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USF College of Engineering

USF UNIVERSITY OF SOUTH FLORIDA
COLLEGE OF ENGINEERING

enVision MAGAZINE

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MISSION STATEMENT

The mission of the College of Engineering at the University of South Florida is to improve the quality of life in our community by providing a high quality education for our students and practicing professionals; by creating new knowledge and solving real world problems via innovative research; and by engaging in effective community service and outreach.

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USF UNIVERSITY OF SOUTH FLORIDA
COLLEGE OF ENGINEERING

Autar Kaw, Mechanical Engineering Professor

Dean John Wiencek Departs the College

Former Dean John Wiencek

John Wiencek, Dean of the College of Engineering since 2007, recently accepted the position of Senior Vice Provost for Administration and Strategic Initiatives at Virginia Commonwealth University in Richmond. During his six years as Dean, the college achieved many significant accomplishments, including moving into the USNWR rankings, improving the size and quality of our PhD programs, increasing the faculty from 95 to almost 140, just to name a few.

While a national search is being conducted for a permanent dean USF Provost Ralph Wilcox has selected Rafael Perez, professor of computer science and engineering and associate dean for academic affairs, to serve as interim dean. We wish Dean Wiencek the best of luck in his new position at VCU.

College Ranks High in Conferring Minority Doctorates

The College of Engineering at the University of South Florida is ranked in the top five nationally in conferring engineering doctorates to both African American and Hispanic/Latino students who are U.S. citizens and permanent residents, according to *Diverse Issues in Higher Education's* annual listing of the top 100 minority graduate degree producers in 2013.

USF Receives National Science Foundation Award

The University of South Florida is the lead institution (along with Arizona State University, University of Pittsburgh and Alabama A & M University) on a National Science Foundation funded ($600,000) award for conducting research on the effectiveness of flipped classrooms for higher education STEM courses. In addition, the group will develop best practices for teaching in a flipped classroom.

Autar Kaw, mechanical engineering professor, is a thought leader in flipped classroom techniques. In a flipped classroom, students first study the topic by themselves typically using video lessons prepared by the professor or a third-party (such as Khan Academy). A flipped classroom frees up a lot of time for hands-on work and students learn by doing and asking questions.

From Left: Joseph Walton, Robert Frisina, Nicole Febles, Tanika Williamson and Jeanine Mansour

USF Biomedical Engineering Program - By Janet Dawald

Leading the way in research and minority doctoral recruitment

Can you name a famous biomedical engineer? For all you Frankenstein fans, your first instincts are close. The famous Mary Shelley novel, hailed as the first true science fiction story, is a fairly accurate description of the science. However, the first biomedical engineer attached a wooden toe to an ancient Egyptian, whose preserved mummy predates Frankenstein by several millennia.

Biomedical engineering today is its own field, a new interdisciplinary fusion of medicine and engineering. The College of Engineering is on the leading edge of research, science and industry opportunities. But there is a quiet revolution here at USF. Underrepresented minority doctoral students are not only joining the program, but have been awarded the most prestigious honors and are performing at the highest levels.

Olukemi "Kemi" Akintewe

"My research is focused on the fabrication of complex tissues for regeneration of myocardial tissues," says Olukemi "Kemi" Akintewe, a chemical engineering doctoral candidate and the recipient of a prestigious United Negro College Fund-Merck Dissertation Graduate Fellowship. I am studying with professors Nathan Gallant (mechanical engineering) and Ryan Toomey (chemical engineering) the use of micro-contact printing techniques and the viability of a thermally tunable platform for rapid fabrication of robust myocardial-like tissues to promote neovascularization, angiogenesis and consequently perfusion upon implantation for cardiac tissue regeneration." If Kemi's research is successful, it could lead to a transformational change in the field of tissue engineering and regenerative medicine.

But there is something else going on with the PhD students in biomedical engineering-related research that does not garner accolades and cannot be measured in student awards and research funding. A common theme runs through their own words: community, support, mentoring, and a sense of family. They express a sense of belonging, of being valued, and most important, of being successful.

Bernard Batson, associate director of student services, is an enthusiastic and vocal supporter for students within the college. "Our country is becoming more diverse, and it is critically important this is reflected in the nation's science and engineering workforce, especially in biomedical research."

Robert Frisina Jr., is a professor in the Department of Chemical & Biomedical Engineering and director of the Global Center for Hearing and Speech Research. As director of the Biomedical Engineering (BME) program, he is involved in recruiting and mentoring minority doctoral students. Frisina is the advisor for three underrepresented BME students (Nicole Febles, Jeanine Mansour, and Tanika Williamson). He has submitted successful fellowship proposals to the National Institute of Aging/National Institutes of Health for Mansour and Williamson. "I think Bernard has made a big impact here

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at the College of Engineering," he says. "Because of all the extra funding and efforts that he makes, the word is out. The students visit and they see that sense of community, it is a feeling."

As the program coordinator for the NSF Florida Georgia Louis Stokes Alliance for Minority Participation (FGLSAMP) Bridge to the Doctorate and Alfred P. Sloan Minority PhD program, Batson works to recruit minority STEM graduate students to USF, identifies potential student-faculty matches, and manages retention initiatives. He encourages doctoral students to support their peers, mentor undergraduates, and participate in STEM outreach to encourage the next generation of young scientists and engineers. The students feel that the biomedical field offers them a chance to give back to society. "Our students truly believe in the African proverb that it takes a village to raise a child," says Batson. It is what makes our programs, and why we have been so highly successful."

The investments in the program by the university, the federal government, and private foundations are now paying handsome dividends. "Since 2004, USF has provided $3 million to the NSF Florida Georgia Louis Stokes Alliance for Minority Participation Bridge to the Doctorate program to support minority graduate STEM education. The funding has been leveraged with $5 million from the National Science Foundation for the program explains Batson. "The College of Engineering has also received over $2 million in graduate student scholarships from the Alfred P. Sloan Minority Ph.D. and Florida Education Fund's McKnight Doctoral Fellowship programs. Since 2004, engineering has recruited and enrolled close to 80 underrepresented doctoral students, and has graduated about one-half with 30 still in the PhD pipeline. A significant number of students either have or are currently working in bioengineering-related research areas. According to *Diverse Issues in Higher Education* (July 2013), the USF College of Engineering is ranked fourth in graduating African-American and fifth in Hispanic/Latino engineering doctoral students. USF was one of only four institutions (University of Michigan, Georgia Tech, MIT, and USF) ranked in the top five for conferring engineering doctorates to both African-Americans and Hispanic students.

Besides the desire to foster greater diversity in biomedical research and in response to NIH's recommendation that institutions provide additional training and career development experiences to equip students for various career options, the college has been leading efforts to provide bioengineering students with diverse training experiences (biotech and national lab internships, entrepreneurship skills, proposal writing workshops, etc.). Perhaps because biomedical engineering is the top engineering job prospect for the next 10 years, and is one of the top three overall job security positions in the United States. This shift in career paths is very interesting, explains Frisina. "More and more PhD's do not become professors, they go into industry and in the case of biomedical engineering they work on medical devices or drug development. It is important that good PhD programs have industrial elements in them. More and more of the graduates will work in industry rather than work for a university."

Nicole Febles, a FGLSAMP Bridge to the Doctorate fellow and Sloan scholar, is investigating innovative mechanical stimulation and tissue engineering techniques to promote regeneration of auditory hair cells needed for normal auditory perception. This past summer at Corning Incorporated, Division of Organic and Biochemical Technologies Division in New York, says Febles, "I was able to utilize the skills gained in my work with Drs. Robert Frisina and Nathan Gallant in the Department of Mechanical Engineering, to successfully model 3D tumor invasion using a new high throughput label-free screening technology, which could help advance the understanding of exact mechanisms of action during single cell cancer invasion."

Frank Alexander, Jr., a doctoral candidate in the Electrical Engineering Department, is another student working on bioengineering projects, who has gained industry experience. He received a National Science Foundation/American Society of Engineering Education Engineering Innovation fellowship to intern with Optofluidics, a biomedical start-up in Philadelphia. "My PhD research seeks to deliver an innovative, label-free, and fully automated diagnostic tool for assessing new chemotherapeutic compounds to cancer clinicians and researchers for the internship," says Alexander. Someday, I want to own a biomedical research company to design microscale systems for high-throughput drug screening. During the summer, I was not only able to gain hands-on industry experience in both microfluidics and optofluidic controls, but also in product development and commercialization."

Both Batson and Frisina agree that support beyond financial assistance must be a fundamental part of the PhD program. Interaction with potential peers and

employers is vital. "We have brought in outstanding faculty and researchers from outside our university," Batson says with pride. "The opportunity to meet and interact with them, especially individuals from underrepresented backgrounds – has been a hallmark of our success." We also help our students by encouraging them to attend conferences and short courses where they see role models, and to be with the best and brightest scientists in the world."

"My experience in the College of Engineering has been very positive," says Edikan Archibong, a doctoral student in the Chemical and Biomedical Engineering Department. "I am working with Dr. Anna Pyayt on an optical MEMS-based biosensor that will provide clinicians with immediate blood measurements. Our research can have broad societal applications including for homeland security, national defense, and even manned spaceflight. Through the FGLSAMP Bridge to the Doctorate and Sloan PhD programs, Mr. Batson helps students align their research interests with the appropriate advisors. We are exposed to opportunities and programs not only at USF, but nationally and internationally. Both Frank [Alexander] and I presented at the Gordon Research Conference (GRC) of Physics and Chemistry of Microfluidics, in Burga, Italy, where we met some of the world's top scientists in the field of microfluidics and biosensors." Archibong was encouraged to participate in a biotech internship with the Center for Bio-Molecular Science and Engineering at the Naval Research Laboratory in Washington, DC.

The bioengineering program obviously has a lot going for it with dedicated faculty and staff like Frisina and Batson. "It has been a true honor to work under the tutelage of Drs. Robert Frisina and Joseph Walton at the Global Center for Hearing & Speech Research (GCHSR) and receive funding from the National Institute of Aging," says Jeannine Mansour. As part of her master's work, Mansour completed an independent study with Frisina exploring aspects of a new way to measure brain activity with a much simpler "electrode" system than is currently used clinically or in human neurophysiology research. She attended an international conference in Cambridge, England, and was able to meet the inventor of a new neurophysiological recording system. According to Mansour, "we graduate students, here at the Global Center, have discussed many times how it's one thing to be working in a highly motivating expert lab that satisfies our professional goals; however, Dr. Frisina truly creates a cohesive community where our personal cultural backgrounds are celebrated and welcomed".

As the students have said in their own words "thank you for the opportunity, the support, and the sense of family that can be found at University of South Florida's College of Engineering.

Recent Awards of USF Engineering Minority Doctoral Students Working on Biomedical Topics

- **Frank Alexander (EE)** – NSF Graduate Research Fellowship, NSF/ASEE Engineering Innovation Fellowship, NSF International Research Engineering Education (IREE) in China Fellowship
- **Olukemi Akintewe (ChBME)** – United Negro College Fund (UNCF)/Merck Graduate Dissertation Fellowship, Society for Biomaterials Student Travel Achievement Recognition (STAR) Award
- **Edikan Archibong (ChBME)** – 2013 National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) Winifred Burks-Houck Women's Graduate Student Leadership Award
- **Vinicio Carias (ChBME)** – U.S. Student Fulbright Fellowship, USF Graduate Student Success Fellowship
- **Tamina Johnson (ChBME)** – USF Graduate Student Success Fellowship Success Fellowship
- **Jeannine Mansour (ChBME)** – National Institute of Aging/ National Institutes of Health Research Supplement
- **Alisha Peterson (ChBME)** – GEM PhD Fellowship, McKnight Doctoral Fellowship
- **Mandek Richardson (ChBME)** – USF Genshaft Doctoral Fellowship, NSF GK-12 STARS Fellowship
- **Tanika Williamson (ChBME)** – National Institute of Aging/ National Institutes of Health Research Supplement

Use your QR reader to view Norma Alcantar's *Science Nation* video interview.

The Miracle Plant

By Janet Dawald

The next miracle plant may not be an endangered rainforest flower, but a common cactus that thrives in the desert, or perhaps in your back yard. The common prickly pear cactus is native to the New World, but is considered an invasive species in many arid areas. There are almost 200 species of Opuntia, a fast-growing cactus with an amazing ability to adapt to almost every environment. One species, Opuntia ficus-indica, is a dietary staple in countries ranging from South America to South Africa. Easily recognizable by its large flat green pads, or nopales, and the bright red fruits, called tunas, the prickly pear manufactures a specific type of mucilage that has uses ranging from water purification to a natural disbursement for oil spills.

Norma Alcantar, associate professor in Chemical & Biomedical Engineering, was introduced to the amazing water purification capabilities of cactus mucilage by her grandmother. A staple part of the Mexican diet, the cactus was cooked by boiling or frying. Boiling produced a gooey mucilage that had amazing water-filtration capabilities.

"In Mexico, my grandmother would have to bring drinking water from a nearby creek," explains Alcantar. "After a storm, it would be cloudy with dirt and sediment. They used the water from the boiled cactus as a flocculant (a substance that enhances sedimentation of particulates). As it sank down into the bucket of dirty water, the sediment would bind with the mucilage, and the top part of the bucket would have clean water."

Fast forward and the granddaughter is a newly-minted professor at the University of South Florida, with a laboratory and an idea. Wanting to test her grandmother's hypothesis, Alcantar and a lab assistant ordered some prickly pear plants from Arizona and started boiling the pads according to the ancient recipe. "It worked!," she exclaims. "We discovered that this mucilage is a combination of sugars and carbohydrates, which basically gives the cactus the ability to store water. It is what makes a cactus a cactus." The ability of the gooey mass to settle out sediment in water as it sinks is easy to visualize. But what Alcantar discovered on the macro level is even more amazing. The hydrophilic, or water-loving sugar molecules, when exposed to sediments and bacteria, caused the net-like nanostructure of the mucilage to sink, taking with them the particles and even bacteria to the bottom of the container.

Known as flocculation, Alcantar's mucilage grabbed onto the sediments and bacteria caused the mucilage to sink under the accumulating weight. "In the water, you don't see the bacteria swirling around," she explains. "The bacteria form flocks when they start sticking to each other and then to the mucilage. It looks like a cotton ball - and you can see it falling

out into the bottom of the column." Because bacteria, viruses and parasites such as Giardia can attach to suspended particles, filtering out the dirt and sediment not only produces a clear glass of drinking water, but also helps prevent gastrointestinal illness. So the sinking mucilage has the ability to gather both inorganic and organic pollutants safely to the bottom of grandmother's bucket or the laboratory test tube.

This got Alcantar to wondering what else the mucilage could sweep out of contaminated water. Heavy metals, especially arsenic, are major water contaminants, especially in developing countries. So she added arsenic to the water/mucilage brew and started measuring. To her surprise, her samples at the top of the water showed that the experiment was actually creating arsenic. "No, this is not possible," she laughs. "It turned out that the lab assistant was not being careful about where he was taking samples from. Sometimes the top or the middle. We determined that what we had was a concentration gradient. The mucilage was actually pushing the arsenic to the top of the column. This is exactly the opposite of what the mucilage was doing with the sediments and bacteria. The water on the bottom had the least amount of arsenic."

This serendipitous discovery was just the beginning. "The mucilage does not work on just one contaminant, such as sediment," explains Alcantar. "It actually has the ability to modify its molecular configuration depending upon what it finds in the water. It is a very flexible process, sometimes hydrophilic, in the case of the sediments and bacteria, and sometimes hydrophobic in the case of the arsenic and heavy metals."

Alcantar decided to test the cactus mucilage in Mexico in areas with arsenic water pollution. Arsenic can be naturally-occurring in water supplies, or man-made because of gold mining processes that used arsenic as part of the smelting process. With the help of an NSF grant, she was exploring using the native cactus in several villages in Mexico, along with an understanding of the social and economic factors, to create a sustainable and economically viable water purification system. This interdisciplinary approach required engineering, sciences and social sciences in order to understand the complexity, economic and cultural viability of growing prickly pear cactus for water purification.

Alcantar's research is also taking cactus where no mucilage has gone before. She is working with a grant from the Gulf of Mexico Research Initiative - Consortium for the Molecular Engineering of Dispersant Systems (C-MEDS), the dispersant qualities of the mucilage with crude oil. After the Gulf oil spill, one of her students tested the mucilage on the spilled oil, and the effects were dramatic. A naturally-occurring and non-toxic cactus mucilage product competed head-on with Corexit®, a commercially-available solution that has some compounds which may be more damaging to the ocean environment than the oil it was supposed to contain. The cactus has several advantages since it is non-toxic and completely biodegradable. Moreover, it is basically edible by humans and other mammals, and poses no threat to ocean environments or aquatic life.

"We are also trying to encapsulate it," continues Alcantar. Making the product more concentrated and easy to transport, the "bio beads" will be useful in aquaculture. Used in conjunction with photocatalysis the beads will control unwanted bacteria in fish farms and will prevent the "fishy smell" on seafood that is grown in recirculating aquaculture systems.

In collaboration with Assistant Professor Sylvia Thomas in Electrical Engineering, Alcantar is working on a method to make fibers out of the mucilage, and using these fibers to create membranes for water filtration. This technology is also feasible for making tissue scaffolds. Bone, skin, or muscle regeneration is encouraged by inserting very small structures into the affected area to aid in the healing process.

The Opuntia ficus-indica species is the ideal cactus for this research because of two unique properties: it grows very fast, and it is very adaptable. "You cannot use a saguaro," explains Alcantar, "because it takes too long to grow, and does not contain enough mucilage." Adapting to climates from Canada to Chile, the prickly pear learns how to grow in almost any environment. "You could see the effects of our Arizona cactus growing in Florida," she continues. "The first pads were filled with spikes, but as the new ones grew out, the spines were fewer and further apart. The cactus actually learned it did not need to make quite so many spikes to take in water."

A master at using and conserving water, Opuntia ficus-indica has an amazing two-way capillary system. "It is like an elevator for water," says Alcantar. Above ground, the spikes wick minute quantities of water from the air into the cactus via an opening near the spine called a stoma. Below ground, the root system does the

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traditional job of sending water up to the green part of the plant via capillary action. But when the spines have gathered enough water through the stomata, the capillary action is reversed, sending water down into the root for storage.

The prickly pear has seen its share of good and bad press. Imported into Australia as stock fodder in the early 1800s, the cactus had no natural enemies. It was estimated that cactus was spreading at the rate of one thousand hectares a day. The Cactoblastis cactorum moth was purposely introduced to Australia in 1925, brought in from the prickly pear's original South American homeland. The Australians actually built a monument to the plain-looking moth due to its success in controlling the spread of the cactus. But in other areas, such as the Caribbean, the accidental introduction has caused the usual environmental disasters, with the moths' larvae munching away on a valuable food source for people and livestock, and even threatening the only food supply for endangered iguanas. The moth is now spreading throughout the southern United States, an issue to the ornamental cactus industry in the Southwest.

The prickly pear cactus is also a problem in South Africa. Introduced 350 years ago by the Dutch East India Company, again as for cattle fodder, it has become a source of income for poor households. The South African Government is actively trying to remove the plant with various programs. This dilemma pits environmental concerns against the poorest of populations which both consume and sell the cactus to supplement meager incomes.

The ancient cultures of the New World appreciated the prickly pear for providing room and board for the Cochineal bug, (Dactylopius coccus) an insect that produces a crimson-colored dye called carmine. Now used as a food coloring and for cosmetics, the dye became an import export during Spanish colonial times, a commodity rivaling gold in the price per ounce. Cactus farming for the cochineal bug was a very profitable venture for Spain before an artificial version of crimson was developed in the 19th century.

Today, Norma Alcantar, her grandmother, and the researchers at USF are discovering that the prickly pear cactus can provide the most valuable commodity in all of humanity: clean drinking water.

USF Ranks in the Top 5 for Peace Corps Master's International Programs

The University of South Florida was named in the top five Master's International programs by the Peace Corps. The Master's International program allows students to earn a graduate degree while serving as a Peace Corps Volunteer overseas.

USF rounds out the fifth spot on the list with 24 volunteers currently serving overseas. USF offers two Peace Corps Master's International programs for Public Health and Civil or Environmental Engineering. The USF program in Civil and Environmental Engineering has a strong focus on sustainability and water/sanitation engineering and the program in Public Health focuses on projects in health, community development, and the environment.

"I am very proud of the large number of USF students who not only value service to our country and the world, but also recognize the advantage of combining their graduate education at USF with the global need for trained engineers and public health professionals," says Dr. James R. Mihelcic, Director of the Peace Corps Master's International Program in Civil and Environmental Engineering.

A Peace Corps Campus Representative is located in USF World to provide information and assist with the application process. For more information visit http://global.usf.edu/peacecorps.php.

View the list top ranked schools for the Master's International Program and the Coverdell Fellows programs here: http://www.peacecorps.gov/resources/media/press/2233/

Maya Trotz - A Driving Force in Caribbean STEM Initiatives

- By Desa Philadelphia

At USF, sabbaticals are granted to faculty as a means of enhancing their opportunities for professional renewal, travel, research, writing and other experiences of educational value. Maya Trotz, Associate Professor in the Civil and Environmental Engineering Department, chose to spend her sabbatical year as a visiting research scientist with the Caribbean Science Foundation (CSF), a non-profit whose mission is to assist with the diversification of Caribbean economies by harnessing science and technology for economic development that will lead to increased quality and life.

As part of her sabbatical, from which she returned this semester, Trotz and other colleagues from the CSF worked with project partners to launch the Sagicor Visionaries Challenge, a competition for high schools to design projects that would introduce and/or boost sustainability within their communities. Students were challenged to design a solution to a problem which, they were told, should help create a Caribbean that is "healthier, wealthier, happier, smarter, safer, cleaner, more resilient to food scarcity, and water scarcity." In short, more sustainable.

Sustainability is an important aspect of Trotz's work. As a USF faculty who succeeded at receiving state-funded grants for "Sustainable and Healthy Communities" and federal grants for "People, Prosperity, and the Planet," Trotz spends a lot of time thinking about creative solutions to the world's sustainability problems. She wanted to apply some of that focus to bringing meaningful change to the Caribbean region. With its unending sunshine, beautiful beaches and lush vegetation, the region seems like it would be an oasis of environmental sustainability. But Trotz, who grew up in Guyana on the northeast coast of South America, knows the region is struggling. She spent the last several years traveling the Caribbean countries—especially those in CARICOM (Caribbean Community) states—conducting research and has witnessed the effects on the environment, and the people, of issues like access to clean water, clogged drainage and irrigation systems that lead to flooding, inconsistent energy sources and an explosion of imported plastic waste. She and her colleagues believed that a school-level competition could influence grassroots efforts to build awareness and community response to these persistent problems.

The Challenge was sponsored by Sagicor, a financial services firm with holdings in the Caribbean, Panama, United Kingdom, and United States, in collaboration with the CSF and the Caribbean Examinations Council. It launched in October 2012 with secondary schools in twelve of the fifteen CARICOM countries participating. Trotz traveled the region, spreading the word. "In the early weeks I personally conducted workshops at more than fifty schools in eight countries," she said, sounding like a political candidate. "I knew that if we were successful, the result would be that the students would be inspired and their community would be positively impacted for years to come. This was also an effort to shed a spotlight on STEM (science, technology, engineering, mathematics) capacity within the region's secondary schools and educate the public about the importance of these fields in improving our countries' economic development and quality of life of our citizens," said Trotz.

The competition began at the country level, requiring local schools to first submit a 250-word description of their proposed projects that were posted on the Sagicor Visionaries website, aimed at soliciting votes from the public. The votes constituted a percentage of the teams' scores so students were encouraged to send family and friends to the website, improving the reach of the messaging. The schools then showcased their projects at a national competition with the winner moving on to a regional competition from which the winner was chosen. One hundred and seventy-five (175) projects entered the competition, representing 900 students ranging in age from 11 to 19.

Participating schools were also assigned a mentor, a STEM-education and/or sustainability expert who could help hone their proposals. Trotz recruited other USF faculty, graduate students and alumni, along with other experts from around the world. Among the mentors were three graduates of USF's environmental engineering Ph.D. program who are also from the Caribbean: Trinidadian-born Ken Thomas, who now teaches at Auburn University, Guyanese-born Kofi Dalrymple and Haitian-born Prony Bonnaire Fils. Lilia Abron, one of the first African-American women to earn a PhD in chemical engineering in the United States (from University of Iowa in 1972), aligned her staff to mentor on various energy-related projects. Abron, whose company Peer Consultants offers environmental and civil engineering expertise to global clients, is a member of the USF College of Engineering advisory board.

The student teams came up with an array of diverse, creative sustainable projects. The Naparaima Girls' High School in Trinidad and Tobago, famous for their widely distributed cookbook, proposed using modern farming techniques like hydroponics to create organic farms on school land, from which students would sell products and build student-run businesses, using social media to reach and educate potential customers.

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Students from the Foundation School in Barbados proposed a mobile app that could be used to reserve spaces like the school's own gyms and classrooms. Members of the public could use the app to request use of the facilities, positioning the school as an even greater asset to its community. The Foundation School was mentored by Dr. Kenfield Griffith, the CEO and Founder of MSurvey, a mobile platform company headquartered in Nairobi, Kenya.

The winning project was an impactful proposal from Bishop Martin High School in Belize. Titled "Coconuts 4 Life" it tackled the problem of increasing numbers of flavored beverages being imported into Belize, and the resulting increase of plastic waste in the country, which doesn't have any plastic recycling capabilities. The proposal called for converting unused school property into an expansive coconut orchard and ecological park. The orchard would produce coconut water for students, which they would drink from the shell, and would double as a bird-watching sanctuary and botanical garden. The orchard would also produce raw materials (coconut shells and husk) for making jewelry and ornaments. While the project required the students to call on many STEM skills, their proposal was also elegantly simple because it relied on coconuts, a familiar, local Belizean resource. Flavored coconut water is also now a global product and has the nutritional profile that is lacking from sugar-sweetened carbonated drinks. Bishop Martin High School was mentored by Weslyn Ashton, an assistant professor in Environmental Management and Sustainability at the Illinois Institute of Technology's Stuart School of Business.

A highlight of the inaugural Sagicor Visionaries year for Trotz is that the twelve winners from the participating countries—Anguilla, Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago—visited central Florida accompanied by colleagues from Sagicor and the CSF. In July 2013, the students and their teachers spent seven days in an International Summer Camp program at the Museum of Science and Industry (MOSI) in Tampa that was designed with the project partners, specifically for this group. During the week the students, many of them on their first trip to the United States, saw demonstrations of innovative research aimed at addressing critical global issues related to water resources, clean energy and nanotechnology. They visited USF laboratories, built robots at MOSI and visited EPCOT Center at Disney World and the Kennedy Space Center.

Belize's team leader Angel Navidad said, "I learned a lot about nanotechnology at USF and things that Caribbean people have done in science and engineering. We don't meet or hear about many Caribbean scientists, but they exist and are role models to students like myself." For Professor Trotz, the experience of working with the students was indeed a professional renewal. "The sabbatical experience has reinvigorated my work and has provided great opportunities to establish even more sustainable relationships between USF and partners in the Caribbean region," she said.

The second Sagicor Visionaries Challenge will launch in January 2014 in the Caribbean and Trotz is exploring ways to expand it to Hillsborough County Public Schools. She said the goal now is to use the program to help schools and educators develop the expertise required to tackle sustainability needs and find solutions. "We are trying to build the institutional capacity in the Caribbean," she said. "Many of the islands have high energy costs, are limited in terms of water resources, limited in terms of many other resources. So from a research perspective the islands are a great place to study sustainability because the needs are so pressing there."

Dodridge Miller, president of Sagicor, sees the Visionaries Challenge as an extension of the company's economic development work. "Our company is proud of its participation in helping students assume responsibility for building sustainable communities," he said. "We look forward to working with the project partners on this worthwhile initiative for the future development of our region."

The needs of the Caribbean may be great but Trotz and her colleagues have definitely primed the region for success by engaging the best possible collaborators. Who better to focus on the region's sustainability than the young people who will be leading its communities and institutions in the future?

For more information, visit www.sagicorvisionaries.org

St. Kitts / Nevis Project "When Rubber Hits the Road."

Trotz, left, works with students.

Guyana Project: Shrimp Drier

Implementing a Database Stream

Computer Science Professor Yicheng Tu receives NSF CAREER award to develop a new method of accessing a database.

By Janet Dawald

In the beginning, a British computer scientist created twelve "commandments" that governed the rules for an emerging science: the relational database. Much to the amusement of computer geeks, there are actually thirteen rules numbered 0 through 12. But since the early 1970's, Edgar "Ted" Codd's rules for the ideal database have governed relational databases from giant IBM to the humble Microsoft Access database application that is probably installed on your Windows PC.

For almost 40 years, the methods of accessing a database have remained unchanged: ask a question, called a query, and wait for the answer, the results of the query. The method was always the same: initialize a computing thread to read the database file to answer any query, no matter how insignificant the question or how many records needed to be read. Improvements were made along the way, including faster computing times, more efficient disk reads, and the use of index files.

But Yicheng Tu, assistant professor in the Department of Computer Science and Engineering, is questioning the old rules. "This method of asking a question works fine if the answer contains hundreds or even thousands of records," Tu explains. "But what if you have one that returns hundreds of millions of records?"

Reading millions of records is actually commonplace today. Scientific applications which model the activities of atoms can take months to run. Retailers, like Walmart, with massive amounts of customer transactions and data warehousing can take several hours just to determine the average price of orange juice or diapers. And game programs, with their astonishing realities, have to process millions of pieces of information to make that avatar walk smoothly through the lurching zombies and explosions.

"The biggest problem is Random Input and Output," says Tu. "That random I/O is the bottleneck and what causes the biggest wait for information." Basically, the mechanical process of finding a record on the hard drive and reading it into memory is literally a drag.

Think of how frustrating it is to go into a new grocery store and searching almost every aisle for every single item on your list. Sure, you can remember where you have seen the Cheerios on your way to the cheese department, so you might cut down your search as you work your way through your list. Or, you could give your list to a store employee who would write down the aisle numbers to find each of your items. This is similar to an index file in your relational database. It saves time, and if the index file is very clever, it will optimize the locations and reduce the number of trips pushing that cart up and down the aisles so that a minimum number of steps are taken. But you still have to go hither and yon in a fairly random method to finally get all your goodies. And remember, it takes a lot longer to find the extra-sharp cheddar cheese than it does to drop it into your shopping cart - exactly the same process in computing.

Professor Tu's NSF CAREER award addresses exactly this problem of random I/O. Instead of a monstrous passive database waiting to be queried, why not pour all that data into a stream, have the user tap into the stream whenever they need to ask a question.

"Many times you have a small question, like what is the average price of orange juice across all Walmart stores," explains Tu. "And your co-worker wants to know how many diapers were purchased. With traditional database query methods, that is two similar questions, two I/O threads that will generate massive I/O issues. And these are really very small questions, and very much alike. This will not work in the era of Big Data." Instead, in Tu's design, the database is constantly read from the first to the last record, and cycles around like a whirlpool. There is no random jumping from one record to another all over the hard drive, records are read in sequential order, record number 1003 is read and it deals with

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Implementing a Database Stream — cont'd.

orange juice, and record number 1004 is read and it contains diaper information. When the entire database is read sequentially, the stream starts all over again from the beginning.

"With this method, a single I/O thread reads all the data from head to tail," explains Professor Tu. "Instead of just sitting there waiting for a query the database becomes a stream, a circular stream of data. The program keeps track of the first record you read, let's say record number 505, and what you want done with it. Then when the stream has cycled through millions of records, the program knows you want to stop at record 504."

In effect, you tap into the stream at a known location, and start reading the records and stop when you have cycled back to your record - minus one. But doesn't this take massive amounts of memory on your computer? "No, not at all," laughs Tu, "it actually takes very little, because you read just one sequential record at a time."

"Take our orange juice user, he wants an average price," Tu explains patiently. "His computer taps into the stream and looks at gathering two variables: the price and units sold." As the data stream goes by, only the items that are coded as orange juice are examined. The cost and the number sold are incremented by that record, so when the data stream cycles back around, the orange juice user has only two variables: a very large number of dollars and the units sold. Divide the large dollar number by the units sold and there is your average price of orange juice. This takes a miniscule amount of memory, and the CPU power can be harnessed into buffering the incoming records in the most efficient and rapid manner.

"Our other user is concerned with the number of diapers sold," continues Tu. "She reaches in to the stream, and of course, ignores all the orange juice records and looks only at the diapers. She only stores one variable, and in the end, has the answer." In this manner, only one massive I/O operation is shared by an unlimited number of users, without all the random I/O seeks that would bring a system to its knees.

But what kind of computational power is needed to push start that enormous data whirlpool? "A few thousand cores for a typical data warehousing systems," estimates Tu. The computer of the future? "No, not really," laughs Tu. "You probably are running a dual core system on your laptop right now. On a mediocre graphics card, say $300 and above, you can get 1,500 cores of computing muscle running on a quad core (basically 4 CPU's on a single chip) computer."

"This can get pretty technical," admits Professor Tu. "But what our research is proposing is actually very cost-effective. You will be able to do massive amounts of computation, on a real-time basis, with fairly inexpensive hardware. This is the basis of the CAREER award, to make this accessible for many types of applications and users. " The CAREER award is titled: "Enabling high-throughput data management in scientific domains," but as Tu illustrated above, it has applications ranging from scientific modeling scenarios to business and real-time computing environments.

This is a revolutionary approach to data processing. Questioning an ancient slumbering monster database, which must unfold itself from "head to tail" in order to answer a simple question is replaced with a swiftly flowing data stream available to all users at all times. It would be as if we walked into the grocery store and stood in one place with our shopping cart while the aisles moved by. We just reach out and grab our Cheerios as the cereal section goes by.

industry consortium - By Janet Dawald

Building relationships between students and companies for real-world experiences

Now starting its third successful year, the Industry Consortium for Industrial and Management Systems Engineering (icIMSE) is all about relationships. It provides companies and engineering students with what each desires the most: real-world experience, professional networking and collaboration between industry and academia.

This concept was developed by Professor Tapas K. Das, chair of the Industrial & Management Systems Engineering Department. In response to student requests for more "real-world hands-on" experience, Das envisioned a consortium dedicated to specific, defined and quality projects that benefit industry and the students eager to use their education, and their hands, to solve actual engineering problems.

Any company can join the icIMSE. Current members include representatives from mining, manufacturing and software engineering. The $5,000 yearly investment enables a company to present up to two project proposals to the IMSE department. Both graduate and undergraduate student teams are carefully coordinated with current classes and assigned to a project for a semester. Teams consist of four to six students in capstone design, design of experiments, simulation, operations research, manufacturing and quality control classes. Professors, students and resources are carefully matched with a company's proposal.

"This concept is not limited to a few special classes," explains Professor Das. "These projects become part of any class's requirements. The professors teaching the classes will select the student teams according to the company's needs and requirements."

The College of Engineering has been doing industry-related projects for many years. "Our students have come to expect even more real-world experience in more classes," says Das. "As engineers, we wanted to ensure the consistency of the projects in the classes, so we developed this program to provide a good experience for everyone involved." It takes a considerable amount of time and effort for an individual instructor to seek the right industry relationships, present a program and make it available for his or her classes several times a year. With the icIMSE, the concept is to provide a clearinghouse-like pool of viable projects with interested industry partners. Response and turn-around time is minimized, and projects are expertly matched with the appropriate professors and students.

The biggest advantage to a company participating in the Consortium is not just getting their problem solved or a program written. They are able to interact, on a limited basis, with the upcoming crop of engineers. It is a trial period for everyone. "The companies get to observe our students in the fall or spring. Then they can invite the best of those students back to be interns during the summer," Das explains. Companies will be able to pick the most promising students involved in the original project group and invite them to follow-up on their projects as summer interns.

"They already have the experience, they have been a part of the company," Das says. "They got to know the people, the processes, and they received a lot of hands-on knowledge during that project." The company already knows that the newly-minted engineer intern or even employee will be productive right away, as opposed to spending several weeks getting acclimated and getting to know the company, the culture and the people. The original $5,000 seems a small price to pay in order to hire engineers that are already familiar with the company's business model and engineering challenges.

A company can propose more than one project per year, and with the proper coordination, a project may last more than one semester. Professor Das encourages a company to have a "centralized" relationship with the icIMSE to maximize efficiency, as opposed to one engineer in one department for one semester. "When that one manager is paying the Consortium out of his or her budget," explains Das, "if that person leaves, we have no relationship. So it is better for everyone if we work with a centralized internal process at our companies."

The Consortium will consider all proposals free of charge. The scope

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of the project is discussed, its feasibility, and exactly what will be delivered. "We spend a lot of effort matching the students, professors and companies," says Das. "We are also very experienced and up front working with licensure, intellectual property and any type of confidentiality that may be required." The University's legal department is well-equipped to handle these types of issues in an expedient and professional manner.

There are three companies that are current Consortium members:

- The **Mosaic Company** is the world's leading producer and marketer of concentrated phosphate and potash, employing 8,000 people in eight countries. One of their largest sites is in Central Florida, with the product being shipped via rail, barge and ocean-going vessels around the world.
- **Pilgrim Software** is a leading provider of enterprise quality and compliance management software for regulated industries. Their corporate headquarters is in Tampa.
- **MTS Medication Technologies** (an Omnicell company) is an international provider of medication packaging systems. They manufacture a system that produces a customized blister card system for taking daily medications. Ensuring that medications are taken as prescribed is a considerable challenge in the health care world.

"I started this Consortium when I became the department chair," says Professor Das. "We were very motivated to bring more real-life projects to the classroom for our students. We listened to the exit interviews coming from our graduates. They placed considerable value on USF and the College of Engineering to provide them with real-life industrial projects and issues. So we listened and developed this Consortium to ensure a reliable and steady supply of experiences for our students - and industry." As is the case with many College of Engineering programs, the icIMSE Consortium concept is win-win, and a great start to any relationship.

For information on the consortium contact Tapas Das at das@usf.edu

Engineering the Future of Medical Devices - By Janet Dawald

To take a new idea from start to finish is one of the most rewarding and fulfilling activities in all of humanity. Just ask any student or faculty in the Industrial and Management Systems Engineering Department. A popular T-shirt in the department puts it this way:

"Engineers make things, but Industrial Engineers make things better. And that is NO BULL."

Professor Lai-Yuen

Students in Professor Lai-Yuen's class not only live up to that boast, but graduate with the chops to prove it: patents, research grants, cutting-edge technology, state-of-the-art collaborations with leading institutions and careers in industry, science and technology. But they also get a good dose of hands-on experience, a tradition passed down through the ages. A tradition that thinks, makes, tests, tweaks, and improves until a useful, working thing is created where none existed before.

Susana Lai-Yuen is a soft-spoken assistant professor in industrial engineering. One of her areas of expertise is medical device design. In her classes, students are actively involved in making new tools for doctors based not on theory, but upon observation of real surgeons operating on real people in real hospitals.

"They start by doing sketches, and from the beginning I discuss with students their ideas and how they plan on designing and manufacturing their products," she explains. "For example, instead of making a certain component in this shape, how could they make it in another shape which still works, but is more feasible to manufacture." The students have to incorporate many ideas from their engineering curriculum, because they also take human factors, ergonomics, manufacturing economics and other considerations into their design.

Erik Esinhart, Adam Lytle and Daniel Kamsler

The current student project involves collaboration with the Center for Advanced Medical Learning and Simulation (CAMLS) in Tampa. A new state-of-the-art facility dedicated to health professional education and training, CAMLS is pioneering a simulation approach to medicine, and is home to some of the most advanced medical machines and equipment in the country. Within CAMLS, the Tampa Bay Research & Innovation Center (TBRIC) specializes in a multidisciplinary approach to creating medical devices, from conceptualization to sales force and provider training. Basically, heaven on earth to engineering students interested in learning how to both improve existing medical devices and creating totally new ones.

Many of the projects started in one of Lai-Yuen's classes will end up as an engineering capstone design class. After that, who knows? USF has a unique system where students, professors and the university can benefit from the patents that are the end result of the design and prototyping process. "It takes many years to actually bring a medical device to market," she explains. "We take it from idea to prototyping, not final product. We show that the prototype works and can be manufactured economically." In the meantime, the patent is filed and prospective companies become interested in the prototypes. "It is exciting to see your students' work progress to this stage. Then, when a manufacturer sees the potential, well that is very exciting," she adds, with a definite note of pride in her voice.

Three engineering students have been working on a laparoscopic device to help surgeons remove uterine tissue when performing hysterectomies. Erik Esinhart, Adam Lytle and Daniel Kamsler are working with Stuart Hart, MD, director of TBRIC at CAMLS. Dr. Hart is a gynecological surgeon at Tampa General Hospital. Along with Mario Simoes, who received his master's degree in mechanical engineering from USF, the group is working on an improved morcellator. A surgical instrument that is used to remove large masses of tissue in laparoscopic surgery, current morcellator models have cutting jaws and grasp tissue with claws, which is drawn up into a cylinder by the surgeon.

A rather gruesome device all around, the morcellator is limited in size and requires repetitive hand motions by the surgeons. In surgeries that can last many hours, fatigue and hand strain can lead to increased risk of injury for the patient. The existing models also became dull during the surgery, and multiple morcellators can be necessary.

The USF team has invented the "MorceShaver" after making a thorough study of its use and drawbacks. It is also the result of an interdisciplinary approach to design. Rather than going through a small laparoscopic incision in the abdomen, the improved model is used through the vagina. A larger diameter is then possible, and two spiral cutting inward blades cut the tissue, instead of grasping at it. The tissue is then transported up the cylinder by an auger - a large screw contained within a cylinder that can bring up water, earth, or human tissue. No more forceps necessary to pull tissue through the device. They even added a safety tip that does not allow the device to come in contact with vital organs, and a retractable cover when the device is not in motion. Only one MorceShaver is needed per operation, saving money and sterilization costs. It is also of the few medical devices in recent history designed for women's surgical needs.

Designed specifically for the new field of minimally invasive surgery markets, the MorceShaver is radically different than the original morcellator concept. The team is positive that its unique design will capture a good market share. Of the students, Erik Esinhart has kept the project going for an independent research study class, and the team filed a patent in July of 2013.

"There are two medical device companies interested in this device," explains Lai-Yuen. "Every year is a different program and device, and this year was specializing in laparoscopic surgery and hysterectomies." Next year a new team of students, doctors, and professors will start a new idea. And like any good engineer, they will make it better. And that is truly no bull.

USF AWARDED $2.8 MILLION AS U.S. DOT CENTER FOR LIVABLE COMMUNITIES

The University of South Florida's Center for Urban Transportation Research (CUTR) has successfully competed for a two year, $2.8 million federal grant to continue work done through its National Center for Transit Research (NCTR). USF is one of only 35 universities to be selected to receive a University Transportation Center grant from the U.S. Department of Transportation in 2013. The grant allows for the continuation of a program that started at USF in 1991, but requires recipients to be selected through a national competition from more than 100 universities throughout the United States. USF has prevailed in all four competitions conducted for Tier I University Transportation Center grants since 2002, and is the only university in the country to have done so.

The University of South Florida will be the lead university and administrator of the grant. The grant will be shared with The University of Illinois at Chicago, Florida International University, and the Texas Transportation Institute at Texas A&M University.

The competition for the grant required applicants to compete in one of five themes representing the Department of Transportation's strategic goals: livable communities, safety, state of good repair, economic competitiveness, and environmental sustainability. While CUTR has done considerable research in all of these theme areas, it applied under the category of livable communities due to the strong research capabilities it has demonstrated in the field of public transportation through its National Center for Transit Research.

U.S. Representative Kathy Castor supported the funding of this grant application, noting "NCTR will conduct research in all forms of public transportation and non-motorized transportation being that public transportation and transportation demand management make livable communities possible. The result of their efforts will also serve to encourage new student entrants to the field of transportation and sponsor professional development opportunities for students in Florida and throughout the nation."

The grant will provide $1.4 million a year for two years to fund transportation research, education/training, and technology transfer activities. The research to be conducted will be targeted toward making public transportation safe, efficient, effective, desirable, and secure. In addition to conducting research, the National Center for Transportation Research will continue other activities including:

Producing the Journal of Public Transportation, the only peer-reviewed university journal dedicated to public transportation issues with a world-wide circulation;

Administer electronic forums and information clearinghouses with more than 10,000 members to allow the sharing of information among transportation professionals and students in a free and flexible manner;

Host the GIS in Transit Conference attracting an international audience to share the latest applications of geographic information system technologies to improve public transportation planning and performance;

Support the development of students with an interest in careers in the field of public transportation

Since 1991, the National Center for Transit Research has brought in $27 million of U.S. DOT grants, matched one to one by community partners, for its transportation research and education center. The Florida Department of Transportation has been an indispensable partner in providing most of the funds required to match the federal grants. In addition to being the lead recipient of a Tier I grant from the USDOT, CUTR was also included as a partner on three other successful university applications for similar grants. CUTR will work with and receive additional funding from:

The consortium led by the University of Tennessee as the Regional University Transportation Center for the Southeastern United States;

The consortium led by Rutgers University as the National University Transportation Center for research involving the state of good repair for transportation infrastructure; and

The consortium led by Portland State University as the National University Transportation Center for research involving livable communities.

"CUTR and the National Center for Transit Research have long been jewels for the University of South Florida," said College of Engineering Interim Dean Rafael Perez. "USF

has become one of the most prominent research public universities in the country, thanks to programs like CUTR that have established an excellent national reputation in transportation research. The work they have done through the National Center for Transportation Research has immediate relevance to operating transportation agencies and has led to research conducted on behalf of other federal sponsors as well. We are particularly pleased to collaborate with so many other fine universities through the University Transportation Center program."

CUTR's Director Jason Bittner noted that "This grant allows USF to remain at the forefront of transit and community focused research. Our team will help solve our nation's transportation challenges and train the next generation of transportation professionals."

IS YOUR PHONE SMART ENOUGH? - By Janet Dawald

Think your smartphone is smart? Does it help you find the nearest gas station, or remember your anniversary? Do you whip it out when the conversation turns to who won the Academy Award for best actress in 1972? Or help you find the constellation Draco? That is pretty smart, right?

"They call it smart, but these phones are not smart enough in terms of communication," says Huseyin Arslan, associate professor of electrical engineering. Arslan is also the faculty advisor for the Wireless Communication and Signal Processing Group (WCSP - http://wcsp.eng.usf.edu/index.html) at the University of South Florida. Their tidy website, geared toward the latest in wireless technology research, is a daunting read for the average smartphone user. However, Arslan embarked on a philosophical journey through radio technology, sociology, culture, the electromagnetic spectrum and even happiness.

Today's smartphone is basically a sophisticated computer that can run various applications. The applications themselves are very clever, and there are thousands of them available. But the smartphone actually provides only a limited amount of data to these applications: location information, rate of travel, what it sees through the camera lens. "All of these application gadgets do not learn anything about the user's communication needs or requirements," explains Arslan. But most important to the WCSP group is that the phone itself never adapts to its environment. "The radio smartphone needs to understand its communications environment, to use the proper waveforms in the proper format, so that it can maximize its two biggest limitations: usage of the spectrum and of power resources. This is what we call cognitive radio, a channel-able radio that is aware of both its user and its communications capabilities. This is not fully implemented in any of the devices that we currently have."

Smartphones, stripped of their fancy apps and eye-candy interfaces, are basically radios that compete for a limited spectrum and a limited power source (the dead battery thing). "In our research, a smart radio is both the phone and the network, and both exploit resources as efficiently as possible, with the information that is available in the phone or in the network," explains Arslan. "A truly intelligent phone would adapt to different transmission parameters, different networks, whatever, to optimize its resources as efficiently as possible. Currently, my research is focusing on how can we efficiently utilize the limited spectrum to provide access for many people or for many devices and for higher and higher data rates."

While the government may be in the process of freeing up more of the spectrum for commercial use, Arslan cautions that it may not be enough. A decade ago, voice-to-voice communications were the biggest part of the traffic on wireless networks. Now, heavy lifting is required to handle the data upload and download, inter-device communications, multimedia and other data-intensive applications - something unheard of a few years ago. Remember, in less than a decade, we went from being gobsmacked that we could call Aunt Minnie in Ypsilanti from the back yard to being extremely irritated when we have to wait a few seconds to find the nearest Starbucks.

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But spectrum limitations are not the only issue, cautions Arslan. "If we have an infinite power supply, everything is possible," he laughs with mock megalomania. "Computation takes power, and therefore we need low power algorithms as part of our design criteria. I need the maximum amount of bits per burst with a minimum amount of power required to do this."

"Of course, your smartphone should also make you happy," he says in all sincerity. "It should learn what kind of user it belongs to. I call this 'customized' radio. For example, I drive back and forth from home to work. It should automatically go out and get traffic information for me. It should also be customized for who I am, and not insist on the same configuration for my grandfather as for my teen-aged son. It should learn my needs, my environment, and my habits." He pauses for a moment. "Like a spouse! Yes, I believe you could write an app for that," he laughs, "but don't tell my wife."

Much of the research at the WCSP is involved with the increasing number of cell phone users and their traffic, especially in high-density population areas. In a simple but elegant analogy, he explains that people living in houses a mile apart is a piece of cake in the wireless world, but what happens when they all assemble in Times Square on December 31? Taking pictures, uploading the data, talking, texting and taxing the local network is Arslan's idea of a good time. "Interference," he says with enthusiasm, "I can use it in a controlled manner. We can allow users to overlap each other and either the phones or the network can understand this interference and cancel it out. I call this intentional interference, but it is controlled in a way that is not harmful to people or their communications."

To illustrate this point, he explains that if someone threatens to hit you, and you do not know where the blow is coming from, it could be potentially harmful. However, if your attacker politely informs you that you will be the recipient of a punch in the nose, you would be able to defend yourself with far better accuracy. Arslan envisions receivers and networks that would allow a certain amount of interference yet still allow all the voice and data communications to function as normal.

"There are about seven billion cellphone devices out there," Arslan muses. "And increasing every day. Not just the devices themselves, but the data going through them is going to increase by a factor of several thousands in the next five years. Where will these things come from? We use the term internet of things or machine to machine communications. There will be a LOT of devices in a VERY SMALL region, communicating and interfering with each other."

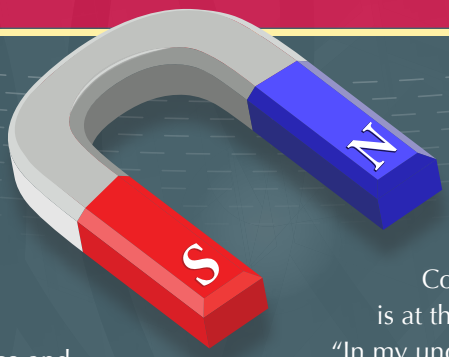
When asked what he thought this form of instant communication would have on mankind, Arslan had an astonishing answer. "Ask me in one year," he replied. "I will have a visiting scholar who will be looking at the relationship between sociology and communication. The question is very relevant, and the answers will be different - maybe American society will be different from, say, Swedish society. Societies are different, and the penetration of communication technology and devices, all that must be taken into the study."

His research group also focuses on security, including eavesdropping, jamming, and authentication. A truly smart phone will be able to avoid these things. He envisions a future where a doctor can monitor a patient's pacemaker, or insulin levels, using small devices implanted in the body and transmitted via a smartphone to a medical monitoring station. He worries about who is in charge of these networks, and what would happen if our world of instant communications were turned off.

His research with cognitive radio would ensure that through any disaster, emergency radios would be able to communicate with each other and adjust their frequencies to accommodate all involved. Pointing to events in the Middle East, where thousands of people were able to come together at a moment's notice, Arslan is aware that this has never before been possible since the beginning of mankind. It needs to be studied. "I tell my students they will always have jobs in this industry," laughs Arslan, "we take communications for granted, unless you go and understand what goes on behind all of these things. It is really complicated, you know. So many constraints, so many things that are not visible. But this is good for us because this is our job. We have problems to face!"

Educational Magnetism

By Janet Dawald



A student leans over a series of magnets arranged before him. Humanity's fascination with the mysterious power of magnets is reflected in his face. Beside him, a dedicated teacher and mentor waits for that expression to change from one of puzzlement to understanding. The teacher watches as two fundamental forces in the universe, human intelligence and electromagnetism, play out in her classroom. Many of us have been that student, unaware at the time, that we have just been transformed by a teacher. As surely as a magnet will pull a compass to change direction, the student's course in life has been altered by a dedicated and brilliant teacher.

Associate Professor Sanjukta Bhanja, is just such a teacher. Her students range from grade school kids to doctoral candidates. The older the student, the smaller the magnet, and small is currently at 300 by 50 nanometers. (To put this into perspective, a nanometer can be compared to the length of one inch in a mile, or one billionth of a meter.) Her undergraduate students in the Department of Electrical Engineering are working with millions of tiny magnets on the cutting edge of MRAM technologies, or magnetoresistive random-access memory. EnVision magazine spoke with Professor Bhanja in between a busy schedule of teaching, organizing, researching and publishing. While somewhat nano in stature, it is clear, like her magnets, that she is indeed a force of nature.

Sanjukta Bhanja

"Little kids love magnets," explains Professor Bhanja when asked about her work in elementary and middle school programs. "I can show them the concept of information, of switches and data. The north and south poles are like logic one and logic zero in computers. We talked about gates and switches, they understand. They did not need to know the process equation. They get it! Then I ask the students what happens if there are a billion of these magnets, what other issues will come up. It is very rewarding."

Combining research with teaching is at the heart of Bhanja's philosophy. "In my undergraduate classes, we talk about majority logic, which is how magnets work. It is not like the logic one and logic zero, but more like a democracy," she laughs. "The output magnet will behave according to the majority of the input magnets - it might not satisfy all of them, but it will satisfy the majority of them."

This ability of magnets to act together at the nano scale is part of her research with the Nano Computing Research Group (NCRG). Like any remarkable instructor, Bhanja sums up her research in simple language: "Magnets retain their value, and you don't need to give any power to a simple bar magnet in order for it to attract a ferromagnetic object. I don't need to power this memory up, the signal comes from the magnetization of the magnets, is it pointing north or south? And magnetic memory does not dissipate power, or heat up, when you are not working. This power dissipation is called leakage." She further explains that her research has shown that magnetic memories consume zero standby power, are extremely robust, resistant to heat and to radiation.

Another one of her research projects at the NCRG involves not only theoretical issues but actual fabrication processes. "Coplanar cross wire systems use a magnetized wire that can cross over each other in a single plane," she explains. One of the reasons why the traditional CMOS architecture has so many layers is that you cannot cross two wires, you get a short circuit. One wire has to make a loop around

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another wire, because you cannot cross them in a single plane. There are some very cool things we have fabricated," she adds with genuine pride.

"It all gets down to a switch," she explains. "You can send rockets to other planets but the basic computing element is the switch. And if the switch source and drain are really close, then you will have a short, current will always be flowing." A good part of her research has been in getting those switches very close, and at the edge of technology. "We are investigating quantum dot cellular automata. It is not really transport of point A to point B through a conventional switch," she adds with excitement. "This is the future of technological limits, we are moving beyond silicon."

How did she get started in this emerging field? Professor Bhanja confessed that she was quite fond of algorithms and graph theory. Her initial work was on probabilistic graph models that bore a resemblance to the CMOS models she addressed in her doctoral dissertation. She credits her training to seeing things in layers from both theoretical and practical levels. "I always look at things from the system point," she muses, "not just like how one magnet is behaving. You have to know the vertical hierarchy of what you have. You have to know the layers."

Does this ability to see the individual layers in the whole picture help in mentoring students? "I don't know about that," she laughs, "but it does take some critical analyzing to see determine what your student's basic skills are. For example, some students are good in coding, or good at abstracting a big picture into an intermediate process, or even in fabrication. It is a challenge to fit them into research and to recognize their abilities. They also have to be passionate about what they are doing." She emphasizes that her passion for her research translates into the students' work. "If I did not have the passion for my research, I cannot expect my students to be passionate about their work," she explains. Having worked with many under-represented groups, Professor Bhanja is very aware of her position of a role model, and actively encourages her students from a position of experience.

For seven years, Bhanja was the only woman professor in her department. She emphasizes with women and minority students who can feel like they don't "belong." With the same clarity she brings to her research and teaching, she pinpoints some of the issues of being a role model. "Because there is only a few of you - women or minorities - you will be stereotyped," she warns. "You really have to publish, get grants, work the system; otherwise there is no point in being a role model. You have to have the strength of your convictions."

The strength of Bhanja's convictions translates into her work with STEM (science, technology, engineering and math) programs. A half-dozen high school students will show up in her lab after school. She challenges them with Boolean logic problems, buckyballs and more magnets. She is a strong advocate of presenting the sciences early in school. She emphasis hands-on experience assignments that reinforce classroom concepts, active learning, and encouraging classroom discourse. "In engineering," she explains, "we have 200 years of fundamentals to learn in the classroom. That is a lot of fundamentals to cover. It is not easy. And what about the next ten years?"

When not advising EE Sloan Scholars, mentoring award-winning students, and messing around with magnets, Professor Bhanja has written more than 80 publications in top tier peer-reviewed journals and organized conferences in very large systems integration (VLSI). She is an associate editor of the IEEE Transactions on VLSI and the ACM Journal on Emerging Technologies in Computing Systems. She is the recipient of the New Researcher award from USF (2002), the prestigious NSF CAREER award (2007-2012), the USF 2008 Outstanding Faculty Research Achievement Award, the Florida Education Foundation (FEF) William Jones Outstanding Mentor (2010) and the Outstanding Undergraduate Teaching Award for 2009-2010. In October, Bhanja was selected as one of two Honorable Mentions for the 2013 Outstanding Graduate Faculty Mentor of the year selected by her peers at USF.

Many of her students are in academia namely Dr. Srivastava (Assistant Professor: University of Lincoln), Dr. Lingasubramanian (Univ. of Alabamam@ Birmingham). Dr. Javier Pulecio, a Bridge to the Doctorate and Sloan scholar is currently at BrookHaven National Lab and is the recipient of Outstanding Dissertation award, USF 2010. Jayita Das, my current PhD student, is also a USF Presidential Fellow and is one of the few elite PhD forum participants in IEEE/ACM DAC. Drew Burgett, the new PhD student in the group is a NASA Space Technology Research Fellowship recipient for 2013-2017, one of the highest paid and honored federal fellowships.

Trishelle Copeland-Johnson, '12 BSCH, has been awarded a prestigious NASA Space Technology Research Fellowship. Trishelle is enrolled in the Chemical Engineering PhD program at the University of Delaware.

Francy Sinatra, '10 BSME, MSME and '11 MSBME, a research scientist at Draper Laboratories, has a project that is heading to the moon. As a member of a four-person team that handles quality management on instrumentation for NASA's Lunar Atmosphere and Dust Environment Explorer – also known as LADEE - the project features an Ultraviolet and Visible Light Spectrometer built by Draper. The instrumentation – which will allow scientists to study the composition of the lunar atmosphere by analyzing the light signature of materials it finds – was launched in September aboard a Minotaur V rocket. It's scheduled to arrive in the moon's orbit in October.

Ripa Construction Receives "Fast 56 Award" - By Tom Edrington

A little less than a dozen miles from the University of South Florida campus is the business home of USF graduate Frank Ripa.

It has been 40 years since he graduated from the university with a degree in civil engineering and his journey has been long and fruitful and the amazing part of it all is that he is still so close to where it all started for him. Ripa was one of the recent recipients of the USF Alumni Association's Fast 56 award, marking the fastest growing companies headed by Bulls alumni.

"It's an honor to be one of the companies in the group," Ripa said as he looked back on a distinguished career of accomplishment that became possible by hard work and perseverance and a good dose of what Ripa called "timing, timing, timing."

And it was good timing.

His story began in Rome, N.Y. His parents made the decision to move the family to Miami to be near his aging grandparents where Ripa attended Miami Norland High School. His journey to USF started the same the way it does for many youngsters, no matter what generation. "I wanted to stay in-state," he recalled. "My best friend, Eliott Parsowith, and I applied to USF. We were accepted and both decided on USF."

When he arrived, engineering was a consideration and the early handwriting was on the wall for Ripa. "At first, I didn't even know what an engineer did. But I was pretty good in math and science. I started out in electrical engineering but things changed when I got to know Dr. Barney Ross and Dr. Mel Anderson.

"Working with Barney, I got into water and wastewater management," Ripa said, looking back on his undergraduate days. "I was one of his team members and that eventually led to my degree in civil engineering.

Ripa graduated in 1973 but hasn't forgotten the good memories of his time on campus. "USF gave me a strong educational experience and it was a great place for building social relationships.

"A lot of the people from engineering stayed in this area and worked for other companies and local governments. Some worked for competitors, some worked for municipalities. It helped my career a lot over the years."

Ripa's professional life after graduation started out with the City of Tampa, working as an engineer and project manager. He went on to Housel and Associates and then to the Tampa Bay Regional Planning Council. He made a move to the fast-growing firm of Post, Buckley, Schuh and Jernigan where he became friends with land planner David Maltby and landscape architect Ed Czyscon.

In 1981, the three formed Florida Land Design and Engineering. "We felt the three of us could do quite well," Ripa recalled. He was spot-on. The multi-disciplinary company grew to 250 employees by 1989 and that was when west coast engineering firm Dames and Moore came knocking with an acquisition offer.

"We were in the right place at the right time," Ripa said, hitting on his recurring professional theme. He stayed on as a manager at Dames and Moore for three years but began to experience some fatigue. "I was burned out," Ripa said. It was in 1993 that he made a change and went to work for Florida Remediation Services and was responsible for their environmental construction work. As the firm grew, it started working on infrastructure projects.

It was June of 1998 when Ripa made a life and career-changing decision. He bought the infrastructure construction division and changed the name to Ripa and Associates, Inc. He was finally on his own.

His initial thought was that the company would stay small. "I thought we might grow to approximately twenty employees and maybe do about $10 million in revenue per year." So much for his initial perceptions. Ripa and Associates grew and grew, very much like the Tampa Bay area grew in that equivalent time span. It was a time of growth and prosperity and his company was taking its part in the growth spurt.

continued on page 22

Less than 10 years later, it all started coming apart for the United States economy. The real estate bubble burst, construction in the state of Florida slowed to a dribble.

"There were a lot of sleepless nights," Ripa remembered but it was his conservative nature that saved his company. "What saved us is that I'm very conservative," he explained. "I was conservative as far as the amount of equipment we bought. Per our business plan, we used more sub-contractors rather than buying more equipment. Fortunately, we had saved up a decent amount of money. I was the only owner and basically my money was the company's money. It was a nervous time, for sure."

What the downturn provided for Ripa was opportunity.

"There were five companies (in the Tampa Bay area) that do what we do. We're the only one left. "At our peak, we had 280 employees and that dropped to 150. As other companies disappeared, we were able to hire some good key employees from other firms and that helped us tremendously.

"We were able to get the cream of the crop, so to speak from the other companies that didn't make it. Now we have grown to over 325 employees, and we are stronger than ever," Ripa said proudly.

One of his key players is son-in-law Chris LaFace, the President of the company, who has been a driving force behind the company's latest growth spurt. Ripa currently serves as the Company's CEO and LaFace is responsible for the firm's day-to-day activities. Chances are if you drive around the Tampa Bay area and take a glance at a construction site, you'll see a Ripa and Associates sign.

Frank Ripa, '73, founder and president of Ripa Construction

Two of the company's biggest current projects are the 71-acre campus for the St. Joseph's South hospital complex located in south Hillsborough County and the University Town Center, an indoor mall, being constructed in Sarasota County.

With the economic recovery in Florida, Ripa and Associates will stay busy. Ripa has been an advocate for new businesses in Hillsborough County and was one of the vocal supporters for the location of the Bass Pro Shops site near Brandon, not far from the headquarters of Ripa and Associates.

"If the county could do five of these types of deals, they should do it," Ripa said. "It will bring jobs and typically other retail businesses will follow." "This County needs jobs and the project would create 1,700 construction jobs," Ripa told the County Commissioners.

With business humming, Ripa has had a chance to reflect and he was quick to point out another key ingredient to his success. "I do have to give a lot of credit to my wife Jackie. I never thought of myself as the smartest guy around. She has done a lot for this company through the years. I met her when she was working as a real estate agent and I was working for an engineering firm.

"When we started, she was right there from the start doing everything, even answering the phones," he recalled.

Ripa also beams with pride when he reveals another family connection at USF.

My daughter, Angela Ripa LaFace, is a 2013 graduate of the Morsani School of Medicine. She wants to be a surgeon, we're really proud of her," Ripa said, remembering how she started with a business degree at the University of Florida then tried a job within the company. "She worked for us here for a year and decided it wasn't for her. She went to USF, did her pre-med work and was accepted into the medical school." She is currently in her first year of general surgery residency at USF Health.

The Ripa family has a lot to smile about these days and the latest award from the Alumni Association is just another validation of great timing.

For, as Frank Ripa says, "it's all timing, timing, timing."

This Engineer has More than Pipedreams

By Janet Gillis

Marjorie Valdez graduated cum laude in spring with a degree in mechanical engineering and spent the summer as an intern working on the Trans-Alaska Pipeline System (TAPS). Native Alaskan, Marjorie Valdez, loves her beautiful home state, but she sometimes felt disconnected from the rest of the United States. With the encouragement of her family, she traveled nearly 5,000 miles to attend the University of South Florida.

Coming from the fourth least populous state to Florida the fourth most populous state was not a big culture shock for her. "Anchorage is a city of 300,000, so I didn't experience any culture shock, but the climate change took a bit of time to get used to," Marjorie said.

As an engineering intern working for Alyeska Pipeline Service Company, the private company that operates and maintains the TAPS, she is assigned to the Project Engineering Department which oversees major projects on the pipeline ranging from maintenance to new equipment installations. The pipeline is 800 miles in length and spans the state from Prudhoe Bay on the North Slope to the southern Alaskan town of Valdez. Approximately 500,000 barrels of crude oil is transported through the pipeline per day and is loaded onto tankers in the port of Valdez where it is sent to market.

With the weather favorable for labor and construction on the pipeline, Marjorie is shadowing a project engineer this summer on pipeline maintenance. One of her first assignments involved a project that will replace the batteries that operate the 62 remote gate valves used to close off oil flow in certain sections of the pipeline in case of emergency. She filled out equipment request forms to assign tag numbers to the batteries which are now as old as the pipeline itself (36 years).

She is currently working with a facility engineer on a minor project that will remove the wooden supports beneath three 10,000-gallon diesel fuel tanks and replace them with concrete supports at Pump Station 4 in a remote location in central Alaska. "My work involves discussing issues with design engineers in order to choose an appropriate situation. Not only am I able to experience the process of this small project first-hand but I also sign off on important engineering documents, she said."

So far, Marjorie has traveled to five of the twelve pipeline pump stations by car and even helicopter. Growing up, she didn't have a dream job in mind, but her high school physics teacher helped to combine her love of math and science and funnel that into an interest in engineering. "I veered towards mechanical (engineering) because that's what seemed to interest me most – how mechanisms work, and trying to solve the puzzle when something doesn't work," she added.

Marjorie's mom, an Alyeska employee since 2007, has been her greatest influence and she admires her mother's accomplishments such as earning both a bachelor's and master's degree while working and raising three kids. "My mom has always supported me. She's always encouraged me to be a free-thinker and make my own decisions," Marjorie said.

She advises students to get involved with an internship as early as their sophomore year. "The experience and knowledge from an internship is one you won't be able to get in a classroom and will only make you that much more prepared and qualified for a job once you graduate."

While at USF, Marjorie was a member of Tau Beta Pi, the engineering honor society, and her fondest memory is bonding with fellow engineering students over late night study sessions in the library before exams. She's not sure what the future holds for her career-wise, but studying for the professional engineer exam is high on that list as well as graduate school. "I would like to start my career by finding a technical position so I can gain more engineering experience," Marjorie said.

Chemical engineering students, **Cheryl McCane** and **Kathleen Baumback**, were each presented with a $1,500 scholarship by the Central Florida chapter of the American Institute of Chemical Engineers.

Pacia Hernandez, a doctoral student in the Department of Civil and Environmental Engineering, has been awarded a Signature Research Fellowship from the USF Graduate School.

Debosruti Dutta, Mandek Richardson, and **Tamina Johnson**, doctoral students in the Department of Chemical and Biomedical Engineering have been awarded fellowships by the USF Graduate School for the 2013-2014 academic year. Debosruti, a doctoral candidate in chemical engineering, received the Dissertation Completion Fellowship. Mandek, a doctoral candidate in biomedical engineering, will receive the Genshaft Family Doctoral Fellowship. Tamina, an engineering science doctoral student, will receive a Graduate Student Success (GSS) Fellowship

Three engineering students were recognized with Excellence in Research Awards at the USF Undergraduate Research and Arts Colloquium. **Mason Chilmonczyk** (Mechanical Engineering); **Michael Del Valle** (Chemical Engineering); and **Benjamin Matlack** (Mechanical Engineering)

Edikan Archibong and **Nicole Febles**, two doctoral students in the Department of Chemical and Biomedical Engineering, received biotechnology internships for summer 2013. Nicole, work as an R&D intern for 12 weeks in the Biochemistry Sector of Life Sciences at Corning Incorporated, in Corning, NY. Edikan participated in a 10-week internship with the Center for Bio-Molecular Science and Engineering at the Naval Research Laboratory in Washington, DC

Drew Burgett, a doctoral student in electrical engineering is one of 65 graduate students selected by NASA to participate in the 2013 class of Space Technology Research Fellows

Several students in the Chemical and Biomedical Engineering Department won in the poster session of the Central Florida Chapter American Institute of Chemical Engineers (AIChE) 37th International Phosphate Fertilizer & Sulfuric Acid Technology Conference held June 7-8 in at Clearwater Beach. In the graduate category: Outstanding Poster - **Syed Ali Zeeshan Gardezi**; Second Place - **Adib Amini**; Third Place - **Joseph Fernandez**. In the undergraduate category: Outstanding Poster - **Cheryl McCane**; Outstanding Poster - **Ryan Kent**.

Jamie Trahan, a doctoral candidate in mechanical engineering, received a Graduate Teaching Fellowship from the American Society of Mechnical Engineers (ASME). Two College of Engineering undergraduate students, **Antonio Enriquez** and **William Cruz**, both majoring in information technology, won best poster at the STARS Celebration at the Atlanta conference.

Senior chemical engineering major **Hayley Rohrer** has been named to the 2014 Class of the Society of Women Engineers Future Leaders (SWEFL). Hayley joined 78 other students from around the world (the largest class ever) in Baltimore on October 26 for the Collegiate Leadership Institute.

Edikan Archibong, a doctoral student in the Department of Chemical and Biomedical Engineering, received the 2013 Winifred Burks-Houck Women's Graduate Student Leadership Award by the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers.

Innocent Udom, a doctoral candidate in the Department of Chemical and Biomedical Engineering, received the Best Poster Award, during the 64th International Astronautical Congress (IAC), in Beijing, China.

Leslie Rodriguez, a senior in the Department of Computer Science and Engineering, is a recipient of the USF Hispanic Pathways (undergraduate category) and USF Status of Latino (SOL) Student awards.

Chemical engineering seniors, **Cheryl McCane** and **Emily Tonjes** have received 2013-2014 academic scholarships from the Society of Women Engineers (SWE). Cheryl was awarded the SWE Dupont Scholarship and Emily was awarded the SWE Susan Miszkowicz Memorial Scholarship.

Andrea Sanchez, a doctoral candidate in the Department of Civil and Environmental Engineering, is the recipient of a Society of Hispanic Professional Engineers (SHPE) dissertation fellowship award.

Mehrnaz Abdollahian, doctoral student in industrial engineering, received first place in the annual INFORMS Conference poster competition in Minneapolis.

The USF student chapter of **INFORMS** received the 2012-2013 Summa Cum Laude INFORMS Student Chapter Annual Award, again this year after winning it last year (2011-2012). This is the highest recognition among all INFORMS Student Chapters worldwide.

The student chapter of the **Society of Automotive Engineers** has a world ranking of 43 out 503 international teams. The ranking was announced in summer and USF is up from No. 76 last year.

Outstanding Student - By Tom Edrington

Mason Chilmonczyk is a young man with a singular mission. He simply wants to be the best. Chilmonczyk is a senior mechanical engineering student and his time at the University of South Florida will reach its zenith when he graduates in the spring of 2014.

It has been an outstanding four years for the young man who grew up in the high desert lands north of Los Angeles called Apple Valley. He and his family were transplanted to Florida just after he turned 12.

Even in those early years, he found fascination in all things mechanical. "I was always at construction sites with my father when I was young," he explained. Math and science came easily to him. He embraced physics and calculus, subjects that don't come easily to most students. Ridgewood High School in Port Richey became his think-tank, although he wasn't sure that engineering was his path.

"I thought I would be a zoologist, but then there was one particular teacher who changed my life. It was Amy Staginer. She was my calculus teacher. And she did change my life. She has her degree in aerospace engineering and she loves teaching. I loved calculus and her love for the subject got me into it even more."

With a passion and drive for his studies: Chilmonczyk had plenty of options his senior year at Ridgewood. "The choice came easy," he recalled. "The University of South Florida offered a full academic scholarship and the great thing about USF is that I would have the chance to get involved in research as an undergraduate. At most schools, that is limited to graduate students."

Chilmonczyk's motivation and drive did not slow down when he stepped foot on the USF campus. The dean's list has been a constant in his academic life. He has made it every semester. His grade point average is an impressive 3.93, just hundredths of a decimal short of perfection.

He is one of the great success stories in the Department of Mechanical Engineering. Awards have piled up for him. Chilmonczyk was named Student Engineer of the Year for the 2012-13 academic year by the Florida West Coast Section of the American Society of Mechanical Engineers (AMSE). The award came not only for his academic prowess but also recognizes service to the community and to the AMSE student section at USF.

It wasn't his only award. He was also named Outstanding Student for District F thanks to his academics and his leadership in promoting the growth of the student section of the AMSE.

Spend some time speaking with Chilmonczyk and you notice he has great communication skills. They have served him well as a student and have carried him to another level of achievement. Last April he competed in the AMSE 's district competition designated the Old Guard Oral Presentation Competition. The district is comprised of eight southern states and the competition brings together students from the highest levels. Chilmonczyk took home first place.

He and his fellow competitors were judged on their abilities to deliver clear and concise oral presentations based on a field of expertise in the world of engineering.

"You have to be extremely detailed," he said, explaining the workings of the competition. "Typically the judges are from your field. The toughest part is after your presentation when they nail you with difficult questions."

Chilmonczyk is a confident young man, but didn't imagine himself as the first-place winner. "I didn't think I was first place. There was a guy from Virginia Tech who had a spectacular presentation." Obviously the judges deemed Chilmonczyk's performance more spectacular.

That victory at the University of Alabama in Tuscaloosa earned him a spot in the national competition. He will travel to San Diego in November and compete at the International Mechanical Engineering Congress and

Exposition. He will go up against the other district winners. In keeping with his drive to be the best, he will go up against the best.

As in the district competition, finalists will be judged on their ability to make great oral presentations from the field of mechanical engineering. "It's an honor just to be there," Chilmonczyk said. "I'm looking forward to it."

One of the things that have prepared him for these competitive situations has been the research opportunities that have been available to him during his undergraduate years. In April, he received yet another award. This one came for his achievements in that research. He received the Excellence in Undergraduate Research award in yet another competitive environment. Just the title of his presentation is enough to leave non-engineering folks scratching their collective heads. His presentation? Try "Technical Design Implementation and Control of an Atomic Layer Deposition Reactor into a Pre-Existing UHV Analysis Chamber."

If that is not impressive enough, the talented senior has found time outside his studies to do some part-time work with one of Tampa Bay's most innovative companies. Chilmonczyk has been logging plenty of hours at PharmaWorks. It is a company founded and run on the belief that world-class products can be and should be engineered and manufactured in the United States. One of the company's main areas of pursuit is pharmaceutical packaging. "It's been a great opportunity to get out there and spend some of my time in real-world experience," Chilmonczyk said of the company located in Odessa, not far from his home in New Port Richey. Cilmonczyk's time at USF has been nothing short of extraordinary. But that time is winding down. "I should graduate in the spring," he indicated. His next calling is graduate studies. "I have applied to UC Berkeley, Cal Tech, Virginia Tech, Georgia Tech and Northwestern," he said as he went down his list of some of the finest graduate engineering programs in the country. USF? "I have that option and I've been told I can get my Ph.D. here and it is humbling to know that they believe that strongly in me," he explained. "I've also been encouraged to expand my horizons."

As far as his next destination is concerned, Chilmonczyk is open minded. "There are a lot of great schools out there. I'm doing everything I can to be the best. If I get an interview from some of the schools on my list, I think I can handle the interview."

Wherever he lands, his growing passion for research should go to the next level. "I want to do research. If I got the opportunity to teach, that would be great," he said. "I love teaching," he added.

And that should be good news wherever his engineering path leads him.

faculty&staff news

D. Yogi Goswami, PE, distinguished university professor in the Chemical and Biomedical Engineering Department, and director of the Clean Energy Research Center (CERC) is the recipient of the 2013 Technical Comunities Globalization Medal from the American Society of Mechanical Engineers (ASME).

Alex Savachkin, associate professor in the Industrial and Management Systems Engineering Department, received the 2013 Annual Award for Excellence in Teaching Operations Research from the Institute of Industrial Engineers.

Drew Hoff, professor in the Electrical Engineering Department, has been elected to the chair position of the Electronics and Photonics Division (established in 1932) of the Electrochemical Society (ECS), which was established in 1902.

John Wiencek, former dean of the College of Engineering and professor of chemical engineering was recently elected a Fellow of the American Institute of Chemical Engineers (AIChE). Fellow is the highest grade of membership and is designated by peers for distinctive professional accomplishments and contributions.

Distinguished University Professor, **Alberto Sagues**, of the Civil and Environmental Engineering Dept., was appointed a Corresponding Academic on the Argentine Academy of Engineering. Sagues holds the Professional Engineer (PE) designation and is a Fellow of NACE International the Corrosion Society. He is also an interdisciplinary professor in the Chemical & Biomedical Engineering Dept.

Professor **Richard Gitlin**, of the Department of Electrical Engineering, has been named Distinguished University Professor by USF. Gitlin joined USF in 2008 after a distinguished career in the private sector with over 30 years at Bell Labs and Lucent Technologies.

Civil Engineering Professor **Gray Mullins** received the 2013 C. William Bermingham Innovation Award from the Deep Foundations Institute for the Thermal Integrity Profiler (TIP). The TIP uses heat generated by curing cement to evaluate the integrity of cast in place concrete foundations or the shape of concrete structures. Researchers at USF developed the technology and Foundation & Geotechnical Engineering, LLC and Pile Dynamics, Inc., jointly incorporated the technology into the TIP.

Duke Energy awarded a grant to support the Power and Energy Systems Teaching Lab, Phase One. The teaching lab will help students build fundamental concepts in power and energy systems, which cannot be achieved through a software lab alone. As part of both the undergraduate and graduate curriculum, this physical lab will benefit approximately 160 students annually. Four benches of lab equipment will be purchased and used in 12 courses to teach electric machines, power electronics and smart grid.

The new Mini Circuits Design for X Laboratory in the Engineering II building will be the center of interdisciplinary research for many years to come thanks to a generous donation from Mini Circuits (Brooklyn, NY) and the Gloria and Harvey Kaylie Foundation. Design services were donated by Duncan Fuller Interiors, Inc. (Birmingham, MI)

Heart of Gold Celebrates Its 20th Anniversary

The annual Heart of Gold Scholarship Luncheon was held October 4. This year 122 students received $162,700 in scholarships. USF System President Dr. Judy Genshaft welcomed the donors and thanked them for their continued commitment to support engineering students. For more photos, visit **http://tinyurl.com/m3k65cx**

Trang Luong, senior civil engineering major, gave an inspiring speech to the audience. She is pictured with Kate Johnson, engineering advising.

President Genshaft shows the Go Bulls sign with engineering student, John Brautigam, a junior majoring in mechanical engineering.

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COLLEGE OF ENGINEERING at the
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USF: UNSTOPPABLE
College of Engineering

Dear Friends,

The Unstoppable Campaign is coming to an end and the College of Engineering is grateful to announce we exceeded our campaign goal, raising $101,000,000. The renovation of Building II was a priority of Dean Wiencek's during the campaign to ensure we have adequate facilities to educate our students. Thanks to Mini-Circuits for supporting this effort through a naming opportunity of the Design for X Laboratory and to Tampa Armature Works for naming the Hall of Flags. These significant gifts, along with many others, helped complete the renovation.

The college is grateful to receive the remainder of the estate of the Stessel family. Richard Ian Stessel, an associate professor at the college, is remembered as one who would crack jokes and perform satirical voices in his lectures. He did work on solid waste research and stressed environmental awareness in his classes. He was a popular professor with his students. Stessel was struck by lightning while crossing campus in 2001 and died at the age of 44. He was survived by his wife, Susan Glaser. An endowed scholarship was established in his memory through donations from family and friends. Recently, the College of Engineering became the recipient of a bequest from the Stessel family estate upon the death of Richard's parents, Paul and Edith Stessel. This estate gift will further enhance the Richard Ian Stessel Fellowship for Graduate Environmental Engineering Students and will make this one of the largest endowments in the College of Engineering.

Beth Fontes
Director of Development

Have you considered including USF College of Engineering in your estate plans? There are variety of ways to make a gift through your estate plans. Including a gift for the USF College of Engineering in your will, as illustrated by the Stessel gift, is but one way. Please contact the College of Engineering Development Office at (813) 974-2541 to learn more about how you can make a positive impact on the future of the USF College of Engineering.