CLEVELAND STATE UNIVERSITY

WASHKEWICZ

COLLEGE OF ENGINEERING

2015 - 2016 ISSUE

YEAR IN REVIEW

MEET OUR NEW FACULTY

WASHKEWICZ COLLEGE OF ENGINEERING GRADUATES THE BEST READY-TO-GO ENGINEERS

INNOVATIVE ADVANCED MANUFACTURING 3D PRINTER LAB

A Message from the Dean

Dear Alumni & Friends,

The 2014-15 academic year was yet another successful 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.

I am extremely pleased to announce that we are starting to plan for a new engineering building, with a planned move-in date of August 2017. This new building is possible thanks to the continued support of Donald and Pamela Washkewicz, who during the year provided an additional gift of $5 million to the College. With this additional funding, combined with support from other individuals and organizations, we now have the opportunity to – for the first time – construct a building that is dedicated to engineering education and research. The new building will provide modern classroom space and research space, as well as space for a range of extra curriculum activities for our students. We are particularly excited about the MakerSpace, which has been made possible by the generous support of Dan T. Moore, a trustee of Cleveland State University.

This year, we welcomed the faculty and students of Computer Science to the College. This program was previously hosted by the Monte Ahuja College of Business. With the move, we now welcome 10 faculty members, 280 undergraduate students and 80 graduate students. The Computer Science program is located in what used to be the Department of Electrical and Computer Engineering. To reflect the expansion, we renamed the department Electrical Engineering and Computer Science.

I am excited to report that College enrollment continues to grow considerably. Excluding the addition of Computer Science students, our five-year total enrollment is up more than 40 percent, and our five-year enrollment of African-American and Hispanic/Latino students is up 35 and 50 percent, respectively. To accommodate these increases, we have begun adding new faculty, five of whom are featured in this publication.

We encourage alumni and friends to remain 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, sponsoring Senior Design projects, sharing your expertise with our students, making a gift, attending our events. You can learn more about these engaging opportunities by visiting our website at www.csuohio.edu/engineering, or contacting us at (216) 687-2555 or via email at engineering@csuohio.edu. Your ongoing involvement with and support for the Washkewicz College of Engineering are greatly appreciated!

As evidenced in 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
2015-2016 ISSUE

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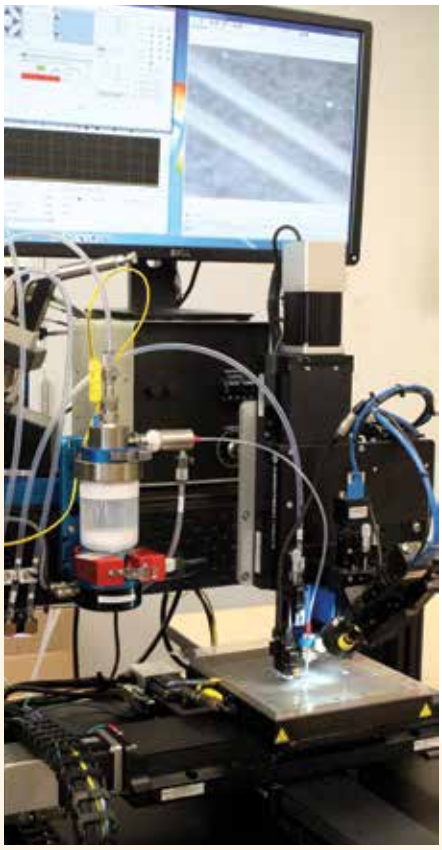

INNOVATIVE ADVANCED MANUFACTURING —
The Washkewicz College of Engineering was awarded an Ohio Department of Higher Education equipment grant for workforce development. These funds combined with college funds allowed for the purchase of two electronics and seven polymer state-of-the-art 3D printers that led to the establishment of the Additive Manufacturing Instructional and Training Laboratory in the College.

MEET THE NEW FACULTY IN WASHKEWICZ COLLEGE OF ENGINEERING —
Over the last three years, the Washkewicz College of Engineering hired 14 faculty members. The new faculty are highly dedicated to teaching and also bring new research efforts to Cleveland State University. Read the exciting research background and interests of five of them.

WASHKEWICZ COLLEGE OF ENGINEERING GRADUATES READY-TO-GO ENGINEERS —
In the Washkewicz College of Engineering, providing the best engineering education and the academic skills for professional success to our students is what we strive for. We are proud of our students and graduates and we never stop listening to them to continuously improve our programs and services. Read a small sample of our students' stories.

Photo: Sarah Kay Watkins
Valedictorian, Spring 2015

INNOVATIVE ADVANCED MANUFACTURING

Recently, the Washkewicz College of Engineering of Cleveland State University was awarded an Ohio Department of Higher Education equipment grant for workforce development. These funds combined with college funds allowed for the purchase of two electronics and seven polymer state-of-the-art 3D printers that led to the establishment of the Additive Manufacturing Instructional and Training Laboratory in the College. Our goal is three fold: (i) to continue to provide our engineering students with the latest in advanced manufacturing technology; (ii) to attract incumbent professionals from regional industry and thereby increase industry activity and expertise within this growing field; and (iii) to form new and strengthen existing partnerships between Cleveland State and other regional educational institutions and industry leaders in an effort to develop collaborations to enhance innovative manufacturing within the fields of aerospace, automotive, biomedical and defense.

Through our industrial (rp+m, OAI, MAGNET) and educational (Tri-C, LCCC, YSU) partners, we plan to provide business support services for entrepreneurs by training employees at our new lab facility, as well as developing new educational tracks and programs to educate our students in this technology. By providing additive manufacturing training and innovation capabilities such as those offered through 3D printing, our goal is to help strengthen the regional economy.

MASTERING ELECTRONICS PRINTING TO MEET INDUSTRY NEEDS

The College of Engineering has acquired two Optomec Aerosol Jet 200 electronics 3D printers, currently the only such printers in an educational institution in the NE Ohio region (Figures 1 and 2). Dr. Lili Dong, Associate Professor in the Department of Electrical Engineering and Computer Science, is managing these printers and is collaborating with industry interested in this technology. She says that "this technology is really interdisciplinary in that it involves electrical, mechanical and chemical engineering skills to operate these printers." Through a collaboration with a company, Dr. Dong and her doctoral students drew a membrane switch circuit, using computer-aided-design software, and transferred it to the Optomec printer. The circuit consisted of three layers (conductive, interface, and dielectric), and they used silver, carbon and dielectric inks to print the parts on these three layers, respectively. Another collaboration involved the printing of a LED lighting circuit. Dr. Dong says that "companies are showing an interest in this technology and would like to collaborate with us on a variety of projects." As the technology becomes known more widely, our collaboration with interested companies will only increase and will lead to the expansion of the lab and our printing capabilities.

3D POLYMER PRINTING IN ACTION

The College has six Stratasys uPrint SE Plus 3D printers and one Stratasys Fortus 250mc 3D printer. Dr. Mounir Ibrahim, Professor and Chair of the Department of Mechanical Engineering is managing the printers and using them in our educational programs.

As part of the Mechanical Engineering curriculum at Cleveland State University, the Stirling engine technology is taught in thermodynamics courses. Since 1980, NASA has worked on the development of Stirling engine technology, first for automotive uses and then for space applications. Using liquid helium as the working fluid, Stirling space engines have linear alternators that produce electricity. Whether being used to provide power or refrigeration, these machines operate in a closed cycle, in which a working fluid is cyclically compressed and expanded at different temperatures. In collaboration with Stratasys, Dr. Ibrahim and his students were able to print parts of a Stirling engine using a 3D polymer printer (see Figure 3). These parts were assembled together with additional parts made via traditional manufacturing, resulting in an

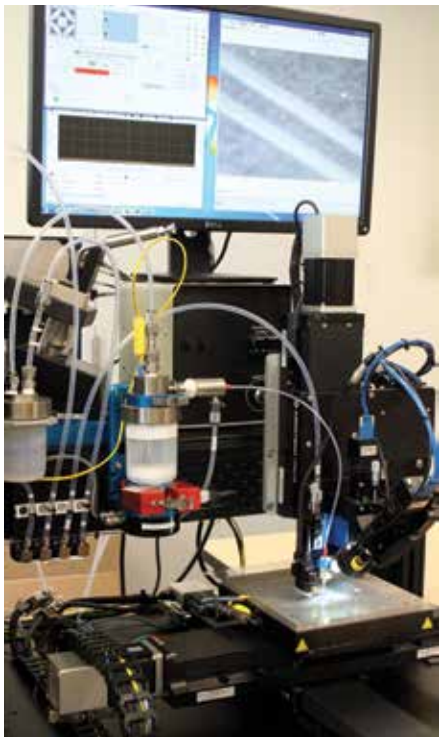

Figure 1. Optomec Aerosol Jet 200 electronics 3D printer.

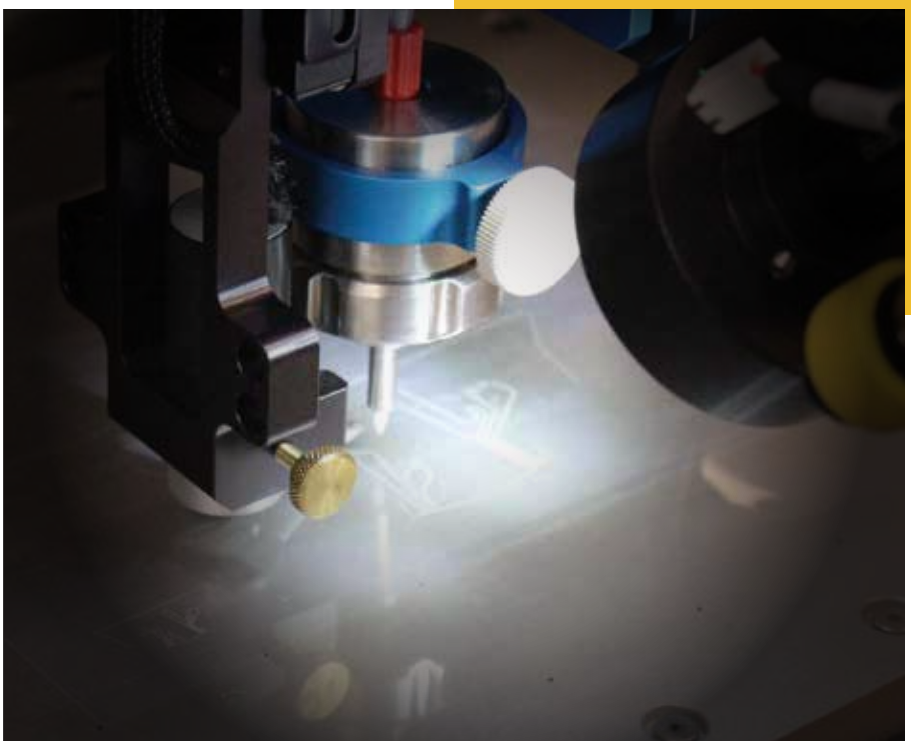

Figure 2. The AJ200 printer in action.

Figure 3. Parts of a Stirling engine printed with a 3D polymer printer.

Figure 4. Faculty being trained in using a Stratasys uPrintSE Plus 3D printer.

operational engine. Stirling engines can run on different types of heat sources: fossil fuel, nuclear, solar and even - as was the case in this project - a common light bulb. This is the first time CSU students have produced a Stirling engine, which will be used as a demonstration tool to show engine performance. Changes can be made to different components of the engine, which would then correlate to changes in engine performance, in terms of output and efficiency.

The potential of this manufacturing technology is great and the College is excited with the opportunities, both at the student-education and industrial training levels. During the current academic year, the printers will be used in existing courses and to make prototypes for Senior Design projects. ■

ORTHOPAEDICS AND MULTI-SCALE TISSUE BIOMECHANICS

OVERVIEW

Dr. Jason Halloran is a Mechanical Engineer and earned his Bachelor's, Master's and Ph.D. degrees from the University of Denver, where he studied in the Mechanical and Materials Engineering Department. His graduate work focused on development of virtual prototyping tools for the orthopaedics device community. In 2007, as a Postdoctoral Fellow, Dr. Halloran joined the Biomedical Engineering Department at the Cleveland Clinic. There, he studied techniques to couple modeling domains for prediction of tissue mechanics in the context of whole body movement. Dr. Halloran also spent an additional five years as a Staff Researcher at the Cleveland Clinic, where he worked on various National Institutes of Health-funded projects, and also developed working relationships with numerous orthopaedics device manufacturers. In Fall 2014, based on his record, experience and training, Dr. Halloran joined the faculty in the Department of Mechanical Engineering of CSU.

Dr. Halloran's research has largely been focused on using computer simulation to study various aspects of human mechanics (Figure 1). More specifically, he has an established record with applications in multi-scale tissue biomechanics, joint mechanics (knees) and orthopaedics. Within this context, and in his current role as an Assistant Professor at CSU, he has developed a focus on cell and related micro-structural spatial scale analysis. He hopes to develop techniques to better quantify the role of mechanics on the biological response of neurons (at spatial scale D in Figure 1).

ORTHOPAEDICS AND MUSCULOSKELETAL BIOMECHANICS

In the two fields of orthopaedics and musculoskeletal biomechanics, Dr. Halloran's contributions can be divided into studies that focus on basic science questions, and those with an applied component. On the applied side, his work has included the study of surgical procedures for reconstruction of failed (or failing) joints, such as the knee. This work has largely been motivated to help improve the performance of both new and current joint replacements or to support the clinical decision making process for physicians. As background, in a clinical setting, arriving at a treatment plan is often based on a philosophy developed through experience and training. Within this context, building tools to facilitate beneficial decision-making, along with qualifying outliers that may need additional attention, will ultimately improve patient satisfaction and curtail the need for costly revision operations.

During Dr. Halloran's time as a Staff Researcher at the Cleveland Clinic, and now in his current role at Cleveland State, orthopaedics-driven research has offered the opportunity to provide analysis for industry as well as insight for general clinical questions. In this context the focus has been on joint reconstruction procedures, both with and without a device, and development of related tools for planning of surgical procedures (Figure 2). Qualifying the effectiveness of a given approach, for a given patient, will help inform clinical decision-making, improve patient outcomes and ultimately lowers the overall cost of health care. For this context, technical challenges are being addressed, including both experiments and simulation to understand the mechanical consequences of various joint reconstruction operations. Related to Dr. Halloran's background in orthopaedics, his work has

JASON HALLORAN, Ph.D.
Assistant Professor
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also included development of general simulation frameworks to study knee implant mechanics. In particular, highlights include published work addressing validation of finite element (FE) models of multiple currently available experimental setups (Figure 1.B) (Halloran et al., 2005, 2010). This work has had particular importance for those developing joint replacements, as they demonstrate that clinical benefit could be realized when properly balanced implantation is achieved.

Critical to any of the above, establishing the predictive capacity of simulation-based approaches in light of known uncertainty is vital if such tools are to be used in a clinical setting. Also confounding this issue, data available in an experiment may be absent within a clinic setting. Complimentary experiments and simulation, designed for the explicit purpose of elucidating the primary markers that dictate the performance of various procedures, can provide the basis to address these issues (Figure 2). Predictive capacity can be established and areas can be highlighted that require innovative approaches that gather data vital to the success of surgical planning tools. Such work may even qualify whether specific tools are sufficient or necessary. This has, and will continue to be, a particular focus of Dr. Halloran's lab (Figure 2).

MULTI-SCALE TISSUE MECHANICS

The human body moves and deforms to accomplish everyday tasks, but this also has implications for underlying biological response. In particular, various cells that populate our tissue serve to support growth and maintenance, as well as provide feedback so that we can interact with the world. Important cellular functions may change due to disease, injury and/or aging. For cartilage, the low friction bearing surface in our joints, osteoarthritis can attack the integrity of this tissue, which ultimately results in pain and loss of function. Dr. Halloran has studied techniques for translating between the spatial scales of cartilage, with an emphasis on understanding the mechanical environment of chondrocytes. Chondrocytes are the sole cell type found in cartilage and are responsible for the growth, maintenance and overall health of this tissue. His contributions include aiding in the development of a multi-scale simulation framework for prediction of chondrocyte mechanics, (Figure 1.C-D), which focused on understanding potential cellular interactions for a given population. Previous studies have typically adopted a single cell assessment of mechanics, and the new results of his work indicate that a population of cells experience variable response based on their neighbors, as well as their location in the tissue. In this context, he has also contributed intellectual perspective, where he was the first author on a review article to address current challenges in multi-scale analysis of cartilage (Halloran et al., 2012).

Beyond cells that maintain tissue health, nerve cells or "neurons" provide important function related to proprioception, pain and sensation. Commonly termed "mechanotransduction," relating neuron signal production to tissue level mechanics is an area with tremendous opportunity (Figure 1.B-D). Establishing this capability has implications to understand healthy and diseased neuron behavior, where cell function is influenced by numerous debilitating diseases. As a first step in this effort, understanding the mechanics and corresponding biology of microtubules, a physical support and transport structure in neurons, is being studied. Specifically, microtubules house the mechanisms for communication between the cell body and what can be called the "axon tip." For neurons, the axon tip is an important location that responds to, supplies and/or collects information for the central nervous system, depending on the specific purpose of the neuron. Cellular response, and the corresponding function of the nervous system, is dictated by a complex array of processes that respond to the chemical and mechanical environment of the cell and axon. Ongoing work in Dr. Halloran's lab includes development of a dynamic simulation tool that is able to predict the sliding and bending behavior of microtubules. With a particular focus on the role of mechanics on the mechanobiological process, the proposed simulation tool will be used to better understand proper function within neurons. The ability of the microtubules to withstand mechanical insult, for both healthy and diseased cells, will also be studied. As an important step in this process, experiments are currently being designed to complement and validate these simulations. ■

Halloran, J.P., Petrella, A.J., and Rullkoetter, P.J. (2005). Explicit finite element modeling of total knee replacement mechanics. J. Biomech. 38, 323–331.

Halloran, J.P., Erdemir, A., and van den Bogert, A.J. (2009). Adaptive surrogate modeling for efficient coupling of musculoskeletal control and tissue deformation models. J. Biomech. Eng. 131, 011014.

Halloran, J.P., Clary, C.W., Maletsky, L.P., Taylor, M., Petrella, A.J., and Rullkoetter, P.J. (2010a). Verification of predicted knee replacement kinematics during simulated gait in the Kansas knee simulator. J. Biomech. Eng. 132, 081010.

Halloran, J.P., Sibole, S., van Donkelaar, C.C., van Turnhout, M.C., Oomens, C.W.J., Weiss, J.A., Guilak, F., and Erdemir, A. (2012). Multiscale Mechanics of Articular Cartilage: Potentials and Challenges of Coupling Musculoskeletal, Joint, and Microscale Computational Models. Ann. Biomed. Eng.

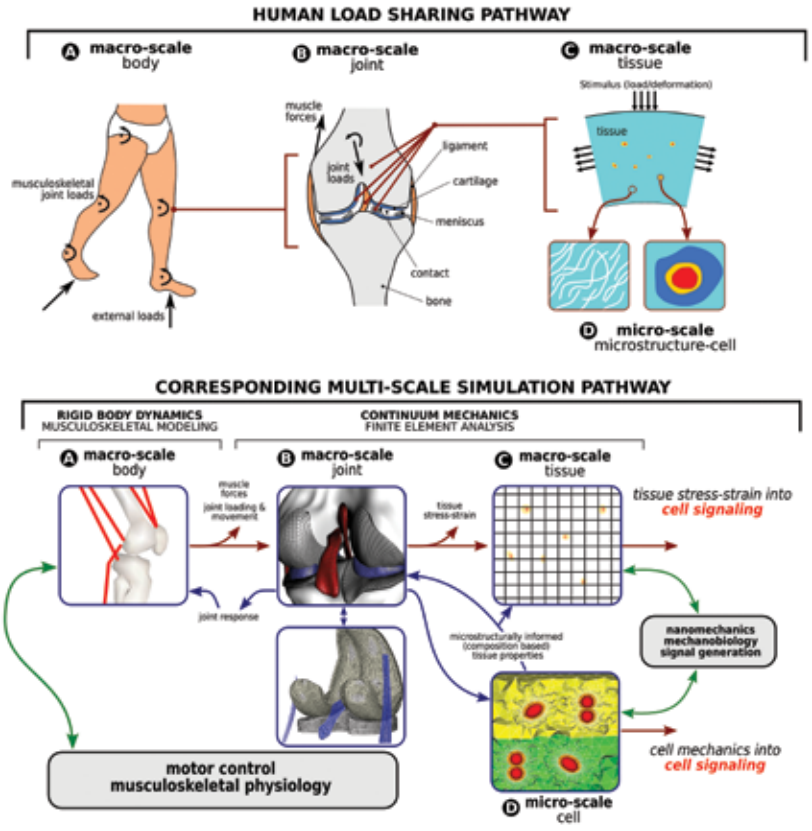

Figure 1. (top row) Abstraction of the load sharing pathway from the body down to the cell and microstuctural level. (bottom row) Corresponding simulation tools to study the mechanics at each of these spatial scales. For human biomechanics related questions, Dr. Halloran's research has utilized simulation techniques at each of these scales. Using various coupling techniques, his work has also spanned spatial scales. For the "joints" (B), both natural and total knee replacement models are pictured to highlight his interest in orthopaedics driven analysis. Figure adapted from Halloran et al, 2012.

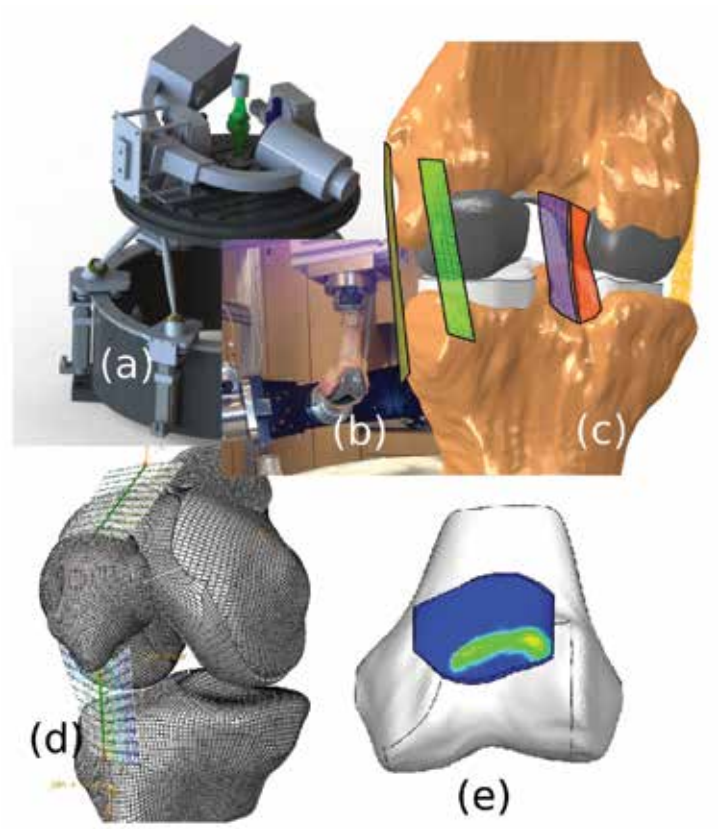

Figure 2. (a, b) Experimentation can provide key data for development of useful simulations. The potential to develop clinical decision support tools is highlighted for the knee using (c) device analysis, (d) healthy joint simulation, which included subsequent evaluation of tissue sensitivity, and (e) the effects of surgical interventions on a diseased joint.

REDUCING UNCERTAINTY IN ENGINEERING DESIGN

UNCERTAINTY WILL NOT BE DEFEATED, BUT CAN BE REDUCED…

Dr. Ungtae Kim joined CSU as an Assistant Professor of the Department of Civil and Environmental Engineering in Fall 2014. Before that, Dr. Kim worked at the University of Tennessee, Knoxville as a Research Scientist/Research Assistant Professor. In 2008, Dr. Kim earned his Ph.D. in water resources engineering and hydrology at Utah State University, with a dissertation entitled Regional Impacts of Climate Change on Water Resources of the Upper Blue Nile River Basin, Ethiopia. His dissertation was supported by scholarships from the U.S. Department of Energy and the International Water Resources Institute (IWMI). In 1999, he completed his M.S. degree of water resources engineering at Korea University, Seoul, South Korea. He worked at a national research institute and consulted with firms in South Korea for six years before he came to the U.S. in 2004. He has been a registered professional engineer of water resources engineering in South Korea since 2001. From 1992 to 1994, he did his military service in Korea as a military engineer. His research focuses on hydrologic analysis based on advanced numerical techniques. He is especially interested in applying high performance computing techniques to solving real-world problems in the field of water resources engineering and watershed science. His ultimate research goal is to provide quantified decision-making information for long-term watershed management. In the following pages, Dr. Kim will describe three examples showing how to quantify decision-making information considering uncertain natural phenomena.

UNGTAE KIM, Ph.D., P.E.
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IMPACTS OF ENVIRONMENTAL CHANGE ON WATERSHED MANAGEMENT

Environmental changes (either natural or artificial) make decision-making processes harder than those during stable conditions. Although there have been many arguments about the term "climate change", it is one of the most concerning environmental changes today. Climate change affects many water-related environmental conditions, and water availability will worsen with increasing water demands. To analyze and evaluate the future changes in hydrology and water resources of a watershed, reliable methodologies and models are essential. In his studies, Dr. Kim used the outcomes of six different global climate models to represent the uncertainty range of the future water availability projected by those different outcomes. Since all models were developed using different physical yet scientific assumptions, these outcomes can be weighted based on their accuracy to represent the baseline climate conditions (e.g., 1971 to 2000) in order to provide an average change in future climatic conditions. Figure 1, for example, shows the range of hydrological change in the Blue Nile Basin located in Ethiopia, where public hydrologic information is very limited. The changes in precipitation and temperature were downscaled from the six climate models and the changes in evapotranspiration and runoff were computed from well-known hydrologic models. This type of information is very useful to watershed managers for analyzing potential long-term economic development strategies (e.g., large scale reservoir construction, irrigation fields and water transfer, etc.). Dr. Kim's research on climate change has been published in his Ph.D. dissertation and in four journal articles, which, since 2008, have been cited over 150 times in many countries.

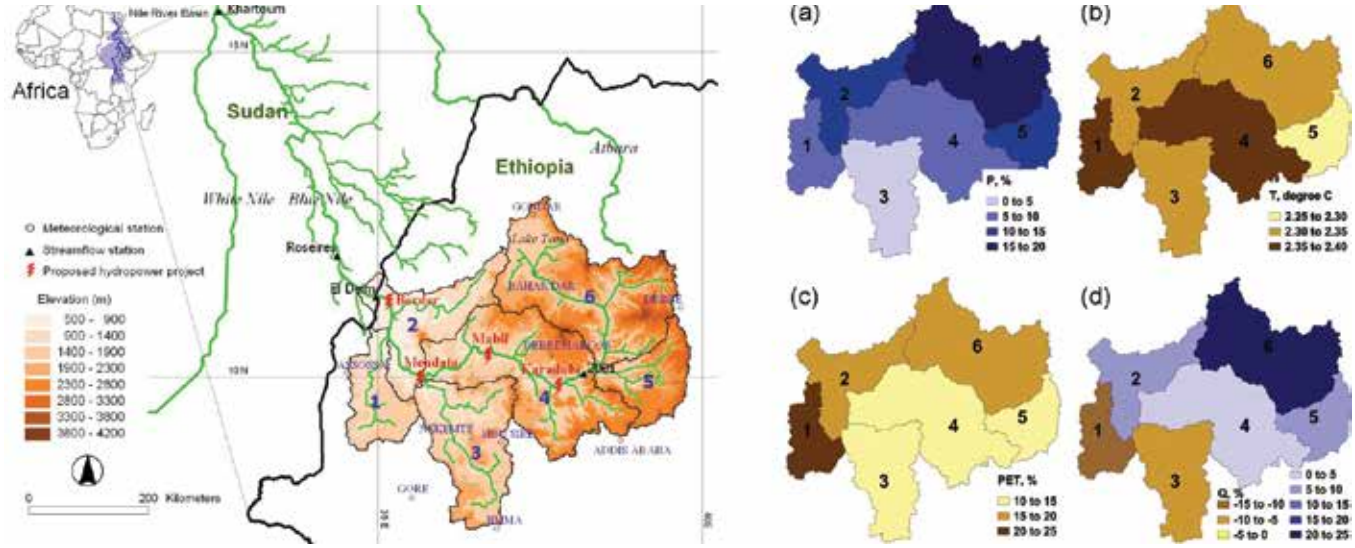

Figure 1. Annual projected changes of hydrologic variables in Blue Nile River Basin, Ethiopia for 2050s compared to the base case (1960 to 1990). P, T, PET, and Q represent precipitation, temperature, potential evapotranspiration and runoff, respectively.

As the framework can be generally applied to other watersheds, Kim, as a PI, had the opportunity to conduct a research project titled Long-term Evaluation of Norris Dam Operation under Changing Climate funded by the U.S. Geological Survey State Water Resources Research Institute (2013 - 2014). He has more than 15 years of experience in analyzing the impacts of climate change on water resources and will continue to develop more practical (yet reliable) methodologies to analyze climate change impacts for urban watershed management through his research at CSU.

GROUNDWATER REMEDIATION DESIGN WITH COST OPTIMIZATION CONSIDERING PREDICTION UNCERTAINTY

Groundwater is a valuable water resource, which is hard to restore when impaired. However, it is one of the most difficult areas of hydrology to study due to its uncertain behavior. A typical example is the hydraulic conductivity field showing high order of heterogeneity (Figure 2). This implies that the best estimate (e.g., mean of measured values in a couple of locations) cannot explain the complex 3-dimensional contaminant transport. As uncertain hydro-geologic parameters largely take effect in the prediction of the contaminant concentration, the remediation cost is thus not constant, but very stochastic.

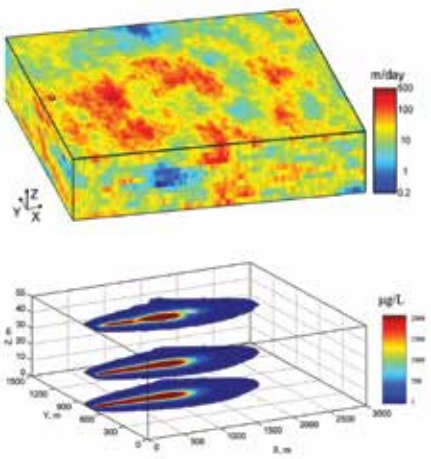

Figure 2. Highly heterogeneous hydraulic conductivity field (top) and 3D simulation of contaminant transport (bottom).

Dr. Kim participated in a U.S. Department of Defense Strategic Environmental Research and Development Program (SERDP) project from 2008 to 2011, entitled *Practical Cost-Optimization of Characterization and Remediation Decisions at DNAPL Sites with Consideration of Prediction Uncertainty*, as a main developer of core numerical modules. He and his colleagues described semi-analytical DNAPL (Dense Non-Aqueous Phase Liquid) dissolution and transport solutions associated with inverse modeling and stochastic cost optimization for groundwater remediation. As a result, the stochastic cost optimization toolkit (SCOToolkit) was developed and publically distributed for extensive testing. Through this extensive project, Dr. Kim showed his advanced computational skills and capability to integrate theory and practical decision-making in solving complex engineering problems. Dr. Kim and Dr. Jack Parker (University of Tennessee) were recently awarded another SERDP project *A Practical Approach for Remediation Performance Assessment and Optimization at DNAPL Sites for Early Identification and Correction of Problems Considering Uncertainty* that includes up-to-date DNAPL remediation methods and a more user-friendly decision support tool.

At Cleveland State University, as a PI, Dr. Kim continues to advance the SCOToolkit modules by adding a web-based education and decision-support system to better (i.e., optimally) manage contaminated sites. Figure 3 shows the overall schematic of the SCOToolkit and many new features. Noticeable updates include various source remediation practices (thermal source reduction, electron donor injection, permeable reactive barriers, in-situ chemical oxidation, and bio-enhancement of source mass transfer) and re-optimization.

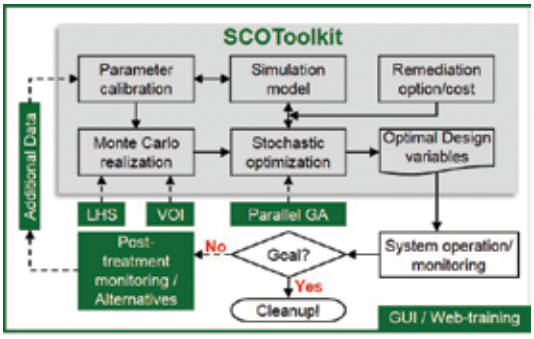

Figure 3. Conceptual schematic of SCOToolkit II. VOI, GA, and GUI represent value of information, genetic algorithm, and graphical user interface, respectively.

Examples of the SCOToolkit application include multiple contaminated sites in the U.S., such as the Dover Air Force Base, the Fort Lewis East Gate Disposal Yard, Lake Hurst and Parris Island. The results showed potential cost savings up to 30%, while increasing the success probability compared to the conventional non-optimized design. Figures 4 and 5 demonstrate how the SCOToolkit quantifies the uncertainty of the prediction and the cost caused by the aquifer heterogeneity and the errors from measurement and numerical assumptions. Uncertainty bands were simulated by evaluating many equi-probable parameter sets realized from inverse modeling techniques. This information can be used in financing a remediation system that usually costs many-millions dollars per site for a long period.

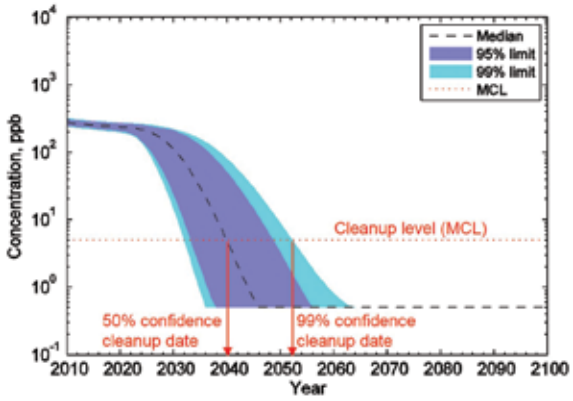

Figure 4. Prediction uncertainty of contaminant transport.

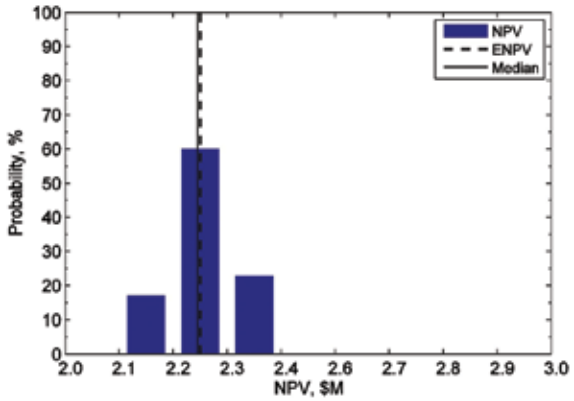

Figure 5. Probability density of clean-up cost. NPV and ENPV represent net present value and expected net present value.

VALUE OF INFORMATION IN WATER RESOURCES MANAGEMENT

Sometimes hydrologic information is limited or inaccurate to provide solid decision-making information in water resources management. Questions that need to be answered are: 1) which type of data is the more important for decision-making; and 2) which parameters should be more accurately monitored to provide less uncertain decision-making information, while minimizing overall expected cost. Although a theory on Value of Information (VOI) was applied to some engineering designs, there is room to use this concept in water resources engineering. Dr. Kim has published two related papers addressing the "value of discontinuous data" and the "value of site-specific information on groundwater remediation." His research interest is how to quantify the monetary value of parameters in engineering design. At CSU, Dr. Kim would like to extend his VOI research to a general decision-making protocol in engineering problems. He expects that a VOI framework will become an important procedure to quantify the uncertainty of information in many engineering designs (including management). ■

Dr. Kim's publication history is found at https://scholar.google.com/citations?user=htBNuXEAAAAJ&hl=en.

HUMAN MOTION AND CONTROL

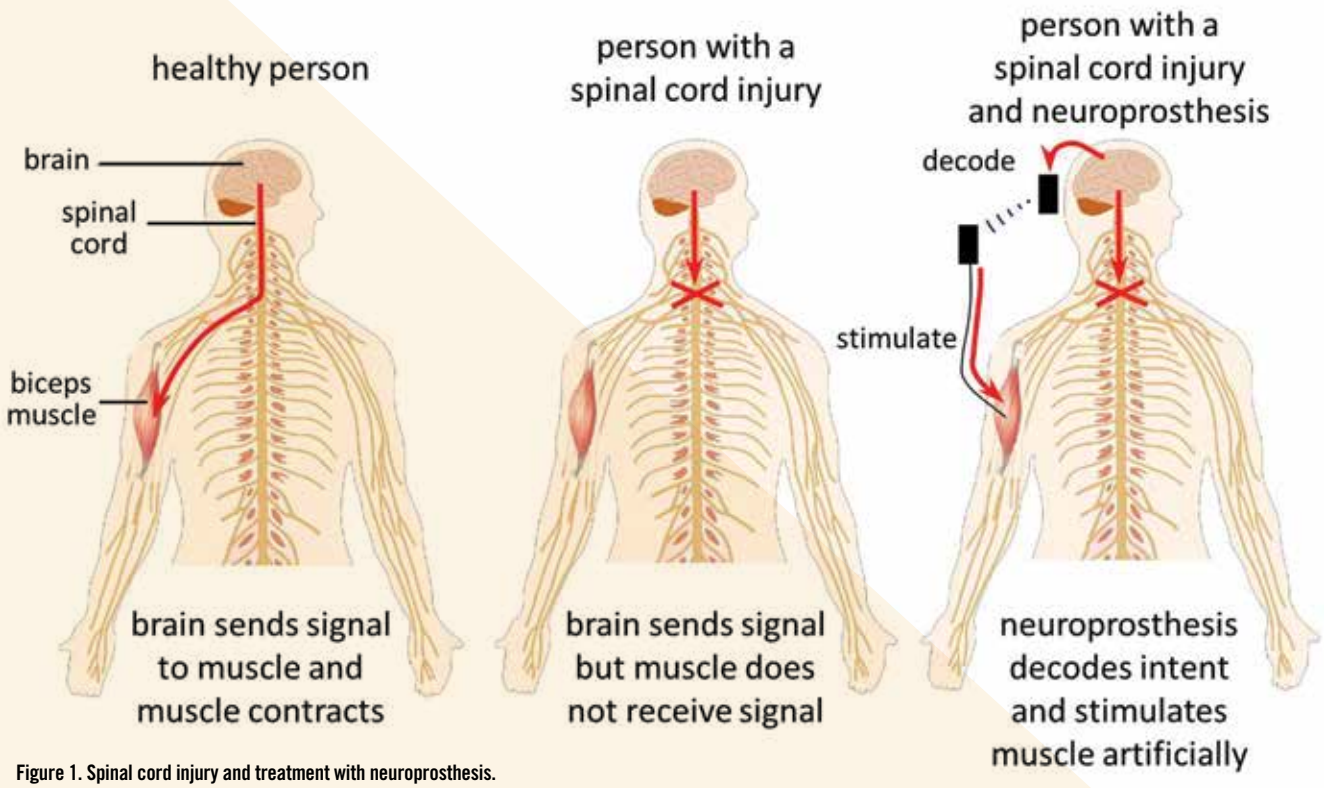

Figure 1. Spinal cord injury and treatment with neuroprosthesis.

ERIC M. SCHEARER, Ph.D.
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MOVING PARALYZED ARMS AND ANIMATING LIVES

Dr. Eric Schearer's vision for teaching and research at CSU is to move people to action; that is, to "animate" people. His research aims to restore function to people with paralyzed arms due to spinal cord injury, so they will be able to voluntarily move their reanimated arms. Dr. Schearer intends for students participating in this research to be moved to use technology to directly impact the lives of those with paralysis.

His vision has been formed by experiences in academia, military service and consulting. As an undergraduate student at the University of Notre Dame, he was exposed to robotics and human motion; more importantly, he learned that our lives can have profound effects on others. Service as an Air Force officer instilled an acute sense of responsibility to come through for one's comrades, and he believes this sense of responsibility extends to the community at large. He earned an M.S. from the Carnegie Mellon Robotics Institute, where he worked on a balancing robot called Ballbot that interacts with humans, and saw the tremendous potential of robotics and artificial intelligence. While consulting at Exponent, Inc., he analyzed failures of engineered systems ranging from amusement park rides to eyelash curlers, which caused a wide range of injuries to people; he saw first hand the importance of training competent and ethical engineers. His Ph.D. research at Northwestern University opened the doors to directly applying technology to help people with movement disabilities.

Dr. Schearer joined the faculty in the Mechanical Engineering Department at CSU's Washkewicz College of Engineering in Fall 2014. His work focuses on developing strategies based on machine intelligence to control the movement of paralyzed human arms.

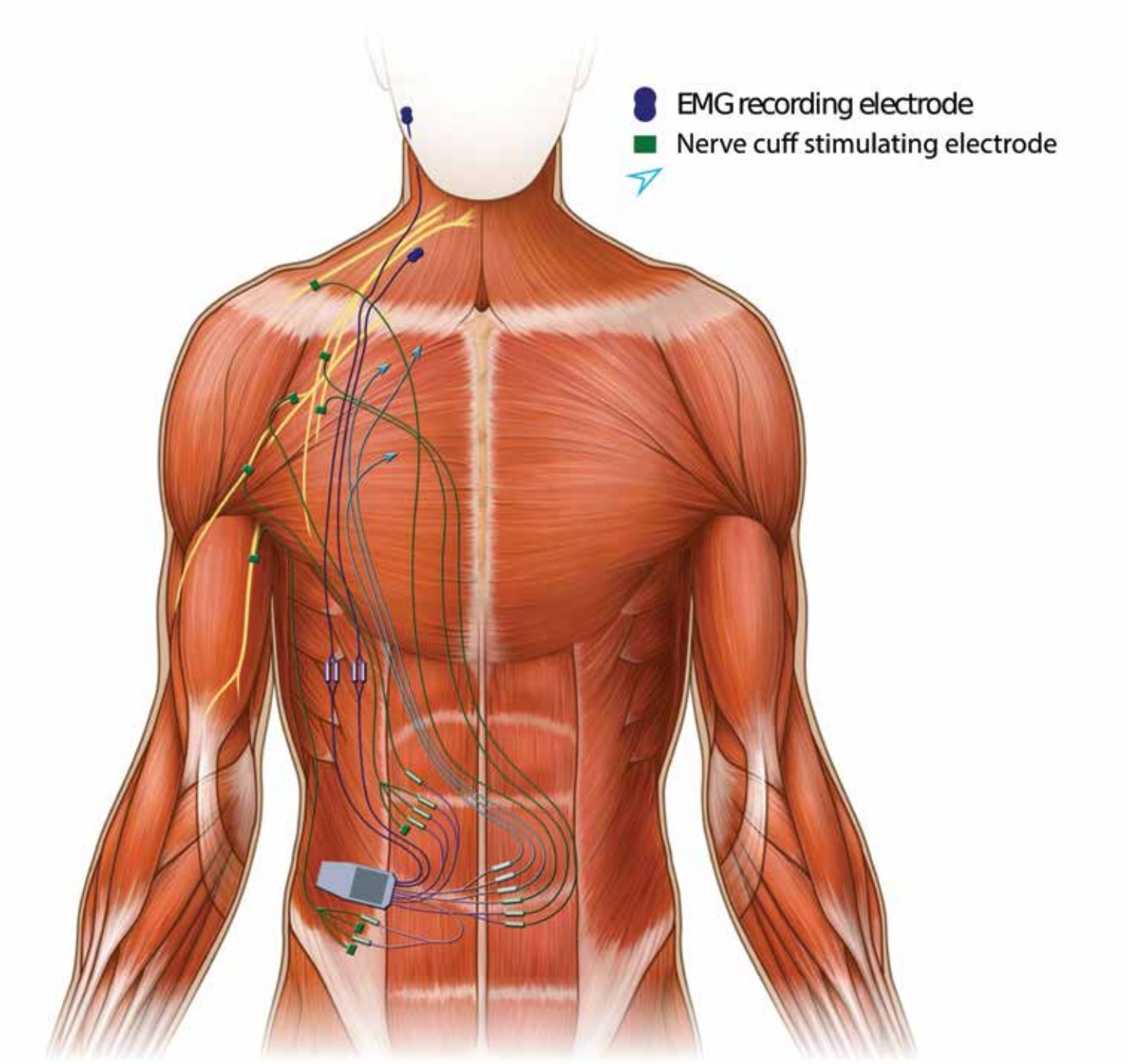


Figure 2. A schematic of the surgically implantable device that can stimulate various nerves and muscles that actuate the shoulder, arm and hand.

MACHINE INTELLIGENCE FOR NEUROPROSTHESES

People who have suffered high spinal cord injuries, which leave them with no or limited use of their arms, have historically had very few rehabilitation options. Most assistive devices are operated using functions of the head and mouth that are retained after the injury. These devices allow a person to control a wheelchair or computer, but do not restore many of their daily living activities, such as eating or grooming.

Dr. Schearer works with colleagues at the Cleveland Functional Electrical Stimulation Center to develop Functional Electrical Stimulation (FES) neuroprostheses that will restore lost function to people with high spinal cord injuries. A neuroprosthesis works in place of a part of the human nervous system that is lost to injury or no longer functions properly. In this case, the neuroprosthesis acts in place of the peripheral nervous system by interpreting the intent of a person with spinal cord injury to move her arm, and translating that intent into a pattern of electrical stimulation to activate muscles, thereby moving the person's arm (Figure 1). With such a neuroprosthesis, a person with a paralyzed arm would be able to perform daily tasks that require reaching and grasping, like opening a door, combing their hair or shaking a friend's hand.

Dr. Schearer develops machine intelligence that automatically decides which muscles to electrically stimulate given a person's intent to move their arm. Using data from force and motion sensors, the neuroprosthesis builds an internal mathematical model of how the arm moves and applies force to its surroundings. Based on this model, the neuroprosthesis determines muscle stimulation patterns required to execute a desired task and improves its performance in reaching and grasping tasks as it gathers more data. Thus, the neuroprosthesis intelligently learns how to control a person's paralyzed arm.

This type of machine intelligence can potentially exploit the capabilities of the human musculoskeletal system and enable people with spinal cord injuries to perform varied tasks with increasing complexity in changing environments. An intelligent neuroprosthesis can adapt to changes in the person's muscles or the environment, determine which past experiences are relevant to a current challenge and learn new tasks through experimentation. People with spinal cord injuries may learn to use their neuroprostheses to do more complex tasks like folding laundry or playing table tennis.

This control strategy based on machine intelligence is part of a larger neuroprosthetic system being developed at the Cleveland FES Center. The system includes a surgically implantable device that can stimulate various nerves and muscles that actuate the shoulder, arm and hand (Figure 2). This system also includes electrodes to record intracortical signals from the brain. The complete system will decode the intracortical signals to determine a person's movement intent, and stimulate the muscles to execute the intended task. Dr. Schearer's control algorithms link the decoder and stimulator by determining how best to stimulate muscles to produce the intended motion.

Dr. Schearer's research will help to reanimate the paralyzed arms of people with high spinal cord injuries, allowing them to perform daily tasks independently, enjoy recreational activities and even return to work. Participating in this research will also animate the lives of his students through direct contact with the people who are affected by this technology. His hope is that students will develop a sense of empathy, purpose and responsibility that will inspire them to pursue meaningful careers and develop technology that changes the lives of people in their own community. ■

ADVANCED NANOMATERIALS AND COLLOIDS

ADVANCING SOFT MATERIALS

Dr. Chris Wirth recently joined CSU as an Assistant Professor in the Department of Chemical and Biomedical Engineering. Following completion of his Ph.D. in Chemical Engineering at Carnegie Mellon University, Dr. Wirth was a research associate at PPG Industries. He then joined the Department of Chemical Engineering at KU Leuven, Belgium, as a postdoctoral scholar in the Soft Matter, Rheology and Technology Laboratory (SMaRT). Following a year and a half at SMaRT, he launched his lab at CSU in Fall 2014.

Dr. Wirth's research falls within the areas of Colloid and Interface Science, Nanomaterials, and Electrokinetics. Although the term "Colloid" may seem unfamiliar to most, the importance of this class of material cannot be overstated. A colloid is any material that contains a second, finely divided material, where "finely divided" means having one dimension that is between ~ 10 and 1,000 nanometers. Dr. Wirth is specifically interested in the control of the forces acting between nanoparticles that ultimately govern the macroscale performance of materials.

NANOMATERIALS ALL AROUND US

What is your morning routine? We wander to the bathroom for a shower and shave, go to the kitchen for coffee and yogurt, and then jump into our car and head to work. Did you know that either nanomaterials or colloids touch each of these rituals? The shampoo and conditioner that you use are complex fluids containing polymers, surface active agents (surfactants), and, occasionally, nanoparticles. Shaving cream is a foam colloid that makes use of surfactants to stabilize the liquid/air interface. Coffee is a suspension of particles in water, while yogurt is a colloidal emulsion. Even the paint on your car has been designed on the nanoscale. Indeed, nanomaterials and colloids are all around us!

Not only does colloid and interface science have profound importance to these conventional examples, materials required for next-generation applications also lie in the colloidal domain. For example, carbon nanotubes and graphene have unique properties that make them candidate materials to help solve many grand challenges identified by the National Academy of Engineering. Unfortunately, the fabrication of macroscopic materials with properties of similar quality to individual particles remains difficult. Herein lies the ultimate goal of Dr. Wirth's work - to engineer new methods for integrating nanomaterials and colloids into macroscopic materials.

Project One: Directed assembly of nanoparticles into functional materials. Particles found in real applications are often anisotropic, which means that the particle has a directionally dependent property. Anisotropic nanoparticles, such as carbon nanotubes, graphene, and polymer ellipsoids, have great potential because of unique properties intrinsic to individual particles. Yet, as noted above, there is a lack of robust techniques to process nanoparticles into macroscopic materials with similarly impressive properties. The goal of this project is to develop a process for the controlled deposition of anisotropic nanoparticles over a large area (~cm^2) substrate. Achieving this goal will pave the way for nano-enabled engineered systems, such as flexible electronics and thin films with directionally dependent properties.

Two separate approaches are being used to assemble nanoparticles over a large area (Figure 1). The first (Figure 1(a)) uses an electric field to control the forces between

CHRISTOPHER WIRTH, Ph.D.
Assistant Professor
DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

particles. Until recently, work in this area has been focused on the response of isotropic particles (i.e. spheres) to an electric field. However, using anisotropic particles can provide an extra degree of control to the process, because of the relationship between particle shape and pairwise interaction force. The second strategy (Figure 1(b)) for assembling anisotropic nanoparticles uses a Langmuir-Blodgett coating process with particles depositing onto a substrate from an interface. The process uses capillary forces arising from interfacial deformation to direct the assembly of nanoparticles.

The lab's ongoing work focuses on the fabrication of particles and measuring the electric field mediated force between them. The particles currently being investigated are dimers and ellipsoids because both the surface chemistry and the shape can be controlled.

Project Two: Designing new low-density materials. Foams, which are mixtures of gas and either a liquid or a solid, are important to a large number of applications. Foams contain polymers, surfactants, and nanoparticles that adsorb to the interface formed between the liquid and gas phases. There has been a substantial amount of recent work on the connection between interparticle interactions, microstructure, and material properties of fluid/fluid interfaces.

Dr. Wirth's lab is investigating the use of solid colloidal particles, rather than molecular surfactants, as stabilizers. Interfaces laden with particles are often more stable than those containing molecular surfactants because of both the large energy necessary to remove particles and also the viscoelastic properties imparted by the particles. Tuning the interfacial structure of foams laden with nanoparticles will enhance performance and encourage greater adoption of foams in many applications. In particular, the wetting properties of the particles could be tuned to impact foam formation (Figure 2). Dr. Wirth's lab is currently identifying candidate particles, conditions, and processing steps that will lead to not only foams, but also entirely new phases.

Project Three: New techniques for measuring colloidal interactions in carbon nanoparticle systems. Colloidal interactions operate on a ~kT energy scale over a ~1 - 100 nm

length scale. Despite the small magnitude of forces governing colloidal interactions, they are essential to the microstructure of macroscopic materials. Total Internal Reflection Microscopy (TIRM) is capable of measuring these weak interactions via the collection of light scattered by a particle in an evanescent wave propagating along a surface (Figure 3). Unfortunately, current state-of-the art TIRM can only be conducted with spherical particles. This is a fundamental drawback for groups studying interactions among non-spherical colloidal particles, such as clay or red blood cells.

In response to this challenge, Dr. Wirth is developing a TIRM capable of measurements on non-spherical particles. Extending the technique to particles of arbitrary shape would be a transformative step forward that will be valued by a vast audience of chemists, physicists, and engineers. ■

Figure 1(a)

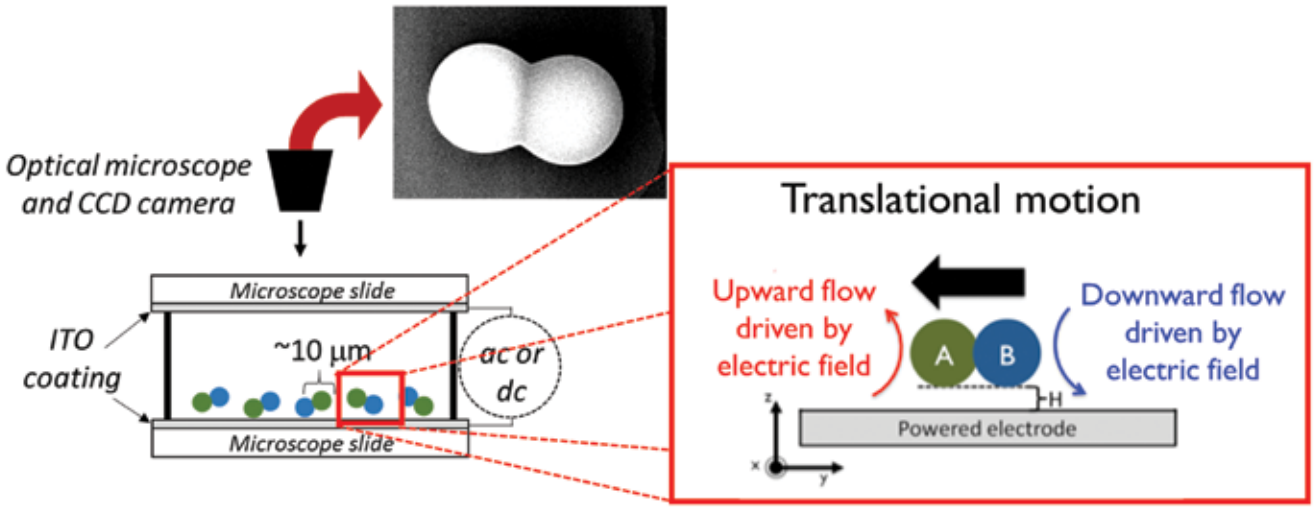


Figure 1(b)

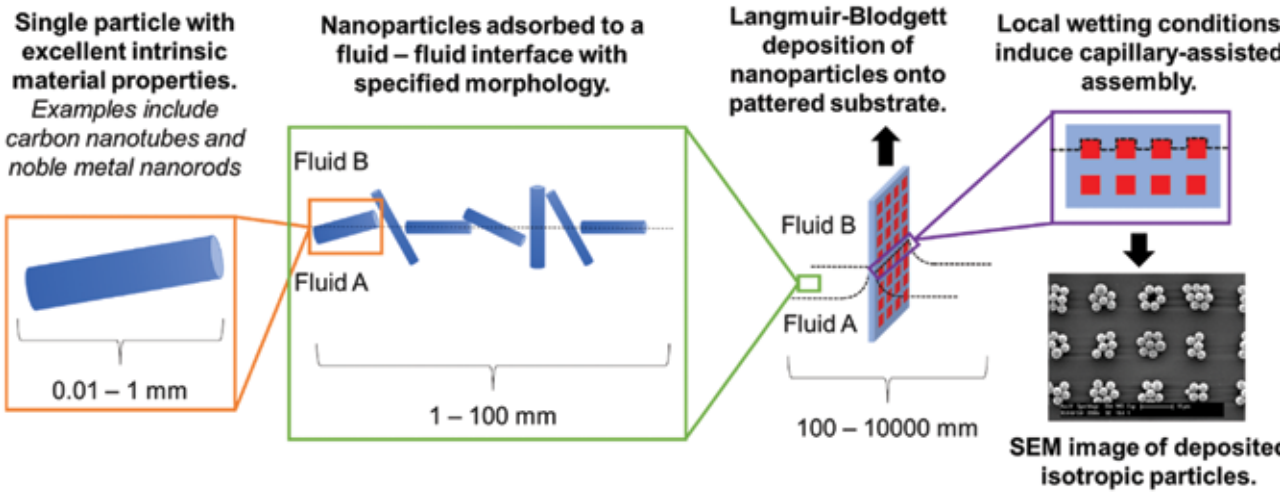


Figure 1: Directed assembly of anisotropic nanoparticles with (a) an externally applied electric field and (b) template-assisted interfacial assembly.

Figure 2(a)

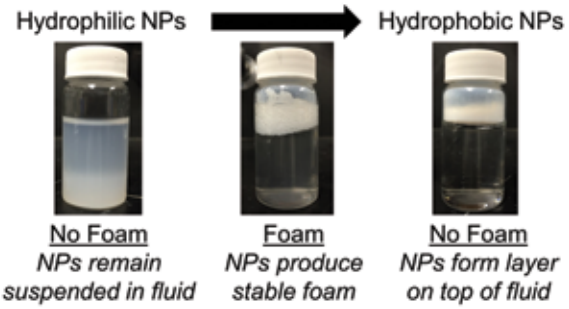


Figure 2(b)

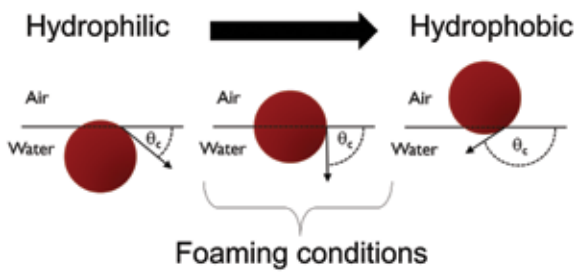


Figure 2: Nanoparticles (NPs) pinned at an interface enhances interfacial stability. (a) The vertical position of NPs at an interface depends on whether the NP is hydrophilic ("water-loving," $\theta_c \rightarrow 0^\circ$), hydrophobic ("water-hating," $\theta_c \rightarrow 180^\circ$), or somewhere in between ($\theta_c \approx 90^\circ$). (b) Suspensions of nanoparticles following agitation, from left to right: wetted NPs, partially wetted NPs, and non-wetted NPs.

Figure 3(a) - 3(c)

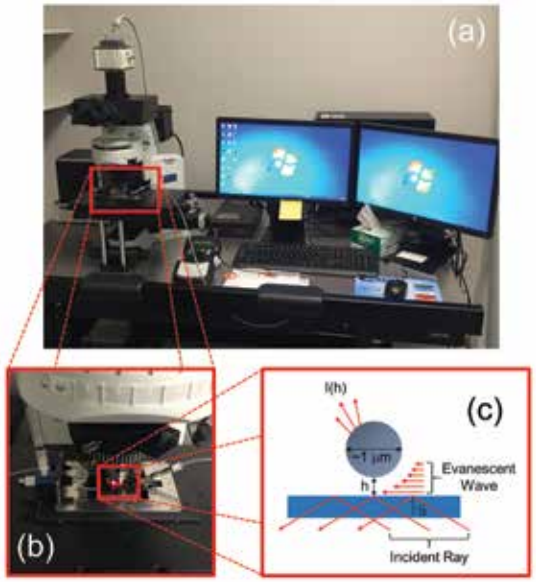


Figure 3(d)

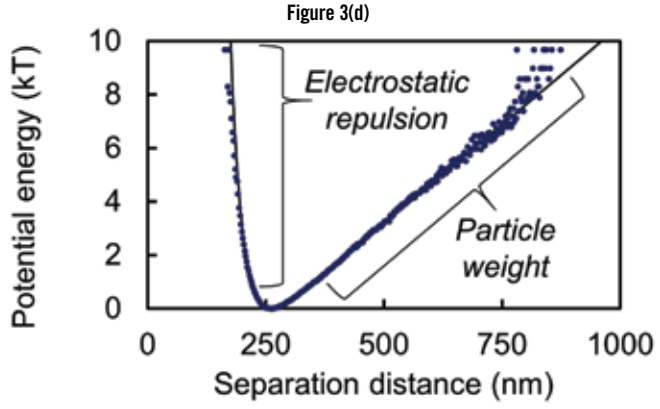


Figure 3(e)

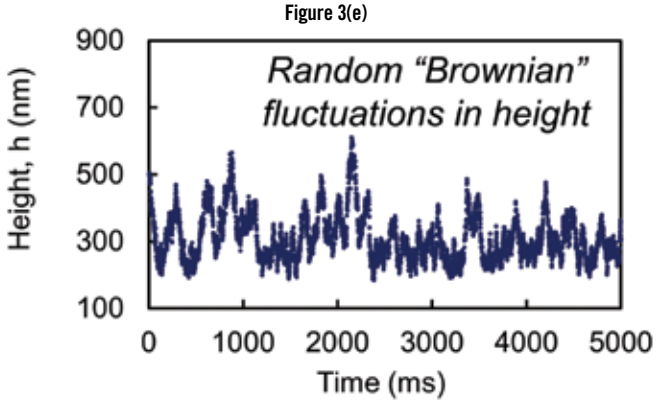


Figure 3: Total Internal Reflection Microscopy (TIRM). (a - c) Experimental apparatus for TIRM consists of an optical microscope with a CCD camera. Total internal reflection occurs if the incident ray is at the appropriate angle, α. An evanescent wave propagates into solution with an intensity that depends on distance. A nearby particle will scatter light with an intensity that depends on the particle's separation distance, I(h). (d) The particle's temporal fluctuations in height are tracked by collecting I(h). (e) The potential energy profile, which characterizes the colloidal force between a nanoparticle and substrate, is calculated from the temporal fluctuations in height shown in (d).

MANEUVERING THE WIND

Dr. Wei Zhang is an Assistant Professor at the Department of Mechanical Engineering of Cleveland State University. She has been a scientific collaborator of the Wind Engineering and Renewable Energy Laboratory of the École Polytechnique Fédérale de Lausanne (EPFL), Switzerland, since 2013. Before joining Cleveland State, Dr. Zhang was a research associate at the Saint Anthony Fall Laboratory of the University of Minnesota. She also carried out research in Aerospace Engineering at Iowa State University and worked as a scientist at the Institute of Fluid Mechanics, Technical University of Braunchweig, Germany. She completed her Ph.D. in Fluid Engineering and Thermo-Physics from Xi'an Jiaotong University, China, and has a B.S. in Civil and Environmental Engineering.

Dr. Zhang conducts research on a wide variety of topics ranging from large-scale systems such as atmospheric boundary-layer turbulence, tornado-like vortices to small-scale transient laminar-turbulent transition over airfoils for micro air vehicle applications. She uses advanced laser-based non-intrusive thermal/fluid measurement techniques to understand turbulent flow structure and kinetic energy transport in complex systems in nature and in industry. Also, she works closely with numerical modelers to develop new parameterization of boundary conditions and provide benchmark experimental datasets to evaluate prediction results and validate specific turbulence models.

At Cleveland State, Dr. Wei Zhang's research goal is to advance understanding of complex turbulent flows of different length scales by developing innovative measurement techniques and new data-processing methods. The current research themes are 1) wind energy: interaction of wind-turbine wakes with atmospheric boundary-layer flows; 2) particle-laden turbulent flows and 3) next-generation fractal wind fences.

WEI ZHANG, Ph.D.
Assistant Professor
DEPARTMENT OF MECHANICAL ENGINEERING

WIND ENERGY: INTERACTION OF WIND-TURBINE WAKES WITH ATMOSPHERIC BOUNDARY-LAYER FLOWS

Wind energy is one of the fastest growing sources of renewable energy world-wide, and it is expected that many more large-scale wind farms will be built onshore and offshore, eventually covering a significant portion of the land and water surfaces. Design of wind energy projects is subject to large uncertainties due to our limited capability to predict mean wind and turbulence relevant to wind turbine operation. Variability of atmospheric boundary-layer wind is recognized as an important source of uncertainty in the wind industry. Errors of less than 1 m/s of the mean wind speed in estimating the annual wind resources for a wind farm can translate into multi-million of dollars in annual revenues. Therefore, it is important to understand the wind turbine wake and atmospheric boundary-layer interaction, which is complicated by the wind farm size, turbine array layout, landscape characteristics and atmospheric thermal stability. Also, it is an open question how to properly parameterize surface scalar fluxes, which may be altered by utility-scale wind farms, in high-resolution computational fluid dynamics models (e.g., Large Eddy Simulation or LES) and meso-scale weather predication models.

With a series of wind-tunnel experiments using up to 36 miniature wind turbines in a thermally-controlled boundary-layer, Dr. Zhang's research revealed salient features of the wind-turbine wake, including coherent tip vortices, swirling near-wake structure and associated enhanced turbulence (Figure 1). These results not only lead to a better understanding of the turbine wake structure, but also inform numerical modelers regarding the underlying mechanism, too critical to be neglected. For example, the swirling near-wake structure, previously ignored in most of numerical models, is found to substantially affect the overall turbulence prediction. Only those models that include the rotation effects can predict more practical results of mean wind and turbulence in wind farms. Additionally, the combined swirling wakes

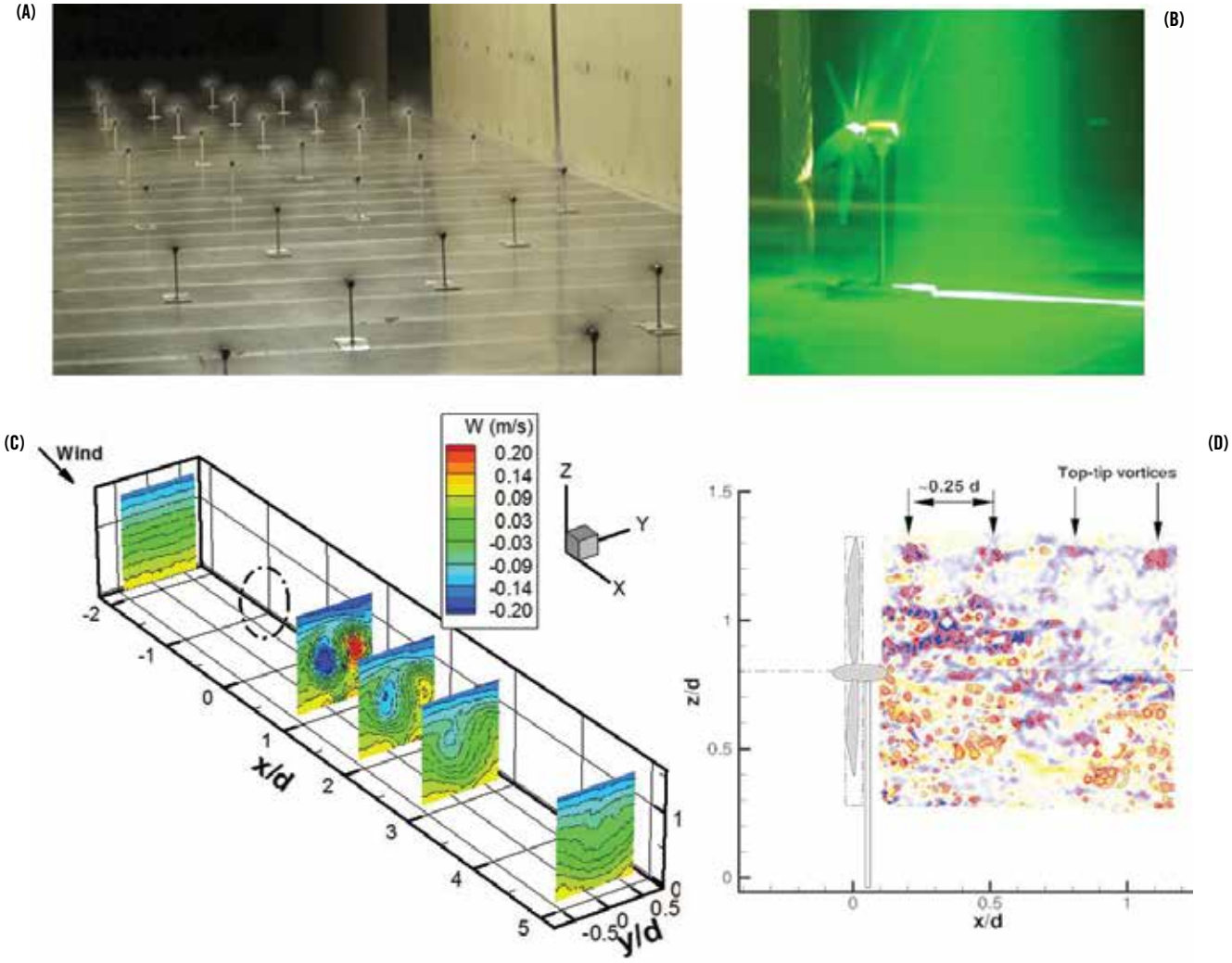


Figure 1. (A) scaled model wind farm in the wind tunnel; (B) wind turbine wake measurements using Particle Image Velocimetry (PIV); (C) swirling wake indicated from multiple cross-sections; (D) a snapshot of top-tip vortices shedding from the turbine blade tips.

from multiple wind turbines are even compelling. For a large wind farm of a regular aligned layout, the highly heterogeneous distribution of the surface heat flux induced by swirling wakes remarkably influences the irrigation planning and crop production of the site. This is the first evidence of wind farm impact on land-atmospheric transport observed in well-controlled laboratory experiments and is an indicator of its impact on local meteorology. This research is highlighted in the Environmental Research Letter.

Continuing her efforts in wind energy, Dr. Zhang currently works on understanding the complex atmospheric boundary-layer flows over real landscape, such as steep topography, tall vegetation, water surface, urban areas, transition of heterogeneous surfaces characterized by large variations in surface heat, and scalar fluxes. One of the goals is to study the wind across the shores of the Lake Erie, where sharp transition of surface flux distribution makes the costal wind prediction very challenging. Collaboration with Dr. Thijs Heus, in the Physics Department, is intended to develop high-fidelity numerical models for better predicting wind resource and wind farm energy output capability at Lake Erie. Through synergy of controlled laboratory experiments, numerical modeling and field observation, Dr. Zhang's long-term goal is to advance the understanding and capability to predict atmospheric boundary-layer turbulence and its interaction with wind turbine wakes.

NEXT-GENERATION FRACTAL WIND FENCES

Controlling atmospheric boundary-layer wind is of great interest to the fluid dynamics and wind engineering community, because it can be used to reduce strong winds, influence pollutant dispersion, and enhance deposition of saltating or suspended snow and sand. It is essential to understand how engineering structures, such as porous fences, affect turbulence. In particular, to control the near-surface wind-blown sand transport, Dr. Zhang is interested in how to design optimal multi-scale fractal wind fences. Different from regular fences having only one dimension, the multi-scale fractal wind fences are composed of several generations of self-similar structure or patterns (Figure 2 (A)). Examples of such fractal structures around us include river networks, branches of trees, and human lungs and blood vessels.

Previous studies suggest the optimal parameters of constructing a conventional wind fence, such as fence height, porosity, and bottom gap ratio. Recently, new multi-scale fractal wind fences showed substantial differences in modifying the generated turbulent structure compared to that of regular (non-fractal) fences with the optimal parameters. In this research, Dr. Zhang's group will test various configurations of fractal wind fences in a wind tunnel, in which velocity fields in the near and far wakes are systematically measured.

(A)

(B)

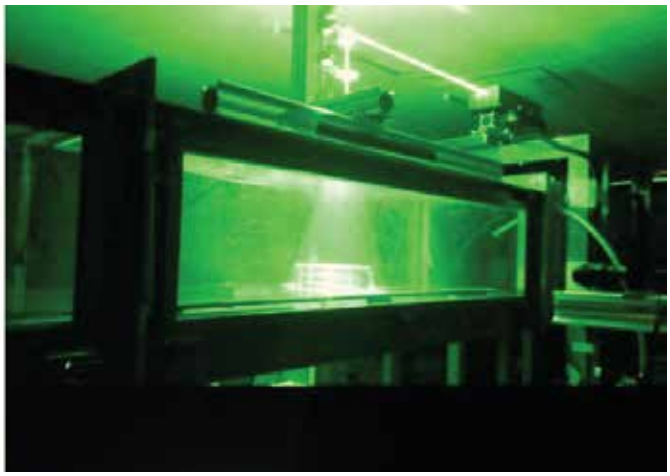


Figure 2. (A) scaled-down fractal wind fence models using 3D printers, i.e., conventional, 2D cross-grid and 1D fractal wind fences from top to bottom; (B) turbulent wake measurements behind the fractal fences in a wind tunnel.

A Master's student, Sarah McClure, supported by an NSF East Asia and Pacific Summer Institute fellowship, has collected preliminary data from wind-tunnel experiments at Pohang University of Science and Technology, South Korea (Figure 2(B)). Ultimately, this research is expected to assist in the design of new-generation fractal wind fences, which can extract sufficient kinetic energy from the mean wind flow to promote snow/sand deposition, but prevent particle remobilization from excessive turbulent stresses. This investigation will advance knowledge of energy transport of turbulence generated by multi-scale fractal structure, which can be used to design optimal engineering structures for turbulent flow control, affecting the cores of a broad range of industrial applications. ■

Our top priority?

TO GRADUATE READY-TO-GO ENGINEERS!

In the Washkewicz College of Engineering, providing the best engineering education and the academic skills for professional success to our students is what we strive for. We are proud of our students and graduates and we never stop listening to them to continuously improve our programs and services. Here is a small sample of our students and their stories.

"Cleveland State has taught you to think and use deductive logic – don't be concerned about not knowing everything as you embark on your careers."

Donald Washkewicz, Chairman of the Board of Parker Hannifin Corporation offered words of encouragement and advice to the graduating engineering students during his keynote address at the Senior Design Symposium and Awards Dinner.

SAMUEL SANYA

DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

Growing up in Nigeria, I always envisioned getting the best education in the world, and albeit, I had no clue as to how that would happen, I knew what I wanted and wouldn't settle for less. Gaining admission to Cleveland State University in 2012 was a significant step towards realizing my dream.

The Washkewicz College of Engineering curriculum has been absolutely phenomenal, and although I am an international student, faculty and the co-op program coordinator have worked hand in hand alongside the Center for International Services and Programs (CISIP) to help me secure co-op opportunities.

The diversity at Cleveland State is second to none, and this has really helped me get engaged with staff, faculty, and the student body. I have served as an officer in numerous capacities for the Student Government Association, the Student Alumni Association and the National Society of Black Engineers. I am a member of the American Institute of Chemical Engineers and the National Society of Black of Engineers, and a former Presidential Student Ambassador.

I have also been blessed with the opportunity of being accepted into the LINK program, as well as the Jack, Joseph and Morton Mandel Honors College. These opportunities, and many more, are readily available to all students. If I were to do things all over, I would still choose Cleveland State, and I strongly advise prospective students to do the same. ■

MICHAEL CONROY

DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

The Washkewicz College of Engineering has taught me so much about what it means to be an engineer and a professional. The quality of education at Cleveland State University is of the highest caliber and has helped me achieve more than I thought possible. For those unfamiliar with Cleveland State, all I can say is that if they were to attend just one semester here, they would see that our faculty is very knowledgeable and go above and beyond what is expected to ensure that their students learn and grow. Whenever I needed help with any of my course work, I knew I could turn to the faculty for help. Faculty members here take the initiative to make sure that we really learn so we may succeed after graduation. The office meetings I had with my instructors also helped me learn the material significantly better and enabled me to excel in the program.

In addition to the faculty's academic knowledge, they have a real working knowledge of what industry is like. Our classes do not simply focus on the traditional curriculum material; they also focus on what is important in an industry environment. For example, in my controls class taught by Dr. Gao, we were taught not only the principles behind a control system, but we were shown how we would use it if we were to work at a company, such as Rockwell Automation. This type of real world education is what makes the College of Engineering at Cleveland State so great. This is the sort of knowledge you could only gain from people who have worked in industry.

One more important thing that is so special about the Washkewicz College of Engineering of Cleveland State is the quality of students. I have been repeatedly told by many instructors that this is a student body like no other. Many students who attend school are either currently working or are returning professionals who are taking classes, while working full-time to further expand their education in their chosen field. This instills such a great sense of work ethic into students that any employer in the engineering industry would value. ■

SARAH McCLURE

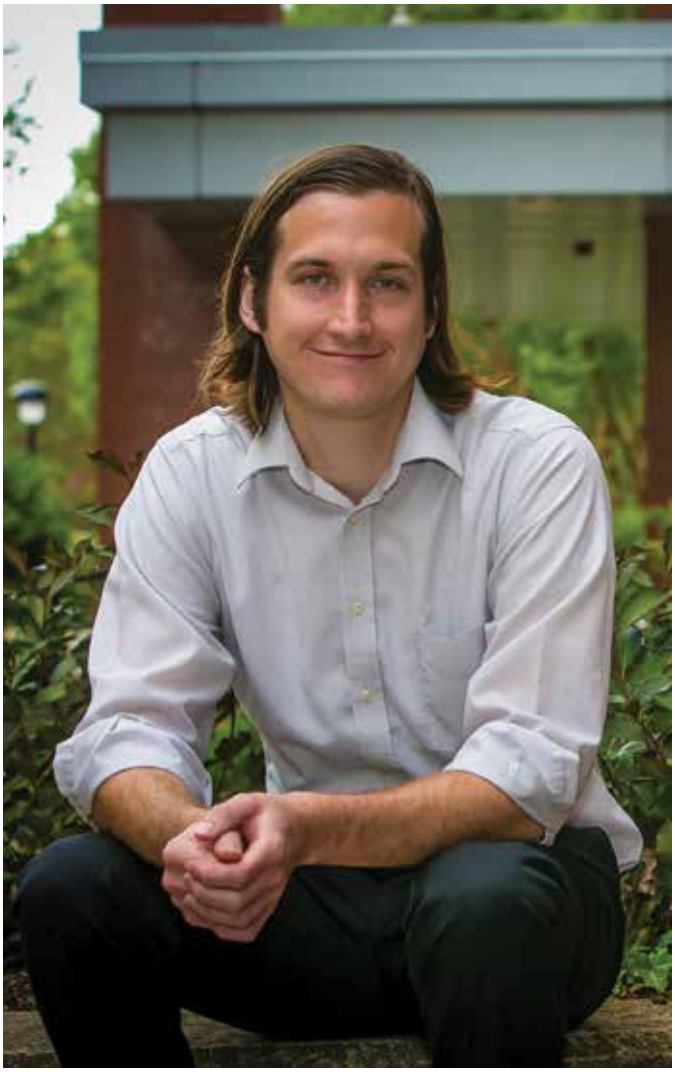
NSF-EAPSI FELLOW

DEPARTMENT OF MECHANICAL ENGINEERING

Sarah McClure, a Master's student in the Department of Mechanical Engineering, was awarded a 2015 Fellowship by National Science Foundation East Asia Pacific Summer Institutes (NSF-EAPSI) for her research proposal on flow around fractal wind fences. She spent the Summer of 2015 as an NSF Research Fellow at the Pohang University of Science and Technology (POSTECH) of South Korea. During her visit, McClure worked with Professor Sang Joon Lee from POSTECH and her research advisor, Dr. Wei Zhang, Assistant Professor of the Department of Mechanical Engineering of Cleveland State University, on quantifying turbulent flow structures of 1D and 2D fractal wind fences using an atmospheric boundary-layer wind tunnel. This research will contribute to optimal design of new-generation fractal wind fences, which can extract sufficient kinetic energy from the mean wind flow to effectively promote snow/sand deposition. In November 2015, McClure will present the research results at the 68th Annual Meeting of the American Physics Society-Division of Fluid Dynamics, in Boston, MA.

An EAPSI award provides U.S. graduate students in science, engineering, and education with: 1) first-hand research experiences in selected regions (e.g., Australia, China, Japan, Korea, New Zealand, Singapore, or Taiwan); 2) an introduction to the science, science policy, and scientific infrastructure of the respective location; and 3) an orientation to the country's society, culture, and language. EAPSI awards will help in developing the next generation of globally engaged U.S. scientists and engineers knowledgeable about the Asian and Pacific regions.

McClure says that "My overall experience in conducting research in Korea was incredible. This program allowed me to travel to another continent, immerse myself in another culture and gain more knowledge of the scientific world. Working with others from a completely different culture was challenging, yet inspiring. Seeing another aspect of lab culture at POSTECH motivated me to strive higher by improving the goals I set for myself academically. One of the most important things I learned from this program is how critical communication is to the success of a research project. It was beneficial to study at a bi-lingual campus, with English being the second language; however, miscommunications still arose. Nevertheless, I would encourage every student eligible to consider this program as it gave me a chance to face different challenges, explore a part of the other side of the world, interact with people from another culture, and gain a renewed appreciation of the opportunities available in America." ■



KURT FARRELL

DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

As a graduate student in biomedical engineering at Cleveland State University, I have been afforded the opportunity to build sincere connections with my peers, as well as engage in lucrative research projects. Every fall, I start the semester by taking part in planning the department's welcome-back picnic, which allows students to socialize with faculty and staff outside of the classroom, before coursework and research becomes our primary focus. I remember attending the event years ago, as a timid Master's student fresh out of undergraduate studies, not sure of what I had gotten myself into. Surrounded by faculty and staff, both at Cleveland State and the Cleveland Clinic, it seemed an impossible task to approach anyone to talk about their research endeavors. However, that was not the case at all, as several faculty members approached me to introduce themselves and were more than happy to discuss their ongoing research.

As a Master's student coming from a non-engineering background, I had some catching up to do. Thankfully, my classmates with engineering backgrounds always took the time outside the classroom to ensure I understood the fundamental concepts of engineering. In return, I would explain to them concepts of biology and physiology that they struggled with. As I finished my Master's degree, I had not only gained a wide-array of engineering skills, but also established strong connections with peers that I would continue to work with in the field. This became extremely important when I embarked on my doctorate in biomedical engineering at CSU, as many of those connections aided in the design and execution of several important experiments producing valuable data contained in my dissertation. As a doctoral student, the triumphs of successful research come with several hardships. Late nights, puzzling data, and constant written revisions are just a few of the tribulations that caused me to question my abilities as a researcher.

I can attest to the support, patience, and guidance provided to me by my advisor, as well as by the entire faculty and staff here at Cleveland State University. My research at CSU has resulted in several peer-reviewed publications and book chapters, all of which were the direct result of faculty guidance and the help of fellow graduate students. The research I have conducted during my time at Cleveland State has incorporated a variety of engineering tools such as mechanical testing and computer simulation coding, together with biological analysis, including cell culture and phenotypic staining, to solve complex problems in bone, cardiac, and neurological tissue engineering and cancer biology. The Washkewicz College of Engineering community fosters innovation and has prepared me for a successful career as a researcher. ■

TEISHA MULLINS

OHIO SPACE GRANT CONSORTIUM SCHOLAR

DEPARTMENT OF CHEMICAL AND
BIOMEDICAL ENGINEERING

When I applied to Cleveland State University, it was due to a singular driving force: the esteemed Fenn, now Washkewicz College of Engineering. The rich history and endless future prospects associated with the College of Engineering lured me from my quiet hometown to vibrant downtown Cleveland. The College of Engineering had so much to offer in terms of scholarships and extra curricular and career experiences. What really sold me, however, was the immersive curriculum, where students learned through engaging lectures and real applications. In just a few semesters, I quickly learned that I chose a degree that was not only interesting, but also one that I passionately enjoyed.

One of the factors that assisted me in solidifying my degree choice was the opportunity to not only conduct, but also present hands-on academic research. Starting in the summer after my first year of college, I consistently worked in the research labs in the Department of Chemical and Biomedical Engineering. While summer research students were given the opportunity to present their research at the beginning of the fall semester, the best presentation experiences I had were through the Ohio Space Grant Consortium (OSGC) Scholarship program. Every April, students from universities and community colleges from all over Ohio meet at the Ohio Aerospace Institute in Cleveland to present their research to fellow students, NASA employees, and a variety of professors, educators, and other university representatives. These experiences were some of my fondest memories, as I enjoyed the challenge of presenting to a heterogeneous audience in a professional setting.

Academics and research aside, the Washkewicz College of Engineering offers its students every opportunity to succeed outside the classroom. During my time as an undergraduate, I held a total of four different officer positions within two student organizations. These experiences supplement the academic curricula, giving students the opportunity to polish their organizational and leadership skills, and prepare them for their professional careers. These opportunities allowed me to work with interdisciplinary teams, lead and organize events, and most importantly, improvise when plans went awry. The leadership skills I developed, along with the practical skills I learned during co-ops and, academic research, coupled with my educational foundation, give me confidence that I have a competitive edge in today's job market. ■

CSU's Spring 2015 Valedictorian

Sarah Kay Watkins

This past spring, Sarah Kay Watkins graduated Summa Cum Laude from Cleveland State University, with a Bachelor's Degree in Computer Engineering. As the 2015 Class Co-Valedictorian, she shares the University honor with Jennifer Kate Berkey, of the College of Liberal Arts and Social Sciences. Watkins is also the Washkewicz College of Engineering's college valedictorian.

In her valedictorian address, Watkins congratulated all her fellow students and reminded them that they did not reach graduation without the help of others; she encouraged them to remember the people in their lives who care for and support them. She entered college without a specific career goal in mind, but she knew she had a purpose and stated that it was her religious beliefs that saw her through the challenges of college life. Watkins ended her address with the following: "Today, as we end one chapter in our lives and prepare to begin a new one, I would challenge all of you to find your purpose."

"I attended Lakewood High School, where I realized I was math-minded, like my father," said Watkins, who would later attend Cleveland State on a full scholarship. While she originally thought she would major in Mechanical Engineering, it was a freshman course in computer programming that changed her future. "I fell in love with software programming – it's what made me decide to major in Computer Engineering."

Watkins describes herself as a hands-on learner: "I need experience to help cement newly found knowledge once I leave the classroom." One of her more memorable courses was Digital Systems Laboratory. As a member of the Honors Program, she would conduct extra research to make the most out of her class experiences.

Her interests are now focused on cloud computing, where the applications are expanding beyond business uses. "It's a great alternative if you forget your flash drive," says Watkins.

With six siblings, she chose Cleveland State to remain close to her family and church. "I also liked the city environment and being able to walk to classes through the interlinked campus buildings, as well as the social interaction that all the campus events offered," said Watkins.

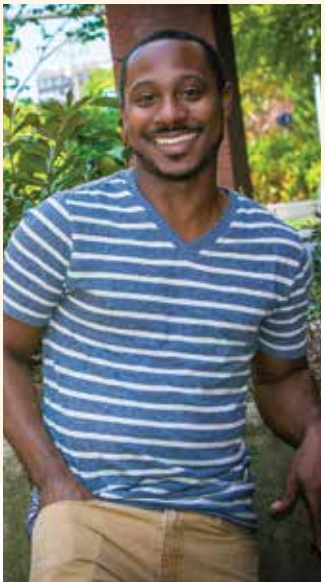
Having taken a year off between her freshman and sophomore years to take advantage of an internship with her church, Watkins spent one day a week that year tutoring sixth and seventh grade students in math and science. Once back on campus, she continued her work with elementary school students through the MindSET program offered by the Engineering Honor Society, Tau Beta Pi.

As for the success she has achieved during her years at Cleveland State, Watkins says she didn't think she had a chance at becoming valedictorian. Watkins recalls she was "bouncing off the walls" when she was originally accepted into Cleveland State University and the Honors Program. She credits her faith and family in helping her achieve her goals. "I'm grateful that I came from a good home and that my parents were the type that only expected us to do our best." ■

"BE PASSIONATE ABOUT WHAT YOU DO"

— DONALD WASHKEWICZ
Chairman of the Board of Parker Hannifin Corporation
Senior Design and Awards Dinner, 2015

Congratulations to the 2015-16 Academic Year Washkewicz Scholars



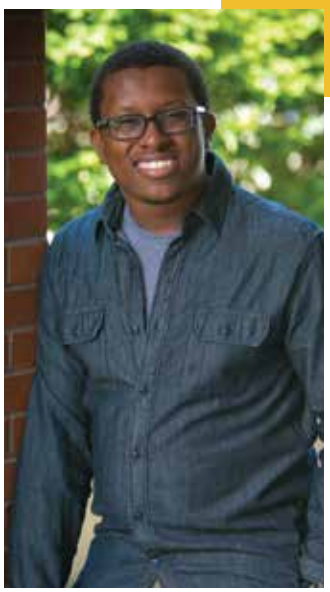
MARCUS COLEMAN
Mechanical Engineering Senior

MITCHEL YAKOWEC
Mechanical Engineering Freshman

ELIZABETH HAMMAN
Civil Engineering Sophomore

JEREMY KELLING
Mechanical Engineering Freshman

MATTHEW HAMMAN
Mechanical Engineering Junior



JAMMEL McRAE
Engineering Sophomore

ANDRES SALDANA
Civil Engineering Sophomore

DAVID PENDLETON
Electrical Engineering Senior

MITSI TORRES
Electrical Engineering Junior

MADELYN HEADINGS
Engineering Freshman

Ohio Space Grant Consortium Fellowships

The Washkewicz College of Engineering was honored to have **two** OSGC Fellows during the 2014-2015 academic year

In an effort to encourage advanced education in STEM related fields, the Ohio Space Grant Consortium (OSGC) offers financial support through competitively awarded fellowship opportunities for Master's students. Under the guidance of a faculty mentor, fellowship recipients are required to propose and initiate a research project or educational activity. The findings of their research/educational activity are presented at the OSGC Annual Student Research Symposium, held every April at the Ohio Aerospace Institute in Cleveland, Ohio.

JOSHUA M. CMAR

OHIO SPACE GRANT CONSORTIUM FELLOW

DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

In Fall 2012, Joshua M. Cmar began doing research on the thermal characterization of polymer slurries as part of the Upper Division of Research for University Scholars at Cleveland State University. "My undergraduate advisor, Dr. Jorge E. Gatica, was doing research through NASA, so that's where I got my feet wet in space related research," said Cmar.

His OSGC project, titled "Catalytic Gasification: A Green Alternative for Waste Management in Space Exploration," focuses on recycling plastics used in space cloths and food packaging. "The ultimate goal is to recycle items while still in space. We are even using simulated human waste made with household oils. By placing waste in containment chambers and then converting it to energy, we are studying at what rate the items convert and then testing it in a zero gravity environment," said Cmar.

The processes of Wet Thermal Catalytic Oxidation (WTCO) promote the conversion of long polymeric chains into synthetic or supply gas at temperatures lower than those required by more traditional gasification technologies. The presence of a catalyst is known to lower the energy required to promote gasification reactions making WTCO processes an attractive route for waste management and converting biomass to energy. The conversion of these polymeric chains through oxidation was studied for two different catalysts (Ru and Pt on Al203) combined in a slurry of water and waste polymers. Data collected has been characterized by gas chromatography, and used for the mathematical modeling of reactions under observation. Such a model is anticipated to enable the optimization of process configurations for continuous waste management in space exploration environments.

"This is a project that will span years. We are still collecting data and working on expanding the building blocks of numeric modeling to gain a greater understanding of how plastics break down. The next group of students to study this will be the ones to actually build the prototype," said Cmar.

While attending the OSGC Symposium this past April, Cmar was most impressed by the expanse of STEM education. "One student project focused on how to teach middle grade school kids about life cycles in space and how to use math to find solutions to these unique types of problems," said Cmar.

Teaching young school children about the uses of technology in space seemed a long way from Cmar's own previous work with young children. During his senior year, he had the opportunity to travel to Belize with Engineers Without Borders to help build an elementary school that doubled as a community hurricane shelter. "It was a humbling experience…our work provided the first flushable toilet for the school kids, who previously only had three holes in the ground covered by a wooden shed," said Cmar. The 10-day trip proved to be an eye opening experience, and given that the project was the result of five years of work by many groups of students, it afforded him the opportunity to gain a greater understanding of success in planning. ■

ANDREW J. ZAK

OHIO SPACE GRANT CONSORTIUM FELLOW

DEPARTMENT OF CHEMICAL AND BIOMEDICAL ENGINEERING

Having earned his Bachelor's Degree with Honors in Chemical Engineering from Cleveland State University, Andrew J. Zak pursued a Master of Science in Chemical Engineering through the 4+1 Accelerated Master's Program at Cleveland State. Zak's interest in drug design and development led to his OSGC research project, titled "Determining the Transport Enhancement of Sodium Fluorescein in Mechanically-Loaded Canine Tibia Bone Tissue."

Quantitative research on the impact of mechanical loading on the transport properties of bone has several critical applications. "NASA is interested in the causes of bone density loss in microgravity environments, as astronauts are susceptible to bone fractures. My goal was to better understand the transport properties of bone and how molecules move through bone tissue, particularly during periods of movement or exercise," said Zak. His research aimed to confirm the hypothesis that exercise decreases bone loss through enhancement of transport of certain molecules through dense cortical bone tissue at the micro-structural level. "A method has been developed in our lab that can potentially allow for the measurement of the effective permeability of large molecules in canine tibia bone tissue under both unloaded and mechanically loaded conditions," said Zak. Since canine and human bone structures are similar, the findings from these experiments utilizing canine bone should provide a reasonable idea of what one might expect for human bone. His research sought to measure the transport

enhancement of sodium fluorescein for a bone beam undergoing four point bend testing in a mechanical loading system, in order to quantify the effect of mechanical loading on solute transport.

"I'm grateful for the funding and research opportunity provided by the Ohio Space Grant Consortium, as well as for the support of the Cleveland State University faculty, and my friends and family. This was my first time at the symposium and I was very impressed with the quality of work, especially among the OSGC senior scholar students," said Zak. He also found the student poster presentations to be helpful in furthering his outreach ideas for the MindSET Project.

As a national outreach program of the Engineering Honor Society, Tau Beta Pi, the MindSET Project's goal is to develop an interest in math, science and engineering among K-12 students. As the Ohio-Epsilon coordinator of the project, Zak has worked with students at the Fairfax Elementary School in Cleveland Heights, conducting one and two week modules covering topics ranging from light and sound to bridge and bottle rocket construction to the physics behind buoyancy. "It's been a great opportunity to give students a means of engaging in engineering concepts that will hopefully pique their interest and foster a love for learning more about the world around them," said Zak.

Zak has also been involved in the American Institute of Chemical Engineers (AIChE). During his senior year at Cleveland State, his group's Senior Design Capstone Project won the AIChE Student Design Competition for their work in designing a new manufacturing process for producing influenza vaccines. Traditionally, vaccine development involves injecting a virus into an egg, which serves as a host to grow specific virus strains that are overseen by the World Health Organization. Manufacturing facilities of influenza vaccines use millions of eggs each day. With the economics of supply and demand, and reoccurring egg shortages, the pharmaceutical industry is looking to cell cultures as a more feasible solution in the event of a pandemic. Their AIChE project required them to design the upstream bioreactor train as well as the downstream purification and separation system while implementing disposable technology throughout their process. The upstream process involved growing a large number of cells and then injecting those cells with a virus stock solution, and the downstream process of separating the virus-like particles (VLPs) out of the cell debris and media solution, whereby the virus protein that makes up the vaccine could then be freeze dried for later use. "Cell culture techniques have been in use for manufacturing influenza vaccines for the past few years, but it may take another 5-10 years for this method to become the mainstream model," said Zak. Additionally, Zak's group focused on implementing disposable technology throughout their manufacturing design. In November 2014, his group had the opportunity to present their winning design at the AIChE Conference in Atlanta, GA. ■

Senior Design Symposium and Awards Dinner

Most Senior Design projects are now sponsored by local and regional companies. "We are grateful for the business community's involvement that has afforded students to be paired with businesses in real world settings," said Dean Anette Karlsson.

The Senior Design projects were funded by the Air Force Research Laboratory, Cleveland Metroparks, DS Express Carriers, Inc., General Electric, First Power Group LLC, Interstate-McBee, Lincoln Electric, MesoCoat Inc., NASA, Parker Hannifin, Rockwell Automation, SMS Meer, Soundwich, Steris, UTC Aerospace Systems, Virtec Enterprises, LLC, and Mike and Amy Sturdevant.

On May 1, 2015, the Washkewicz College of Engineering hosted the Senior Design Symposium and Awards Dinner event in the Ballroom of the Cleveland State University Student Center. Cleveland State University President Ronald M. Berkman honored the event with his presence and words of advice to the students. The excellent keynote speech of the event was given by Mr. Donald Washkewicz, who inspired the students providing invaluable advice for professional success.

The Senior Design Project student teams displayed their project posters and related equipment/devices during the poster presentation at the event. The top 14 projects, as selected by the departments, participated in a poster competition. Judges included representatives from Parker-Hannifin, Hill International and the Universities Space Research Association.

Projects were diverse, reflecting the nature and mission of the institution, and included the development of a water purification system that removes hormones and pharmaceutical products from tap water, the modification of the electrical power consumption of a restored 1928 movie theater, the creation of a web app for the trucking industry, and the development of a greenhouse heating system, just to name a few.

The following presents the First, Second and Third Place Senior Design projects for 2014-15 as determined by our panel of judges.

First Place Winner:
Wireless Water Monitoring Sensor Network

The team members for this project, sponsored by the Cleveland Metroparks, were Michael Conroy, Sedrick Bolden and Alexander J. Resendes from the Department of Electrical and Computer Engineering. Their instructor, Dr. Zhiqiang Gao, supervised the project.

The goal of the project was to integrate a wireless transmitter onto existing sensors and then construct a wireless network of existing water level sensors. The system in turn would be used to monitor ground water levels and flow rates throughout the Cleveland Metroparks's extensive system of nature preserves. The various reservations, which surround the city of Cleveland, are situated near the rivers and creeks that flow through the region. As the park system can be navigated in part by interconnected roadways, monitoring water levels also helps track overflow from creek beds and wetlands, enabling park rangers to decide when to close roads off for safety reasons. Assessing where water tends to pool helps maintain the parks other features, including its numerous golf courses.

"The Metroparks had sensors in place, but the antiquated system involved plugging a PDA in at each site to obtain readings. With over 100 checkpoints, the park needed a high tech system without the high tech costs," said team member, Michael Conroy. An Electrical Engineering major, Conroy sought this project out, as his father had worked for the Cleveland Metroparks.

Patrick Lorch, a conservation expert with the Metroparks, was the team's industry contact. After presenting them with the problem, the team spent the first semester in the planning process. Using a low cost, Raspberry Pi mini computer, the team connected into the Metroparks internet system, making the sensors accessible across any computer. The Raspberry Pi computer acted as a convertor, enabling the team to create a wireless network.

Building new sensors compatible with the Metroparks old water level sensors that have a depth of three feet, they tested how the new sensors worked by placing them into a bucket of water. "One of our biggest challenges was figuring out how the Raspberry Pi would fit the sensors," said team member, Alexander Resendes.

As Resendes and Bolden are computer engineers, they also designed the project's website and real-time accessible database. "Integrating the sensors and the database was a trial and error process," said Conroy, who claimed one of his takeaways was learning patience in problem solving. ■

Second Place Winner:
Design of an Engine Air Particle Separator for Unmanned Aerial Vehicles

The team members for this project, sponsored by the Air Force Research Laboratory, were Jason B. Wolf, Erick Shelley and Daniel Stralka. Their instructor, Dr. Majid Rashidi, from the Department of Mechanical Engineering, supervised the project. Dr. Mark D. Benedict, a member of the Materials and Manufacturing Directorate for the Air Force Research Laboratory, provided the appropriate advising and overseeing for the project.

The goal of the project was to design, build and test an engine air particle separator for a UAV using Additive Manufacturing that focused on separating airborne particles within 10-200 microns. Air Force specs also required that the finished product fit within a volume of 8" x 6" x 6."

Possible usage scenarios could include adverse military situations, such as the deserts of the Middle East, or civilian purposes, as in the case of a volcanic eruption, where volcanic ash would present a problem for UAV engine performance.

To gain a better understanding of the problem they faced in designing a more efficient air particle separator, they looked at separators currently used on aircraft and helicopters. "Once we understood the physics behind the project, we had a baseline to work from," said team member, Jason Wolf. "Having access to 3D printers for this project gave us a whole new way to think about product design and development."

In March 2015, they printed their first full-scale model. In the experimental analysis, the particle separation efficiency in test apparatus was 86.25%, while in the computational analysis using SolidWorks Flow Simulation they achieved 89% efficiency.

This was team member Dan Stralka's first experience in working with a 3D printer. "Seeing our air particle separator come to life through 3D printing was pretty exciting," said Stralka. "Working as a team was a great experience too. Jason handled manufacturing and Erick designed the software, while I dealt with computational fluid dynamic issues."

In April 2015, the team presented their work at a conference at Wright Patterson Air Force Base in Dayton, Ohio. "My advice to Senior Design Project students is to be ambitious – you'll get more from the experience," said Wolf. ■

Third Place Winner: Chainless Challenge

The team members of this project, sponsored by the Parker Hannifin Corporation, were Sabrina J. Abram, Gregory R. Arcangelini, Huda M. Qawi, Jesse C. Malone, Jonathan A. Tarnay and Jordan G. Thomas. Their instructor, Dr. Majid Rashidi from the Department of Mechanical Engineering, supervised the project while Dr. Joseph Kovach from Parker Hannifin helped overseeing it.

The Parker Chainless Challenge tasks students from colleges and universities around the country with designing a bicycle (or tricycle) that operates on fluid power instead of a conventional chain. The goal is not really to create a new product for market, as the standard bicycle chain still remains the way of choice to power a bike, but rather to give students an open-ended problem to solve using fluid power. Specifications for the challenge, as outlined by Parker Hannifin, stated that the objective was to promote original thinking in a competitive setting by combining two technology platforms that are not normally associated with one another - the bicycle and fluid power.

The Challenge was hosted in California, where students scored points based on vehicle and fluid circuit design, hardware selection, analysis of dynamics, fluid flow, expected performance and prototype construction. The final phase of the competition involved a sprint race, a time trial race, an efficiency challenge, and other races designed to test how well each individual team's prototype bike performed.

Committed to the task, this team worked 100 hours over the spring break to complete the project on schedule. "Coordinating schedules was one of our challenges, so we shared individual work via Google Drive to ensure everyone was on the same page," said team member, Gregory Arcangelini. Determining who was good at which task and then distributing the workload, while at times dealing with conflicting ideas, was all part of the teamwork process. "We had input from members of the group, our project advisor and our representative from Parker, and while they all sounded like good ideas, my advice to future students is don't try and incorporate every single piece of advice into your project, otherwise you may end up with a project that isn't what you intended at the start," said Arcangelini.

Designing an in-frame reservoir, where the frame was used as the hydraulic reservoir, allowed them to save critical frame space and allowed for more flexible component placement. Using a Parker motor and gear head, the team created a crank assembly, a hydrashift (a phrase coined by Arcangelini) and an electronic circuit to power their tricycle. "To implement hydraulic shifting, while minimizing hydraulic losses, the custom designed hydrashift allowed for mechanical disengagement of the cylinders," said Arcangelini. Their design employed three hydraulic cylinders that simulated a bike's gears. The intent was that engaging the second cylinder would double the available power, while engaging the third cylinder would triple the power. However, powering the bike with legs proved to be a challenge, as friction within the piping caused a pressure drop.

Team member Jesse Malone designed a pin for the shifting mechanism that allowed two of the three cylinders to be locked down, while one was in motion. While machining took longer than planned, it would not be his greatest challenge. As part of the bike was crushed during shipment to California, Malone flew out early to fix the front end. "My career goal is to be in project management, so this project offered me real world experience not only in terms of teamwork, but also in handling unforeseen crises," said Malone. ■

DEAN'S DIVERSITY COUNCIL

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 16, 2015. THIS IS THE SECOND YEAR IN A ROW THAT THE COLLEGE RECEIVED THIS HONOR. THE MISSION OF THE DEAN'S DIVERSITY COUNCIL IS TO PROMOTE A CULTURALLY AND INTELLECTUALLY RICH ENVIRONMENT FOR DIVERSITY AND INCLUSION, AND SUPPORT EDUCATIONAL SUCCESS AND PERSONAL DEVELOPMENT FOR ALL.

The Chair of the Engineering Dean Diversity Council, Sandra English, receives the President's Award for Excellence in Diversity from CSU President Ronald M. Berkman.

College of Engineering faculty, staff and students at the event; standing (from left): Dr. Mounir Ibrahim, Sandra English, Dr. Woodrow Whitlow, Dr. Nigamanth Sridhar, Rose Begalla, Gregg Schoof, Dean Anette Karlsson, and Associate Dean Paul Lin; sitting (from left): Danielle Vath, Vesnyana Liskevich, and Titus Lungu.

DIVERSITY IN THE WORKPLACE SEMINAR

ON FRIDAY, NOVEMBER 21, 2014, THE COLLEGE ORGANIZED THE DIVERSITY IN THE WORKPLACE SEMINAR, A FULL-DAY EVENT CONSISTING OF THE FOLLOWING SECTIONS:

1. Women of Color Conference Panel

The 2014 Women of Color (WOC) Stem Conference took place in Detroit, Michigan, on October 23-25, 2014. Four students and two staff members from the Washkewicz College of Engineering were invited to attend on behalf of the Dean's Diversity Council. The conference was an opportunity to network with professionals in corporate America, meet top employers at the career expo, and enhance skills through workshops and seminars.

Based on the information collected at the WOC conference, there was a panel discussion on November 21 at the College, held by the student attendees of the WOC conference and facilitated by Lachen Parks, the student communications assistant for the Dean's Office, which entailed all that the conference had provided, including workshops and resources for professional development, and a career expo that encompassed over 50 companies. Students shared information about their experiences at the conference, including what they learned and enjoyed the most. Some of the highlight events included the 19th Women of Color Awards Gala and Dinner, where 30 outstanding women of color were recognized, and a resume-writing workshop to assist students in acquiring professional experiences from the career expo. Furthermore, the student panel shared ideas on how they could become more involved and help diverse student organizations at the Washkewicz College of Engineering, by assisting the National Society of Black Engineers (NSBE) and the Society of Hispanic Professional Engineers (SHPE) to become more active and involved with the diverse engineering student body. The panel closed with a Q&A session, where engineering students were able to ask additional questions about the WOC conference events.

2. Lincoln Electric and UTC Aerospace Systems Panel

Company representatives from Lincoln Electric and UTC Aerospace Systems presented about the services that their companies provide during the second panel presentation for the Diversity in the Workplace Seminar. Presentations included thorough information about each company's culture, opportunities for advancement and mentoring, examples of prosperous successes, and events held to allow employees to get to know each other better. In addition, companies discussed opportunities within their organizations that highlight the benefits of diversity. Students were able to learn more about adaptation and growth required when entering the workforce, following graduation from college. Students also discussed employee retention and professional development with company representatives.

3. NASA

Representatives from the National Aeronautics and Space Administration (NASA) were the participants of the final panel of the Diversity in the Workplace Seminar program. They discussed the various existing sectors of research at the NASA Glenn Research Center (NASA-GRC). The panel discussed the transition following graduation, and how to utilize their website to apply for engineering opportunities. Students were able to learn about the types of engineering work that happens at NASA-GRC, as well as the benefits to initiating a career with NASA.

The event started with NASA-GRC's Director of Research and Engineering, Dr. Rickey Shyne, discussing in detail the six areas of focus that he oversees. The prospective vision and overall goals of all the sectors were discussed along with explanations of some of the ongoing research work. The variety of the work involved in these sectors was a clear indication that NASA syndicates a diverse set of skills from all engineering fields to accomplish a particular goal. A panel of Cleveland State University alumni, who currently work at NASA-GRC, followed the director by discussing their transition period from school to full-time permanent employment. The alumni explained their current roles at NASA and how the College of Engineering at Cleveland State prepared them well to succeed in their careers. The panel also discussed the importance of getting involved with student organizations, volunteering opportunities, and pursuing a graduate degree. The final segment of the workshop was a step-by-step informational session on how to effectively use NASA's website to apply for full time internship and fellowship opportunities. Students were instructed on how to select the top 15 research projects they would like to be involved with and how the selection process works. The HR representatives also discussed how to apply for full-time graduate opportunities through JobsOhio. The event was a great success and helped students obtain important information about NASA-GRC. From an alumni perspective to an HR debriefing, this workshop definitely provided the essential knowledge for understanding what it is like and how to become part of NASA-GRC's team. ■

FENNCO-OP

OUR CO-OP PROGRAM IS GROWING

Currently, over 20% of CSU's engineering students are participating in the Fenn Co-op program, with the goal being to increase this number to 50% of the engineering student body within the next five years. The College of Engineering has strong relationships with industry, which provide meaningful opportunities to meet the needs of the students in the program. In addition, the Fenn Co-op program offers support, guidance, and faculty mentorship. Once students complete the program, they are awarded a co-op scholarship. During their participation in the program, they are also encouraged to apply for external co-op scholarships.

In the past few years, the Fenn Co-op program has experienced a tremendous increase in student participation, with an increase in the number of minority and female students. Faculty members from all engineering departments are fully involved in the program, and a peer-mentoring program was recently created to assist current co-op students. A Fenn Co-Op Advisory Council was also established consisting of co-op alumni, faculty and industry representatives.

Students who enter the Fenn Co-op program are committed to a five-year academic program, during which they receive up to a full year of practical engineering experience. While on the job, students take the Engineering Cooperative Education Experience course to further enhance their knowledge. Students receive credit on their transcript for their co-op semesters and are awarded a certificate of completion upon graduation. ■

FENN CO-OP RECEIVES THE E. SAM SOVILLA AWARD OF EXCELLENCE FROM THE OHIO COOPERATIVE EDUCATION ASSOCIATION

On Thursday, May 14, 2015, the Ohio Cooperative Education Association (OCEA) honored the Fenn Co-Op program with the E. Sam Sovilla Award of Excellence. The award is the highest honor presented by the Association for educational institutions and employing organizations that maintain exceptional cooperative education and/or internship programs. Previous winners of this award include the University of Akron, Case Western Reserve University and the University of Cincinnati.

OCEA is a nonprofit professional association founded in 1971. OCEA membership is open to employers, educators, and those interested in cooperative education and internships in the State of Ohio. ■

Danielle Vath being presented with the E. Sam Sovilla Award of Excellence for the Fenn Co-Op program by the Ohio Cooperative Education Association (OCEA)

WELCOME NEW PROGRAM COORDINATOR

Danielle Vath, M.Ed., is our new co-op program coordinator. A native of Bowling Green, OH, Danielle earned her undergraduate degree in Journalism from the University of Toledo and her Master of Education in Higher Education Administration and College Student Personnel from Kent State University. Danielle joined the Fenn Co-Op Program team in July, 2014, and has been assisting in expanding the services of the co-op office.

ENGINEERING CONNECTIONS FAIR:

The Washkewicz College of Engineering has an annual Engineering Connections Fair where over 70 employers come to the college campus to recruit engineering students. Engineering students looking for co-ops, internships, graduate and full-time opportunities are invited to attend the event. The 3rd annual Engineering Connections Fair took place in early October 2015. For more information, please contact the Manager of Fenn Co-Op, Sandra English, at s.l.english@csuohio.edu or at (216) 687-6968. ■

TO OUR CO-OP STUDENTS:

Fenn Co-Op has launched an improved method of providing students with an engaging process for interacting with industry. Using Optimal Resume, a web-based program, engineering students can create high-quality multimedia resumes and share them online. Students will be able to vastly improve their job hunting and self-promoting skills with the various tools the website provides. This program also has added features for graduates and alumni opportunities.

Students can access this service from any computer by visiting https://csuohio-eng.optimalresume.com, and using their CSU student e-mail address to create or access their account. For more information, please contact the Fenn Co-Op Coordinator, Danielle Vath, d.vath@csuohio.edu or at (216) 687-6970. ■

TO OUR CO-OP INDUSTRIAL PARTNERS:

Optimal Resume also offers companies, looking for co-op students as well as undergraduate or graduate student interns, an easier way to contact our students. Employers are able to post available opportunities, which can be easily accessed by students, receive daily notifications of newly submitted applications, review students resumes, cover letters and portfolios, and directly interact with job applicants to arrange interviews and follow-ups.

Companies can access this service from any computer by visiting https://csuohio-eng.optimalresume.com/employers, and filling out the log-in information to create or access their account. For more information, please contact the Manager of Fenn Co-Op, Sandra English, at s.l.english@csuohio.edu or at (216) 687-6968. ■

To learn more about events or to participate in the Fenn Co-Op program, please contact Sandra English (s.l.english@csuohio.edu or (216) 687-6968) or Danielle Vath (d.vath@csuohio.edu or (216) 687-6970).

ENGAGING HIGH-SCHOOL STUDENTS

FENN ACADEMY IS DESIGNED TO ENCOURAGE STUDENTS TO PURSUE CAREERS IN ENGINEERING

The Fenn Academy, established in 2005, is a consortium between Cleveland State University's Washkewicz College of Engineering, local school districts and industry partners that collaborate in educational activities designed to encourage students to pursue post-secondary education and careers in engineering. The Academy is also dedicated to promoting living and working in northeast Ohio after graduation from college.

During the academic year 2014-15, the Fenn Academy provided activities for 1,191 students at 51 middle schools and high schools. New partner schools included Perry High School, John F. Kennedy High School, Midview High School and Orchard STEM Middle School. The Academy also welcomed Dansville High School, located in western New York, after one of its students discovered Fenn Academy on the Internet and brought the program to the attention of school officials.

The Fenn Academy reaches students in Cuyahoga and four adjacent counties. Activities include free on-campus, half-day events known as Engineering Activity Days, an annual job shadowing program for up to 100 students in grades 9-12, and a new small grants program for teachers. Support is also provided for team competitions like VEX Robotics through IEEE, curriculum consultation with area teachers and individual tours and advising. Engineering faculty members are also available to speak on topics of interest at participating schools.

The Academy strives to recruit increasing numbers of female and other students who are underrepresented in the engineering field. In pursuit of that goal, the Fenn Academy works closely with schools in the Cleveland Metropolitan School District (CMSD), including MC2STEM High School, Success Tech Academy, the Design Lab at Jane Adams High School, Max Hayes High School, John Hay Early College High School, Rhodes

High School, John F. Kennedy High School and Horizon Science Academy, a Cleveland charter school. Several high schools in diverse inner ring suburbs are also served, including those in Lakewood, Parma, Shaker Heights, Garfield Heights, Cleveland Heights/University Heights, Wickliffe and Euclid. Additionally, St. Joseph Academy and Beaumont School, both all-female high schools, are also served.

Fenn Academy's staff also speaks to students enrolled in College Now Greater Cleveland, a college preparatory program that conducts their summer camp in Fenn Hall. We also partner with the ACE Mentor Program of Cleveland, part of a nationwide effort to prepare students for STEM careers. The Washkewicz College of Engineering provides annual matching scholarships for students from ACE who enroll in engineering at CSU. We also work with the Perry Initiative, a national program that encourages girls to pursue careers in engineering and medicine, and we host an annual tour and presentation for students in the Cleveland Clinic's Healthcare+ Pathways Program.

Over $6,000 was distributed through small grants to high school teachers who submitted creative proposals engaging more than 600 students in engineering activities. Projects were selected that reached broad geographic regions and diverse populations. Funded projects included the region's only all girls robotics team at Beaumont School. Others included a biosphere project at Shaker Heights High School, designing 3D objects using 3D printing by a team of girls at the Cuyahoga Valley Career Center, collaboration in a design project with the ACE Mentor Program at John Hay High School, and exploration of the engineering cycle and physics concepts at Design Lab Early College High School. Tools were also purchased for 70 students in the Six District Educational Compact's Engineering Academy, and a grant also supported the purchase of bridge, solar power, wind and bio energy kits for research projects at Villa Angela-St. Joseph High School.

Working closely with staff from CSU's Michael Schwartz Library and the NASA Glenn Research Center, the Academy brought NASA's Science on a Sphere display to campus. Built as a vehicle for nationwide STEM outreach, Science on a Sphere uses computers and video projectors to display animated data on the outside of a suspended, 6-foot white globe. Over 200 visiting students, led by NASA staff, learned about subjects including global environmental problems, migratory patterns of birds and sea life and the use of satellites to track changes in the weather. ■

The Fenn Academy is grateful to its current sponsors, including Lincoln Electric, Middough, Inc., Lubrizol and the Northeast Ohio Regional Sewer District. To learn more, visit www.csuohio.edu/fennacademy or contact Gregg Schoof, Manager, Engineering Student Programs at (216) 687-5272 or g.schoof@csuohio.edu.

COMPUTER SCIENCE *MOVES* TO ENGINEERING

Starting in the Fall 2015 semester, the Computer Science programs have moved from the Monte Ahuja College of Business to the Washkewicz College of Engineering and are part of the Department of Electrical Engineering and Computer Science (formerly Electrical and Computer Engineering). We are very pleased to welcome the Computer Science faculty and look forward to providing a first-class education to our new students and graduating the best computer science professionals.

Timothy J. Arndt, Ph.D.
Professor

Dr. Arndt is Professor of Electrical Engineering and Computer Science with a joint appointment in the Department of Information Systems. He has a B.S. from Purdue University, a M.S. from the University of Florida, and a Ph.D. in Computer Science from the University of Pittsburgh. While at Pitt, he worked at Microelectronics and Computer Technology Corporation. He also worked at Siemens-Nixdorf Information Systems in Italy. Dr. Arndt is a Senior Member of the Association for Computing Machinery. He was program co-chair for the international Distributed Multimedia Systems conference, international Distance Education Technology workshops, and PC member on numerous international conferences. He is Viewpoints Editor for the Elsevier Journal of Visual Languages and Computing and editorial board member for several other journals. He has published about 20 journal and 30 conference papers. Dr. Arndt has been co-PI on two NSF grants. His research interests include multimedia, social network analysis, and eLearning. ■

Ben A. Blake, Ph.D.
Associate Professor

Dr. Blake was awarded a Bachelor of Arts degree in Mathematics by Wittenberg University in June 1983, a Master of Science degree in Computer and Information Science from the Ohio State University in June 1985 and a Doctor of Philosophy in Computer and Information Science from The Ohio State University in March 1990. He has been continuously employed at Cleveland State University as a faculty member or interim chair since September 1990. His research interests include computer science education, programming languages, mobile computing, networks, real-time computing, and embedded systems. Ben both consults and runs in-house training sessions for government and corporate entities. Outside of Cleveland State, Ben enjoys golf, snowboarding, brewing, gardening and hiking. ■

Sunnie S. Chung, Ph.D.
Assistant College Lecturer

Dr. Chung received her Ph.D. in Computer Science from Case Western Reserve University and performed postdoctoral work in Information Retrieval at Case. Before joining Cleveland State University, she worked as Research Associate at NCR/Teradata (Previously known as AT&T) in California. Dr. Chung's research interests include Data Analytics/Data Mining, Big Data Processing in Massively Parallel Processing Systems: Map Reduce/Hadoop, Parallel Data Warehouse/OLAP, Cloud, Integration of Big Data Processing Systems, Query Rewrite Optimization for Parallel Database Performance, Cyber Database System Security, and Advanced Data Processing Techniques. Her research has resulted in 5 research project realizations into Teradata Massively Parallel Processing Data Warehouse System. She is a member of Data Scientists Professionals and she is currently serving in establishing a Center of Expertise in Data Analytics, Cloud Computing, and Cyber Security at Cleveland State University. ■

Sanchita Mal-Sarkar, Dr.E.
Associate College Lecturer

Dr. Mal-Sarkar received her Doctor of Engineering degree in Computer Engineering from Cleveland State University, her M.S. in Computer Science from the University of Windsor, Canada, and her M.S. in Physics from Banaras Hindu University (BHU), India. Dr. Mal-Sarkar published several conference and journal papers on hardware and software security and trust, fault-tolerant networks, soft/granular computing and risk analysis, and wireless sensor networks. Dr. Mal-Sarkar has been awarded two grants as Principal Investigator on cyber security education: one from NSF ($200,000), and the other from CSU (Teaching Enhancement Award - $4,560). Dr. Mal-Sarkar recently served in a program committee of an international conference. Her research was highlighted in NPR, the Plain dealer, and several other magazines. ■

Victor M. Matos, Ph.D.
Professor

Dr. Matos is a Fulbright Scholar and a Professor in the Department of Electrical Engineering and Computer Science. His research areas include database systems, mobile application development, and computer science education. Dr. Matos received a Ph.D. from Case Western Reserve University, and a Bsc and Msc degrees from Universidad Simon Bolivar (Venezuela). Dr. Matos has published in very prestigious journals and conferences including ACM Transactions on Database Systems, ACM SIGACT-SIGMOD Symposium on Principles of Database Systems, Communications of the ACM, Journal of Information Systems Education, ACM-SIGCSE Inroads, International Journal of Technology, Knowledge and Society. He has received various awards for outstanding contributions including the "Michael Cangemi Award" granted by the Information Systems Audit and Control Journal, for his work on electronic money, and an award from the International Journal of Technology, Knowledge and Society for his contribution on global emergency detection and response systems. ■

Janche Sang, Ph.D.
Professor

Dr. Sang received his B.S. degree from National Taiwan University, his M.S. degree from Michigan State University and his Ph.D. degree from Purdue University, all in Computer Science. Dr. Sang's research interests include parallel and distributed computing, simulation, software engineering, cloud computing, computer networks, operating systems, compiler, and performance measurement. While at Purdue, he received the Halstead Award, which is given annually to the student who has made the most significant contributions to software engineering research. From August 2000 to July 2001, he was an invited researcher at the NASA Glenn Research Center. Additionally, Dr. Sang was awarded the Fulbright Senior Research grant in 2012, conducting his research at National Tsing Hua University in Taiwan. He has served as an editorial board member for three journals and has also served on the program committees of several international conferences. His research has been supported by NSF, NASA, OBOR, and OSC. ■

Haodong Wang, Ph.D.
Assistant Professor

Dr. Wang received his B.E. degree in Electronic Engineering from Tsinghua University, his MSEE degree from Penn State University and his Ph.D. degree in Computer Science from College of William and Mary. Dr. Wang's research interests include data management and search, security and privacy in pervasive computing, high efficient public-key cryptography primitives for embedded systems, IEEE 802.11/4G/LTE wireless computing, mobile operating system and web security, and cognitive radio. His open-source ECC and RSA public-key cryptosystem implementation, WM-ECC and WM-RSA have been adopted by more than twenty renowned research institutes and universities in the world. He has served on the program committees of a number of international conferences. His research has been supported by NSF. ■

In addition to the individuals shown above, the Computer Science faculty also includes Vijaya K. Konangi, Ph.D., and Chien-Hua Lin, Ph.D., as well as Pooyan Fasli, Ph.D., who joined the department in Fall 2015.

DEVELOPMENT & ALUMNI NEWS

WASHKEWICZ $5 MILLION DONATION BOOSTS ENGAGE CAMPAIGN AND COLLEGE OF ENGINEERING

For the second time in as many years, alumnus Don Washkewicz, and his wife, Pamela, have made a transformative gift to the Washkewicz College of Engineering. The couple announced their latest gift of $5 million on May 8, 2015, at the launch of *ENGAGE: The Campaign for Cleveland State University*.

In 2014, the couple also made a $5 million gift in support of engineering scholarships and the construction of a new engineering building on the CSU campus.

"This gift conveys our strong belief in CSU and its future," said Washkewicz in announcing his latest investment in CSU, and in Northeast Ohio. "We are very proud to contribute again, and we are confident that CSU alumni and the community will join us in responding strongly to this opportunity to build on the University's momentum."

President Ronald M. Berkman added, "We are extraordinarily grateful to the Washkewicz family for propelling this campaign forward and supporting our mission to be a model for public, urban universities."

ENGAGE: The Campaign for Cleveland State University is a $100 million fundraising campaign to support student success, with top priorities of expanding scholarship opportunities and strengthening workforce preparedness capabilities. To learn more about the Campaign, visit www.engageforcsu.com. ■

DAN T. MOORE MAKERSPACE TO BE ESTABLISHED IN NEW ENGINEERING BUILDING

Cleveland State University trustee, industrialist and entrepreneur Dan T. Moore III has made a $250,000 gift commitment to support the creation of a MakerSpace on the ground floor of CSU's new engineering building.

The Dan T. Moore MakerSpace will consist of 6,400 square feet of open access laboratory, providing CSU students with the space and tools they need to transform their ideas into reality. The space will house the latest technology for prototyping and innovation, including high-resolution 3D printers and scanners, Computer Aided Manufacturing (CAM) equipment, digital fabrication tools, laser engraving and cutting machines, plasma cutting machines and design tools for testing and designing electronic devices.

"I am proud to make this gift to help create a space where CSU students, faculty and the community can develop their innovations," said Moore. "It is my hope that this MakerSpace will fuel a culture of creativity and entrepreneurship that pervades the entire CSU campus."

Dean Anette Karlsson added, "The Dan T. Moore MakerSpace will provide an interdisciplinary, hands-on engineering education beyond the classroom in a collaborative, team environment. It will greatly strengthen the College's core undergraduate courses in design and experimentation, providing opportunities

for industry and alumni involvement and continuing the College's legacy of developing "Ready-to-Go" engineers."

Mr. Moore, President of the Dan T. Moore Company, has been starting businesses since 1979. He currently serves as chairman of seven companies, each with its own proprietary edge: Soundwich, Inc.; Team Wendy LLC; Impact Armor Technologies, LLC; Sleep Optima LLC; Tennessee Iron Products, LLC; Polyfill, LLC; and NatGasCar, LLC. He serves as director of Park-Ohio Holdings Corp (NASDAQ), Cleveland, Ohio, and Invacare Corporation (NYSE), Elyria, Ohio.

The Dan T. Moore MakerSpace will open in Fall 2017, in concert with the new Washkewicz College of Engineering building. ■

GRADUATE MAKES FORBES 30 UNDER 30

Eugene Malinskiy, MS, a 2012 biomedical engineering graduate from the Department of Chemical and Biomedical Engineering, was nationally recognized by *Forbes* Magazine in the 2015 Forbes 30 Under 30 list in Manufacturing & Industry. At 29, he is the founder of a Cleveland Heights-based biomedical engineering firm, DragonID. The firm contracts in developing medical devices, such as a surgical device that reduces the risk of strokes following a transcatheter aortic valve replacement surgery. ■

(see more at: http://www.forbes.com/30under30/#/manufacturing-industry)

ALUMNI MEET AND GREET WITH DEAN ANETTE KARLSSON

The Washkewicz College of Engineering hosted its second annual Alumni Meet and Greet with Dean Anette Karlsson at Pickwick & Frolic, on East 4th Street in downtown Cleveland, August 13, 2015.

The event, held in the intimate, retro setting of Kevin's Martini Bar and Taproom, featured classic martinis, delicious food, networking, and comments from College leaders and volunteers. Dean Anette Karlsson provided a College update, including plans for a new 100,000 square feet engineering building to be built on campus.

More than 60 people, including College alumni, department chairs, faculty, and officers of student organizations, attended the festive affair. ■

THE LUBRIZOL FOUNDATION AWARDS $350,000 GRANT TO CSU FOR RENOVATION OF CHEMICAL ENGINEERING LABORATORY

Cleveland State University has received a $350,000 grant from The Lubrizol Foundation for the renovation of the Chemical Engineering Laboratory in CSU's Washkewicz College of Engineering.

The upgraded facility will be named The Lubrizol Foundation Chemical Engineering Laboratory. Plans call for a new entrance, furniture, and lab equipment. The space also will feature improved experimental stations for studying the intricacies of chemical reaction kinetics.

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

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

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

CSU has enjoyed a longstanding partnership with The Lubrizol Foundation, and its parent company, The Lubrizol Corporation, a Wickliffe, Ohio-based global specialty chemical company serving customers in more than 100 countries. Over the past 25 years, Lubrizol has contributed more than $500,000 to CSU in the form of scholarships, lab equipment, and employee matching gifts for a wide variety of University programs. Lubrizol's support of the College of Engineering's cooperative education program has led to the employment of more than 200 CSU graduates. ■

(from: http://www.csuohio.edu/engineering/news/lubrizol-foundation-awards-350000-grant-csu-for-renovation-chemical-engineering-laboratory

FORMER CSU TRUSTEE'S LEGACY LIVES ON THROUGH SCHOLARSHIP: EDWARD BELL (1930-2012)

Photo 1
Former CSU Trustee Edward F. Bell

Photo 2
Members of the Bell family (L-R) Alyssa (Bell) Kamm, Martha (Bell) West, Edward J. Bell, Barbara Bell, scholarship recipient Roy Klein and his father, Roy Klein. Not pictured Thomas J. Bell, Matthew R. Bell and Kenneth A. Bell.

Edward F. Bell began his career in the telecommunications industry digging holes, climbing telephone poles and hanging wire. He joined Illinois Bell Telephone Company as a lineman after graduating from the University of Illinois in 1951 with a degree in electrical engineering and serving two years in the Army Signal Corp. He learned the business from the ground up, attained his MBA from Northwestern University while working and raising his family, and after years in a variety of staff and management positions he rose to the top of his profession, becoming president, chief executive and chairman of Ohio Bell (now AT&T) in Cleveland.

Bell was extremely dedicated to the community where he lived and worked, serving on the boards of the Catholic Charities Foundation, Catholic Cemeteries Association, University Hospitals, Cleveland Clinic, Lubrizol, Ameritrust, Key Bank and Leaseway Corporation. He also served as chair of the local United Way campaign and the Greater Cleveland Roundtable, which would eventually merge with other like organizations to become the Greater Cleveland Partnership, one of the largest metropolitan chambers of commerce in the nation.

In 1986, Bell was appointed by Governor Richard Celeste as a Cleveland State University trustee. It was during his nine year term that Bell's dedication to Cleveland State developed. He was a passionate advocate for higher education, believing it should be attainable for all students, regardless of financial circumstance.

Following Mr. Bell's passing in 2012, Barbara and the Bell family made the decision to honor his legacy by establishing the ***Edward F. Bell Memorial Scholarship*** at Cleveland State University. The scholarship was set-up to benefit an incoming freshman electrical engineering student in financial need. The scholarship will continue in perpetuity.

"We think Ed would have approved of us establishing this scholarship. When he created the Edward F. and Barbara A. Bell Family Foundation he was clear about how he wanted the foundation to continue to help others. He wanted the funds to stay in Cleveland, and to help those who needed a 'bridge' to find success. He believed in the value of education and its ability to transform lives." said Barbara Bell. "It is a fitting way to honor him and continue his proud affiliation with CSU."

This past July, Roy Klein, an incoming freshman from Berea-Midpark High School, was named the inaugural recipient of the Edward F. Bell Memorial Scholarship. Members of the Bell Family visited with Roy over lunch and learned more about his College plans and career aspirations. They also shared stories about their late husband and father, whose commitment to higher education will continue to live on through the scholarship that bears his name. ■

thank you

A heartfelt thank you to the 657 donors who gave a record $11,387,940 in gifts and pledges to the Washkewicz College of Engineering during Fiscal Year 2015 (July 1, 2014 – June 30, 2015).

It was also a record year of giving for Cleveland State University as a whole, with 7,472 donors contributing $22,047,687 in gifts and pledges!

Your generous support allows the College to continue providing a high quality, affordable engineering education, along with innovative programming that helps our students succeed.

The list below gratefully acknowledges gifts and pledges of $100 or more from alumni, friends, corporations and foundations to the Washkewicz College of Engineering during the period of July 1, 2014 – June 30, 2015.

$1 million or more

Mr. and Mrs. Donald E. Washkewicz

$100,000 - $999,999

Mrs. Barbara A. Bell
The Lubrizol Foundation
Mr. Dan T. Moore III
Mr. Edmond J. Sobey*

$25,000 - $99,999

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Mr. Richard Wasiewicz
Mr. Denis Zaharija

$100 - $249

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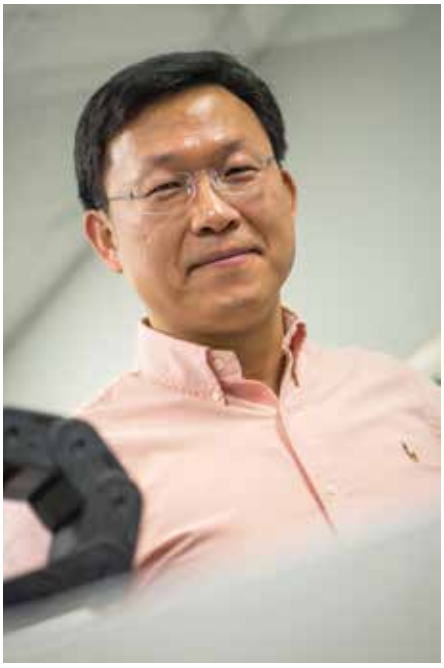
Ms. Patricia G. Zentner
Ms. Stephanie L. Zingale
Mr. Ray F. Zucker, Jr.
Mr. John E. Zuzek

*Deceased

Again, on behalf of our students, faculty and staff – Thank You!

COLLEGE NEWS



Dr. Moo-Yeal Lee

Dr. Chandra Kothapalli

RESEARCHERS IN CHEMICAL AND BIOMEDICAL ENGINEERING RECEIVE A $1.3M GRANT FROM NIH

Dr. Moo-Yeal Lee and Dr. Chandra Kothapalli, from the Department of Chemical and Biomedical Engineering, were awarded a $1.3 million grant from the National Institutes of Health for innovative stem cell research to improve testing for toxic compounds that could harm the development of the human brain. They are developing an in vitro technique for analyzing the effects of toxicants on neural stem cells, which are found in the brain and evolve into nerve cells. Exposure to such toxicants in utero or during childhood may result in neurological disorders. "Our goal is to expand our understanding of developmental toxicity on neural stem cells, which has profound implications for healthy neurological development as well as disease prevention," said Dr. Lee, the principal investigator on the project. The NIH grant will fund the research of Dr. Lee and Dr. Kothapalli for the next four years, through June 2019. At CSU, Dr. Lee is developing microarrays that utilize "3-D bioprinting" to mimic human tissue, with potential applications ranging from regenerative medicine to drug testing. He has published 50 papers in peer-reviewed journals, including the prestigious Nature Communications. He holds 12 patents and patent applications. Dr. Kothapalli's research interest include stem cells, vascular tissue engineering and cancer cell biology. His work has led to one approved patent and two filed patents, as well as 30 peer-reviewed journal publications. He holds adjunct appointments at the Cleveland Clinic's Lerner Research Institute and the Case Western Reserve University School of Medicine, where Dr. Lee is also an adjunct faculty member. ■

(from: http://www.csuohio.edu/engineering/news/drs-lee-and-kothapalli-awarded-13-million-national-institutes-health-for-innovative-stem-cell)

COLLEGE NEWS

DR. NAYFEH RECEIVES A $600,000 GRANT FROM THE OHIO BOARD OF REGENTS

Dr. Taysir Nayfeh, from the Department of Mechanical Engineering, was awarded $600,000 from the Ohio Board of Regents to support ongoing research and development of ultraconductive copper wire that has the potential to dramatically improve electrical systems and devices. Dr. Nayfeh and his team have created a nanocomposite copper wire that is more than twice as conductive as pure copper. With continuous improvement, ultraconductive wire could ultimately achieve more than 100 times the conductivity of copper. This wire 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. The International Copper Association (ICA), a trade organization representing the copper industry, is a partner in the project. "We hope that industries around the world will benefit from our work at Cleveland State University," Dr. Nayfeh said. "When this cost-effective technology is fully developed, it will have the disruptive potential to dramatically improve the performance of virtually all electrical systems and devices, in addition to reducing energy consumption." The OBOR grant will enable Dr. Nayfeh and his team to develop manufacturing processes for ultraconductive wire and transfer their research into beta products. ■

(from: http://www.csuohio.edu/engineering/news/dr-taysir-nayfeh-leads-ultraconductive-wire-rd)







FACULTY AND STAFF RETIREMENT

On May 8, 2015, the College had a retirement party to honor Dr. D. B. Shah (Chemical and Biomedical Engineering), Ms. Adrienne Fox, Dr. F. Eugenio Villaseca, Dr. Fuqin Xiong (Electrical Engineering and Computer Science), Dr. John Frater, and Dr. Rama Gorla (Mechanical Engineering) who retired this year. College faculty and staff wished the best to their colleagues as they are entering into the new chapter of their life. We would like to express our gratitude for all their services and offer our best wishes to all of them! ■

CHEMICAL ENGINEERING STUDENT AWARDED THE BENJAMIN A. GILMAN INTERNATIONAL SCHOLARSHIP FOR STUDIES ABROAD

Aaron Smith, a student from the Department of Chemical and Biomedical Engineering, is one of 800 American undergraduate students from 356 colleges and universities across the U.S. selected to receive the prestigious Benjamin A. Gilman International Scholarship, sponsored by the U.S. Department of State's Bureau of Educational and Cultural Affairs to study or intern abroad during the spring 2015 academic term. Mr. Smith studied abroad in Argentina on exchange to the Universidad Nacional de Tucuman. Gilman scholars receive up to $5,000 to apply towards their study abroad or internship program costs. The program aims to diversify the students who study and intern abroad and the countries and regions where they go. Students receiving a Federal Pell Grant from two- and four-year institutions who will be studying abroad or participating in a career-oriented international internship for academic credit are eligible to apply. Scholarship recipients have the opportunity to gain a better understanding of other cultures, countries, languages, and economies -- making them better prepared to assume leadership roles within government and the private sector. ■

(from: http://www.csuohio.edu/engineering/news/aaron-smith-awarded-benjamin-gilman-international-scholarship-for-studies-abroad

DR. SIMON APPOINTED INTERIM ASSOCIATE VICE PRESIDENT FOR RESEARCH

Dr. Dan Simon, from the Department of Electrical Engineering and Computer Science, has been appointed Interim Associate Vice President for Research. Dr. Simon is an accomplished researcher, teacher, and mentor of graduate students and he recently received the CSU 2015 Distinguished Faculty Award for Research. In his new role, he will serve as liaison between the Office of Research and scholarly and creative activities across the University. He will work with the Vice President for Research, as well as faculty, staff, and students to enhance the University's scholarly productivity and to improve the research environment. ■

COLLEGE FACULTY RECEIVE CSU DISTINGUISHED FACULTY AWARDS

Dr. Jorge Gatica, from the Department of Chemical and Biomedical Engineering and Dr. Dan Simon, from the Department of Electrical Engineering and Computer Science received the 2015 Distinguished Faculty Awards for Service and Research, respectively. ■

COLLEGE NEWS

DR. GATICA RECEIVES THE DR. JENNIE S. HWANG AWARD

Dr. Jorge E. Gatica, Ph.D., received the Dr. Jennie S. Hwang Award for Faculty Excellence at Cleveland State University's 2015 President's Convocation.

CSU President Ronald M. Berkman presented the award to Dr. Gatica during a ceremony Thursday, October 8, in Waetjen Auditorium.

Dr. Gatica is a professor in the Department of Chemical and Biomedical Engineering and director of graduate programs at the Washkewicz College of Engineering.

The Dr. Jennie S. Hwang Award is the highest honor for CSU faculty members in all disciplines and recognizes individuals for bringing regional, national and international recognition to the University through exceptional achievements in teaching, research and service. The award is named after Dr. Jennie S. Hwang, a member of the Cleveland State University Foundation board of directors and founder, president and CEO of H Technologies Group. She established the award through a gift to the Foundation to help inspire faculty to ever-increasing levels of excellence. ■

DR. DELATTE COMPLETES ERSKINE FELLOWSHIP IN NEW ZEALAND

Dr. Norbert Delatte, Professor and Chair of the Department of Civil and Environmental Engineering, recently completed a six week Erskine Fellowship at the University of Canterbury in Christchurch, New Zealand. He gave 12 lectures and part of another as the first portion of the ENCN 470 Professional Development Course. He also helped develop an individual case study assignment and a marking rubric for the assignment. His lectures encompassed the History of Bridges and a number of topics related to engineering failures, failure investigations, and lessons learned. There were 166 enrolled students since the course is required for fourth year students in both the civil engineering and natural resources engineering degree programs. In addition, he provided a seminar entitled "Systems for Structural Failure Investigations in the United States." This seminar was open to UC undergraduate and postgraduate students. It was also promoted to practicing engineers through IPENZ (Institution of Professional Engineers New Zealand) and the ASCE New Zealand Group. He also led a two hour workshop on "Assessment of professional engineering issues" for about ten faculty from the civil and natural resources engineering department and the engineering college. More information about the Erskine Program is available at http://www.canterbury.ac.nz/erskine/about.shtml ■

COLLEGE NEWS

Joshua Cmar, a student from the Department of Chemical and Biomedical Engineering, received sponsorship from NASA to present his research at the 66th International Astronautical Congress (IAC), in Jerusalem, Israel, on October 12-16, 2015. ■

Two undergraduate students from the Department of Electrical Engineering and Computer Science, Abou-Baker Fofana and Connor Gordon, demonstrated their summer project at Cleveland [R] IoT (Realizing Internet of Things) Happy Hour Event held at the Music Box Supper Club in the Flats. The project is titled "Human Motion Tracking" and the main goal is to track consenting users in the Kinect sensor view and to provide them real-time haptic feedback based on their actions. The demo system consists of a smartwatch, a smartphone and a server. More than 200 individuals from local industry and academia attended and there were about 20 demonstrations. ■

CSU IEEE Student Branch holds first place with a total of 44 SPAx (Student Professional Awareness Experience, http://ieeeusa.org/volunteers/committees/spax/) events with the help from Jim Watson, IEEE SPA Support Coordinator. There are 531 IEEE Student Branches in the USA. A total of 1,243 SPAx have been completed by 293 Student Branches. In addition to the list of SPAx events, CSU IEEE Student Branch held several social and other activities for the benefit of CSU students. ■

The student chapter of IEEE organized the Vex Robotics Competition at Cleveland State University's Wolstein Center January 31, 2015 with robots designed and built by more than 40 teams of Northeast Ohio high school students. ■

Dr. Ungtae Kim of CVE successfully brought in an amended subaward from University of Tennessee at Knoxville (funded by U.S. Department of Defense). This amendment is a part of his continuing grant "A Practical Approach for Remediation Performance Assessment and Optimization at DNAPL Sites for Early Identification and Correction of Problems Considering Uncertainty." The amendment includes an additional $60,532 totaling $135,000 from October 1, 2014 to December 30, 2015. This project is planned to be completed in December 2016 by adding extra $135,000. ■

Dr. Pong Chu, from the Department of Electrical Engineering and Computer Science, received an NSF award for his project titled "A Spiral Computer Engineering Lab Framework." Dr. Chu's co-investigators are Dr. Chansu Yu (Electrical Engineering and Computer Science) and Dr. Karla Hamlen (College of Education and Human Services). In addition, Dr. Chu's new book, titled "Embedded SoPC Design with Nios II Processor and Verilog Examples," has been published in China. ■

Cleveland State University has been selected to host the 2016 IEEE Region 2 Student Activities Conference on April 19-20, 2016. ■

COLLEGE NEWS

Dr. Charles Alexander, from the Department of Electrical Engineering and Computer Science, served as hosting co-chair of the fifth annual Energy and Technology Conference (EnergyTech 2015), which was held November 30 - December 2, 2015 at Cleveland State University. CSU once again welcomed a congregation of engineers, scientists, academics, government and community stakeholders. Top sponsors included INCOSE (the International Council on Systems Engineering), IEEE (the Institute of Electrical and Electronic Engineers) and the NASA Glenn Research Center. For more details, please visit http://www.energytech2015.com/ ■

Dr. Wenbing Zhao, from the Department of Electrical Engineering and Computer Science, received a grant award from Ohio Bureau of Workers' Compensation via the Ohio Occupational Safety and Health Research Program. The project is titled "Safe Patient Handling among STNA's in Nursing Homes: Compliance, Monitoring, and Continuous Quality Improvement of Best Practices." He collaborates with Drs. Glenn Goodman, Beth Ekelman, Deborah Espy, and Ann Reinthal, from the College of Sciences and Health Professions, and Dr. Joan Niederriter from the School of Nursing, as well as external partners. ■

Dr. Sunnie Chung, from the Department of Electrical Engineering and Computer Science, helped host the Cleveland Big Data and Hadoop User Group meetup on November 16, 2015 at Cleveland State University. This user group is for those interested in the distributed processing of large amounts of data, focusing heavily on the Hadoop stack. This group is industry agnostic and has a mix of classic user-group presentations as well as informative vendor sessions. Topics include networking, storage (e.g., HDFS, KeyValue storage like HBase), computation (e.g., MapReduce/YARN, graph processing), indexing/search (e.g., Solr), and analytics (e.g., Hive), among others. Please see details at http://www.meetup.com/Cleveland-Hadoop/ ■

Dr. Ungtae Kim, from the Department of Civil and Environmental Engineering, will host a Visiting Scholar from Hanbat University in South Korea, Dr. Joon Mook Lim. Dr. Lim is a Professor of the Department of Creative Convergence Engineering in Hanbat National University, Daejeon, South Korea. His research interests include system optimization, data processing, operational management, design optimization, and statistical analysis. Dr. Lim will stay at CSU approximately one year for his sabbatical leave developing various research projects in his field. ■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