op office," said Polito. "It has been a very rewarding experience – a winwin for students and our company." Polito shared that those "wins" for Turner include having the opportunity to share their perspectives with faculty, helping co-op students improve their skills and building relationships with Board members, many of whom come from different engineering fields.

He has also been very impressed with the many improvements and new initiatives coming out of the co-op program under the leadership of Sandra English. This includes the implementation of the ESC 130 engineering co-op orientation course for freshman students. Co-taught by co-op office staff and industry partners, students receive training in resume development, presentation/ interview skills, networking, job searching, and more.

"As a result of this class, I have seen CSU engineering students who are better prepared and more competitive than their peers," said Polito.

Other program improvements recognized by Polito include implementing feedback sessions among faculty, students and industry representatives in the field during co-op experiences, launching the Optimal Resume software platform so employers can view candidate resumes online, providing scholarships to students who complete three co-op rotations and the opportunity to connect with students at the co-op Employer and Student Appreciation Night.

"All of these efforts have resulted in significant increases in both the number and quality of CSU students participating in the co-op program," said Polito.

"Being a part of the co-op program's growth and development has been very rewarding and I will gladly continue to serve."



STUDENT EXPERIENCES CO-OP ABROAD

KATHERINE FLOREK certainly doesn't let any grass grow under her feet. The rising senior mechanical engineering major from Parma, Ohio, has completed two international co-op experiences in just the past year. Her first international co-op took place between June and November 2015 with the Alstom Company (now part of GE Power) in Baden, Switzerland (20 minutes outside of Zurich). There she served on the thermal team of the Gas Turbine Research and Development Group.

"Most interns had regular tasks, but Alstom trusted me with my own project," said Florek. "I looked at the cooling airflow between the inner and outer housing of the turbine. I also analyzed how heat transfer would impact the mechanical integrity of the housing and the clearance between the veins and rotor of the turbine."

Florek's experience with Alstom was overwhelmingly positive.

"Work was challenging and I learned a

lot about design, different fluid dynamics and meshing software applications," said Florek.

"I had great reception from anyone I asked questions of. The team lead was very good at his job. He really helped me develop as an engineer and professional. He gave me constructive feedback on how I could improve."

Despite being the only intern and female on the thermal team, Florek never felt uncomfortable.

"They treated me like a professional, like any other member of the team. I always felt welcome."

From June through August 2016, Florek did her second international co-op experience at Thermoelektrane Nikola Tesla, a power distribution company in Serbia.

Both of her co-op experiences were coordinated by IAESTE (International Association for the Exchange of Students for Technical Experience), which matches math, science and engineering students with international internships and co-ops. All IAESTE trainees receive a cost of living allowance that will at least cover food, accommodations and travel to and from work, with students being responsible for airline transportation and a program placement fee.

So what was Florek's motivation to participate in the Washkewicz College of Engineering's Fenn Co-op Program, as opposed to going it alone?

"I liked the idea of receiving something official that says I did the work (students who complete the co-op program receive an official certificate of academic completion upon graduation). It shows employers that I accomplished something and is very rewarding on a personal level," said Florek.

"It is also great to have someone to touch base with here at CSU, to keep the lines of communication open, especially when you are 3,000 miles away."



WASHKEWICZ COLLEGE OF ENGINEERING HOSTS ENGINEERING CONNECTIONS FAIR

THE FENN COOPERATIVE EDUCATION Program hosted the Third Annual Engineering Connections Fair October 9, 2015, in Woodling Gym on the CSU Campus. More than 500 engineering students were able to connect with 70 employers seeking students to fill coop, internship and full-time positions. Employers were invited to engage with faculty members from each department prior to the beginning of the fair.

The 2016 Engineering Connections Fair will be Friday, October 14, from 11 a.m. to 3 p.m. in Woodling Gym. To register, visit www.csuohio.edu/engineering or contact Danielle Vath, Fenn Co-Op Program Coordinator, at d.vath@csuohio.edu or 216-687-6970.



Fenn Co-op Program Employer and Student Appreciation Night

THE FENN CO-OP Program Employer and Student Appreciation Night held November 12 in the Fenn Tower Ballroom was a huge success! This annual event featured a sit-down dinner and recognition of our 2015 co-op program graduates, co-op scholarship recipients, co-op companies, faculty and special honors. The program began with opening remarks from Dean Anette Karlsson, followed by a co-op overview presentation by Sandra English, Fenn co-op program manager. Dr. Boyd Yarbrough, vice president for student affairs, made a university address and Michael Cole, computer engineer with Sherwin Williams, gave the keynote address on co-op career success. Following the special recognition portion of the program, Danielle Vath, Fenn co-op coordinator, gave closing remarks.

There were 14 co-op poster presentations at the event outlining each student's three co-op rotation experience, and the number of co-op graduates increased by 50 percent over last year. Faculty, staff and industry partners reviewed the poster displays and mingled with students throughout the program.





MULTIDISCIPLINARY CEREBRO PROJECT TAKES FIRST PLACE AT SENIOR DESIGN SYMPOSIUM

A MULTIDISCIPLINARY TEAM of electrical, mechanical and computer engineering students took first place at the Washkewicz College of Engineering's second annual Senior Design Symposium and Awards Dinner Friday, May 6, for their project entitled "Cerebro Real Time Security."

Cerebro uses an innovative human detection and recognition algorithm to detect humans in the video streams of cameras within a specified area. As a crime is committed, the suspect is tagged in the system and tracked from camera to camera as they attempt to flee. This information is then reported to police in real time.

Members of the Cerebro project team include Andrew Fisher, Robert Marshall, Brahm Powell, Titus Lungu, Mark Heller and Nick White. Dr. Pong Chu, associate professor of electrical engineering and computer science, and Dr. Majid Rashidi, professor of mechanical engineering, served as faculty advisors. Parker Hannifin Corporation sponsored the project.

Electrical Engineering Technology student Ryan Crawford earned second place for his "Wireless Vehicle Sensor Network" project. His solution consisted of a mesh network of sensor nodes to detect vehicle presence for parking and traffic applications. This data would then be uploaded in real time to an Internet of Things (IoT) service for analysis. Toufik Aidja, lecturer, engineering technology, served as faculty advisor.

Mechanical engineering students Marcus Coleman, Michael Hipp, Jacob Tester and Benjamin Wollenburg took third place for their project, "Development of a Simple Handheld Tool for Inserting into Various Size Hozes." Dr. Majid Rashidi served as faculty advisor and Parker Hannifin Corporation was the project sponsor.

The top three teams took home cash prizes of \$1,000, \$500 and \$250, respectively.

The Senior Design Symposium and Awards Dinner is the culmination of the two-semester-long Senior Design Capstone Course, where teams of engineering students partner with industry to develop solutions to real-world engineering problems. The event featured a poster session showcasing more than 60 design projects (over half of which were sponsored by industry), a keynote presentation by CSU Trustee and entrepreneur Dan T. Moore and the Senior Design Awards Ceremony where the top three projects were recognized.

"I would like to congratulate all of our students and faculty for their outstanding work on Senior Design this past year," said Washkewicz College of Engineering Dean Anette Karlsson. "These projects demonstrate the incredible ingenuity of our students, and the tremendous impact their ideas can have on society."

ENTREPRENEURIAL SENIOR DESIGN PILOT PROGRAM LAUNCHED

THE WASHKEWICZ COLLEGE of Engineering is piloting a new program where senior students can utilize their Senior Design Capstone Course to develop their own products and potentially launch startup companies. Entrepreneurial Senior Design Projects will mimic current industrysponsored Senior Design Projects and fulfill the capstone course requirement.

This past spring, eight teams of engineering students submitted project proposals and made oral presentations to a selection committee consisting of College faculty, Visiting Committee members and industry representatives. The committee then selected the top three teams to conduct Entrepreneurial Senior Design Projects during the 2016-17 academic year. The teams are listed at right, in no particular order.

Each of these teams will have access to funding from the College to purchase materials and build prototypes for their projects. The teams will also receive guidance on developing their projects from members of the College's Visiting Committee and faculty.

"We believe it is important to provide students with opportunities to foster their own creative ideas, and Entrepreneurial Senior Design Projects are a great way to accomplish that," said Dean Anette Karlsson, Ph.D. "We are excited to support these projects and look forward to seeing our students' innovative results." TEAM 1 **"Go Baby Go"** Guided Steering System for Ride-On Racecars

TEAM MEMBERS Dina Nabutovsky Ronnie Brady

MAJORS Electrical Engineering

TEAM 2 Cam Compressor

TEAM MEMBERS Kevin Calmer Robby Miller Philip Sesco Chris Abraham Tim Watkins

> MAJORS Mechanical Engineering

TEAM 3 Fluid Powered Walking Device

TEAM MEMBERS Daniel Miller Ryan Doris Robert Moody

> MAJORS Mechanical Engineering



PAYS IT FORWARD

ichael Pollock was a child of the Depression, growing up in the late 1920s in the Collinwood neighborhood of Cleveland. His father, who emigrated from Poland in 1913, studied English until he could try to obtain a job as a Polish/English translator. That never materialized. But because he could write, read and speak English fluently he got a job at the White Motor Company in 1918. Unfortunately during the Great Depression work dropped to three days a week.

WHILE POLLOCK EARNED excellent grades at Collinwood High School, he hadn't thought much about college, given his family situation. During his senior year, he was called to the principal's office, where principal Frank P. Whitney and C.V. Thomas, President of Fenn College, were waiting to interview him.

"They wanted to know what I was planning to do for the future," said Pollock.

"I said I was hoping to become an electrical engineer, and then they asked if I would be interested in competing for a scholarship to attend Fenn College. They explained that I would be able to work and study in a cooperative education program."

Pollock decided to compete and earned a \$175 scholarship to attend Fenn, which paid for his first year of tuition in 1936. He also received a \$50 scholarship from Collinwood High School, which paid for his books. He chose to major in electrical engineering, which had peaked his interest at an early age.

"When I was 13, we had a two-story home and we rented the top

floor to an Ohio Bell employee," said Pollock. "At that time Ohio Bell had been converting the old-fashioned stand-up phone with the new desk rotary dial phone."

Michael Pollock

"Our telephone-installer tenant would give me some of the discarded old telephones and I would take them apart. I was fascinated by their inner workings, and it inspired me to pursue a degree in electrical engineering."

Pollock participated in Fenn's Co-op Program, which allowed him to pay for his subsequent years of school. One of his co-ops was with Republic Steel in the electrical research department, where he worked on Eddy-Current testing of the electric welds that joined the lips of steel tubing.

Pollock's bright mind and Fenn College education helped him create a new process for testing steel welds, which impressed his boss so much he transferred Pollock to Republic Steel's new War Defense Plant in Brooklyn, New York, to serve as plant electrical engineer.

It was at Fenn College where Pollock met his future wife Felicia Peters, an extremely bright business major who was only 16 years old when she began her freshman year. While reluctant to Pollock's approaches at first, he eventually won her heart at a romantic musical entitled *Rose Marie* that was performed on a floating stage on Lake Erie at the Great Lakes Exposition. Pollock graduated with a degree in electrical engineering in 1940, while his future wife graduated with a degree in Business in 1941.

The two married in January 1943, jumped into a Pullman Sleeper and headed to New York City, where they enjoyed a weeklong honeymoon at the prestigious Hotel St. George (paid for by Republic Steel). Shortly thereafter, they found a home, started a family in Valley Stream, New York, and Pollock continued his work at Republic Steel.



Michael's late wife, Felicia, after whom the Felicia Peters Pollock Fenn Academy Scholarship is named.

In 1954, Pollock earned a second degree from the Polytechnic Institute of New York University, where he graduated cum laude in mechanical engineering. With his new degree in hand, he began exploring new professional opportunities. Pollock eventually landed a job with AMF (American Machine and Foundry), a company that built nuclear reactors all across Europe using matching dollars from President Eisenhower's "Atoms for Peace Program." The idea was to build nuclear reactors/research facilities to promote the peaceful use of atomic energy.

In 1960, Pollock connected with his old Fenn College buddy Hank Oldenkamp, who was working in San Jose for the FMC Corporation. One of Oldenkamp's new projects involved work with the United States Postal Service on their goal to mechanize the operation of the U.S. postal system. Oldenkamp convinced Pollock to take a job with FMC, so he, Felicia and their four children moved across the country to Saratoga, Calif., the location he still calls home today. He started as a Project Manager and eventually worked his way up to the Ordnance Division where he served as Program Manager for the U.S. Army's Bradley Fighting Vehicle. Pollock retired in 1983, and after retirement he and Felicia traveled the world, seeking new exciting places to visit and photograph.

Felicia passed away in September 2014 at the age of 93, after 71 years of marriage to Michael. She was a professional photographer for 30 years.

In 2015, Pollock decided to honor the

memory of Felicia, as well as the people who invested in his future at Fenn College so many years earlier, by establishing two new scholarship endowments at the Washkewicz College of Engineering.

The Michael David Pollock Fenn Academy Scholarship provides two scholarships annually to students who have graduated from a Fenn Academy partner high school (Fenn Academy is the Washkewicz College of Engineering's high school outreach program). They must be high academic achievers studying engineering, with preference given to students who are planning to participate in the Fenn Co-op Program and were members of the Boy Scouts of America or similar leadership-based organizations.

The Felicia Peters Pollock Fenn Academy scholarship provides two scholarships annually to students who have graduated from a Fenn Academy partner high school. They must be high academic achievers studying engineering, with preference given to students who are planning to participate in the Fenn Co-op Program and were members of the Girl Scouts of America or similar leadership-based organizations.

"I wanted to help any young man or woman who proved they were capable and needed the money," said Pollock.

"The Washkewicz College of Engineering is extremely grateful to Mr. and Mrs. Pollock for their generous support," said Dean Dr. Anette Karlsson. "These scholarships will serve as their permanent legacy, and will impact the lives of many, many deserving students."



Matt Hlavin Establishes Scholarship Fund at Washkewicz College of Engineering

MATT HLAVIN (BA '99) has made a commitment to establish the Matt Hlavin Scholarship Fund at the Washkewicz College of Engineering. The scholarship will support rising junior and senior engineering students active in the Fenn Co-op Program. In addition, Hlavin's commitment will support *Radiance* scholarships and the CSU Annual Fund.

Hlavin graduated from CSU with a degree in communication, is the president and CEO of Thogus and rapid prototype manufacturing (rp+m) and has served as a member of the CSU Foundation Board since 2012.

His support will help CSU expand its student success initiatives that are at the heart of ENGAGE: The Campaign for Cleveland State University. This \$100 million effort helps students stay in school and graduate better-equipped to achieve their aspirations and make meaningful contributions in their communities.

'62 JAMES HECKELMAN

2016 Washkewicz College of Engineering Distinguished Alumni Award Recipient

JIM HECKELMAN, a 1962 graduate with a degree in electrical engineering, is the Washkewicz College of Engineering's 2016 Distinguished Alumni Award (DAA) recipient.

Heckelman grew up on a farm in rural Huron, Ohio. Due to his many farm-related chores, he was never able to participate in extracurricular activities or sports. His father was very busy managing the farm, and his mother never learned to drive, so he had to find his own interests. Fortunately his father allowed him (when his chores were done) to pursue his interest in electricity and subsequently, electronics.

"I did not plan to go to college as dad and mom could not afford tuition and scholarships were far and few between," said Heckelman.

Fortunately Heckelman had neighbors, Irma and Harvey Roberts, who were in the banking industry. One day Harvey insisted he take Heckelman to Fenn College because of the co-op work program. Heckelman liked what he saw and enrolled in the electrical engineering program. He lived in Fenn Tower on campus, and on the weekends he would go home to repair electronic devices and install PA systems, which along with his co-op wages allowed him to pay for his education.

Shortly after graduating from Fenn College, Heckelman started his career at NASA Plum Brook Station in Sandusky where he worked on the nuclear reactor being built there. He also started a side business out of his home in Huron, which would eventually become the Dan-Mar Company in 1972.

Dan-Mar, which is derived from the Jim's middle name (Dan) and his wife's first name (Margaret), specializes in developing custom electronic products for the medical, automotive, military, mining and aerospace industries. Heckelman led the company as President and CEO for over 40 years, and designed hundreds of systems that remain staples in their industries. He also has nine patents to his credit.

In 2010, Dan-Mar was acquired by the Austin Powder Company, an international mining and blasting company. In 2012, Heckelman stepped down from his post as President and CEO, and now serves as a senior consultant for Austin Powder.

Heckelman believes his experience at Fenn was instrumental to his future success.

"During my time at Fenn, the professors were great and fair, the co-op work coordinator was very effective and one quarter, when a job was not available, allowed me to work for myself (with full reporting, of course)," said Heckelman.

"What an education! Fenn College gave me the tools to succeed. I wanted to give back to Fenn and that is why we established the James and Margaret Heckelman Scholarship Endowment at the College."

Heckelman and other DAA recipients will be honored at the Distinguished Alumni Awards event on Friday, September 30, at CSU's Wolstein Center. Sponsored by CSU and the CSU Alumni Association, the event recognizes one graduate from each CSU College each year based on his or her professional accomplishments, community involvement and engagement with Cleveland State. Dr. Taber works with an admittance meter in the Fenn College electrical engineering laboratory in 1956.

TABER LEAVES A LEGACY

r. Margaret Taber was a pioneer at Fenn College. In 1958, she was one of the first women to graduate with a degree in engineering (electrical engineering and engineering science). She then went on to earn her master's degree and embarked on her

career as an engineering faculty member.

DR. TABER BEGAN HER CAREER as an instructor in electricalelectronic engineering at Cuyahoga Community College in Cleveland. She went on to become an assistant, associate, and full professor, as well as chairperson of engineering technologies at the College. In 1976, Taber received an education doctorate from Nova Southeastern University in Fort Lauderdale, Florida, and, in 1979, she became both an associate professor at Purdue University and an Educational Consultant and Writer for the Cleveland Institute of Electronics. Taber was the only female faculty member of the University's Department of Electrical Engineering Technology, but quickly received tenure as an associate professor, was made full professor in 1983 and became a professor emerita in 2000.

Dr. Taber was a passionate advocate for women in engineering, establishing scholarships in support of this cause at Purdue University, the University of Akron and in 1998, the Dr. Margaret R. Taber Endowed Scholarship at Cleveland State University. Dr. Taber was deeply interested in her scholarship recipients, wanting to learn not only who they were and what their major was, but how they were making a difference on campus and what they wanted to accomplish in their professional lives.

Sadly, Dr. Taber passed away in June 2015, but her legacy lives on at CSU through her scholarship. Through a generous charitable bequest and by making the CSU Foundation the beneficiary of a life insurance policy, Dr. Taber contributed nearly \$400,000 to her scholarship endowment. This will result in approximately \$20,000 in additional scholarship dollars being awarded to deserving engineering students on an annual basis.

"I can't say enough about how grateful we are to Dr. Margaret Taber for her generous support of women's engineering scholarships at the College," said Dean Anette Karlsson, Ph.D. "As a student, she blazed new trails for women in engineering, and she will continue to do so through her endowed scholarship fund."

LINCOLN ELECTRIC

COLLEGE AND LINCOLN ELECTRIC LAUNCH INNOVATIVE SCHOLARS PROGRAM

ON MARCH 1, the Washkewicz College of Engineering and Lincoln Electric officially launched the Lincoln Electric Scholars Program with an event on campus. This innovative new partnership will provide three \$5,000 scholarships annually to undergraduate engineering students, along with co-op assignments at Lincoln Electric.

The Lincoln Electric Scholars Program was created to support CSU students in further developing their skills as engineers, while also enhancing diversity and inclusion in the engineering profession as a whole. On top of financial support, scholars will be placed in cooperative education positions with the company and receive additional mentoring from Lincoln Electric engineers and executives.

"Lincoln Electric is committed to promoting engineering education, expanding diversity in the profession, and supporting the greater Cleveland community," said Doug Lance, senior vice president for North American operations at Lincoln Electric. "The Scholars Program assists us in achieving these goals and we could not ask for a better collaborator than CSU."

"This initiative provides significant financial support and learning opportunities for our students while also deepening our relationship with one of our key corporate partners," said Anette Karlsson, Ph.D., Dean of the Washkewicz College of Engineering.

Lincoln Electric is the world leader in the design, development and manufacture of arc welding products, robotic arc welding systems and plasma and oxyfuel cutting equipment and has a leading global position in the brazing and soldering alloys market. Headquartered in Cleveland, Lincoln has 47 manufacturing locations, including operations and joint ventures in 19 countries and a worldwide network of distributors and sales offices covering more than 160 countries.

CHAMPA HONORS HUSBAND WITH UNIQUE GIVING VEHICLE

ANNIE CHAMPA, wife of alumnus Bernard "Bernie" Champa '60, describes her late husband as a "short-sleeve engineer," meaning he was a hands-on sort of professional. In recent years, the Washkewicz College of Engineering has been using the term "Ready-to-go-



Engineers" to describe its graduates. However, that is what CSU has always been about: offering practical, hands-on learning that experiences help graduates succeed as young engineers. To honor Bernie and continue the legacy of job-ready engineering graduates, Annie is planning to establish an endowed

fund to support students within the Washkewicz College of Engineering by using a unique vehicle – her CD, with the Cleveland State University Foundation as the account's primary beneficiary.

The Annie and Bernard Champa Engineering Scholarship Fund will be established in memory of Bernie Champa, a mechanical engineering graduate of Fenn College. The scholarship will provide tuition support for all engineering students within the Washkewicz College of Engineering.

Annie taught for many years in the Cleveland Public Schools. She instilled in her students that each person is unique and has a special talent. "It is your task to discover each and every unique offering a person holds," she says.

With this planned endowment, Annie can honor her mantra of supporting the promise in every student, as well as Bernie's memory. Engineering students at the Washkewicz College of Engineering will have the financial assistance they need to achieve their educational goals.

Your CD is a powerful way to support CSU and is as simple as filling out a revocable form. Naming the CSU Foundation as the beneficiary of your CD requires no upfront money and does not require hiring an attorney. This gift passes outside of probate court and requires only a simple one-page designation form.



THE LUBRIZOL FOUNDATION AWARDS \$350,000 FOR RENOVATION OF CHEMICAL ENGINEERING LABORATORY

IN JUNE 2015, Cleveland State University received a \$350,000 grant from The Lubrizol Foundation for the renovation of the Chemical Engineering Laboratory in Fenn Hall (formerly Stilwell Hall).

The upgraded facility has been named The Lubrizol Foundation Chemical Engineering Laboratory. Renovations included a new entrance, furniture and lab equipment. The space also features improved experimental stations for studying the intricacies of chemical reaction kinetics.

"This is an investment in the hands-on style of higher education at Cleveland State University that the next generation of chemical engineers will need to succeed in a global economy," said J. Mark Sutherland, president of The Lubrizol Foundation.

Undergraduate enrollment in the Washkewicz College of Engineering has increased 150 percent over the past decade. In particular, enrollment in CSU's Department of Chemical and Biomedical Engineering has tripled in recent years.

"Chemical engineering is a growth area for Cleveland State University, and the generous support of The Lubrizol Foundation will enable us to better prepare our students to meet the demands of the 21st-century workplace," said Dean Anette Karlsson, Ph.D. "In this state-ofthe-art laboratory, students will be able to conduct research, test theories and apply new knowledge and skills."

CSU has enjoyed a longstanding partnership with The Lubrizol Foundation and its parent company, The Lubrizol Corporation, a Wickliffe, Ohio-based global specialty chemical company serving customers in more than 100 countries. Former Lubrizol COO Stephen F. Kirk, who holds an MBA and Honorary Doctor of Business from CSU, is immediate past chair of The CSU Foundation and an executive-in-residence at CSU's Monte Ahuja College of Business.

Over the past 25 years, Lubrizol has contributed more than \$500,000 to CSU in the form of scholarships, lab equipment and employee matching gifts for a wide variety of University programs. Lubrizol's support of the College of Engineering's cooperative education program has led to the employment of more than 200 CSU graduates.

Chemical Engineering Receives \$22,000 from Dominion Foundation

In September, 2015, the Department of Chemical and Biomedical Engineering received a \$22,000 grant from the Dominion Foundation Higher Educational Partnership to support the purchase of a chemical reactor service unit for the chemical engineering laboratory in Fenn Hall.

"With the gift of the reactor service unit, our number of active experimental stations increased from four to five, which increased the capacity of the lab from 12 to 15 students," said Dr. Joanne Belovich, Chair of the Department of Chemical and Biomedical Engineering. "This increase in capacity allowed us to make the best use of faculty and graduate assistants time in the lab. We are very grateful to the Dominion Foundation for their support."

The Dominion Foundation will award \$1 million in grants to support K-12 education, colleges and universities, community colleges and post-secondary, non-profit training schools throughout targeted areas in 2016.





Meredith Wintering, New Director of Advancement

CSU alumna Meredith Wintering is the new director of advancement for the Washkewicz College of Engineering. In this role, Wintering will be responsible for directing the College's fundraising efforts and raising major gifts to support the College's priority programs.

Wintering brings extensive business sector experience in project management, sales training and coaching, consultative selling and strategic planning. She has been consistently recognized for excellence in sales and business development work throughout her career with well-known companies such as Xerox, Norstan Communications, and Coopers & Lybrand (formerly PricewaterhouseCoopers). As president of her own consultancy, she assisted small and mid-size companies develop go-to-market strategies that increased market share and profits. During her tenure with Xerox Business Services, she worked with some notable engineering firms, providing document management services to support key engineering projects.



THANK YOU FOR YOUR GENEROUS SUPPORT!

A HEARTFELT THANK YOU to the 677 donors who gave over \$1.2 million in gifts and pledges to the Washkewicz College of Engineering during Fiscal Year 2016 (July 1, 2015 – June 30, 2016). Your generous support allows the College to continue providing a high quality, affordable engineering education, along

with innovative programming that helps our students succeed. The list below gratefully acknowledges gifts and pledges of

\$250 or more from alumni, friends, corporations and foundations to the College during the period of July 1, 2015 – June 30, 2016. Please note that pledge payments are not included on this list.

> **\$300,000+** Dr. Margaret R. Taber*

\$100,000 - \$299,999 Mr. Michael D. Pollock

\$25,000 - \$99,999

Mr. Anthony Colnar Mr. Matthew Kane Hlavin The Lincoln Electric Foundation The Lubrizol Foundation Dr. David D. McFarland Parker Hannifin Corporation Mr. Richard R. Schier*

\$10,000 - \$24,999

AT&T Company Mr. Thomas Edward Bell Bodies Done Right, LLC Channel Products Orbital Research, Inc. Mr. Frederick H. Ray* Mr. Stanley F. Szwed Thogus Mr. Donald E. Washkewicz

\$5,000 - \$9,999

Dante Solutions, Inc. DS Express Carriers, Inc. Eaton Charitable Fund FirstEnergy Foundation Greater Cleveland Regional Transit Authority Lumitex, Inc. MCI Technologies, LTD Rockwell Automation, Inc. Rooftop Green, LLC Selas Heat Technology Company LLC STERIS Corporation Mr. William J. Taber*

\$2,500 - \$4,999
Mr. James D. Heckelman
Great Lakes Construction
Company Inc.
Mr. Ward L. Kinney
Mr. Joseph Masters
Parsons Brinckerhoff
Foundation

\$1,000 - \$2,499

Mr. Edward R. Addicott Mr. Vishal Chittranj Aslot The Jack and Carol Aten Fund Mr. John W. Beadle Mr. Timothy Patrick Esson Mr. Jeffrey R. Grinnell Ms. Victoria L. Hoover Mr. Martin C. Ignasiak Dr. Anette Karlsson Mr. Michael L. Kocevar Mr. John J. Kuwik Mr. John A. Lei Mr. Robert J. Maas Mr. George A. McIntosh National Fluid Power Mr. Michael S. Podkowa Mr. Noel B. Sargent Mrs. Lela M. Schier* Richard J. Schindler Mrs. Florence J. Trybuski

\$500 - \$999

Mr. Jeffrey H. Ahrens Mr. Vishal Chittranj Aslot Mr. Robert A. Bauer Mr. Eugene P. Baxendale Mr. Peter Oliver Botten Dr. Nicholas Carino Ms. Marianne Carmella Corrao Mr. Gary S. Creager Mr. John L. Fetters Mr. Michael S. Galgoczy Mr. Patrick D. Goran Mr. Donald P. Grob Mr. Laszlo A. Ilyes Mr. Frank D. Jankowski Mr. Daniel John Lee Mr. Joseph Lenner Mrs. Kathleen Fitzgerald Lorentz Mr. Joseph R. Marcsik Mr. Timothy F. Powell Mr. Gary L. Price Mr. James F. Reagan

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\$250 - \$499 Nancy A Alatrash

Ams Family Charitable Fund Mr. Mohammed A. R. Atif Mr. John Jeffrey Boeckl Mr. Brian Daniel Boles Mr. Mark L. Bubnick Mr. Michael James Claus Mr. Robert J. Der Mr. James L. Eucker Mr. Richard James Eucker Dr. Brian Richard Fast Mr. Jeffrey John Filarski Mr. Lawrence Robert Foore Mr. Chanakya Reddy Gaddam Mr. Donald P. Grob Mr. Jeremy Samuel Halverstadt Mr. Richard N. Henfling Mr. Eugene R. Horvath Mr. Edward John Hren Dr. Shaohua Hu Ms. Deborah M. Insana

Mr. Phillip P. Jenkins Mr. Charles I. Jeon Mr. Bogdan Kiyashchuk Mr. Lawrence Karl Kunkel Mr. Joseph M. Lastovka Mr. Joseph A. Laumer Mr. Fred A. Lotte, Jr. Mr. Joseph R. Marcsik Mr. Francis P. Mokris, Jr. Mr. George J. Ockuly Mr. Laurence D. Pellegrini **Rockwell Automation** Charitable Corporation Mr. Michael K. Repas Mr. Joseph Edward Rymut Dr. Robert F. Savinell Mr. John V. Semen Mr. David Senkfor Mr. Richard K. Shaltens Adam Philip Shands Mr. Daniel Shellek Mr. Vivek Shivananda Mr. Kim L. Skippers Mr. Anthony Siracusa Mr. Dilip Ayyala Somayajula Dr. Nigamanth Sridhar Mr. Wayne S. Stanko Mr. Ritesh Kumar Tiwari Mr. Edward A. Toth Mr. John F. Toth Mr. John J. Whitely Mr. David E. Wojnowski

*Deceased

COLLEGE NEWS



ALUMNI ADAPT 47 TOYS FOR REPLAY FOR KIDS

The Foxes' Den at the Washkewicz College of Engineering was transformed into Santa's Workshop December 2 as over 40 alumni and friends gathered to adapt 47 toys to benefit children with disabilities as part of the College's annual Toy Modification Workshop. The event benefitted RePlay for Kids, a non-profit organization whose mission is to increase the availability of toys and assistive devices for children with disabilities.

Alumni and friends adapted mainstream, battery-operated toys by placing a switch cable in parallel with the original on/off switch, allowing the toy to be operated by an alternative on/off switch that is plugged into the cable. This alternative on/ off switch is larger and easier for children with disabilities to use.

"It is great to see so many of our alumni and friends come each year and support this wonderful cause," said Paul Pawlaczyk, manager of external affairs and communications with the Washkewicz College of Engineering. "This event brings out the holiday spirit in all who participate."

On December 3, RePlay for Kids conducted its annual Adapted Toy Giveaway, where over 1,000 adapted toys collected over the course of the year were given to 24 agencies in Northeast Ohio that provide services to children with disabilities.

"It is an honor to be part of a program that makes such a positive difference for children in our community," said Pawlaczyk.

DR. ABDUL RAZAQUE AND RICHARD KOLK AWARDED BEST PAPER AT LISAT

Dr. Abdul Razaque, visiting professor in the Department of Electrical Engineering and Computer Science, and Master of Software Engineering Student Richard Kolk earned Best Paper in the Applications Track at the 2016 Institute of Electrical and Electronic Engineers (IEEE) Long Island Systems, Applications and Technology (LISAT) Conference. The conference was held April 29 at Farmingdale State College of the State University of New York.

Dr. Razaque and Kolk earned the award for their manuscript entitled "Scalable and Energy Efficient Computer Vision for Text Translation," based on the significance of the paper, clarity of the manuscript, creativity and originality of the work.

DR. SIU-TUNG YAU'S TECHNOLOGY LICENSED TO PROTEOSENSE

Dr. Siu-Tung Yau's patented biosensor technology has been licensed to ProteoSense, a Columbus, Ohio, company focused on rapid foodborne pathogen detection. Dr. Yau is a professor in the Department of Electrical Engineering and Computer Science, and his research covers areas in bioelectronics and molecular electronics. His research group at Cleveland State is engaged in developing new materials for molecular electronic applications and prototyping biosensors based on improved enzyme immobilization techniques.

Dr. Yau has authored and co-authored over 50 publications in refereed journals.



Left to right: Professors Eddie Lam, Aimin Zhou, Harry Fox, and Siu-Tung Yau



PROFESSORS YAU, ZHOU, LAM AND FOX RECEIVE **\$75.000 MIRP AWARD**

Professors Siu-Tung Yau (College of Engineering), Aimin Zhou (College of Sciences and Health Professions), Eddie Lam (College of Education and Human Services), and Harry Fox (College of Engineering), have been granted a \$75,000 Multi-College Interdisciplinary Research Program (MIRP) award from the CSU Office of Research. MIRP awards fund broad, interdisciplinary, collaborative research activities that involve faculty from multiple colleges at CSU.

The team's research builds on previous results from Yau, who has invented and patented an ultrasensitive molecular detection method, and Zhou, who has discovered a novel urine-based biomarker for the diagnosis of liver cancer. The research team proposes to develop an inexpensive, hand-held device capable of detecting extremely low concentrations of disease biomarkers in urine. Fox will provide the technological expertise to design a prototype of the meter, which will have an expected cost of less than \$200. Lam will conduct a survey in Cleveland and across the nation on the applicability and demand of the device for the detection of traumatic brain injury among high school football players. The research team plans to use the MIRP award to collect preliminary results for external funding from the National Institutes of Health and the American Cancer Society.

College Hosts FIRST Robotics Participants, **Establishes FIRST Robotics Scholarship**

ON MARCH 17, 2016, the Washkewicz College of Engineering hosted a Lunch and Learn Program for 80 high school students who were in town participating in the FIRST (For Inspiration & Recognition of Science & Technology) Robotics Buckeye Regional competition being held at the Wolstein Center. The event draws nearly 1,500 high school students from eight states and Canada.

FIRST Robotics combines the excitement of sport with the rigors of science and technology. Teams of 10 or more high school students (ages 14-18/grades 9-12) are challenged to build and program a robot to perform prescribed tasks against a field of competitors, raise funds, design a team "brand" and hone teamwork skills.

Lunch and Learn participants, the majority of whom were from New Jersey and Michigan high schools, heard comments from Dean Karlsson and received a Washkewicz College of Engineering admissions presentation during lunch. The students then split up into groups and participated in tours of Parker Hannifin Human Motion and Control Lab, received a 3D bioprinting demonstration and observed a mini-wind turbine test exercise.

At the event, the College announced the establishment of the Washkewicz College of Engineering FIRST Robotics Scholarship. The scholarships will provide two annual, renewable awards of \$2,000 for high-achieving incoming freshman students who have participated in FIRST Robotics Competitions.





Left to right: Professors Robert Ferguson, Nolan Holland, and Kiril Streletzky



PROFESSORS HOLLAND, STRELETZKY AND FERGUSON RECEIVE \$75,000 MIRP AWARD

Professors Nolan Holland (College of Engineering), Kiril Streletzky (College of Sciences and Health Professions), and Robert Ferguson (College of Education and Human Services), have been granted a \$75,000 Multi-College Interdisciplinary Research Program (MIRP) award from the CSU Office of Research.

The title of the team's research project is "Designing Drug Delivery Materials with the Help of High School Students." The project has two overarching goals: (1) to perform cutting-edge research on advanced materials, and (2) to provide an authentic research experience for high school students. The scientific objectives will be driven by Holland and Streletzky, who have a track record of collaborative research on the synthesis and characterization of protein-based nanoparticles. Their research will explore the optimization of nanoparticles for the encapsulation and controlled release of drug compounds. Ferguson will coordinate the pedagogical and logistical issues associated with the integration of this research at two local high schools: Gilmour Academy in Gates Mills, Ohio, and MC²STEM on the CSU campus. The MIRP award will allow this interdisciplinary team to establish a biotechnology course for designing new protein-based materials and to collect preliminary data for proposals to the NSF and NIH.



Left to right: Dr. Norbert Delatte, Dr. Ben Blake, Dean Anette Karlsson, Dr. Chien-Hua (Mike) Lin



FACULTY RETIREES, DELATTE HONORED AT RECEPTION

Dr. Ben Blake, associate professor of Electrical Engineering and Computer Science, and Dr. Chien-Hua (Mike) Lin, professor of Electrical Engineering and Computer Science, were recognized for their years of dedicated service at a retirement reception on April 22 at the Washkewicz College of Engineering. Dr. Blake retired after a 26-year career at Cleveland State, while Dr. Lin retired after a 36 year career at CSU.

The College congratulated Dr. Norbert Delatte as he embarked on a new journey at Oklahoma State University beginning August 2016. Dr. Delatte served as chair of the Department of Civil and Environmental Engineering the past six years, and as a Department faculty member since 2003.

BATU CHALISE AWARDED AIR FORCE SUMMER FACULTY FELLOWSHIP

Dr. Batu Chalise, a visiting professor in the Electrical Engineering and Computer Science Department, was awarded an Air Force Research Lab Summer Faculty Fellowship. Dr. Chalise conducted research on radar systems at Wright Patterson Air Force Base in Dayton, Ohio.

Passive multiple-input multiple-output, radar (PMR) systems have several advantages over conventional radars. The key objectives of Dr. Chalise's research project are to: (1) Investigate the detection performance of PMR systems with a single receiver; (2) Develop robust detectors so that PMR systems are resilient against imperfectly known location and motion parameters; (3) Improve detection performance and verify its validity using the long-term evolution (LTE) communications system; and (4) Exploit LTE broadcast signals to enhance detection performance. Dr. Chalise's research promises to simplify PMR design and implementation, make detectors robust against imperfectly known transmitter parameters, enhance detection performance using widely available flexible-bandwidth communication signals and pave the way for efficient and optimum detection of target motion parameters. Dr. Chalise's research has long-term implications for innovations in the design and implementation of radar systems. Dr. Chalise also intends to incorporate the results of his research in the courses he teaches at CSU.





Chandra Kothapalli

Moo-Yeal Lee

VIDEO ON PROFESSORS LEE AND KOTHAPALLI'S BIOPRINTING RESEARCH HIGHLIGHTED

A video highlighting the bioprinting research of Professor Moo-Yeal Lee and Professor Chandra Kothapalli, assistant professors in the Department of Chemical and Biomedical Engineering, was highlighted at the 3D Printing Annual Conference in April.

Recent advances in three-dimensional (3D) bioprinting offer new opportunities for creating highly organized multicellular tissue constructs by precisely placing multiple human cell types in hydrogels in a layer-by-layer fashion with printing robots. This technology, as illustrated in the video, could potentially revolutionize the fields of regenerative medicine, oncology and drug discovery as these 3D printed human tissues can be used as ex vivo disease models for screening therapeutic drugs, ultimately enhancing the predictability of preclinical evaluations.

Lee and Kothapalli use their technology to create miniaturized human tissues on a micropillar/ microwell chip platform by mimicking the microenvironment of native human tissues. Lee and Kothapalli plan to implement their technology to predict chemical toxicity and identify pharmacology in a safer way, and to find effective drug candidates. The video can be viewed at www.csuohio.edu/ engineering.



Orhan Talu



Sridhar Ungarala

INVACARE-SPONSORED RESEARCH RESULTS

Invacare has a long-standing research relationship with Professor Orhan Talu and Professor Sridhar Ungarala in the Department of Chemical and Biomedical Engineering. Their research has resulted in the submission of an invention disclosure to Invacare. The invention involves a prototype developed by Professor Talu and Professor Ungarala for a portable oxygen concentrator that will transform oxygen therapy products for patients with chronic obstructive pulmonary disease (COPD), which affects 12.7 million adults in the U.S.





WASHKEWICZ COLLEGE OF ENGINEERING

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CHANGE SERVICE REQUESTED



The new south courtyard will feature a landscaped quad with pedestrian walks between Fenn Hall, Science, and Science Research.