CLEVELAND STATE 50 1964 – 2014

CLEVELAND STATE UNIVERSITY

WASHKEWICZ

COLLEGE OF ENGINEERING

2014 - 2015 ISSUE

CSU RENAMES THE COLLEGE OF ENGINEERING

MESSAGE FROM

DEAN **DR. ANETTE KARLSSON**

Dear Alumni and Friends,

The 2013-14 academic year was a historic one for our College, and we hope you enjoy learning more about it in this issue of the annual magazine of the Washkewicz College of Engineering.

In November, 2013 the College was the beneficiary of a $10 million transformational gift from Donald and Pamela Washkewicz and the Parker Hannifin Foundation. In recognition of this gift, the University Board of Trustees voted unanimously to rename our College the Washkewicz College of Engineering at Cleveland State University. Don earned a Bachelor's degree in Mechanical Engineering from CSU in 1972 and is Chairman of the Board, Chief Executive Officer and President of Parker Hannifin Corporation.

Six million dollars from this gift will jumpstart the multi-million dollar renovation and expansion of 1920s era Fenn Hall, formerly Stilwell Hall, into a building that more effectively facilitates collaboration, innovation and academic excellence. Among the improvements will be major enhancements to classroom space, mobility, and student activities. There will also be two unique laboratory spaces – a Learning Incubator for Undergraduate Education and a Laboratory for Research and Innovation.

The remaining $4 million dollars directly benefits CSU students in the form of scholarships including the Washkewicz Scholars and Parker Hannifin Scholars program. This highly selective program awarded full tuition scholarships and co-op opportunities to five deserving engineering students in August. Couple these awards with additional Parker College scholarships and our students receive more than $220,000 in scholarship support from Parker Hannifin for the 2014-15 academic year. Since these scholarships are generated from interest earned on endowed funds, they serve as a permanent source of scholarship support, helping untold numbers of students achieve the dream of obtaining a higher education. In this issue we feature a Q &A with Don Washkewicz and Ryan Polder, a senior mechanical engineering student, along with highlights from students that have benefitted from Don's generous support.

I am excited to report that College enrollment continues to grow considerably. Our five-year total enrollment is up nearly 40 percent, and our five-year enrollment of African-American and Hispanic/Latino students is up 70 and 50 percent, respectively. To accommodate these increases, we are beginning to add new faculty, two of which are featured in this publication (Dr. Moo-Yeal Lee, Assistant Professor, Department of Chemical and Biomedical Engineering; Dr. Mehdi Jalalpour, Assistant Professor, Department of Civil and Environmental Engineering). We also feature the innovative research of faculty such as Dr. Joanne Belovich (algae-based biofuels), Dr. Norbert Delatte (structural failures) and Dr. Ana Stankovic (renewable energy technology); along with the story of Rebecca Bompiedi, one of our distinguished alumni. Last and certainly not least, we spotlight the outstanding accomplishments of our students, both in the classroom and in the field.

We encourage alumni and friends to keep engaged with the College by bringing a prospective student to campus for a tour, hiring one of our students for a co-op or job, sharing your expertise with our students, making a gift or attending one of our events. You can learn more about these engaging opportunities by visiting our website at http://www.csuohio.edu/engineering/ or by contacting us at (216) 687-2555, engineering@csuohio.edu. Your ongoing involvement with and support for the College is greatly appreciated!

As evidenced by this publication, the future of engineering at CSU is quite bright, and we look forward to working with you to make it even brighter!

Enjoy!

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

WASHKEWICZ
2014-2015 ISSUE

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PARTNERSHIP

FENN HAS A NEW NAME

FENN IS NOW WASHKEWICZ — Don Washkewicz's partnership with CSU most recently culminated in a $10 million gift to the College of Engineering. To show its appreciation, CSU renamed the College of Engineering to the Washkewicz College of Engineering.

RESEARCH

BIOMEDICAL

EMERGING FACULTY RESEARCHERS — Dr. Belovich and her team of graduate students have developed new methods, which are low in energy use and manufacturing cost, to separate water from algae and extract the valuable oil.

STUDENTS

VIKING ORGANIZATIONS

NEXT GENERATION OF ENGINEERS — The 2013-14 academic year was one of unprecedented success for the Cleveland State engineering students.

FENN WASHKEWICZ

"I am honored to be a Cleveland State alumnus and to play

As a Garfield Heights High School student imagining his future, Don Washkewicz was directed toward three career choices by his parents – doctor, lawyer or engineer. They then gave him three school choices – Cleveland State, Cleveland State or Cleveland State.

So no surprise, he followed in the footsteps of his father, uncle and brother and enrolled at Cleveland State's Fenn College of Engineering. It was the beginning of a personal and professional partnership with CSU that most recently culminated in a $10 million gift to the College of Engineering from Washkewicz, his wife Pam, and the Parker Hannifin Foundation.

The transformative gift equals the largest-ever gift in University history and is the largest ever for engineering. To show its appreciation, CSU renamed the College of Engineering to the Washkewicz College of Engineering.

DON AND PAMELA WASHKEWICZ

COVER STORY

Q&A

Donald Washkewicz

by Ryan Polder

SENIOR
Mechanical Engineering

a role in the success of this great University."

DON WASHKEWICZ AND MECHANICAL ENGINEERING SENIOR STUDENT RYAN POLDER

Accompanied by a small entourage from the Washkewicz College of Engineering, I set out to interview Donald Washkewicz, Chairman, CEO and President of Parker Hannifin. Mr. Washkewicz and his wife Pamela, along with the Parker Hannifin Foundation, are the donors of CSU's recent $10 million gift, new namesake of the college, and a longtime supporter of both the college and the university.

Arriving at the corporate campus, we toured the facilities. Most exciting was a large room showcasing some of Parker Hannifin's latest innovations in engineering technologies, including an impressive array of pumps, valves, and hydraulic actuators, all used in a variety of applications ranging from aerospace technology to medical devices. All in all, a thought provoking experience for a senior mechanical engineering student, such as myself!

After viewing the exhibit of Parker innovations, we met Mr. Washkewicz. We hit it off right away, as we both have Fenn College in our blood; I'm a third generation student, and Mr. Washkewicz was a second. Mentioning that one of their newest products in development, the Indego® system, was being tested downstairs, he invited us to take a quick look in one of the labs.

It was amazing what we saw unfold before our eyes: A young man, who had lost the use of his legs following a spinal cord injury, was up and walking around with the assistance of a device that was strapped around his waist and down his legs. Although it clearly took some amount of training to operate, he was quickly learning how to use the device, as his skill in moving about the room markedly increased during the few minutes of our stay. We all marveled at the potential of this device to dramatically improve the quality of life for people with spinal cord injuries around the world.

Proceeding to Mr. Washkewicz's office, I had the opportunity to gain some insight into the views, values and interests of a corporation's president. When I look back on this day in the years to come, the following interview will stand out as a defining moment in my college experience. I'm as proud to be an alumnus of the Washkewicz College of Engineering as CSU is proud to have Don Washkewicz as an alumnus and supporter of the college. ■

COVER STORY

Q&A

Donald Washkewicz *by* Ryan Polder

What is one of your best memories of attending CSU?

I was a commuter, so I didn't live on campus. I spent many hours in the Society of Automotive Engineers room, located in the basement. We spent a lot of time there doing homework and socializing, but there was a lot of work to do. They loaded you up with so many problems, enough that it took up most of the evening, so there wasn't a whole lot of time for anything else. But getting together with other students was still fun.

What was the impetus for your gift to the college?

We had done a number of things for the university already, such as helping out with the administration building, Howe Mansion and the Allen Theatre. President Berkman asked if we could do something more significant, so we made a contribution to develop the Human Motion and Control Lab. After that, there was talk of expanding the college of engineering. Since we hadn't done anything in a big way for the engineering college, and recognizing that they had some big gifts on the business side, I thought the time was right to do something for engineering. I had the wherewithal to do it, so I talked to my wife and she liked the idea.

I was able to get an affordable education at CSU - my engineering degree cost about $2,000, which was very cost effective, even back then. I felt it would be nice to give something back as the college was good to me and I learned a lot there. We want to continue to be active, and I'm sure there will be things down the road that we can support. Pamela and I are happy to play a part and be a part. We're excited for the college, we're excited for the university, and I think nothing but good things are going to come from this.

How do you envision this gift impacting the college and what are your long term goals for the university?

You can't have a first class engineering college unless you have a first class structure. So I think this is a step in that direction. I see this as a first step in moving the college into becoming a first rate college. I think it starts with the facilities - we'd like to add more labs, like what we've done with the Human Motion and Control lab. We'd like to continue to support the college, and possibly bring in some state funds for the future. The university is growing and this gift can have an impact on that growth. Since my name is on the college now, I want it to be number one, and I'm here to help make that happen in any way possible. We want to attract more students - not necessarily straight A students, but we want the best and the brightest, who have great motivation.

How would you like to stay involved with the college?

I would certainly want to support the strategic mission of the university. At some point, when I step down from my current position, I would like to become more involved with selecting candidates for scholarships, and supporting scholarships to help meet the strategic mission. Anything that Parker Hannifin can do as far as providing internships and co-ops, as well as full time jobs after graduation - I think that is how the company can help support the college's goals. So it's a combination of my personal help, as well as assistance from the company that I envision for the future.

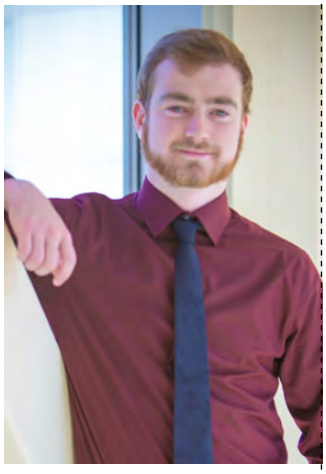
Do you have any time for hobbies?

I'm not a real good golfer, but I'm into golfing. I used to be into photography. In fact, I just finished digitizing all the family's photographs, which was a major project. In the summers, we're more into water sports. I have some wave runners and I have a boat up in Sandusky. We go up to the islands now and then, and it's a really good way to decompress. You need an escape; otherwise you would be doing this job 24 hours a day, 7 days a week.

Is there anything else you would like people to know about you?

I just had my first grandchild early this summer. She's doing really well, and I really look forward to spending time with her, so we're pretty excited. Also, I've been personally involved in the area of cancer treatment. I've been working with others on this project, including the biochemistry department at Cleveland State. My hope is that a treatment can be developed that is nontoxic and noninvasive, so that patients do not have to suffer from the medication, in addition to the disease itself. We have developed a product that will be featured in our annual report this year, and we hope to be able to commercialize it. I think we fail miserably in this country in how people are treated for chronic diseases, and I think that we can do a lot better. ■

The Washkewicz SCHOLARS PROGRAM



MATTHEW HAMMAN
SOPHOMORE
Mechanical Engineering

The Washkewicz Scholars Program provides scholarships through the generous donation of Donald E. and Pamela Waskewicz and the Parker Hannifin Foundation. The scholarships cover tuition up to 15 semester credit hours during the fall and spring term. Recipients are also expected to complete a summer co-op/internship at the Parker Hannifin Corporation. One of the main elements of this award is the hands-on experience the recipients will receive during their summer training period. Parker Hannifin Corporation has a vested interest in helping create a synergistic relationship between industry and higher education which helps supplement the education our students receive in the classroom. Our college considers this program to be of high importance and the recipients were selected after a rigorous selection process. The success of our graduates can only be strengthened through more relationships like what we have with Donald Waskewicz and Parker Hannifin. ■

ALEXANDER RESENDES
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BIOFUEL RESEARCH

JOANNE BELOVICH, Ph.D.
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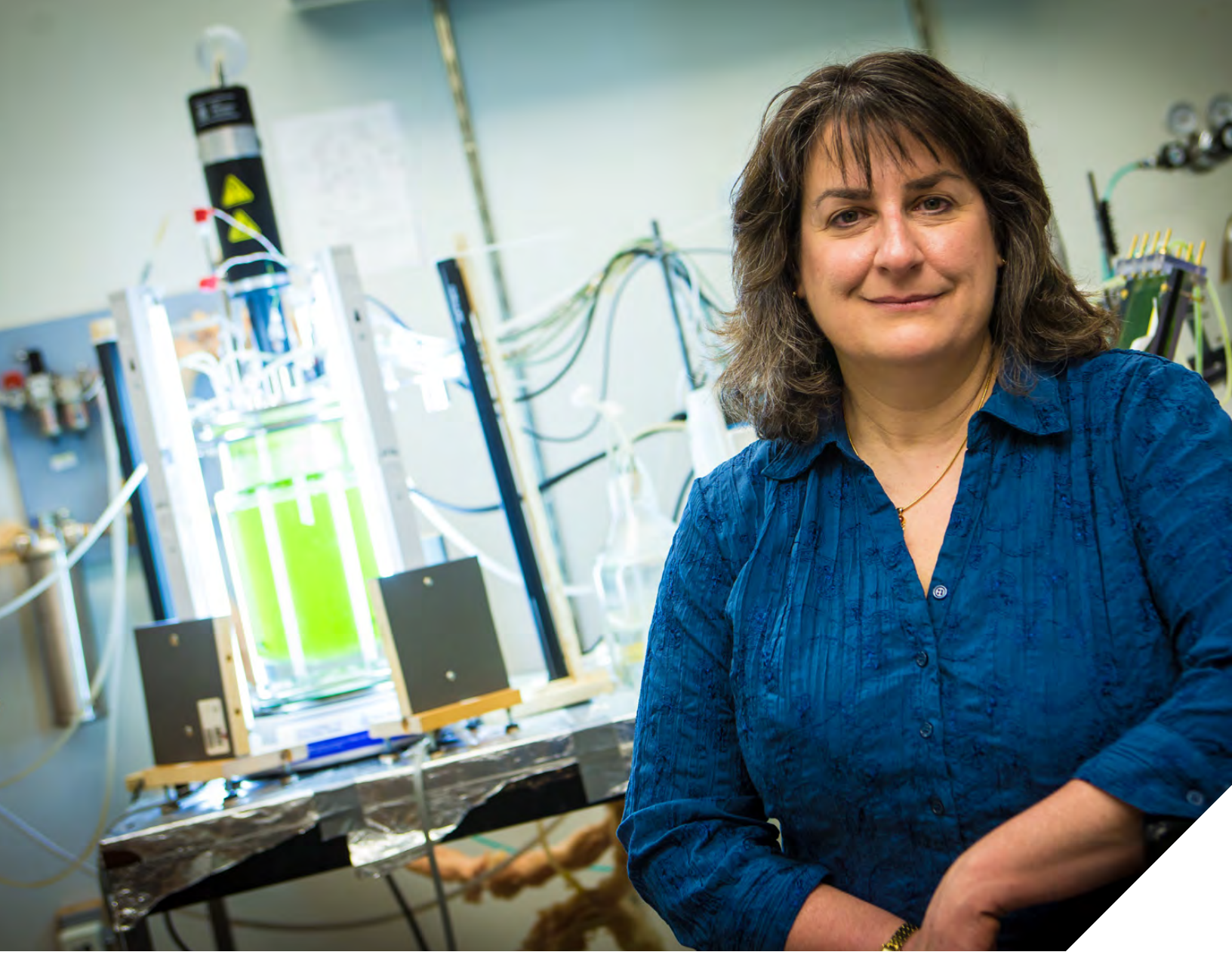
DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

In the wake of the 1973 Arab Oil Embargo that caused skyrocketing gas prices, the U.S. Department of Energy funded the Aquatic Species Program to research producing biodiesel from high lipid-content algae grown in ponds, utilizing waste CO2 from coal fired power plants to fuel the process of photosynthesis. However, as the price of oil began to drop, alternative fuel research fell with it. With more recent increases in oil prices the demand for ethanol has risen, driving up the price of corn, while global droughts are creating food shortages, creating greater demands on farm commodities. While cultivating algae as a potential major source of biofuel is not a new concept, harvesting techniques are getting a second look.

Cell harvesting systems traditionally used in pharmaceutical and nutritional supplement labs, such as centrifugation and membrane filtration, previously have proven cost prohibitive in large-scale production due to high energy and capital costs. The cost of algae harvesting is a significant barrier to commercial-scale biofuel production, resulting in 15–30% of the total cost in manufacturing crude algae oil. While most commercial inclined settlers used to remove solids from wastewater are upward flow systems, as the upward flow assists in compacting the settling solids, five years ago Dr. Belovich began researching the effectiveness of downward flow inclined gravity settlers in the dewatering process.

Algae harvesting systems traditionally used in pharmaceutical and nutritional supplement labs, such as centrifugation and membrane filtration, previously have proven cost prohibitive in large-scale production due to the need to function in continuous mode. By adapting the design of a gravity settler, Dr. Belovich's team was able to harvest algae at higher concentration levels, yielding up to an 8-fold concentration using a single stage system and a sixty-fold increase when using a two-stage system.

In an article co-authored by Dr. Belovich entitled, "Evaluation of



an Inclined Gravity Settler for Microalgae Harvesting," published in the August 2013 issue of the Journal of Chemical Technology and Biotechnology, research showed that the downward-flow inclined gravity settler demonstrated consistent results with 72% efficiency in biomass recovery and low operating costs. As most freshwater algae species are denser than water, they can be harvested using gravity sedimentation, making the downward flow technique energy efficient. The article further stated that the separation system warranted further investigation on an industrial scale, for the harvesting of algae from dilute cell suspensions, with applications to biofuels.

Previously, Dr. Belovich received a grant from Algaeventure Systems, a research facility headquartered in Marysville, Ohio, that is working to find the operating parameters that will maximize both growth rate and oil content needed for large-scale biofuel production. Research includes looking at the rate at which cells consume nutrients, how fast cells multiply and the flow rate of food. If the growth rate is too fast, algae cells do not produce fat (oil), much as human growth during teen years typically produces height and weight proportionally, while in later years, slower growth periods will produce body fat, based on food consumption levels.

The potential increase in fuel production per acre could be much greater than corn (ethanol) yields. If one acre of algae can produce 5,000 gallons of fuel per year, a 2,000-acre facility would produce 10 million gallons of fuel.

To attain those levels, Dr. Belovich's research is now focused on developing algae growth in saline water. Developing solar conversion systems, in expansive areas like New Mexico and Arizona, as well as the Florida Everglades region, would provide the needed landmass without competing with agriculture for land, fresh water or fertilizer use. Locating these systems near brackish waters found in estuaries, resulting from the mixture of river water and seawater, would solve the problem of lack of fresh water in desert terrains.

Dr. Belovich and her research team are also focusing on the use of ultrasound in the harvesting process. Using sound waves to push the algae cells together may prove more efficient than the gravity settler. As research into the sustainability of algae as a biofuel continues, it carries renewed hope of reduced dependence on foreign oil and reduction in climate changes caused by fossil fuel consumption. ■

BRIDGING the CONSTRUCTION

On a hot August afternoon in Minneapolis, Minnesota, rush hour traffic crawls slowly across the I-35W Mississippi River Bridge. The delays are worse than usual, due to resurfacing construction work blocking some of the bridge's eight lanes. Suddenly, with no warning, the bridge collapses, plummeting cars into the Mississippi River. Thirteen are killed, while many others are injured.

What happened? After nearly 40 years of service, why would a bridge suddenly fail? What can be learned from this disaster to make bridges safer in the future? In the wake of this 2007 incident, research showed there were roughly 400 aging steel deck truss bridges throughout the U.S., including the Cleveland Inner Belt Bridge. Were these bridges in as much danger as the I-35W?

In the wake of these types of structural disasters, teams of forensic engineers study the wreckage to determine why structures fail, and how the knowledge gained can be implemented in the future. Ironically, the Minneapolis steel truss arch bridge may have acted like an air bag under the concrete bridge deck, cushioning the impact for the falling cars.

Failure prevention is the essence of engineering. Studying failure mechanisms through detailed analysis of specific cases is the domain of forensic engineers. These engineers need to be not only experts in structural engineering, but they also need to have keen observation and investigation skills. To improve education for the next generation of engineers, this analysis process needs to be embedded in the academic engineering curriculum.

GAP

NORBERT DELATTE, Ph.D., P.E.
Professor and Chair
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

For the past 15 years, Norbert Delatte, Ph.D., currently Professor and Chair, CSU Civil and Environmental Engineering Department, has worked to bring the study of structural failures into the engineering classroom. Dr. Delatte has been an active member of the American Society of Civil Engineers Technical Council on Forensic Engineering (ASCE TCFE), and served as a former chair on their Executive Committee. In 2006, he helped the Council host the Fourth Forensic Engineering Congress on the CSU campus. Prior to chairing the Executive Committee, he chaired the Education Committee within the TCFE.

His work has been aided by three National Science Foundation grants totaling $700,000. The first grant helped develop failure case studies suitable for integration into classroom curriculum. Under the second grant, Dr. Delatte and now retired colleague, Dr. Paul Bosela, teamed with Dr. Joshua Bagaka's of CSU College of Education and Human Services, to assess the impact of such case studies on student learning. A third grant allowed for the expansion of this work to include a network of 11 partner universities across the U.S., to determine if the benefits could be replicated on a wide scale basis. Over the past five years, the partner universities have been working with CSU to provide data on the student benefits of case study integration.

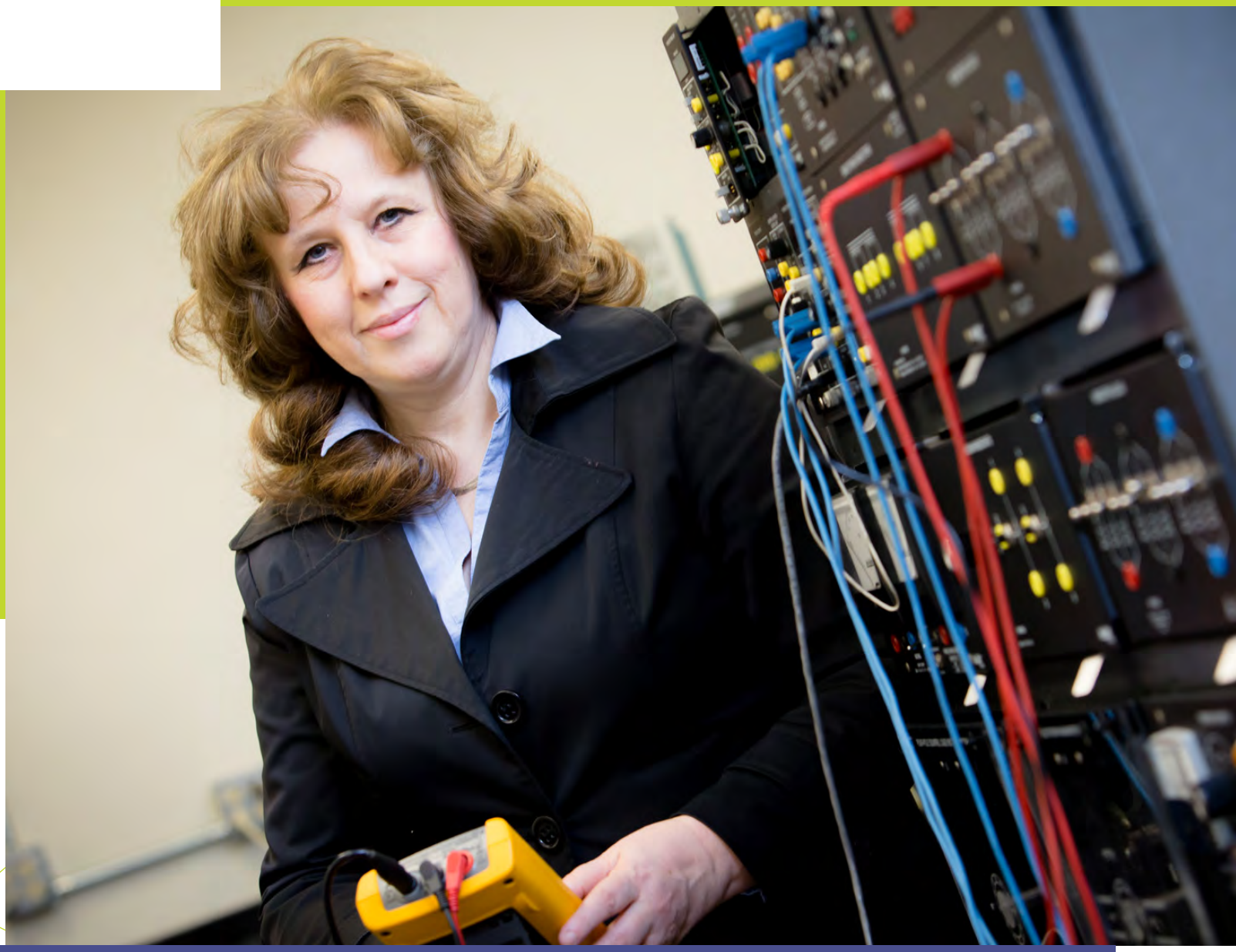
This research resulted in two important outcomes — Beyond Failure: Forensic Case Studies for Civil Engineers, a book by Dr. Delatte published in 2009, and a web page (http://matdl.org/failurecases/index.html) entitled "Failure Case Studies: Civil Engineering and Engineering Mechanics," hosted by MatDL Materials Pathway, which provides content and materials for students, faculty and researchers.

Over the past decade, Dr. Delatte has led faculty workshops in the U.S., Canada, England, Costa Rica, Ecuador, China and India, on strategies for integrating failure case studies into course curriculum.

In the past 10 years, Dr. Delatte has also obtained several Ohio Department of Transportation research contracts geared toward improving the built infrastructure in the State of Ohio, with a focus on building better bridges and longer lasting roads. The first project evaluated a wide range of concrete mixtures to reduce cracking and improve long term performance of concrete bridge decks, whereas another project investigated premature cracking of concrete parapets on four bridges in the Cleveland area. Through an additional project, some of the proposed solutions are being implemented on a number of bridges, with research to monitor their performance and effectiveness.

Under the latest large scale project, Dr. Delatte and Dr. Mehdi Jalalpour, Assistant Professor, CSU Civil and Environmental Engineering Department, and their students are teaming with Dr. Richard Miller at the University of Cincinnati and the Great Lakes Construction Company to install high performance pavement and conduct bridge deck repairs near Xenia, Ohio. Continuing work includes monitoring bridge performance under traffic and harsh winter conditions.

As vast investments in the built infrastructure continue to be made nationwide and throughout Ohio, Dr. Delatte's work will continue to focus on improving construction techniques, increasing materials durability, and providing greater safety for the public and construction workers alike. ■



ANA STANKOVIC, Ph.D.
Professor
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

RENEWABLE ENERGY TECHNOLOGY

Dr. Ana Stankovic's latest research in the area of renewable energy sources grid integration may change the long-term viability of wind energy technology.

With wind being a free, renewable and clean energy resource, wind energy is one of the fastest-growing forms of electricity generation in the world. Significant wind power capacity is beginning to be connected to the grid, allowing wind to become a fully utilized power source. However, technical challenges interfacing wind power to the power grid still exist. If the wind turbine, which has a constant frequency, is directly connected to the grid, the generator has to run at a constant rotating speed.

Traditionally, variable pitch constant speed turbines and gear boxes are coupled to the generator, so that with the changing of the wind speed, the generator can still run at a constant speed. However, gear boxes create extreme noise that is harmful to the environment, and the physical abrasion causes degradation of the turbine and generator. Another option is to control the frequency conversion between the grid and the generator, through the use of two power electronic converters, also known as back-to-back PWM converters.

In the past decade, interest in the design and control of grid side converters for renewable energy systems has grown. According to the new standards (grid codes), renewable energy sources are required to remain connected to the grid during short grid disturbances (voltage dips), and to guarantee high power quality. Advanced control of grid side converters can potentially prevent cascading events that may lead to blackouts and system instability.

It has been shown that grid side converters are sensitive to voltage disturbances (transient events or persistent unbalanced voltage conditions), which result in the appearance of low order harmonics in line currents, as well as large ripples on a DC link capacitor. These types of low frequency occurrences in line currents pollute the utility and cause additional energy losses. Furthermore, the overall stability of the renewable energy system is adversely affected under severe grid disturbances.

Dr. Stankovic's research focuses on development of robust control methods and the design of grid side converters for renewable energy systems that function under generalized unbalanced operating conditions. The proposed control methods should comply with the latest grid codes, allowing for operations to be maintained during grid disturbances that require fast restoration of active power to the pre-fault level and adjustable power factor.

Additionally, the proposed methods should provide for harmonic-free operation of grid side converters during severe faults in the power grid. This research will directly improve reliability and security of renewable energy sources grid integration. These proposed technological advances will help to ensure the increasing use of renewable energy resources, while reducing the reliance on fossil fuels, and improving national energy security.

Dr. Stankovic's research into renewable energy sources grid integration is conducted in the state of the art Power laboratory, within the Washkewicz College of Engineering. This modern laboratory is supported by the NASA Glenn Research Center, the U.S. Department of Energy, the National Science Foundation and Cleveland State University. ■

WASHKEWICZ COLLEGE OF ENGINEERING

COOPERATIVE EDUCATION PROGRAM

The Fenn Cooperative Education (co-op) Program of the Washkewicz College of Engineering kicked off fall semester with co-op informational seminars and resume workshops that highlighted the program application process and tips for crafting successful resumes. In October, Lincoln Electric visited the College with the purpose of recruiting select seniors for permanent opportunities. This led up to the Engineering Cooperative Student and Employer Engagement event. The first of its kind, this event was organized and hosted by the Fenn co-op program and attracted over 50 employers who met more than 100 students who presented resumes for future employment opportunities.

The College of Engineering celebrated 90 years of cooperative education on November 7, 2013. More than 100 guests, including industry partners, alumni, students, faculty and staff were invited to celebrate the College's rich history, and learn about the Cooperative Education Program's continuing growth.

Other recent events included Diversity seminars, where representatives from ABB, FirstEnergy, Lincoln Electric and Turner Construction Company provided tips for success in college that will also assist students in the workplace. The company participants also discussed opportunities within their organizations that highlight the benefits of diversity.

Throughout the year, the co-op program continued to engage students in various workshops and sessions designed to help with their co-op search and placement, scholarship opportunities and employer engagement. Some of the workshops offered last spring included a resource workshop where different approaches to finding a summer job were discussed. An Optional Practical Training (OPT) and Curricular Practical Training (CPT) Engineering Workshop was held in collaboration with The Center for International Services and Programs (CISP) provided international students information about OPT/CPT and related requirements and guidelines. Scholarship opportunities and interview skills sessions were also discussed. The co-op office also partnered with the University's Office of Development to present an alumni speaker series designed to encourage engineering students. Gareth Vaughn, President and CEO for a|m|Highley presented.

Last spring, the Fenn co-op program engaged the outside community at two conferences. At the American Society of Engineering Education Conference for Industry and Education Collaboration, the Manager of the Fenn co-op program, Sandra English, spoke about how cooperative education programs can contribute to sustainable diversity in the workplace. Her presentation highlighted Engineering Diversity Pipelines, a program where high school students engage in engineering activities through pre-college cooperative educational experiences. The College's co-op program was also invited to partake in a round table discussion at the Ohio Cooperative Education Association Conference. Emphasis was placed on the cooperative education option providing students a unique opportunity to apply their formal classroom preparation to real-world situations, develop their interpersonal, communication, and leadership skills in a workplace environment, and connect with employers. The roundtable discussion also offered the perspectives of students, employers and educators, and emphasized co-op as a recruitment and retention tool to increase diversity participation within the engineering profession. The College's Fenn co-op program was represented by presenters Sandra English, Program Manager, Dr. Woodrow Whitlow, Executive-in-Residence, and students Deury Estrella, Mechanical Engineering and Samuel Sanya, Chemical Engineering. ■

MOMENTS FROM THE 90TH COOPERATIVE EDUCATION CELEBRATION OF THE COLLEGE OF ENGINEERING

GREGORY ARCANGELINI
Mechanical Engineering

Throughout my time in high school, my career choices ranged from engineer, to wildlife photographer, to priest, and everything in between. When I graduated, my career picture wasn't any clearer. With such a wide range of interests, I attended Tri-C to help determine what I wanted to spend the rest of my life doing. After two years, 70 plus credits and two degrees, I learned that liberal arts weren't for me. I chose to attend Cleveland State because my future wife was attending Baldwin-Wallace University. Upon arriving at Cleveland State, I learned about the engineering co-op program and how it actually pays you to work in your chosen profession.

My experience with the co-op program has been everything I hoped it would be. I landed a position with MTD Products Inc. - the company behind Cub Cadet, Troy-Bilt, Yard Machines, and other outer power equipment brands. The first semester, they put me in the Computer-aided Design (CAD) department, where my first day on the job I was working on one of the company's biggest projects. The following semester, MTD recognized that my practical knowledge of engineering was lacking compared to my theoretical knowledge. MTD then assigned me to work in the prototype model shop, where I learned about various manufacturing processes like laser-cutting, 3D printing, machining, and assembly.

The time I've spent in the industry has given me insight that I simply couldn't get in a classroom setting. I've always had the grades, but when it came to designing something that could actually be manufactured, I was far behind. On-the-job training has given me insight into how things actually work and fit together. Working in the shop, I was able to learn about the vital connection between blueprints and prototypes, as well as how something as simple as changing one of the bend radii on a piece of sheet metal can lead to major problems when it comes to production.

I strongly advise new students to consider the co-op program. I interviewed for MTD my first semester and when the next semester rolled around, I was asked, "When can you start?" I hope to continue working with MTD when I graduate. I know their system and I know that it fits with what I'm looking for in a company.

Sandra and the entire co-op staff work hard to make sure the co-op experience pays off for its students. The co-op program holds special career fairs just for co-op students, including several events each semester where we are put in direct contact with big-name engineering companies. I have never seen or heard of any school doing as much for its engineering students as Cleveland State. The College cares about making sure you have a job when you graduate. I made the right choice when I chose Cleveland State and the co-op program, and hope that other students do the same.

JOSEPH FEIGENBAUM
Electrical Engineering

When I first came to Cleveland State University, I wasn't interested in participating in the co-op program. However, one of my teachers convinced me to participate and it was the best decision I made during my college experience. I know many students, who had one or two internships during the summers, but these experiences paled in comparison to the structured experiences provided by the co-op program. This became apparent to me during my first co-op. I quickly realized that a three-month internship would be hardly sufficient in providing me with a strong understanding of the company and a real-life working environment.

The co-op program provided me with the resources I needed to apply to and win an engineering job, including how to write a resume and negotiate salaries. The program had seminars on developing effective communication skills, setting goals and evaluating my own performance. These skills were particularly important lessons for me, as the program taught me how to adapt and thrive in a workplace environment.

My experiences during my three co-ops at Rockwell Automation gave me a solid understanding of what engineering is and how education helps prepare us for working in the real world.

The first project I worked on at Rockwell was a cost analysis project. I analyzed different display technologies, their suppliers and evalutated which combination fit the industry's needs. At first, the job felt like busy work, until I realized just how important it was. I learned about the rigorous industrial requirements for components and product lifecycle, and how to properly spec out a component. Dr. Villaseca said in class many times, "Engineering without economics is not engineering." Analyzing price differences gives you a competitive edge and is crucial in engineering design. The end decision saved the company more than $200,000 per year.

During my time with the product development group, I learned that there are no clear-cut solutions. Tasked with characterizing the performance of Rockwell controllers in electromagnetically noisy environments, Rockwell's engineers helped me learn to isolate important variables and solve many problems that occurred during the course of the project. Perhaps the most beneficial experience I had, however, was with the product continuation group. As engineering students, we focus on creating products, but in the industrial environment, products must be supported for decades. My experiences made me think about part obsolescence and manufacturing issues. I also gained an understanding of the full lifecycle of engineering designs.

The co-op program helped guide me through all these experiences. Thanks to the program, I was offered a full-time position with Rockwell Automation upon graduation.

CLAUDINE LACDAO
Chemical Engineering

One of the greatest experiences I've had thus far in college is my trip to the Advance Photon Source at the Argonne National Laboratory (ANL) in Illinois. I became a member of the Thermal Barrier Coatings research team that included mechanical and aerospace engineers from the University of Central Florida and the German Aerospace Centre DLR. To be able to collect data for characterization of thermal barrier coatings on commercial jet engine turbines is an incredible opportunity. ANL offers the brightest storage ring-generated X-ray beam technology in this hemisphere. The experience taught me many lessons including technical knowledge about materials, problem-solving in a time constraint situation, and communication needs within an interdisciplinary team.

DURING THE PAST YEAR, THE ENGINEERING DEAN'S DIVERSITY COUNCIL FOCUSED ON THREE MAIN GOALS:

1. TO ENRICH THE CAMPUS CLIMATE FOR DIVERSITY AND INCLUSION
2. TO STRENGTHEN RECRUITMENT, RETENTION, ACHIEVEMENT AND GRADUATION OF DIVERSE STUDENTS
3. TO STRENGTHEN AND PROMOTE MULTICULTURAL PROGRAMS

TO MEET THESE GOALS THE ENGINEERING DDC HOSTED THE FOLLOWING EVENTS:

❖ Faculty Recruitment/Best Practices: Searching for Excellence Seminar that included guest speakers, offering faculty helpful information about selecting new faculty, with an emphasis on increasing diversity and promoting inclusion.

❖ Global Awareness Day, a multicultural event that was attended by 104 engineering students, faculty and staff representing at least 17 different countries. The event featured an international buffet, fun icebreakers, karaoke, cultural displays, a slide show of world travels from faculty and staff, and an international student panel presentation.

❖ Thanks to the input of the DDC, Fenn Academy increased its outreach efforts to minority students and women during the 2013-14 academic year. The College's unique pre-engineering program reaches out to 48 public and private high schools in a five-county region of Northeast Ohio, serving Cleveland Metropolitan School District science, technology, engineering and mathematics (STEM) high schools like MC2STEM at Cleveland State, as well as all-girls schools, inner-ring schools, additional suburban high schools, plus charter schools like Horizon Science Academy. More than 400 minority students, including 276 female students, attended engineering career presentations, both on and off campus, that included students from College Now/Upward Bound, serving Shaw High School, and the ACE Mentor Program, serving the Cleveland Metropolitan School District.

❖ Women in Engineering Day attracted 60 girls, grades 8-12, and their parents. The event included a welcome from Dr. Anette Karlsson, the Dean of the Washkewicz College of Engineering, as well as lab demonstrations, a trip to the Great Lakes Science Center and an opportunity for students to meet Dr. Sandra Magnus, a NASA astronaut. Dr. Margaret Nazario, also from NASA, gave the keynote address.

❖ Other recent events included Diversity seminars, where representatives from ABB, FirstEnergy, Lincoln Electric and Turner Construction Company provided tips for success in college that will also assist students in the workplace. Additionally, these companies discussed opportunities within their organizations that highlight the benefits of diversity.

Expanding Diversity

AT THE WASHKEWICZ COLLEGE OF ENGINEERING

THE WASHKEWICZ COLLEGE OF ENGINEERING WAS HONORED TO RECEIVE THE PRESIDENT'S AWARD FOR EXCELLENCE IN DIVERSITY AT THE DEAN'S DIVERSITY COUNCIL'S RECOGNITION CEREMONY ON APRIL 7, 2104. THE MISSION OF THE DEAN'S DIVERSITY COUNCIL (DDC) IS TO PROMOTE A CULTURALLY AND INTELLECTUALLY RICH ENVIRONMENT FOR DIVERSITY AND INCLUSION, AND SUPPORT EDUCATIONAL SUCCESS AND PERSONAL DEVELOPMENT FOR ALL.

The Washkewicz College of Engineering Dean's Diversity Council also hosted two Diversity in the Workplace seminars, presented in conjunction with the Society of Women Engineers and the National Society of Black Engineers (NSBE). ABB, First Energy, Lincoln Electric and Turner Construction were featured. Gregg Schoof, Chair of the DDC, spoke on student retention and graduation as contributing factors to diversity in the workforce. Company representatives provided tips to guide students' success in future workplace positions. Following the presentations, students had the opportunity to discuss mentoring, professional development, advancement opportunities, and employee retention with company representatives. Approximately 41 students of different ethnic backgrounds and from all engineering disciplines attended the seminars.

Twelve students represented CSU at the National Society of Black Engineers (NSBE) National Conference in Nashville. For next year, the student chapter hopes to develop workshops for African-American engineering students, as well as have more students participate at NSBE national and regional conferences.

Additional Engineering DDC activities included a conference presentation on how the Co-op Program can be used as a minority student recruitment and retention tool. Students and parents had the opportunity to meet with Dr. Woodrow Whitlow, Executive in Residence and former NASA Glenn Research Center director. Parents also attended a cooperative education and college prep program provided by Sandra English, Cooperative Education Program Manager.

The Engineering Dean's Diversity Council committee members for 2013/14 included: Anette Karlsson (Dean), Gregg Schoof (Chair), Nigamanth Sridhar (Co-chair), Fouad Abou-Ghalioum, Duane Crockrom, Lili Dong, Nilufer Dural, Asuquo Ebiana, Sandra English, Ali Farran, Chris Hardulak, Mounir Ibrahim, Jin Lin Jia, Ankur Mantri, Ryan Polder, Iddrisu Seidu, Harlan Smith, Ana Stankovic, Sridhar Ungarala and Woodrow Whitlow.

For more information about upcoming events or to schedule a seminar, contact Sandra English, at 216-687-6968 or s.l.english@csuohio.edu. ■

ADVANCING SUPPORT SYSTEMS: BOTH STRUCTURAL AND HUMAN

MEHDI JALALPOUR, Ph.D.
Assistant Professor
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

NEW FACULTY

Mehdi Jalalpour earned a Bachelor's Degree in Civil Engineering from Isfahan University of Technology in Iran, and a Master's Degree in Civil Structural Engineering from Tehran University. He then practiced civil engineering in Iran for two years, where he obtained his professional license. Continuing his education at Johns Hopkins University, he received his Ph.D. in Civil Engineering Systems. Upon obtaining his Ph.D. in 2013, Dr. Jalalpour joined Cleveland State University as a faculty member in the Department of Civil and Environmental Engineering. Dr. Jalalpour also holds an adjunct position with the Cleveland Clinic's Department of Quantitative Health Sciences.

Dr. Jalalpour's research is multidisciplinary with a common theme of modeling complex systems under real-world uncertainties. He currently focuses on application and development of system engineering tools to analyze and optimize structural designs and health care delivery systems. While these two areas of research are distinctly different, his interest in medicine is to determine ways to utilize data to inform management and decision-making strategies for improving patient outcomes.

RELIABLE STRUCTURAL DESIGN OPTIMIZATION

This line of research applies structural topology optimization in designing high-performance structures and components. Topology optimization means that the design domain is fixed and the goal is to distribute the material in an optimized way. Optimality is dependent on the purpose of the design, and is often achieved by minimizing an objective (cost) function. For example, minimum-weight designs with predefined stiffness under the applied load can be achieved through minimizing the structure weight (cost) while controlling for displacement under the location of the applied load (constraint). This ensures that the design is economic and is also stiff enough to resist the applied loads. This concept is illustrated in Figure 1, that depicts a symmetric simply supported beam. The left side illustrates the design domain and the applied load, along with the boundary conditions. Due to symmetry, the optimal material distribution for only half of the beam is found, as shown on the right.

Figure 1 Topology optimization, (left) design domain and load, (right) material distribution for half of beam (Black means material and white means no material)

Topology optimization therefore can help save on material consumption while achieving designs that meet the required performance criteria. However, such high-performance designs under deterministic conditions feature sparse and slender member connectivity, making their performance sensitive to manufacturing uncertainties and possible material variability. This ultimately makes these designs suboptimal under real-world conditions. To address these concerns, Dr. Jalalpour is researching on methods to tightly couple these manufacturing uncertainties with the optimization algorithm. He has published two journal articles highlighting specific applications to truss structural systems under fabrication uncertainties. With nonlinear analysis, he has shown that this tight coupling results in truss designs that outperform traditional designs under real world conditions[1].

At Cleveland State, Dr. Jalalpour is extending this research to continuum optimization under uncertainty. The first effort is to tailor the designs in such a manner that the minimum-weight topology is dependent on the chosen risk level (reliability) and magnitude of uncertainty in materials properties. The methodology is termed Reliability-based topology optimization (RBTO). A sample of the results is shown in Figure 2. The design on the right side of Figure 2 is optimized for a higher level of reliability—or lower risk. We can see that this design is not only more complex, but also features thicker members in comparison to the design on the left. Both of these designs, however, feature more load diversification path in comparison to the deterministic design shown in the right side of Figure 1.

Figure 2 Designs under uncertainty: (left) lower reliability and (right) higher reliability

The proposed RBTO method therefore helps optimally use the minimum amount of material depending on our current manufacturing tolerances, and leads to designs that are safer under real world conditions. Dr. Jalalpour also hopes to use additive manufacturing devices to "print" these designs, and test them under real-world conditions.

FORECASTING THE DEMAND FOR HEALTH CARE AND IMPROVING PATIENT OUTCOMES

Efficient health care delivery systems aim to match resources to demand for services over time. Resource allocation decisions must be made under uncertainty. This includes uncertainty as to the number of individuals, that is, counts in need of services over discrete time intervals. Examples include: counts of patients arriving at emergency facilities; amount of prescription medications distributed by pharmacies; and number of magnetic resonance imaging studies performed in hospitals. Accurately forecasting data within health care systems allows decision makers to anticipate the need for services, while making informed decisions about how to manage resources and purchase supplies over time.

To contribute to this field, Dr. Jalalpour joined a multidisciplinary team of researchers from Johns Hopkins School of Medicine's, Department of Emergency Medicine, to develop forecast models for weekly counts of patients with confirmed Influenza that are admitted to the emergency department at Johns Hopkins Hospital. The focus of the model was to predict counts of patients one week in advance by using information that is available on a weekly basis, such as average temperature, time of year and Google Flu Trends (GFT). GFT is an index of the rate of people within a given region who are searching for treatments of influenza-like symptoms, is available weekly, and can be narrowed down to the city of interest (in this research case, Baltimore). By developing a forecast model using six years of data, the team was able to predict the seventh year of data with high accuracy [2].

The team has since launched a publicly accessible web-based application designated "Flucast," that allows individual hospitals around the U.S. to use the forecasting model to predict counts of patients with Influenza for the coming week. The application automatically finds relevant GFT data based on the hospital zip code and can be accessed at www.pacerapps.org. This tool allows hospital administrators to be better prepared for influenza outbreaks and to prevent overcrowding in the emergency rooms, thereby contributing to overall patient quality of care. Dr. Jalalpour and his collaborators have also published a computationally efficient, general prediction toolbox for count data sets in an open-source format, so that researchers and hospital administrations can conveniently build predictive models for time series count data set. This toolbox is available for download from Dr. Jalalpour's personal webpage on the Cleveland State website.

Ongoing collaboration with the Agency for Healthcare Research and Quality (AHRQ) has allowed the team to access more extensive data in various cities, further helping them to verify their findings. It is expected that this research extension will help understand the space-time variations of influenza activity. Two snapshots of the data are shown in Figure 3. In this Figure, the circles indicate cities, while the size of each circle is proportional to the number of patients that were admitted with influenza to hospitals within each city. The circle size is normalized by the maximum number of weekly patients that hospitals in each city attended to, thus accounting for population size effect. In 2005, it seems that the rise of influenza is correlated among most of the cities, while in 2006, a completely different conclusion can be drawn. Here the east coast cities see some moderate activity, while the mid-west cities do not. Advanced analysis techniques will be applied on this large data set to understand the spread of influenza better. It is hoped to develop spatiotemporal forecast models with higher accuracy and wider application to respond to influenza proactively for improved patient outcomes nationally. ■

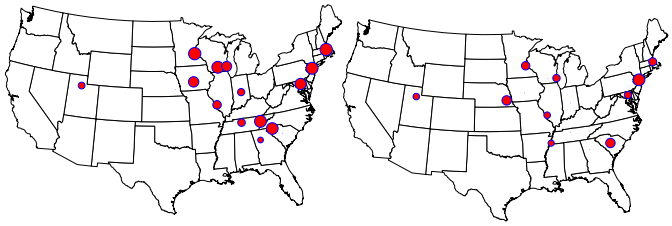


Figure 3. Influenza activity in two snapshots of data: (left) 2005 and (right) 2006

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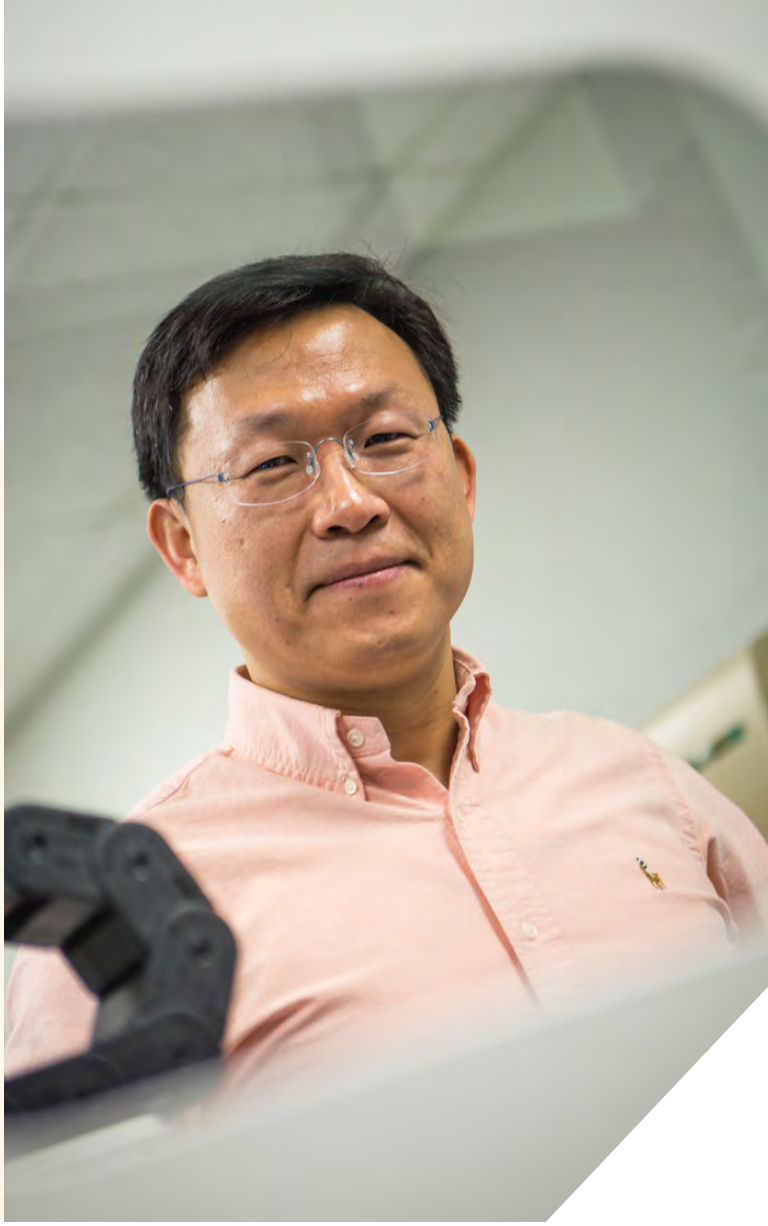
A NEW LIMIT TO DRUG TOXICITY

Dr. Lee earned his Bachelor's Degree in Chemical Engineering from Gyeong Sang National University in South Korea, and a Master's Degree in Chemical and Biomolecular Engineering from Korea Advanced Institute of Science and Technology (KAIST), where he also received his Ph.D. in Chemical and Biomolecular Engineering. Following graduation, he spent two years at Tokyo Institute of Technology, Japan, as a Postdoctoral Fellow supported by the Japan Society for the Promotion of Science. He spent three years at Rensselaer Polytechnic Institute in New York as a Postdoctoral Research Scientist.

Dr. Lee's work in microarray chip technology began when he was a lead senior scientist at Solidus Biosciences, Inc., a startup company that specialized in microarray chip technologies with applications in drug development. Dr. Lee received A Successful Fellow of Korea-Japan Researchers' Friendship Award and Postdoctoral Fellowships from the Japan Society for the Promotion of Science and the Korea Science and Engineering Foundation. His work has been highlighted by the Biological Research Information Center, a renowned research center in South Korea, as well as other news outlets throughout the U.S.

Through Cleveland State University, Solidus Biosciences, Inc., and Rensselaer Polytechnic Institute, Dr. Lee has focused on developing highly automatable, high-throughput microarray screening platforms and associated instruments and devices that can be used for biochemical and cell-based assays to assess human metabolism and toxicology. His specific areas and current research include various microarray biochip platforms such as carbohydrate, enzyme, virus, and cell-based microarrays. Dr. Lee's contributions, among others, include the metabolizing enzyme toxicology assay chip (MetaChip), the data analysis toxicology assay chip (Data Chip), the metabolic stability assay chip (MesaChip), and the transfected enzyme and metabolism chip (TeamChip). His research funding is from the National Science Foundation and the National Institutes of Health, as well as from L'Oreal, Pfizer, and Samsung Electro-Mechanics, Co.

Dr. Lee's research goal at Cleveland State is to develop innovative microarray biochip platforms and miniaturized biochemical and cell-based assays in droplets as small as 30-800 nanoliters for predictive,



MOO-YEAL LEE, Ph.D.
Assistant Professor
DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

low-cost, high throughput evaluation of drug toxicity and efficacy. Dr. Lee envisions microarray chip platforms representing a promising, high throughput microscale alternative to conventional methods that will create new opportunities for rapid and inexpensive assessment of compound toxicity and efficacy at the early phases of drug development.

Increasing Success Rates in Drug Development

Modern drug development is a multidisciplinary enterprise consisting of disease-based target identification and validation, and high throughput screening of chemical and natural products against disease targets. The selected lead compounds go through careful structural optimization, coupled with efficacy and toxicity tests, preclinical pharmacokinetics and pharmacodynamics with animals, and ultimately a few compounds are advanced to clinical studies with humans.

In the past decade, there has been a dramatic increase in the number of new chemical entities (NCEs) and screenable drug targets as a result of combinatorial chemistry and advances in bioinformatics, genomics, and proteomics. However, nearly 30% of preclinical and clinical drug candidates fail due to unanticipated toxicity. The total capitalized development cost per drug now approaches $2 billion, of which 70% is attributable to drug candidate failures. If effective, screening for toxicity at early stages of the drug discovery process would help reduce these failures and enable medicinal chemists to focus their research on drug candidates with acceptable levels of both bioactivity and toxicity. Unfortunately, there has been a lack of in vitro technologies that have the requisite throughput, that is, number of bioassay per given time, to address early-stage toxicology and that can adequately mimic human metabolism to predict the likelihood of drug candidate toxicity. This problem is intensified by some FDA-approved drugs that have been withdrawn from the market due to unexpected adverse effects, for example, idiosyncratic or individual-dependent toxicity, which were not detected during preclinical studies using animal models and clinical human trials. The idiosyncratic toxicity of drugs is difficult to predict using conventional in vitro screens, as it is a rare incidence in humans, that is, 1 in

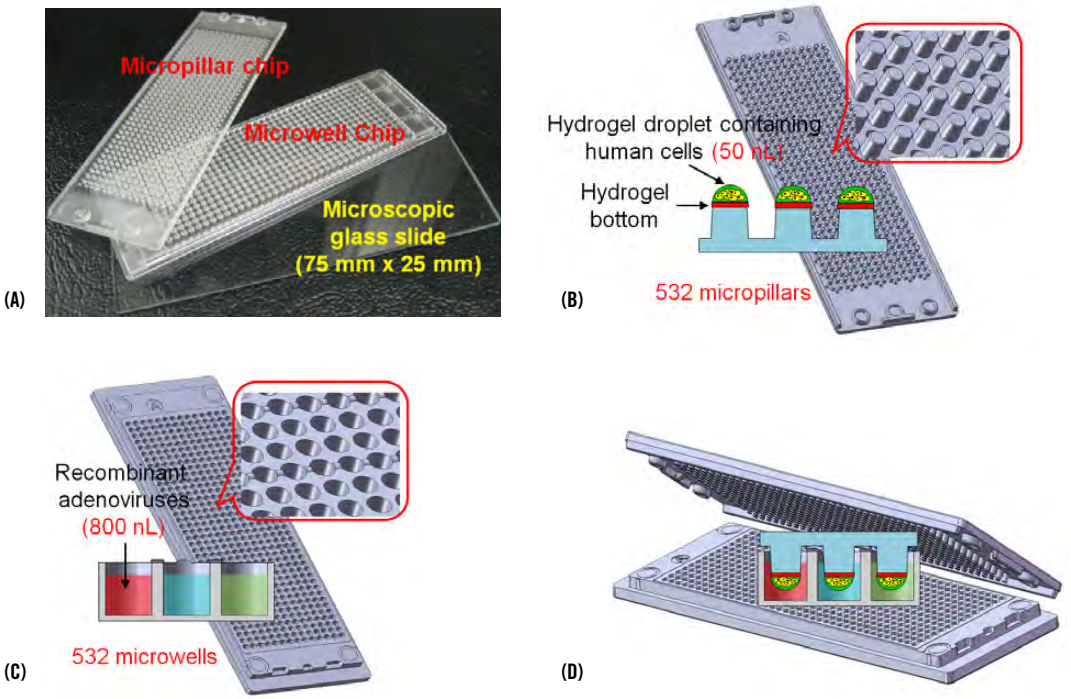


Figure 1. (A) Micropillar/microwell chip components in relation to a standard glass microscope slide, (B) Micropillar chip containing cells (DataChip), (C) Microwell chip containing recombinant adenoviruses carrying genes for drug metabolizing enzymes (TeamChip), and (D) Sandwiching the DataChip onto the TeamChip for gene transduction

5,000 or more, caused by genetic polymorphism of drug metabolism and related hypersensitive immune responses. Due to the critical link between toxicity and drug development failure, the National Institutes of Health (NIH) has identified the need for improved in vitro human toxicology testing in the early stages of drug development. Their goal is to increase drug research success rates by reducing expensive failures in animal and human testing, by enabling more effective and safer compounds to enter clinical trials.

In recognition of the importance of performing toxicology studies early in the drug development process, Dr. Lee's focus is on developing microarray biochip technologies and associated automation instruments. In collaboration with Samsung Electro-Mechanics Co. (SEMCO) of South Korea, a highly versatile micropillar/microwell chip system has been developed for rapidly testing drug candidates and environmental toxicants against human cells isolated from organs. The disposable micro micropillar/microwell chips – 25 mm x 75 mm in size – were manufactured by plastic injection molding (Fig. 1A). The new chip platform is a robust and flexible system for use in developing three-dimensional (3D) cultures of human and animal cells, as well as studying enzymatic reactions and viral infection, and conducting compound screening. The micropillar chip supports 3D cell cultures and comprises an array of human cells for gene expression and toxicity screening (Fig. 1B). A single micropillar chip contains 532 micropillars – 0.8 mm pillar diameter, 1 mm pillar height, and 1.5 mm pillar-to-pillar distance – onto which an array of 3D human cell cultures – cells entrapped in 50-nL spots of hydrogel – is dispensed using a microarray spotter (Fig. 2A-C). The microwell chip contains a complementary array of enzymes, recombinant viruses, growth media, reagents, or test compounds – typically 800-nL solutions in the microwells – (Fig. 1C). By sandwiching two chips together, various miniaturized biochemical and cell-based assays can be performed on the chip platform (Fig. 1D).

For full automation, a microarray spotter, a chip-imaging system, and computer software have been developed to enable consistent manipulation of the micropillar/microwell chip and to analyze data from the scanned images in a high-throughput manner (Fig. 2D).

Predicting Human Toxicology

Dr. Lee and his graduate students, Alexander Roth, Pranav Joshi and Akshata Datar, are continuing to develop the microarray chip technology in predicting human toxicology. Their research is focused on three main areas:

1) Nanoscale organotypic human cell cultures on a chip to closely mimic in vivo conditions of major tissues in the body for toxicology/efficacy screening.

• Developing viral gene delivery systems on the chip that would allow researchers to study drug metabolism and simulate idiosyncratic, that is, individual-dependent, adverse drug responses.

• Developing high content imaging – HCI – on the chip with human cells to test for mechanistic toxicology

• Developing 3D neural stem cell cultures on the chip to study effects of environmental toxicants, including additives in hydraulic fracturing – hydrofracking – solutions.

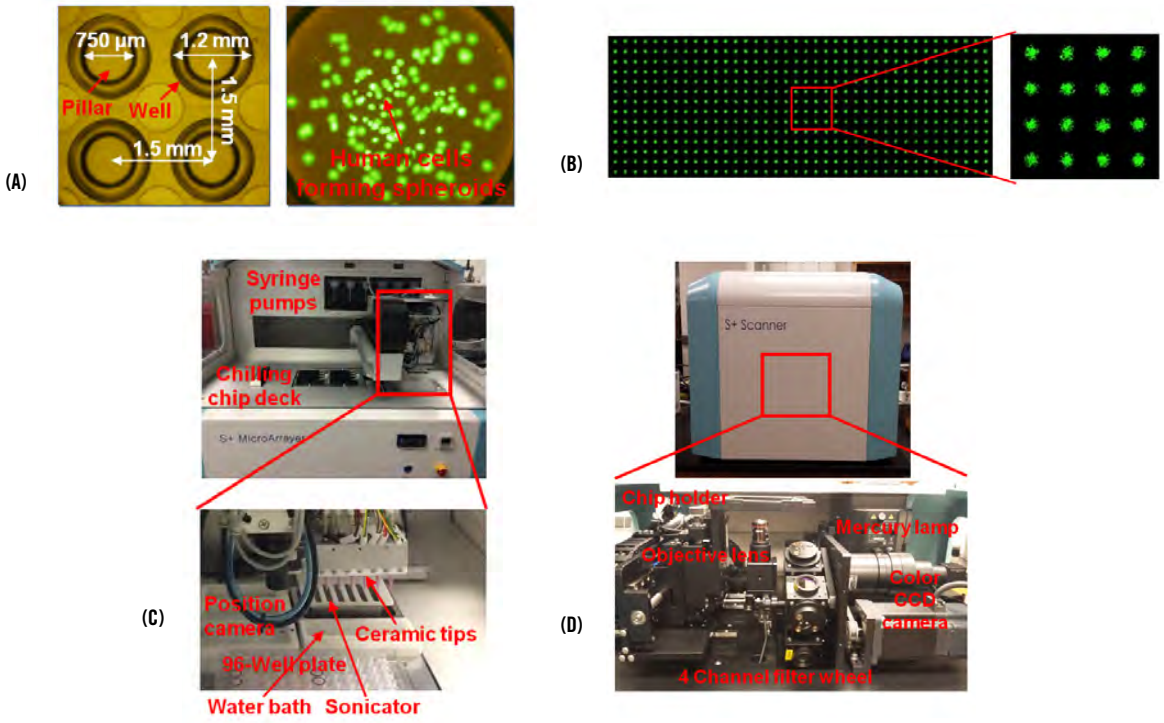


Figure 2. (A) Microscopic pictures of the sandwiched chips (left) and live human liver cells encapsulated on the micropillar chip (right), (B) Scanned images of the entire micropillar chip with live human liver cells stained with a green fluorescent dye, (C) A microarray spotter with 6 ceramic tips for dispensing biological samples in solutions, and (D) A chip-imaging system for data acquisition and analysis. Several human cell types can be spotted in hydrogels such as alginate and matrigel onto micropillars – typically 50 nL – and various combinations of biological samples, as well as test compounds, (typically 800 nL) can be dispensed into microwells. Two chips can be sandwiched together and incubated in a gas-permeable chamber for cell growth. The micropillar chip with cells can be stained uniformly on a staining plate for various cell-based assays

2) The development of personalized patient cancer treatment utilizing therapy chip technology that allows an individual's cancer cells – obtained via biopsy – to be encapsulated on a chip, where likely human responses to therapeutic drug dosages could be efficiently mimicked.

• Culturing brain tumor cells from patients on the chip to screen individual efficacy of various therapeutic drugs

• Studying the effect of cellular microenvironments using 3D spheroid cell models on the chip in assessing anticancer drug resistance

3) The development of an integrated chip platform consisting of a micropillar chip, a microperfusion chip, and a micropump chip to allow for long-term retention of 3D human cell cultures. This integrated chip platform would supply various solutions from the reagent wells to the micropillar chip containing a variety of primary human cells and circulate test compounds to mimic the human circulatory system for toxicology screening.

Microarray chip technology offers several clear advantages over more conventional in vitro toxicology screening tools. Specifically, it requires extremely small amounts of cells, viruses, compounds, and reagents for analysis. It is well suited for early stage, high throughput screening of compound libraries, which include drug candidates, chemicals, cosmetic ingredients, and environmental toxicants. The cell encapsulation technology is flexible and allows for culturing multiple cell types from different organs in hydrogel droplets on the chip, thus providing more predictive insight into potential organ-specific toxicity of compounds. Three-dimensional (3D) cell cultures on the chip may also provide an environment that simulates the in vivo extracellular matrix conditions, and therefore help to maintain the specific biochemical functions and morphological features of human cells similar to those found in human organ tissues. Through the use of recombinant adenoviruses, the chip enables the controlled expression of each human drug metabolizing enzyme, as well as various combinations of multiple enzymes in human cells. The gene transduction technology on the chip can be extended to other cell-based in vitro assays, including gain- and loss-of-function genomic screening. The chip can also be tailored to different subgroups of the population and even individual patients, by adjusting the expression levels of the various metabolizing enzymes in human liver cells to match the enzyme levels representative of a subgroup or unique to an individual. Using this technology, adverse responses of drug candidates and their reactive metabolites by combinations of various drug metabolizing enzymes in the human liver can be assessed and quantified at speeds commensurate with early-stage human toxicity tests. Ultimately, this approach will provide critical information needed for the design of patient-specific treatment regimens, as well as for the identification of pharmacologically safe and effective lead compounds best suited for advancement to clinical trials. With high quality information on chemical toxicity early on, pharmaceutical companies can make better educated decisions on which compounds to take forward, accelerate drug development times, and reduce investments that result in late-stage drug failures.

The Future Application of Microarray Chip Technology

The pharmaceutical and biotechnology industries are under intense

pressure to discover new drugs and advance them through clinical trials faster than ever before. Many potential drugs fail in clinical trials due to unpredicted organ-specific toxicity, either due to the drug candidate itself or its enzyme-generated metabolites. Microarray chip technology has the potential to revolutionize in vitro toxicology testing and enable metabolism studies to be introduced during the drug discovery phase. As patient response to drugs and potential adverse drug reactions depend strongly on the levels and activities of critical drug metabolizing enzymes, microarray chip technology will enable clinical laboratories to design patient-specific treatments by predicting drug metabolism profiles for specific cell types.

The cosmetics, cosmeceuticals, and chemical industries also face serious regulatory challenges in bringing new compounds to market and in maintaining the market of existing compounds. These regulations are centered on the safety evaluation of new and existing chemicals that form the mainstay of the aforementioned industries. For cosmetics, the European Union's Seventh Amendment now bans the use of animal testing in the development of new cosmetic compounds. This has resulted in an immediate need for alternative in vitro technologies, and in particular, approaches for identifying acute toxicity resulting from metabolism.

In the chemical industry, European REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) legislation requires registration of an increasing number of chemicals based on knowledge of key toxicity endpoints. As new U.S. regulations may follow suit, early detection of potential toxicity problems will become bottom line driven in terms of profit margins.

In the U.S., hydraulic fracturing (hydrofracking) has raised public concerns due to potential environmental impacts and health effects to people exposed on a daily basis to toxicants used in hydrofracking solutions. Thus, studying toxicity of various toxicants in hydrofracking solutions has become an important area of research.

Meanwhile, workers in many different industries continue to run the risk of exposure to potentially hazardous chemicals. Growing concerns over occupational safety and the need for new hazards testing will be an expanding area for microarray chip technology, as companies seek rapid screening measures to test employees for hyper-sensitivity to potentially toxic or dangerous substances.

Once fully developed, microarray chip technology may be used by regulatory and environmental agencies, and perhaps even by consumers, to test for the possibility of harmful interactions between pharmaceutical products and certain food ingredients, as well as environmental chemical compounds that may lead to organ toxicity. ■

DR. WOODROW WHITLOW

Dr. Woodrow Whitlow, a distinguished award-winning NASA administrator and scientist has been appointed an Executive-in-Residence in Cleveland State University's Washkewicz College of Engineering. At CSU, Dr. Whitlow will help strengthen the collaboration between the college and industry and will assist CSU's efforts in diversity. "On behalf of the entire Cleveland State University community, I am thrilled to welcome Dr. Whitlow to CSU," said CSU President Ronald Berkman. "This widely respected administrator and outstanding scientist will enrich CSU's Washkewicz College of Engineering with a keen wisdom earned over the course of more than three decades with NASA. By sharing unique insights from his distinguished career, Dr. Whitlow will embody CSU's commitment to Engaged Learning."

Dr. Whitlow earned his bachelor's degree, master's degree and doctorate in aeronautics and astronautics from the Massachusetts Institute of Technology. Before coming to CSU, he held a variety of key leadership and scientific research positions within the National Aeronautics and Space Administration for 34 years before retiring in August 2013. He started his NASA career in 1979 as a research scientist at the Langley Research Center in Virginia, where he eventually led research programs to develop technology for airframe systems and oversaw research in structural mechanics, structural dynamics, computational structures and other areas. As deputy director of NASA's Kennedy Space Center in Florida from September 2003 to December 2005, Dr. Whitlow coordinated with the center director to oversee the safe resumption of U.S. human space flights after the Columbia shuttle tragedy and the successful implementation of new procedures to maximize the safety of space missions. From December 2005 to April 2010, Dr. Whitlow was director of NASA's Glenn Research Center in Cleveland. Under his leadership, the center increased its statewide annual economic impact to $1.2 billion while conducting integral aeronautics and spaceflight research. He served as the center's director of research and technology from September 1998 to September 2003. Most recently, he was associate administrator for mission support at NASA headquarters in Washington, D.C., where he was credited with streamlining NASA missions by realigning the agency's workforce and infrastructure. In addition to the management of complex organizations, Dr. Whitlow's areas of expertise include unsteady aerodynamics, computational fluid dynamics and aeroelasticity. He is a fellow of the American Institute of Aeronautics and Astronautics, and he is one of only three U.S. citizens who have been awarded the honorary doctorate of engineering by Cranfield University, Bedfordshire, United Kingdom. Dr. Whitlow has won many awards, including the NASA Distinguished Service Honor Medal and the Presidential Rank Award of Distinguished Executive. He has written more than 40 technical papers, primarily on unsteady transonic flow and aeroelasticity. ■

DUANE M. CROCKROM

Duane Crockrom, a veteran human resources professional who held managerial positions with Parker Hannifin Corporation and other Fortune 500 companies, has been appointed Executive-in-Residence at Cleveland State University's Washkewicz College of Engineering. "Cleveland State University is fortunate to have an executive of Duane Crockrom's caliber in residence," said CSU President Ronald M. Berkman. "His wealth of experience, particularly with regard to successfully connecting college graduates with rewarding employment opportunities, will be a tremendous asset for our students."

In his new role at CSU, Crockrom will serve as a liaison between the University and Parker, which enjoy a strong partnership. He will oversee initiatives including a scholarship program for students in the Washkewicz College of Engineering and in CSU's Monte Ahuja College of Business. "These scholarships will provide transformational opportunities for outstanding engineering and business students," Crockrom said. Through his career, Crockrom was involved with recruiting college graduates for various employers. CSU students often stood out to him, thanks to the University's emphasis on Engaged Learning. "The majority of recruits from CSU had some kind of hands-on experience, either through co-op opportunities or internships, that put them ahead of other job candidates," he said. "They had a solid foundation of knowledge, too, but they weren't just book smart." Crockrom joined Parker in 1988 and served as an area human resources manager, directing recruitment, talent development and employee relations. He retired in August 2013, although he continues to work with Parker in a consulting role. After launching his career in human resources with the Sherwin-Williams Company, Crockrom went on to work 10 years in various personnel positions with the Warner & Swasey Company. From 1986 to 1988, he served as human resources management consultant for NASA in Washington, D.C. Crockrom, a Cleveland native, holds a B.A. from Baldwin Wallace University and an M.B.A. from Lake Erie College, as well as an industrial relations certification from CSU. He is a member of the College of Engineering's Diversity Council and an emeritus member of the Visiting Committee. He also is past vice president of the Fenn Educational Foundation, past president of the Delta Alpha Lambda Chapter (Cleveland) of Alpha Phi Alpha Fraternity, a Prince Hall Mason and member of the Steward Board and Praise Choir of Lee Memorial AME Church. ■

STUDENT ORGANIZATIONS

IEEE STUDENT CHAPTER

SERVING THE COMMUNITY, BRINGING HOME THE HARDWARE

The 2013-14 academic year was one of unprecedented success for the Cleveland State Student Chapter of the Institute of Electrical and Electronics Engineers (IEEE). Under the leadership of Taylor Barto, the organization grew by 20 members and established a new committee system, allowing more students to get involved planning events like the VEX Robotics Regional Competition at the Cleveland State Bert L. and Iris S. Wolstein Center held on February 8.

This event hosted over 100 middle and high school students from throughout Ohio; as students competed in VEX Toss Up, a game where teams earn points by having their robots lift large balls into goals and positioning them in different zones on the field of play. The chapter will host two VEX competitions next year, in hopes of giving more schools the opportunity to qualify for nationals.

"VEX is great for many reasons," said Barto. "It gives competitors valuable engineering experience and the opportunity to meet students with common interests. It also promotes science, technology, engineering and mathematics (STEM) in schools, gives our chapter experience coordinating large events, and allows us to give back to the Cleveland area."

Giving back is just what IEEE student chapter members Will Monahan and Emily Nemeth did on May 2, when they presented to approximately 50 fourth grade students at Moreland Hills Elementary in Pepper Pike, Ohio. Will and Emily shared information on the many jobs that engineers do and how students can get introduced to the world of engineering through Lego and robotics activities. Monahan and Nemeth also demonstrated their MICROMOUSE and VEX robots, and concluded the program by giving students the opportunity to design and fly their own paper airplanes.

The chapter brought home plenty of hardware to Cleveland State after competing in the IEEE Region 2 Student Activities Conference at Rowan University in Glassboro, New Jersey April 4-5. Students took second place in physics and third place in the undergraduate paper competition. The success attained at the Conference, coupled with more experience staging VEX competitions, will prepare the chapter to possibly host the Region 2 Student Activities Conference at Cleveland State in 2016. ■


VEX


VEX COMPETITION SIGN-IN
IEEE
VEX
ROBOTICS
Autodesk
EMC

NATIONAL SOCIETY OF BLACK ENGINEERS

AMAZING NATIONAL CONFERENCE HELD IN NASHVILLE

At Cleveland State University, the National Society of Black Engineers (NSBE) provides engineering students with resources to develop leadership and networking skills through professional workshops. Partnering with the local engineering industry helps to provide NSBE students with internship and co-op opportunities..

The Cleveland State NSBE chapter's commitment is to assist as many students as possible to overcome difficulties and challenges. This is evident in the mission statement:

To increase the number of culturally responsible Black Engineers who excel academically, succeed professionally and positively impact the community.

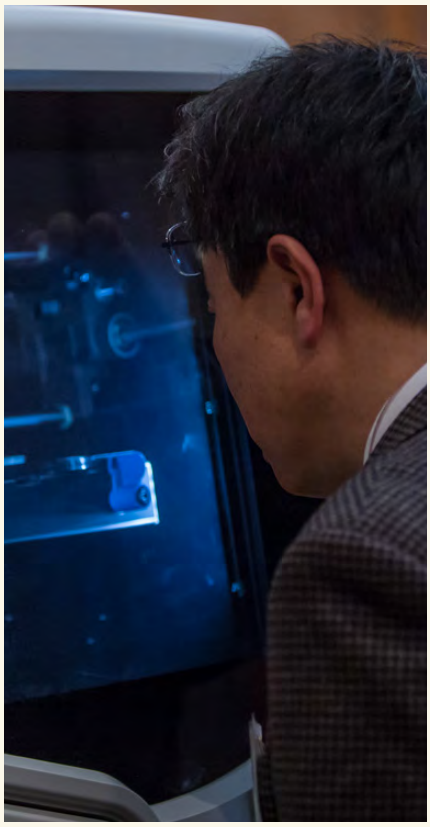
Last year, the NSBE National Conference was held in Nashville, Tennessee. The experience was an amazing opportunity for 12 Cleveland State engineering students, who represented the chapter and had the opportunity to interact with 300 companies. Cleveland State NSBE student members also had the chance to conduct onsite job interviews, with some of the students receiving offers from several different companies. Cleveland State is proud to partner with NBSE in providing young engineers the best opportunities to excel academically and professionally.

The NSBE, with more than 29,900 members, is one of the largest student-governed organizations in the country. Founded in 1975, NSBE has over 394 college, pre-college and technical professional/alumni chapters in the United States and abroad.

NSBE is a non-profit association owned and managed by its members. The organization is dedicated to the academic and professional success of African-American engineering students and professionals, and offers members leadership training, professional development, mentoring opportunities and career placement services. Comprised of 242 collegiate, 70 professional and 82 pre-college active chapters nationwide and overseas, these chapters are geographically divided into six regions. Cleveland State University's NSBE student chapter is in Region 4, also known as the motherland of all regions. ■

RESEARCH DAY

MATT HLAVIN, THE KEYNOTE SPEAKER OF THE EVENT, ADDRESSES THE STUDENTS, FACULTY, STAFF AND VISITORS.



MOMENTS FROM THE 2014 RESEARCH DAY

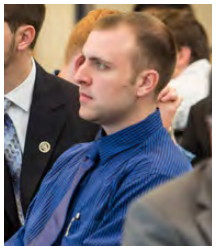
The College hosted its annual Research Day on April 10. The University community once again observed the cutting-edge research being performed by the Washkewicz College of Engineering. Our industrial visitors were impressed with the high-quality research displayed and all of the college's activities. The event was held in the Fenn Tower Ballroom and Fenn Hall, the home of the College of Engineering. It included poster sessions, laboratory tours, research presentations and a keynote speaker. Matt Hlavin, President and CEO at Thogus, CEO at Radiation Protection Technologies (RPT), CEO at Rapid Prototype and Manufacturing LLC, and CEO at JALEX Medical was the keynote speaker. The event ended with a poster competition. To all of our students, faculty and staff, we thank you for making this year's event a huge success. ■

DEAN KARLSSON SPEAKING TO STUDENTS, FACULTY, STAFF AND INDUSTRIAL VISITORS.

SENIOR

DR. WOODROW WHITLOW PRESENTS HIS KEYNOTE SPEECH.

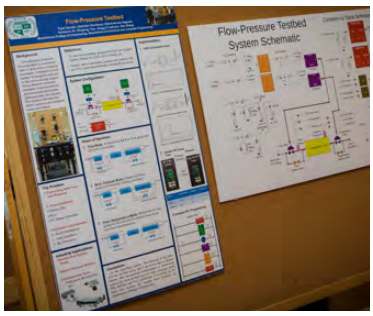
THE ENGINEERING COMMUNITY AND INDUSTRIAL VISITORS THOROUGHLY ENJOYED THE PRESENTATIONS OF THE EVENT.

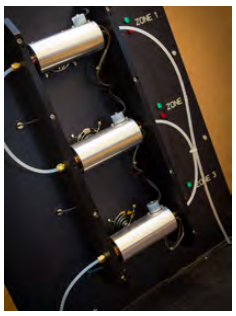



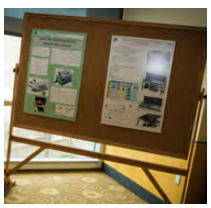


DESIGN DAY

The College hosted a Senior Design Project Day on May 2. The senior class from all undergraduate programs had the opportunity to present their projects to the University community and our industrial visitors who expressed their enthusiasm about the event and the top-quality of the projects. The students also had the chance to discuss their projects and network with the visiting company representatives. The event was held in the University Center Ballroom and included oral and poster presentations of the projects. Keynote speaker was Dr. Woodrow Whitlow, an Executive-in-Residence in the college and former NASA-Glenn Research Center director and NASA-Kennedy Space Center deputy director. Many thanks to all of the students, senior design faculty instructors and staff for making this year's event a huge success. ■








FENN ACADEMY

at CLEVELAND STATE

THE FENN ACADEMY, LED BY PROFESSOR MAJID RASHIDI AND MANAGED BY GREGG SCHOOF, MSSA, MANAGER OF ENGINEERING STUDENT PROGRAMS, IS A PARTNERSHIP BETWEEN THE FENN ACADEMY IS A PARTNERSHIP BETWEEN THE CLEVELAND STATE UNIVERSITY WASHKEWICZ COLLEGE OF ENGINEERING, LOCAL HIGH SCHOOLS, GOVERNMENT AGENCIES AND THE REGIONAL BUSINESS COMMUNITY. THESE GROUPS COLLABORATE TO PROVIDE EDUCATIONAL ACTIVITIES DESIGNED TO ENCOURAGE HIGH SCHOOL STUDENTS TO PURSUE A COLLEGE EDUCATION, AND ULTIMATELY CAREERS IN ENGINEERING.

FENN ACADEMY










Thousands of students from 47 high schools, in a five county region within northeast Ohio, benefit from Fenn Academy activities. These include on-campus Engineering Activity Days, the annual Engineer For A Day job shadowing program, curriculum consultation with educators, and a new Small Grants Program for high school STEM activities. Eligible students may also receive scholarships to attend the Washkewicz College of Engineering, once they graduate from high school.

In 2013-14 Fenn Academy staff and engineering faculty spoke to nearly 900 students in public, private and charter schools, including STEM schools in the Cleveland Metropolitan School District and other pre-engineering programs in NE Ohio. Forty-two percent of participating students were female, and more than 36 percent were minorities.

The Fenn Academy and the Engineering Dean's Diversity Council co-sponsored the Women in Engineering Day for high school girls. The Perry Initiative, a nationwide program to encourage young girls to enter the fields of engineering and medicine, also took place with the Academy's support, with a total of 54 girls taking part in these two events.

Since its inception, the Academy has also sponsored summer camps for both students and teachers, focusing on renewable energy and the introduction of STEM curriculum in high school classrooms.

Fenn Academy partners include College Now, Cuyahoga Community College, Lorain County Community College, the ACE Mentor Program of Cleveland, the Cleveland Engineering Society, the Ohio Board of Regents, the Ohio STEM Learning Network, the Six District Educational Compact, the West Shore Career Technical Education District, as well as 12 engineering student chapter organizations, local engineering organizations, and the faculty and staff of the Washkewicz College of Engineering.

The impact of Fenn Academy activities is impressive. From 2007 to 2011, undergraduate fall enrollment for engineering students saw a 41 percent increase. While over the past five years, engineering freshmen enrollment has risen 47 percent.

The Fenn Academy is grateful to its current sponsors, including Lincoln Electric, Middough, and Lubrizol. To learn more about the Academy's activities, visit www.csuohio.edu/fennacademy, or call Gregg Schoof, Manager of Engineering Student Programs, at (216) 687-5272. To discuss how to become a sponsor or make a donation to the Fenn Academy, please contact Paul Pawlaczyk, Director of Advancement, at (216) 875-9754. ■

ALUMNI ENGAGEMENT

MAKING A DIFFERENCE FOR KIDS

Washkewicz College of Engineering alumni, students, and friends gathered at Fenn Hall on March 27 to participate in the CSU Engineering Alumni Chapter's annual Toy Modification Workshop. Participants re-wired toys with remote controls, giving children with limited fine motor skills and other physical challenges the opportunity to use them. The group also repaired broken children's toys that were then sent to local social service agencies for distribution. The workshop is staged in conjunction with RePlay For Kids, a non-profit organization of volunteers who repair and adapt toys and assistive devices for children with disabilities in Northeast Ohio. The next CSU Engineering Alumni Chapter Toy Modification Workshop is slated for November/December 2014. To become involved contact Engineering Alumni Chapter leader Joni Ledinsky '00, '06, at JLedinsky@usg.com.

SHARING KNOWLEDGE WITH THE NEXT GENERATION OF ENGINEERS

More than 10 alumni and friends shared their knowledge and expertise with CSU engineering students, faculty, and staff this past academic year through their participation in the Washkewicz College of Engineering Speaker Series. Presentation topics included Making a Difference While Making a Profit, Fighting and Winning the New Cyber Security War and Promoting One's Engineering Skills to Maximize Professional Opportunity. Presentations take place in Fenn Hall on Tuesdays or Thursdays at noon and are typically 30 minutes in length, followed by a Q & A Session. The College is in the process of developing its Speaker Series schedule for the 2014-15 academic year. Contact Paul Pawlaczyk at p.pawlaczyk@csuohio.edu, or call (216) 875-9754 with your presentation topic ideas or if you are interested in participating. ■

Lighting the Path to Sucess

REBECCA A. BOMPIEDI, BS, '84 AND MS, '90
Senior Vice President for Business Transformation
PHILIPS LIGHTING AMERICAS

Originally a pre-dentistry student at John Carroll University, Rebecca A. Bompiedi soon found she was more interested in engineering. In the early 1980s, after spending a day touring the campus and college with Cleveland State University College of Engineering Dean George Coulman, her mind was set. "I was sold by the end of the day," said Bompiedi, who earned her Bachelor's Degree in Chemical Engineering from Cleveland State in 1984.

Bompiedi says Cleveland State University provided her with the knowledge of real-life engineering applications. "I came into my first job with academic experience that was both innovative and practical, and was able to start solving problems immediately, which helped build my professional credibility," Bompiedi said. At the time, Bompiedi was the only woman in the plant outside of the shipping department.

MOVING WITH THE TIMES AND TECHNOLOGY

Bompiedi held various positions in engineering and technology, ranging from research and development to manufacturing capacity management and quality control. As the manufacturing industry began moving from quality control and assurance to quality management systems, Bompiedi returned to Cleveland State to pursue her Master's Degree in Industrial Engineering. "Dr. Andrew Liou was inspirational about quality control and what it took to drive change," said Bompiedi, who completed her advanced degree in 1990.

By the mid-90s, Bompiedi was involved with new product development for GE Lighting, as well as leading their Six Sigma corporate quality initiative that GE's CEO Jack Welch had advocated. The program called for long-term production controls that identified and eliminated root problems to increase overall efficiency, thus impacting the company's bottom line.

In 1998, Bompiedi moved into a global technology leadership role, managing 13 GE plants worldwide. As a lighting transformation/strategic initiatives leader, she led a $500 million restructuring to phase out incandescent and linear fluorescent lighting. From 2007 to 2009, she was based in Europe, until she was called back stateside to help reshape GE Lighting, helping to make them a competitor in the digital lighting arena.

By 2013, she was on the move again. As senior vice president of business transformation at Philips Lighting Americas, Bompiedi is now in charge of Philips Accelerate Initiative, overseeing new operational management strategies. Keeping up with technology and innovation changes in digital lighting makes product development and production a challenge. "New technology is coming out every six to nine months, not unlike cell phone technology that continues to upgrade features and functionality," said Bompiedi. Analog technology is disappearing, as LED technology offers greater efficiency. "Twenty percent of our energy costs today revolve around lighting, so reducing total consumption allows us to offset other demands," Bompiedi said. End user needs range from pleasure to safety. New lights can respond automatically to changes in room light levels, while advances in roadway and community lighting provide greater security. Even hospitals are changing lighting systems to address the emotional aspects of treatment and recovery, making MRI environments less fearful for children, and resulting in quicker recovery times for patients.

ALUMNI COMMITMENT AND RECOGNITION

As a member of the Washkewicz College's Visiting Committee since 2011, Bompiedi is eager to be part of the new direction the committee is taking under the guidance of Dean Anette Karlsson. The focus is to drive engagement with alumni and develop more co-ops with regional businesses. "I think the co-op program is a hallmark of Cleveland State," Bompiedi said.

"I'm really honored to be an Engineering Distinguished Alumni Award recipient and am thrilled to see the growth at Cleveland State. I believe the College of Engineering has a real opportunity to be a monumental influence in Cleveland. Through the co-op program, and the engagement of alumni and the business community, there is a lot of opportunity for growth here," said Bompiedi.

In January 2014, Bompiedi established an endowed scholarship fund to help engineering students with on-campus living expenses. "I think students benefit more from the overall student experience, if they are fully immersed in campus life," Bompiedi said.

While there is little time in her busy career for hobbies, she does enjoy biking and travel. While working in Germany for two years, Bompiedi, her husband and two daughters gained a greater sense of appreciation for Europe, and frequently return for vacations. As for future family engineers, their 16-year-old daughter recently studied robotics and given her interest in science, may follow her mother's career path. ■

MR. RAY IS SHOWN IN THE TOP ROW, RIGHT

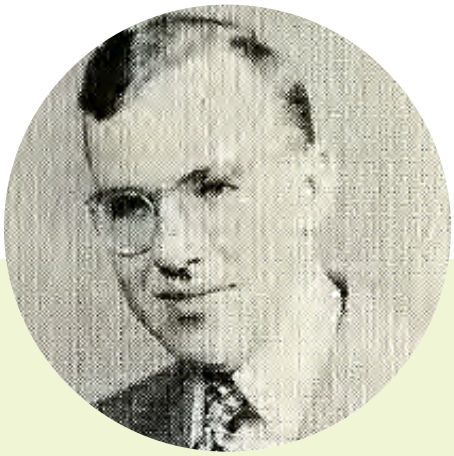
The Estate of Frederick H. Ray Leaves a Legacy Gift of $733,000

The funds will support capital improvements and equipment purchases for the planned renovation of Fenn Hall (formerly Stilwell Hall).. The gift was made in memory of Ray's late wife Dorothy (Mainey) Ray, a fellow engineer who studied at Purdue University and whom Ray met in Cleveland.

The funds will support capital improvements and equipment purchases for the planned renovation of Fenn Hall.

"We are extremely grateful to Mr. Frederick Ray for his very generous gift that illustrates the enduring legacy of the College," said Anette Karlsson, Ph.D., Dean of the Washkewicz College of Engineering. "It will add significant momentum to the creation of a state-of-the-art engineering environment. His philanthropy demonstrates the indelible impact our College has on the lives of its students, and the remarkable impact alumni can have when giving back."

As a student, Ray was an active member of the Iota Eta, Alpha Chi and Phi Epsilon Nu fraternities. He also served as president of the Fenn Society of Structural Engineers and on the Cauldron student newspaper staff. Ray died April 11, 2013 at the age of 91. ■



FREDERICK H. RAY

Passion for Radio Leads to Unique Gift

As a young boy, Angelo Licata, M.D., Ph.D., would visit his grandparents' home and gather around their shortwave radio, listening to programs broadcast from Europe and other parts of the world. The thought of radio signals traveling such vast distances fascinated him. But how did it all work? His uncle, an electrical engineer, provided him with an electronics manual, and Licata was instantly hooked. He began gathering electronic components from wherever he could find them, and soon after building his own shortwave radio, was listening to people from around the world.

College, medical school, family, and a busy career as a clinical endocrinologist and Director of the Center for Space Medicine at the Cleveland Clinic forced Licata to shelve his passion for radio. Later in life, after more than 25 successful years in medicine, he dusted off his old radio and once again began dabbling in his favorite hobby.

Following the passing of a friend, who was also an avid radio operator, Licata found himself in possession of a vast collection of electronic components. Given their mutual love of radio, Licata began investigating who might be able to use the treasure trove of electronics that his friend had willed him. He reached out to his former Cleveland Clinic colleague Meredith Bond, Ph.D., now Dean of the College of Sciences and Health Professions at Cleveland State. Bond connected Licata with the Washkewicz College of Engineering and the Institute of Electrical and Electronics Engineers (IEEE) student chapter.

The IEEE students gladly accepted Licata's generous in-kind donation, and had a chance to visit with him when he delivered the components to campus. "I was very impressed with the students and their work, along with the engineering program as a whole," said Licata. "My experience that day made me want to become more engaged."

Just a few weeks later, Licata did just that as he presented to students, faculty and staff as part of the Washkewicz College of Engineering Speaker Series. His program, entitled Astronauts, Engineers and one Endocrinologist, A Chance Meeting in Time, featured discussion on the field of endocrinology and how it helps resolve NASA medical knowledge gaps, the challenges of medicine/therapy in a non-terrestrial environment, and a new risk assessment model to predict bone fractures in extra-terrestrial locations.

"Sharing my knowledge and interacting with smart, energetic students and faculty was a very exciting opportunity for me," said Licata. "It made me think, 'Hey, being a college professor would be pretty darn nice.' " While joining the college faculty ranks may not be in Licata's immediate future, becoming a college student again just may be. "I would like to learn more about CSU's electrical engineering curriculum as a matter of educating myself to help with my hobby, and just in general," said Licata. "It is never too late to learn something new. ■

ANGELO LICATA, M.D., Ph.D

THANK YOU FOR YOUR GENEROUS SUPPORT!

A heartfelt thank you to the 575 donors who contributed $8,196,000 in cash in support of the Washkewicz College of Engineering during Fiscal Year 2014 (July 1, 2013 – June 30, 2014). This represents a new cash record for the College, and the second highest number of College donors in the past five years. College attainment (gifts and pledges) of $11,076,000 was also a record, as was total University attainment at $20,390,000.

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 of $100 or more from alumni, friends, corporations and foundations to the Washkewicz College of Engineering during the period of July 1, 2013 - June 30, 2014. ■

$1 MILLION OR MORE
Parker Hannifin Foundation
Mr. and Mrs. Donald E. Washkewicz '72

$500,000 - $999,999
Mr. Frederick H. Ray* '49

$100,000 - $499,999
Mr. Matthew K. Hlavin '99

$50,000 - $99,999
Mrs. Betty L. Gordon

$25,000 - $49,999
Mr. and Mrs. Anthony Colnar '42
National Council of Examiners for Engineering and Surveying
Rockwell Automation

$10,000 - $24,999
Dr. Bart A. DiLiddo '54
The Lincoln Electric Foundation

$5,000 - $9,999
Mrs. Rebecca A. Bompiedi '84
Mr. James D. Heckelman '62
The Lubrizol Foundation
Ms. Amy Struble
Mr. Terrence V. '64 and Mrs. Mary K. Zuk

$2,500 - $4,999
Mr. Martin C. Ignasiak '78
Dr. Marie Anette Karlsson
Mr. Franklyn W. Kirk* '60
Mr. Eugene A. Klingshirn '46
Dr. Angelo Licata
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Mr. Daniel Shellek ‘51
Mr. Anthony Siracusa ‘91
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Dr. Timothy A. Wolfe ‘73
Mr. Denis Zaharija ‘01
Ms. Elizabeth J. Zavada ‘73

$100 - $249

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Mr. John R. Anzlovar
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Mr. Larry R. Coulter ‘69
Mr. and Mrs. Duane Crockrom
Mr. Ronald E. Croucher ‘70
Mr. Ronald C. Cull ‘70
Mr. Theodore H. Czupik ‘70
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DR. TAYSIR NAYFEH HONORED FOR ULTRACONDUCTIVE WIRE

Dr. Taysir Nayfeh of the Department of Mechanical Engineering received the Trailblazer in Copper Technology Award for his game-changing research into ultraconductive copper wire with the potential to dramatically improve electrical systems and devices.

The Copper Development Association presented the award to Dr. Nayfeh during the Nano-Carbon Enhanced Materials Consortium in Cambridge, Mass.

"I am gratified and humbled by this honor," said Dr. Nayfeh, Professor of Mechanical Engineering at CSU. "This is a wonderful validation of our work at Cleveland State University, which we hope will benefit industries around the world."

Dr. Nayfeh and his research team, which includes Anita Wiederholt and Jamal Chehab, have developed a nanocomposite copper wire whose ultraconductive properties surpass the electrical conductivities of any known material on Earth.

The nanocomposite copper wire is currently more than twice as conductive as pure copper and with continuous improvement could ultimately reach more than 100 times the conductivity of copper. It promises to improve the performance of electric machines and dramatically reduce the size and weight of motors. It also will reduce losses in electrical power lines.

This breakthrough could revolutionize a wide range of applications, from residential wiring to the creation of lighter high-performance motors for aircraft, electric cars, electric submarines and other vehicles.

NASA HONORS EXECUTIVE IN RESIDENCE WITH AGENCY'S HIGHEST AWARD

Dr. Woodrow Whitlow, Jr. received the Distinguished Service Medal from the National Aeronautics and Space Administration (NASA) during the Agency's Honor Awards Ceremony. The ceremony is an opportunity for the NASA Administrator to recognize the "BEST of the BEST" at NASA, by awarding them with NASA's highest honor. The Distinguished Service Medal is NASA's highest form of recognition and is presented to individuals whose contributions are so extraordinary that other forms of recognition by NASA would be inadequate. Dr. Whitlow, who held a variety of key leadership and scientific research positions with NASA over a 34-year career, is now serving as a Washkewicz College of Engineering Executive in Residence. He won many awards while at NASA including the Presidential Rank of Distinguished Executive Award.

DR. MOO-YEAL LEE PUBLISHES IN NATURE COMMUNICATIONS

Dr. Moo-Yeal Lee of the Department of Chemical and Biomedical Engineering is a co-author of an article published in the prestigious journal Nature Communications.

In "High-throughput and combinatorial gene expression on a chip for metabolism-induced toxicology screening," Dr. Lee and his colleagues at Rensselaer Polytechnic Institute and the University of California, Berkeley, as well as Samsung Electro-Mechanics and Solidus Biosciences report on their development of the "Transfected Enzyme and Metabolism Chip" – TeamChip for short.

Their new microarray biochip can mimic drug metabolism in human livers and predict likely adverse drug reactions.

"Many compounds, including drugs, chemicals and even environmental toxicants, can be converted into different molecules in human livers, which often results in enhanced toxicity," said Dr. Lee, Assistant Professor in CSU's Department of Chemical and Biomedical Engineering.

Predicting the toxicity of compounds and their products of metabolism is an important area of research for developing safer drugs.

"The problem is each individual has different levels of drug-metabolizing enzymes in the liver, which makes assessment of drug metabolism and toxicity very difficult," said Dr. Lee. "Our biochip allows us to assess this problem with extremely small samples, with a volume of only 60 nanoliters."

Dr. Lee and his graduate students at CSU are now refining the biochip technology, in hopes of better predicting what happens in the body when compounds are delivered.

THE NATIONAL SCIENCE FOUNDATION AWARDS TWO MAJOR RESEARCH INSTRUMENTATION GRANTS TO CSU

Dr. Chandrasekhar Kothapalli, Dr. Nolan Holland and Dr. Orhan Talu of the Department of Chemical and Biomedical Engineering, in collaboration with Dr. Xue-Long Sun (Chemistry) and Dr. Andrew Resnick (Physics) of CSU's College of Sciences and Health Professions received the first grant for the project titled "MRI: Acquisition of an integrated atomic force microscope/inverted optical microscope for interdisciplinary research at Cleveland State University" for the amount of $289,939.

Dr. Ye Zhu, Dr. Chansu Yu, and Dr. Fuqin Xiong of the Department of Electrical and Computer Engineering in collaboration with Dr. Haodong Wang (Computer and Information Science) of CSU's Monte Ahuja College of Business and Dr. Miron Kaufman (Physics) of CSU's College of Sciences and Health Professions received the second grant for the project titled "MRI: Acquisition of a 4G/LTE Wireless Communications Test Set" for the amount of $252,699.

These grants and the equipment associated with them will be of tremendous use to various ongoing projects in the College and will further strengthen the intra- and inter-college collaborations, enhancing the infrastructure at the University.

COLLEGE RECEIVES $1.5 MILLION GRANT FROM THE NATIONAL SCIENCE FOUNDATION TO DEVELOP OPTIMAL PROSTHETIC LEG

Dr. Dan Simon of the Department of Electrical and Computer Engineering in collaboration with Dr. Hanz Richter and Dr. Antonie van den Bogert of the Department of Mechanical Engineering received a $1.5 million grant from NSF for a four-year project to develop a prosthetic leg that emulates able-bodied gait and utilizes a groundbreaking energy-regeneration system.

This revolutionary new device promises to dramatically improve the quality of life for people with transfemoral (above-knee) amputations. With current prostheses, these amputees typically walk with a stiff-legged gait, which quickly can lead to other health issues, including degenerative joint disease.

"Our prosthesis will allow amputees to walk with the same natural gait as an able-bodied person and reduce the adverse health effects caused by inadequate prostheses," said Dr. Simon, Professor in CSU's Department of Electrical and Computer Engineering. "With our prosthesis, they'll be able to lead healthier and more active lives."

Innovative energy-regeneration technology will allow the new prosthesis to operate for significantly longer intervals than current prostheses, which require frequent battery charges.

"Our design will mimic the human leg, which operates by transferring energy between the knee, which absorbs energy, and the ankle, which produces energy," Simon said. "Our prosthesis will capture energy at the knee and pass it on to the ankle, but instead of using ligaments and tendons, we'll use supercapacitors."

Each member of the research team brings a unique expertise to the project.

Dr. Simon specializes in microprocessor design and optimization. Dr. Richter, Associate Professor in the Department of Mechanical Engineering, specializes in mechanical systems and controls. Dr. van den Bogert, the Parker Hannifin Endowed Chair in the Department of Mechanical Engineering and past president of the International Society of Biomechanics, is a leading authority on biomechanics and gait analysis.

The team will conduct research in the new Parker Hannifin Human Motion and Control Laboratory in the Washkewicz College of Engineering, a state-of-the-art facility with a V-Gait treadmill that uses motion sensors and 10 cameras to capture human movement. Parker Hannifin, a global leader in motion and control technologies, has pledged $1.5 million for an endowed professorship and research into human motion and control at CSU.

Prosthesis testing will be conducted using robot technology at CSU, and human trials will be conducted at the Cleveland VA Medical Center.

STATE AWARDS GRANT TO ESTABLISH AN ADDITIVE MANUFACTURING 3 D PRINTING LABORATORY FOR WORKFORCE DEVELOPMENT

The College has been awarded a $293,500 grant from the Ohio Board of Regents in support of the College's proposed Workforce Development Equipment and Facility Program in Additive Manufacturing.

Additive manufacturing allows products and components to be made from a digital model, using 3-D printers. This application is being used in a wide range of industries, including aerospace, automotive, biomedical, defense and materials manufacturing.

The award will fund the purchase of electronics and polymer 3-D printers, to be housed within the College's Addictive Manufacturing Instructional and Training Laboratory. The educational, training and research outcomes from the laboratory will lead to the establishment of the Center for Innovative Manufacturing.

Access to the latest in 3-D printer technology will enable faculty, students and local businesses to develop prototypes and products, while engaging in 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 an emerging industry," said Anette Karlsson, Dean of the Washkewicz College of Engineering.

The college will work in partnership with Youngstown State University, Cuyahoga Community College and Lorain County Community College, offering students from each institution access to a unique educational environment designed to further their interest in the applications of addictive manufacturing.

The Washkewicz College of Engineering will collaborate with rp+m, a leading additive manufacturing company, which will assist in developing the project. The College will also collaborate with MAGNET, the Ohio Aerospace Institute and regional manufacturing companies to offer professionals on-campus training, thereby expanding industry knowledge and activity within the field.

STUDENT CHAPTER OF ENGINEERS WITHOUT BORDERS RECEIVES $10,000 GRANT FROM EWB-INTERNATIONAL AND THE ALCOA FOUNDATION

The CSU student chapter of Engineers without Borders (EWB) received the $10,000 grant award for its Water Quality and Alternative Energy project in Belize. Students designed and constructed the August Pine Ridge School/Hurricane Shelter in Belize.

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