enVision MAGAZINE

MECHANICAL ENGINEERING'S OUTSTANDING YOUNG FACULTY RESEARCHERS

By Tom Edrington

There is a Command Central in the College of Engineering where the words to live and work by are inspiration, innovation and invention. That Command Central is the Department of Mechanical Engineering. With 139 patents in the books and more on the way, the College of Engineering has become an extraordinary think-tank, if you will, for some incredibly bright, ambitious young professors.

There are five who are all under 40, five who are in the midst of research that is simply cutting edge work that can make life better in our complex technological society. Their names are **Rasim Guldiken, Kyle Reed, Nathan Crane, Nathan Gallant and Craig Lusk**. Five accomplished Ph.D.'s, five young researchers (nicknamed the "Fab Five") doing work that can be deemed fabulous and extraordinary.

Fasten your seat belts and treat yourself to a more detailed account of what they're doing to inspire, innovate and invent things that reach far beyond the borders of the USF campus.

Rasim Guldiken

PhD, Assistant Professor

Rasim Guldiken smiles quickly and easily when you speak with him. He should. This 32- year-old native of Turkey who earned his doctorate from Georgia Tech, is producing something that can change and save lives. He has created a sensor that will be used in the early detection of ovarian cancer. It is a tiny sensor that simply needs a drop of urine placed on it.

"Our goal is to detect ovarian cancer at a very early stage. This technology in this setting has shown it can detect phase I," Guldiken explained.

What's innovative about Guldiken's sensor is that it is inexpensive to mass produce, it's disposable and it involves a urine sample, not a blood sample that is the current procedure.

"Now it will be similar to a pregnancy test, the ability to use a drop of urine to detect the elevated BCL-2 protein that shows up in ovarian cancer tests," Guldiken pointed out. "It's inexpensive technology," Guldiken emphasized. And that's a word that typically doesn't go with technology these days, the word "inexpensive."

"This can probably be mass produced for about a dollar," Guldiken estimated. "We're at the stage where we're ready to take it and make it a marketable product," he said of his patent-pending sensor.

His work doesn't end there, either. He has another patent-pending micro-fluidic device for cell separation in blood samples. It has a number of medical uses – leukemia detection, stem cell isolation, fetal cell collection from maternal blood, blood cleansing, blood component therapy and can aid in the detection and analysis of circuiting cancer cells.

Once again, it is an inexpensive device and the need to reduce medical costs is an unending quest. It's pretty good stuff for a mechanical engineer whose expertise is acoustics. He also works on a micro-acoustic device with support from NSF to quantify our cardiovascular age, and detect cardiovascular disease by identifying vulnerable coronary plaques well before the current state of techniques such as intravascular ultrasound and angioplasty can.

"Our research is very un-mechanical," Guldiken offered. "As a mechanical engineer, I don't know everything about the medical side but that's where we have a wonderful coop with USF Health and Moffitt Cancer Institute. That said, Guldiken has yet another rabbit up his research sleeve that is pure acoustics.

"About 25 percent of the bridges in this country are structurally deficient," Guldiken said. "I've developed an acoustic technology to detect structural defects of bolts that hold those bridges together. It can detect bolts that are loosening, it can identify those loose bolts that are not readily visible."

The need for detection of defects is ongoing and came to the forefront when the Minneapolis Bridge collapsed nearly five years ago as a result of structural aging. Needless to say, with all of his research and classroom work, Guldiken is a busy man.

But he likes that. He came to USF in 2008 and is making his mark and coming up with ways to change lives. "It's a pretty sweet spot," he said as he sat in his research lab. You look at what he's done and that's probably an understatement and it makes you wonder what he'll come up with next.

Kyle Reed

PhD, Assistant Professor

When you walk into Kyle Reed's lab, the first thing you notice are devices, all kinds of devices.

You might think he's starting his own physical rehabilitation facility but that's not what he's up to.

Each year in the United States an estimated 700,000 people suffer strokes. Half of them are left with a disability. Reed is doing something to help them recover. He's developing methods that will restore motion to those victims of the disabling effects of a stroke. Many of the innovations focus on allowing people to self-rehabilitate at home.

continued on page 2

Photo by Chen Wang

"Typically one side of the body is affected," he explained. "One of our methods is bimanual symmetric motion training," he said as he demonstrated a prototype. "It allows the unaffected side to re-train the disabled side; it helps the patient teach himself to relearn the motions that were taken away by the stroke. It allows the healthy side to rebuild the motor pathways to the affected side."

Reed is also clever enough to create something that is less expensive. "So even if insurance doesn't cover it, it's good enough and inexpensive enough for people to buy it themselves, or, it makes it easier for a rehab center to buy several and be able to loan them out."

Reed received his doctorate in mechanical engineering from Northwestern and came to USF two and a half years ago from The Johns Hopkins University. Since the field of rehab robotics is interdisciplinary in nature, he has several projects in conjunction with the USF School of Physical Therapy. In his work, Reed also integrates his knowledge of mechanical engineering with principles from the field of Haptics. This field relates to the sense of touch and how that translates into human-robot interaction.

"We're talking about fine motion, like the motion a doctor uses in surgery or the motions that a pilot uses when flying a helicopter," he explained.

He pulls out a small platform about the size of an average shoe and reveals his Gait-Enhancing Mobile Shoe (GEMS).

"It provides the ability to refine and restore a patient's walking ability," he explained. "It has a provisional patent. This is not for the severely impaired but more for the patient with a moderate gait problem following a stroke.

"The shoe creates a similar motion a patient would experience on a split-belt treadmill," Reed pointed out. The difference is that Reed's invention would cost a lot less than a split-belt treadmill and would be substantially easier to use. The GEMS could have other eventual use perhaps to allow a user to simply walk at a very rapid pace.

Another Reed project is his Asymmetric Passive Dynamic Walker (APDW). It's a proof-of-concept based on a mathematical model that walks down a slope. His goal with this research is to understand and correct asymmetric gait patterns. One example is to examine more functional prosthesis designs for amputees, such as how different knee locations enhance the function of the prosthesis and improve a patient's gait.

It's all heady stuff but work that will translate to everyday problems, especially in the world of physical rehabilitation.

Message From The Dean

Dean Wiencek

Five Years: Where did it go?

Once in a while, I actually have time to reflect on time well spent. Many of us have had a difficult time in the past five years, as the economy sputters and our lives seem a bit out of control. I have read many books on business and leadership but many fail to emphasize the key aspect of accomplishing great things. You may say the right things, but it is what you DO that matters. Some notable authors who recognize this key aspect of successful organizations call it the Say-Do gap.

So, as I looked back over the past five years, I wondered if we actually DID what we SAID. I feel very blessed to come to the completion of my first term as Dean of Engineering at USF knowing that we have focused clearly on what was possible and made it happen. We drafted the College's first master strategic plan, "We Envision a Great Future." We have utilized that philosophical framework to define action plans and productivity measures for ourselves. The plan has allowed us to focus our faculty hiring and to increase financial support for our graduate students while simultaneously increasing the PhD enrollment. In addition, the strategic plan reaffirmed our values and our dedication to providing a high quality education to our undergraduates, which many faculty and alumni felt were being left behind in USF's push to grow its research productivity. Because of the sense of structure and planning that has been provided to the College at all levels since 2007, we are now moving forward at a rapid pace. Faculty size has grown from 95 to 110, research expenditures have grown from $22 M in 2007 to over $28 M in 2011, fundraising has increased from $700 K in 2007 to over $39 M in 2011, and our US News and World Report rankings for Graduate Engineering programs has gone from unranked in 2007 (and never ranked before then) to 72nd among public institutions in the most current rankings. USF Engineering joins AAU member institutions (UF, Georgia Tech, Northwestern) as one of four universities ranked as a top 10 producer of both African American and Hispanic/Latino engineering doctorates.

We DID and more importantly we WILL continue to execute and build a better educational and research environment for our students and our faculty. The College of Engineering is coming to the end of that first strategic plan this year and, thus, we will be engaging many of you as we map out the next five year plan in the coming year. Just as we have new challenges with reduced state support, we also have new opportunities to partner with the private sector in educating the next generation of computer scientists and engineers. We hope you will remain engaged and help us DO what is so important.

enVision April 2012

enVision is produced twice a year by the College of Engineering at the University of South Florida.

Editor	Janet Gillis, MS Bus '00
Writers	Janet Dawald Tom Edrington Desa Philadelphia
Photography	Roger Cox, *PE '85* Samuel DuPont, '06, MS EVE '08 Chen Wang
Designed by	Mantra Creative

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.

To be added to our mailing list or for more information, contact:

Janet Gillis
Communications and Marketing Officer
College of Engineering
University of South Florida
4202 E. Fowler Ave. ENB 118
Tampa, FL 33620
email: *janetgillis@usf.edu*

USF UNIVERSITY OF SOUTH FLORIDA
COLLEGE OF ENGINEERING

Nathan Crane

PhD, Assistant Professor

Nathan Crane is thinking small, very small, as in micro and nano-small. No, he's no under achiever, he's just the opposite as he explores the complex problem of how to assemble very, very small things, to put it in understandable terms.

Crane, who received his doctorate from MIT, is involved in the research of assembly at microscopic levels and that involves a cutting-edge process of "self assembly."

"If you can't see it and can't touch it and it's too small for robotic assembly, then that's an obstacle to assembly," Crane explained. "Technology has come so far in the ability to design things and it gets ahead of our ability to assemble those things into functional systems." In self-assembly, the parts are designed to spontaneously bond when they come together. The assembly process becomes very simple. The parts are just agitated together to complete the assemblies. The hard part is designing the parts to assemble in the right configuration.

Crane is also working on micro-manipulation in fluids using electrical charges. He's discovering ways to use those electric fields to position and assemble small components. The practicalities are easy to understand, even if the technology isn't.

"It's costing more to put things together, more than they are worth," is how Crane put it in simple terms.

"Right now, companies are trying to figure out ways around the obstacles surrounding micro-assembly," he pointed out. He's working on ways to get rid of the obstacles.

Crane brings some "real-world" working experience into his academic setting at USF. He has worked at Sandia National Labs in Los Alamos, N.M., and at Pratt-Witney in East Hartford, Conn. He's in his sixth year at USF.

In addition to his micro-assembly projects, he's studying the process called Electrowetting that can manipulate fluid surfaces which in turn will help micro-assembly processes. In a world where technology is creating smaller devices daily, Crane has his eyes, not on the big picture, but on the small picture. He has identified the need for enhanced micro-assembly technologies and is coming up with answers.

Nathan Gallant

PhD, Assistant Professor

Nathan Gallant's lab has a very medical look to it. It should because he's another one of USF's young mechanical engineers involved in bio-sciences. Put in simple terms, Gallant is looking to grow tissues from the cellular level and his research is working toward replicating blood vessels and other tissues that need a blood supply from vessels growing through them.

"It's biomimetrics. We're trying to mimic the biological material," Gallant explained. One of the main problems he faces when trying to create artificial vessels is the clotting process. He's working on materials that will organize and guide cells lining the replacement vessels so that blood will flow freely rather than clot.

Gallant hopes his work will eventually make it possible to grow a replacement for a human coronary artery. "It's fun when you're working on a problem and solutions nobody else has worked on," said Gallant, who received his doctorate at Georgia Tech and is entering his fourth year at USF. He came to USF after working in the polymers division of the National Institute of Standards and Technology in Gaithersburg, Md. He works closely with USF Health's nano-medicine group with this cellular-level research.

"It's a slow process," says Gallant, but his work is all about future possibilities. If his work can successfully replicate blood vessels, there's no telling where it could lead.

"Can you grow a kidney?" Gallant asked. "Right now, obviously you can't," he said, answering his own question. For now, Gallant's work may be just an early stepping stone to a future process that could answer that question with a "yes."

Craig Lusk

PhD, Assistant Professor

Imagine for a moment that you're looking at a flat map of the world that morphs into a sphere, a globe of the world. How's that for a transformer?

When you look at Craig Lusk's desk, you might get the idea that he's a toy inventor. To the un-trained eye, that might be but what he's really involved in is the world of compliant mechanisms.

"It involves taking things that already exist and making them lighter, making them work without pins, without assembly," Lusk explained. "We're looking at ways of doing more with less weight."

"It's not a new technique," Lusk said of the world of compliant mechanisms, citing the early bow and arrow as a good example. No pins, very little assembly.

Lusk picks up some interesting gadgets on his desk and talks about his work with "shape shifting surfaces." He talks about future possibilities, about the possibility of creating flexible body armor for soldiers and law enforcement work - flexible surfaces that move, but still offer the same protection afforded by a non-flexing material.

The fascinating part of Lusk's work is that the possibilities in the commercial world appear unlimited. Lusk, who has been at USF for seven years and received his doctorate at Brigham Young, understands the commercial needs.

"It's creating inexpensive technology," he said, bringing back the theme that his associates have focused on. "If we can take something that's one-piece, with no assembly, make it inexpensively, then it becomes disposable once there's been too much stress from use."

With this work in shape-shifting surfaces Lusk sees environmental-protecting applications as well. "Think about the Gulf oil spill. If it can work with these flexible, shape-shifting materials and make them water-tight, they'd be practical for stopping those type of oil spill accidents."

His desk is covered with small proto-types and you can't help wanting to pick them up and play with them. Which begs the question - what about toys, shape-shifting toys?

"I know my kids would sure be impressed if I were creating toys," Lusk said with a laugh. "Actually, that's another possibility with this sort of thing. You never know."

For now, he's focused on the serious stuff. But it is hard to not imagine that flat map that morphs into a sphere.

They're quite a group, these five mechanical engineers with youthful exuberance and eyes fixed on the future. Look at their work and you see more medical influences these days. The fact is that these are not your father's mechanical engineers.

When all is said and done, it's all about science and mechanical engineering is a science. They have gone in directions that will attract research dollars and in turn, they are working to change the world for the good. Better engineering, better science, creating a better world is what the University of South Florida's "Fab Five" are all about.

research news

U.S. Patent No. 8,036,679 titled "Optimizing Performance of Location-Aware Applications Using State Machines" was issued October 11, 2011 to the inventors group that includes **Sean Barbeau**, CUTR research associate and Computer Science and Engineering PhD candidate; **Philip Winters**, Director of Transportation Demand Management Program at CUTR; **Rafael Perez**, computer science and engineering professor; **Miguel Labrador**, associate professor of computer science and engineering; and CUTR Senior Research Associate **Nevine Georggi**. While the patent was developed for the transportation world, it will have a lot of value elsewhere.

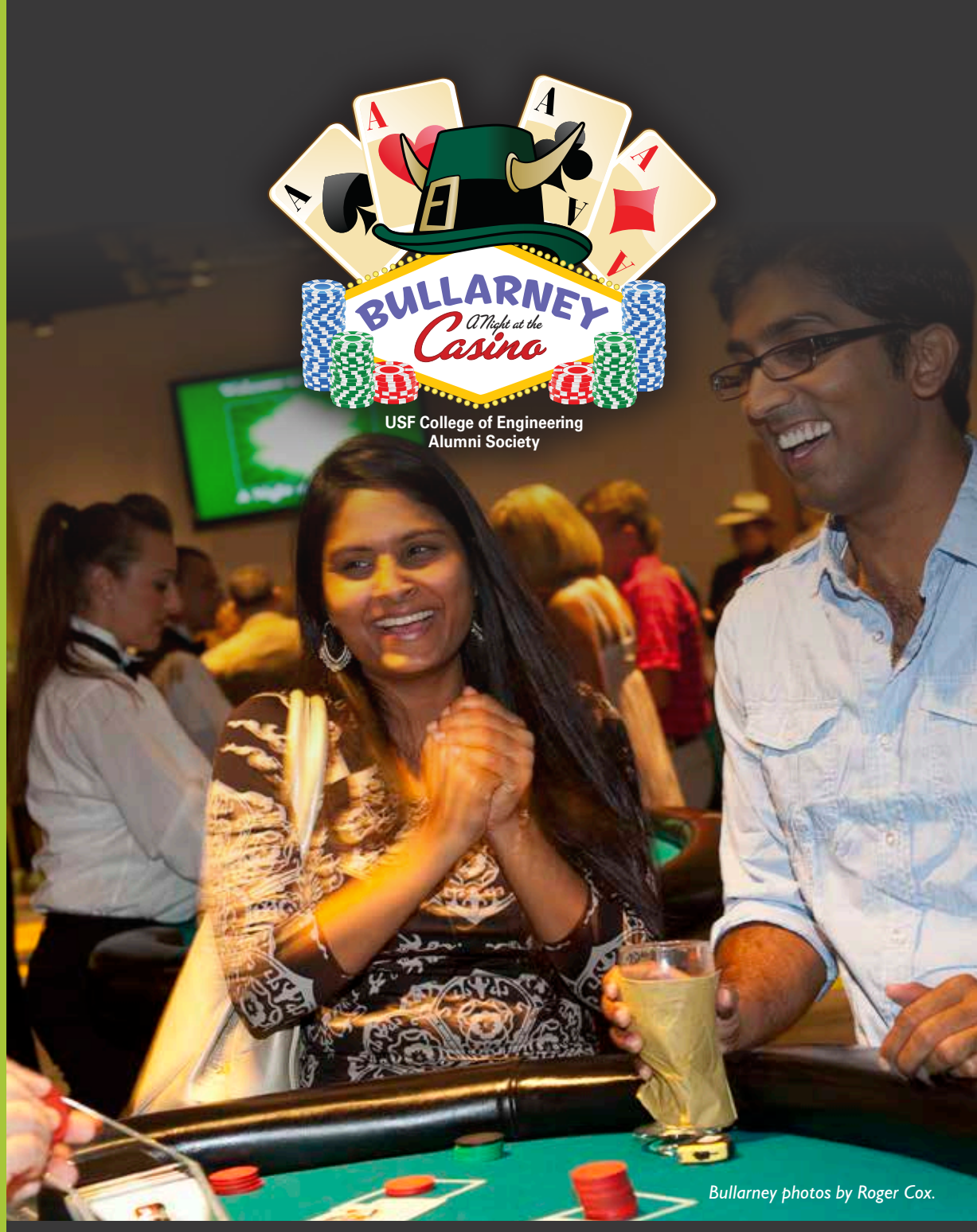
U.S. Patent No. 8,045,954 titled "Wireless Emergency-Reporting System" was issued in October to the inventors group that includes **Sean Barbeau**, CUTR research associate and Computer Science and Engineering doctoral candidate; **Philip Winters**, Director of Transportation Demand Management Program at CUTR; **Rafael Perez**, computer science and engineering professor; **Miguel Labrador**, associate professor of computer science and engineering; and CUTR Senior Research Associate **Nevine Georggi**. This is the second patent this research group received in October the other being U.S. Patent No. 8,036,679 titled "Optimizing Performance of Location-Aware Applications Using State Machines."

As if these patents weren't enough, this group continues to be awarded patents - U.S. Patent No. 8,137,907 Travel Assistance Device and U.S. Patent No. 8,145,183 On-Demand Emergency Notification System Using GPS-Equipped Devices. **Sasha Dos Santos** was an additional inventor for this patent (8,145,183).

The University of South Florida has received funding through Grand Challenges Explorations, an initiative created by the Bill & Melinda Gates Foundation that enables researchers worldwide to test unorthodox ideas that address persistent health and development challenges. **Daniel Yeh**, associate professor of Civil & Environmental Engineering will pursue an innovative global health research project, titled **"NEW generator for recovery of nutrients, energy and water from human wastes."**

The University of South Florida's **National Center for Transit Research** (NCTR) at the Center for Urban Transportation Research (CUTR) has been competitively selected as one of 22 national University Transportation Centers by the U.S. Department of Transportation. This designation will provide USF with a grant of $3.5 million from the USDOT fiscal year 2011 budget to be matched with an additional $3.5 million for a total of $7 million. USF's National Center for Transit Research was selected as one of only two public transportation-focused university research programs to receive this highly competitive national grant. Sixty-three university consortiums applied.

Pei-Sung Lin, PhD, PE, PTOE, Director of the ITS, Traffic Operations and Safety Program at USF's Center for Urban Transportation Research (CUTR) has received the Comprehensive Motorcycle Safety Program grant from the Florida Department of Transportation (FDOT) and the National Highway Traffic Safety Administration (NHTSA) to improve motorcycle safety and reduce motorcycle-related crashes in Florida. This project has $575,000 in funding. This is the third year that Dr. Lin has been awarded this important motorcycle safety grant



Bullarney photos by Roger Cox.

The Engineering Alumni Society held its annual Bullarney fundraiser "A Night at the Casino" on March 24 at the Glazer Children's Museum in downtown Tampa.

The event raised more than $20,000 for scholarships and conference grants for engineering students as well as funds for the renovation of the Engineering II building. Missed out on the fun this year? Mark your calendar for March 23, 2013 for next year's Bullarney event.

Using Computer Science to Study Biological Systems

By Desa Philadelphia

The increasing realization that understanding disruptions in biological systems—including the development and spread of disease—may be best achieved through analysis at the macromolecular or cellular levels, has led to an explosion both in the amount (and quality) of research being done and in the amount of data that is generated by such research. The development of the tools that facilitate both the work, and analysis of the data has, understandably, also become of paramount importance at research universities everywhere. The Computational Systems Biology Group (CSBG) in the Department of Computer Science and Engineering is at the forefront of such efforts at USF.

Led by Professor Xiaoning Qian, the CSBG's work focuses on Computational Systems Biology, applications of computer science to biological study. The group explores how mathematical models and algorithms can contribute to systematic analysis of biological functions at the molecular level, e.g., by using techniques like graph theory, stochastic processes, and data mining. CSBG's work also includes image analysis, in order to improve visualizations that can be useful in studying biological systems.

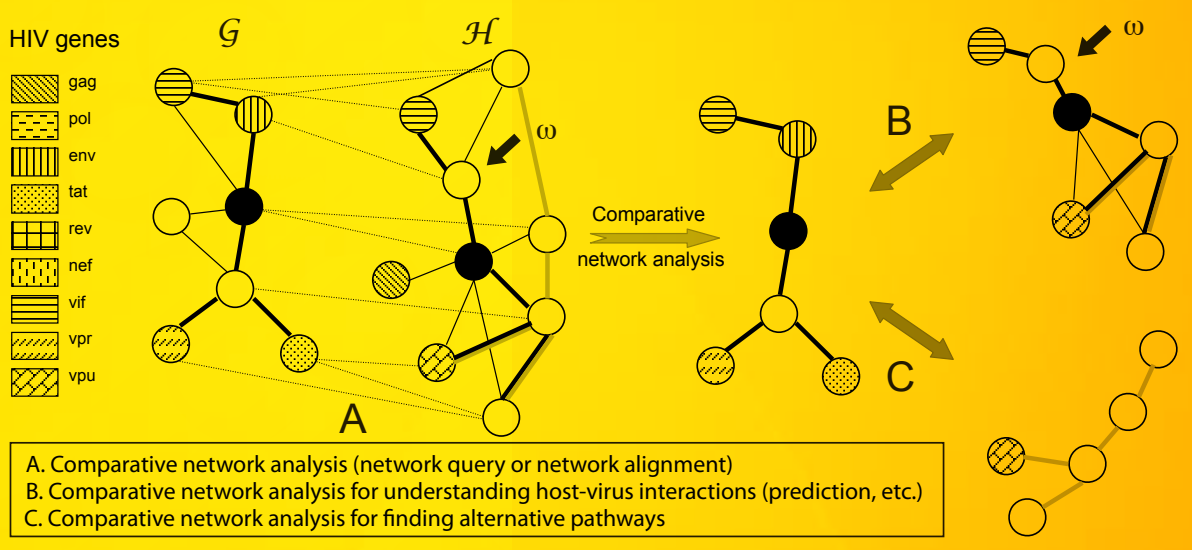
Ultimately, Prof. Qian and his colleagues are interested in how the information revealed through these methods can form the basis for improving diagnosis and developing therapeutics in the fight against disease like cancer, diabetes and HIV. They collaborate heavily with researchers in the medical sciences, including at the College of Medicine and Moffitt Cancer Center.

Traditionally biological research focuses on targeting a few molecules to see how they function in living systems. However in some research, there can be thousands and thousands of molecules that should be included in the search for the understanding of underlying mechanisms. Computational analysis allows biologists to expand their search efforts less tediously. "Bioinformatics is mostly for large-scale analysis," says Qian. "It's difficult for biologists to understand how those thousands of molecules are behaving in real time. So it's necessary to have some computational tools to analyze expression changes or concentration level changes of molecules in the living system. That's why bioinformatics has become so important."

Last year, Qian and collaborator Byung-Jun Yoon of the Department of Electrical and Computer Engineering at Texas A&M presented a paper titled *Comparative analysis of protein interaction networks revels that conserved pathways are susceptible to HIV-1 interception* to the Ninth Asia Pacific Bioinformatics Conference outside Seoul, Korea. In the paper, the results of a proof-of-concept study, Profs. Qian and Yoon used a computer algorithm to do a comparative network analysis of how HIV attacks biological pathways that have been conserved between two species, in this case Homo sapiens and Mus musculus (the house mouse), versus how it attacks random pathways in humans. As the title itself indicates the study showed how bioinformatics can be used to analyze important information about the way HIV invades host species. "We believe that the proposed framework has the potential to expedite the elucidation of the important mechanisms of HIV-1, and ultimately, the discovery of novel anti-HIV drugs," they wrote.

"We are assuming that the conserved pathways are essential pathways and so HIV has to attack those pathways," Qian explains. "Hopefully, we can find the target of the HIV virus and then we can (design) the intervention strategy to circumvent the destroying of the systems by the virus."

Prof. Qian's descriptions of comparing molecule behaviors in biological systems can initially sound similar to network analysis done in social sciences. However, he points out that there are some key differences. First, there is the difference of sheer size. "Typically the size of social networks in old days is pretty small. In biological systems we know there are tens of thousands of genes or tens of thousands of proteins in the system," he says.



A. Comparative network analysis (network query or network alignment)
B. Comparative network analysis for understanding host-virus interactions (prediction, etc.)
C. Comparative network analysis for finding alternative pathways

In the social sciences, researchers are also able to aggregate subjects together based on common traits that can help predict their behavior. Therefore, says Qian, it's easier "to aggregate to the behavior to make the system smaller." Not so in biological systems where the individual is the important piece. Prof. Qian explains: "When we talk about biological systems you want to understand an individual molecule and how that plays a role in the system. It's relatively harder to do the aggregation to reduce the size of the networks and the complexity of the computations. So, biological systems are a little tricky to deal with in comparing to social networks." It's interesting to note that in the age of Facebook and Twitter, the use of computational algorithms has also become important in the study of social networks.

Prof. Qian's academic training is in electrical engineering. He received a BS and MS degrees in electronic engineering from Shanghai Jiao-Tong University in 1997 and MS, Mph. and PhD degrees in electrical engineering from Yale. Post-doctoral research at the Yale School of Medicine led to the Bioinformatics Training Program at Texas A&M University. He came to USF in 2009.

student profile

Ivonne Rodriguez

Ivonne Rodriguez

Senior majoring in Chemical Engineering

Describe some of the challenges you have faced in pursuing your education.

I was born in Bogotá, Colombia where I lived with my two sisters and my two parents. At the age of 10, I left Colombia along with the rest of my family in search of the 'American Dream'. Approximately a year after residing in the United States, I learned the reason for our departure when we were applying for political asylum. Our family was threatened due to my father's work with the Colombian government in trying to end the guerilla warfare that has displaced millions within the country over the past four decades. When I came to the United States I had to focus to do my best in classes because I did not understand what my teachers were saying due to the language barriers I encountered. I studied hard, learned English, and graduated from high school near the top of my class.

Have you received any scholarships?

I am a recipient of the Jenkins Scholars Program funded by Publix Super Market Charities. Jenkins recipients are academically talented students with financial need. We receive financial, academic and personal support services from our freshmen to senior year. I have also received scholarship support from the Hispanic Scholarship Fund. This scholarship provides financial aid to students of Hispanic descent based on their academics and financial need. I also received the Marathon Petroleum Scholarship Program and was awarded a two year scholarship as well as a summer internship opportunity with the company.

Describe your undergraduate research and its broader impact.

I am assisting an Organic Synthesis research group in the Department of Chemistry in the development of compounds that could be used as medicinal targets. By using mild conditions and inexpensive reagents the group has developed compounds that could be used as medicinal targets for ischemic stroke therapeutics. This research is important because stroke is the third leading cause of death in the United States.

THE INCREDIBLE SHRINKING ANTENNA

By Desa Philadelphia

The idea that a smaller antenna would be better is not a hard sell. While incredibly important, antennas often look like afterthought appendages on sleekly designed equipment. No wonder then that they are increasingly shrinking (or disappearing altogether) from commercial products like televisions, radios and cars.

The size of an antenna is even more important when attached to military equipment being used in the field—for peacekeeping operations and in war—since the elements have specific strategic functions. For example, Raytheon, the military electronics giant, currently sells anti-jamming aircraft antenna, used to detect and intercept the radio frequencies (some unintentional, some intentional) that can interfere with the GPS signaling and mapping capabilities of military communications equipment.

There are five to seven antenna elements in the current antenna array, which occupies a space about 14 inches in diameter and is used on large aircraft. The engineers at Raytheon theorized that if they could shrink the anti-jamming antenna array to less than 5 inches in diameter, it could be used on UAVs, the unmanned aerial vehicles that are commonly called drones.

Prof. Gokhan Mumcu

In 2010, through the Florida High Tech Corridor Council's (FHTCC) Matching Grants Research Program, Raytheon and USF Department of Electrical Engineering partnered to tackle the problem. It took less than two years for USF researchers, led by Assistant Professor Gokhan Mumcu, to successfully shrink the antenna array to less than five inches in diameter, while maintaining the anti-jamming capabilities. "This is much more suitable for UAVs, because it would require a much smaller area and weight on the aircraft," says Prof. Mumcu.

Raytheon is of course pleased with the results of what was thought to be a difficult proposition. "Miniaturization of antennas while maintaining performance is a difficult thing to do," says Paul Herzig, the engineer who led the Raytheon effort. "The technology developed serves as a basis to develop other antennas for GPS and other applications, especially those needing multi-element capability in a small package size."

"Small antenna technology is important for all the mobile devices," says Mumcu. "This kind of small antenna array can be miniaturized even further so that maybe instead of putting it on aircraft we can provide this kind of capability to the soldiers." Prof. Mumcu adds that further miniaturization would also require increased effort to make sure the technological capabilities are also improved, or at least maintained. "If you keep miniaturizing an antenna, you begin to lose from its performance," he explains. "But as long as these losses are tailored to remain within the system tolerances, we can make our approach applicable to a wide range of military and commercial devices. Due to the platform differences between an aircraft and a small handheld device, it would require us to pursue a slightly different approach if we were to extend the use of our miniature antennas for mobile devices such as cell phones."

The success of this project has led to further collaboration, to tackle performance degradation problems that arise when several antenna elements are in close proximity (like the five inch antenna array). "What we are trying to do in our continuing effort is to make use of metamaterials to isolate these antennas from each other. This will enable each antenna to operate as well as it was just standing alone by itself. It will prevent the nearby antennas from negatively interfering with the reception of the individual element," says Mumcu. "We are accomplishing these goals by designing an engineered structure that we'll put between the antennas."

Raytheon and Prof. Mumcu have applied for a patent that "pertains to techniques that permit further size reduction of an antenna element while maintaining radiating efficiency in the element," explains Herzig. "This is huge because one of the biggest problems with shrinking an antenna element is the loss of radiating efficiency. This permits further size reduction in overall antenna size without loss of performance."

The work has brought Mumcu some well-deserved attention, especially since this was his very first project after joining USF in 2009. Prof. Mumcu, it should be noted, is accustomed to distinguishing himself. After ranking first in nationwide university entrance exams, taken by more than 1.5 million students in his native Turkey, he received a BS degree in Electrical Engineering from Bilkent University, Ankara, in 2003. His MS and PhD degrees in Electrical and Computer Engineering were earned at the The Ohio State University in 2005 and 2008.

"This is huge because one of the biggest problems with shrinking an antenna element is the loss of radiating efficiency. This permits further size reduction in overall antenna size without loss of performance."

Raytheon's Herzig says the company will continue to find ways to work with Mumcu and other USF researchers, who, he says, are developing state of the art technology "in many fields of interest to Raytheon." Herzig says the talent at USF, combined with the university's proximity to Raytheon's Largo operations and the ability to obtain FHTC grants makes the collaboration extremely cost-effective. "The work provided both in quantity and quality for the cost incurred, makes using (USF engineers) very much a bargain for Raytheon," says Herzig. "It is an exceptional value proposition."

meet

Jason Bittner, CUTR's New Director

By Tom Edrington

It's a long way from Madison, Wisconsin to Tampa, Florida.

It's the University of Wisconsin to the University of South Florida long.

It's L.L. Bean to Tommy Bahama long.

In late 2011, Jason Bittner, his wife Sarah and their three daughters made the lifestyle-altering decision to leave the familiar surroundings of the University of Wisconsin for the much warmer environs of USF where Bittner is the new face in the director's position at the Center for Urban Transportation Research, that's CUTR as it's known around campus.

Bittner settled in to his position in January, taking over for interim director Steve Reich, who is now back in his familiar role as the program director for Transportation Program Evaluation & Economic Analysis. Leaving Wisconsin was a huge decision; after all, Bittner had spent most of his life there.

"It was a tremendous opportunity and it came along at a good time," Bittner said, thinking back to the decision to head for Tampa and USF. "CUTR has a good national reputation with great support from the University."

Madison had been his home since his graduate school days. He was the deputy director of the National Center for Freight and Infrastructure Research and Education when the CUTR position came to his attention. The opportunity to run this center was too good to pass up. He brings his experience in freight transportation and it is something he hopes to translate into more research in that field here at USF.

"I see CUTR as a research vehicle that can serve the entire state and on a national level as well," he pointed out with the firm goal of expanding the center's contract and client base.

In today's uncertain world of educational budget problems, CUTR is one of those entities that is primarily self-funded. CUTR's current clients include the US and Florida DOTs as well as transit systems around the state. CUTR has research contracts with the Cooperative Research Programs of the National Academies and consulting entities. "We have an entrepreneurial environment here and we're focused on bringing in new contracts. Our research is generally self-funded through those," Bittner said.

This new job has him overseeing 130 employees, 45 of those are full-time research faculty with another 27 support staff. The center will be celebrating its 25th anniversary next year and Bittner is glad he's here to take an active part in that milestone. "We want to tap new markets for research and continue to integrate CUTR into the university community," he said. That integration into the rest of the USF educational disciplines is something Bittner wants to pursue and emphasize. "It's about building bridges to all the programs here," he said, talking about the center's immediate future.

One of USF's strengths has been its ongoing push to increase research endeavors in all of its programs and Bittner wants CUTR to be right there on the forefront of that action. CUTR conducts nearly $9M in research annually and Bittner's goal is to make that number grow. That research is produced for a variety of public and private sector sponsors in Florida and around the nation. Those areas include public transportation, transportation planning, mobility policies, intelligent transportation systems, transportation safety, transportation demand management, transportation economics and finance along with corridor planning.

Then there is the ongoing quest for partnerships within the USF campus. "We're looking to create and enhance partnerships within the university. It's another way we'll be looking to increase our growth, involvement and profile," Bittner said. The center's current programs are putting together research for improved safety for motorcycle riders -- a natural considering the Florida climate is conducive to open-air enjoyment on the roads.

There's also research on the improvement of safety for schools and a national program, a $2M project examining human factors and safety in a naturalistic environment. "It puts cameras in vehicles and records everything that goes on inside and outside," Bittner explained. "We have all our subjects set up in the 30, 40 and 50 age demographics, we've had challenges finding subjects in the 16-17 age range as well as older drivers, 65 and up." That study will help produce data on collisions, near misses; it will explore blind spots on vehicles and help discover ways to improve safety and infrastructure.

Bittner has made himself at home, he's quick to smile but there may be something he misses when fall rolls around.

"We're looking to create and enhance partnerships within the university. It's another way we'll be looking to increase our growth, involvement and profile,"

- Jason Bittner

"We're huge Green Bay Packers fans," he said. He joined the list of public owners of the Packers years ago. He keeps his stock certificate on his wall and has been on the team's long waiting list for season tickets since 1991. "I've even put the children on that waiting list," Bittner added.

Tampa offers the Buccaneers, who don't have the same storied past but Bittner doesn't mind, he is delighted to be leading CUTR and has no reservations when it comes to the future of the center, where his goal is to make it a "preeminent, internationally recognized catalyst for transportation innovation through research, education, training, and outreach" and keep it moving forward.

"I'm looking forward to the rest of the year, and of course, our 25th anniversary next year. Transportation in our nation is critically important and as the population continues to grow and infrastructure ages, there is a lot of work to be done. It's important to ensure that those systems enhance quality of life, they need to help us to be competitive, and they need to protect the environment."

In other words, for Bittner and CUTR, there's plenty of work out there and a world of research opportunities waiting.

TOP SECRET! Engineering Super Heroes

By Tom Edrington

The story you are about to read contains some highly classified information, please govern yourself accordingly.

Deep within the Kopp Engineering building on the campus of the University of South Florida, unbeknown to most, there is something amazing going on.

Disguised as room 203 is the headquarters of three Superheroes - Megabyte, Sublimation and Super Conductor.

Their mission is to battle the evil forces of Dr. Entropy, a mad scientist, and his henchmen.

Their mission within that mission is to give elementary school students an entertaining introduction into the worlds of science and engineering. It's part of the STARS (Students, Teachers and Resources in Science) that is the GK12 initiative of the National Science Foundation. The Superheroes are answering a world-class challenge to get students interested in science but these Superheroes are up for the task.

The vehicle for MegaByte, Sublimation and Super Conductor is the Superhero Training Network™ and it's just what the fun doctor might order for teachers in the Hillsborough County school system. Called STN for short, and it reaches out to fifth grade students in a manner that is irresistible to those young minds.

The Superheroes are equally irresistible. Underneath their costumes you will find three engineering fellows - grad students Samuel DuPont, Audrey Buttice and Robert Bair. Those are their secret identities; don't spill the beans, please.

DuPont and Buttice are doctoral candidates, and Bair is a second year PhD student.

They are the stars of their own productions, a wonderfully creative series of videos that entice any and all of their young target audience to join in their quest for truth and justice in the world of science, and in the process, those eager students are learning.

"I love this program and many of my students ask me on a regular basis when another video will arrive," is how one fifth grade teacher put it.

Those videos are a unique media tool and they cater to the fact that these elementary school students respond well to visual stimuli in the learning process. DuPont, Buttice and Bair have hit a home run with their attention-grabbing presentation using something children love and relate to - Superheroes.

The videos don't come without major effort. These Superheroes burn the midnight oil and spend weekends producing them.

"It might take 72-80 hours to produce one," DuPont said matter-of-factly. It is a monumental task. Scripts have to be written followed by editing and filming. "Making those videos, once we made the decision to go with them, the one thing I worried about was can a scientist do this. Fortunately, I'd always been an artistic person," DuPont revealed. "To be able to show that scientists can do this sort of thing is significant," he said of the clever, mind-catching videos that even have their own theme song.

"It's amazing that when we go to the schools for a day-long workshop, the kids are singing the words to the theme song," DuPont said, smiling.

The videos are just one of the tools that gain the attention of the young audiences.

Next comes the "Trainee Confidentiality Agreement." "It's something we wanted to put in front of them, something they can read, something that really gets them committed and involved," said Buttice. "It also gets them moving in the direction of becoming solid citizens."

The two-fold agreement spells out expectations for the students.

"Superheroes are expected to uphold the ethical guidelines discussed here in the code of ethics. Superhero level may never be achieved or the trainee may be removed from the Superhero training program if the trainee fails to follow these rules," is how the agreement begins.

It's serious stuff. No one wants to get booted from the Superhero Training Network. It brings an entirely new meaning to "no child left behind," when it comes to learning about science and engineering. In this case, the children do not want to leave themselves out of the process.

Here's a sample of the "contract:"

"Superheroes should protect the environment around them to the best of their abilities. They should avoid littering, leaving the lights on, leaving water running or being wasteful of food. If any items that belong in the garbage or recycling bin are seen on the ground, they should be picked up and placed in the appropriate container."

Parents are happy to see that one. There are behavioral expectations of trainees and it's pretty specific:

"Superheroes are always kind and courteous to those around them by using good language, helping anyone who needs a hand and respecting fellow trainees, authorities and elders. Superheroes will treat others as they would like to be treated in return."

Ah, a Golden Rule for trainees!

This is also a scientific pact. This is, after all, looking toward planting seeds that could grow a future generation of engineers.

"Superheroes always use their scientific and mathematical knowledge for the betterment of mankind and never for evil or to support evil motives. They always work to learn more about science and math and

For more information on the Super Hero Training Network go to

www.superherotrainingnetwork.com

or use the QR reader on your smart phone and snap this.

understand that knowledge about these subjects is never complete and that there will always be more to learn."

The "contract" also requires the trainees to be "watchful" and points them in the direction of present and future "community involvement."

There is also a standing order to help the "trainers" also known as the classroom teachers.

"Having a positive attitude and displaying good behavior in the classroom while training in the Superhero Training Network greatly reflects on the Scientific League of Superheroes (SLOSH). This means that paying attention in class, following directions, working hard, learning to the best of your ability and completing your assigned homework, is very important to your success as a trainee and future Superhero."

Great stuff, great directives for the students and a great tool to help the everyday task of elementary school teachers.

What makes the contract fun, after the serious commitment by the trainee, is one last standing order:

"I also understand that my secret identity as well as the secret identities of other members of the Scientific League of Superheroes is secret and should be shared with no one because this may result in harm to me, my fellow superheroes, their friends and families."

Yes, by all means, don't spill the beans to Dr. Entropy and his band of thugs.

Between the Superheroes live and in person, the videos and the "trainee contract" the students are drawn in, invited in eagerly, if you will. Suddenly they see positive role models from the scientific community and they are invited in a most unusual way to go all in on this exciting, unique approach to learning.

"Teachers are always looking for something that instructs the kids and grabs their attention at the same time," DuPont explained. "We're making a connection between the students and the community of scientists and teachers. This program gives back. We want to be able to show that scientists can do the sort of thing that is significant in the learning process. We hope students can make a connection that engineering is science. You typically ask them at first what an engineer does and most of the time they'll tell you he operates a train."

The Superheroes are changing that perception.

"Sure, it's pretend, but they pretend with us," DuPont says of the adventures he and the other Superheroes create in the lesson videos. "You have their attention. At that point, it's a matter of giving them something they can hold on to, something they'll retain from a knowledge standpoint."

To accomplish that, the Superheroes developed an "academic challenge" that goes with each video episode. The academic challenge will typically have a series of six or more learning exercises that present science-related questions to the "trainees" and they in return, can work toward finding the solutions.

After the episodes, the challenges and the solutions, the next question students often come up with is - "when's the next video coming?"

The answer is they cannot come fast enough to quench the thirst for knowledge. It's also unfortunate that only four schools have benefited from the excitement brought about by the Superheroes. "At first we were shooting for eight schools but because of the time commitment involved with doing workshops, that became unrealistic and we were down to four," Buttice said.

Photos by Samuel DuPont

Those four lucky schools are Tampa Palms, Maniscalco, Robles and Childs elementary schools. DuPont, Buttice and Bair gave some videos to a staff member at the university who took them home to her son, an advanced nine-year-old who attends a school that doesn't have the Superhero Training Network.

"She told us he wouldn't take a break from watching them," DuPont reported. "Even at bed time, she had a tough time getting him to stop watching them. She had to promise to let him watch them first thing Saturday morning. So we know this works, we know the kids love them and learn from them."

The "love" factor is a two-way street. As much as the children love the program, so do the USF fellows who morphed into Superheroes. It all came about when DuPont and Buttice were in a line at Disney World. "We were thinking, circus performers? No. Lab Rats? No. And suddenly it dawned on us - Superheroes!" Buttice remembered.

DuPont, Buttice and Bair then made a presentation to Professor Tapas Das, the principal investigator at USF for the STARS program.

"I was sold immediately," Das said, smiling as he recalled the presentation. "I told them they were absolutely free to go with it from day one," he recalled. "I said 'this is a great idea,' but I also was concerned about the time element, they are graduate students first and I didn't want them to get behind on their studies."

The three have put that concern to rest. DuPont and Buttice are preparing to defend their dissertations by the end of the year and Bair is planning to advance to candidacy by the end of the summer.

Along the way, the Superhero initiative attracted the attention of USF's Division of Patents and Licensing. Rebecca Haworth from the department is working to find a sponsor for the Superheroes. After all, there are nice merchandise opportunities. The Superheroes already have their own trading cards and make buttons for distribution to the "trainees." When you look at the big picture, with some better equipment to produce their videos, there might be a place for the episodes on a nationally-produced television series devoted to scientific education - a modem day "Mr. Wizard."

"When it comes to licensing," Das observed, "it is all theirs. I had nothing to do with the creation of it, it should be theirs."

"It's a wonderful thing how this evolved into videos and they can build knowledge through video delivery. It's all about time and as I said before, I was concerned about the amount of time they spend on it. They still have their own work to do. But as it works out, they put together these day-long workshops for the schools where the Superheroes appear and lead the workshops. They have been so very well received. They're like magic shows."

Hopefully the "magic" can continue.

"We hope 100 percent," DuPont said. "We'll try everything in our power to keep it going because we see the benefit to the students."

Sadly, the national STARS program will end in June but the Superheroes are hoping it's not the end, only the beginning. The Scientific League of Superheroes needs to go on. "We're excited to try and keep this program going," DuPont said.

The program not only needs to keep going, it needs to expand. It needs to expand past the four elementary schools into all of the Hillsborough County elementary schools. And past that, it would be a great thing if it went state-wide then nation-wide. That will take time and money.

The right combination of assets could take the Superheroes to a much larger arena. These young go-getters could end up in the worlds of chemical or environmental engineering, or, DuPont, Buttice and Bair could end up putting those career paths on hold for a while and become full-time scientific Superheroes with a world-wide mission of education.

Keep that in mind, but please don't reveal the secret identities of these Superheroes.

On second thought, please do. Everyone needs to know about this program. It's a program that deserves to find the right funding, the proper resources and a suitable vehicle to spread the knowledge.

And the reason is simple, it's the best reason of all: It works, it works really well.

NSF STARS Program
A 10-year run is coming to an end

By Tom Edrington

Professor Tapas Das Chair of Industrial & Management Systems Engineering is both happy, and at the same time, a bit sad these days.

For 10 years the NSF GK-12 STARS (Students Teachers and Resources in Science) program has been like a long-running big hit Broadway show. It has been a popular, incredibly successful program but it will come to an end in June.

Das has been the co-principal and subsequently the principal investigator (Prof. Geoffrey Okogbaa served as the PI in early STARS years) within the University of South Florida's College of Engineering for the outreach program that was established and funded by the National Science Foundation back in 2002. It was created to fill a void in the nation's elementary schools. "Our kids weren't getting any science training," Das said and he knew firsthand, remembering when his own children were getting no exposure to the sciences during their elementary school years even at one of the top rated school of the county.

"The need to engage elementary school students is ongoing," Das explained, as he anxiously waits to see what will follow STARS. "We want to see where we go from here," he said. "We have to find the right program to build on what STARS has accomplished. We have to take part in building the future for good students."

The National Science Foundation's primary goal is and has been to advance science and technology and build the scientific workforce.

The STARS program puts the top graduate students (called *GK-12 Fellows*) from the nation's universities on the front line to bring the message of science and engineering to the elementary school classrooms. "The primary goal, however, has always been development of the Fellows into full blown researchers, educators, communicators, and finally the leaders," Das said, thinking about all the graduate students he has mentored. "It's been an excellent journey. It has been very exciting for them. When they heard it's ending, they're not happy."

The opportunity has been a nice one. The NSF project provided a $30,000 yearly stipend for the Fellows who participated in the STARS initiative in addition to their tuition and some conference travel support.

Those graduate students have gone out into the community with a message and at the same time, have helped themselves. "STARS has created leadership, community involvement and communication opportunities for the Fellows," Das said. "You wouldn't get those things without it."

Along with the daily involvement in classrooms, there were other huge benefits created by STARS. "We had day-long teacher workshops on Saturdays. This has been a wonderful partnership with Hillsborough County. The workshops were well attended, the teachers received credits for ongoing education hours and most of all; they were fun. Many teachers that we knew eagerly looked forward to the Saturday Mentor Teacher Workshops at USF campus."

The teachers weren't the only ones with workshops. There were day-long workshops for the students as well and the program evolved into engineering summer camps at USF.

"We had extremely successful STARS summer camps here on our campus," Das pointed out. "They were week-long camps and we'd have 80-90 students and there were two-week camps as well. They had different themes like space exploration and green technologies and energy."

The STARS program has helped the nation's graduate students learn more about their own responsibilities as future educators. "The great thing about the STARS program is that it is focused on answering the question 'why' in sciences and engineering," Das said. Too often the students are just learning the 'how' side of science (i.e., the `facts' of science and engineering). Kids hardly ever hear about 'why things happen the way they do'. For example, what changes in the molecular structure causes water molecules to escape in the air when heat is applied?"

The Fellows have discovered that their role is not just inside their research labs, Das described. This gets them out into the real world and gets them real world experience. Describing nanotechnology to 4th graders has given many Fellows a better appreciation of their research and their true understanding of the field, Das added.

The program has helped pave the way for more prepared students as they work their way through high school and eventually into college.

"We can't wait until they come through our (USF's) doors," Das said. "The need is ongoing."

The STARS program, like that great Broadway play, like a mega-hit movie, deserves a sequel.

"It's always good to try new things and NSF will no doubt take something that has been as successful as this and morph it into a new program that can have a big impact," Das predicted.

"There will be something," Das said, with hope and optimism in his voice. "There will be something that will continue this line of work. As I said before and it's important enough to repeat, the need is ongoing."

Prof. Tapas Das

Unlike any other GK-12 project, USF adopted a novel strategy of engaging other PhD students, who were otherwise not eligible (per NSF residency/citizenship requirement) to be Fellows, as project managers. This strategy allowed us the opportunity to train many more doctoral students through the project. "I feel very proud of accomplishments of my project managers, which is also well recognized by the program directors at the National Science Foundation," said Das. My first STARS project manager Rajesh Ganesan (also my direct PhD student), who is now a tenured Associate Professor of Industrial Engineering at George Mason University in Virginia, was recognized and encouraged by NSF program directors to start a GK-12 program of his own at GMU. Prof. Ganesan in his first year at GMU established a comprehensive partnership with the Virginia school district and the College of Education at GMU to develop a wonderful proposal and win a $3M GK-12 peer reviewed grant. Ganesan is now a well recognized leader in the GK-12 community. Other STARS project managers have also become successful leaders in academia and industry Vishnu Nanduri, Assistant Professor of Industrial Engineering at University of Wisconsin, Milwaukee; Wilkistar Otieno, Assistant Professor of Industrial Engineering at University of Wisconsin, Milwaukee; Diana Prieto, Assistant Professor of Industrial Engineering at Western Michigan University; Patricio Rocha, Senior Analyst at PJM Power Exchange at Philadelphia.

GAANN Program – Interdisciplinary on a Global Scale

By Janet Dawald

The term "interdisciplinary" does not usually apply to kilowatts or kindergartens. But it does at the University of South Florida. For proof, just look at the roof and new canopy of the Marshall Student Center amphitheater. The project, designed to generate a combined 23.6 kilowatts of solar energy, was spearheaded by the current GAANN fellowship students at USF and funded in part by the "green fee" included in tuition.

The Graduate Assistance in Area of National Need (GAANN) is funded by the U.S. Department of Education to assist graduate students who plan to pursue the highest degree available. The first cohort of eight students is currently half way through the three-year program at the College of Engineering. Under the direction of Maya Trotz, associate professor of Civil & Environmental Engineering and Delcie Durham, professor of Mechanical Engineering, the students receive a yearly stipend of up to $30,000 and the opportunity of a lifetime.

Students take traditional engineering classes in civil, mechanical, chemical and electrical engineering, but the "old school" approach stops there. They also create linkages with anthropology, public health, geography and geology to create research opportunities in the areas of energy, water, materials and societal sustainability required to bring new renewable technologies to communities across the globe. The members of the cohort support each other's efforts and a broad spectrum of engineering faculty act as mentors and advisors.

"We are building professors for the future," explains Delcie Durham. "These people are going to be involved with research and teaching sustainability, so we provide them with the right tools to do interdisciplinary research. We want to create holistic approaches, how to take your research and translate it into learning experiences for others, and how to inform the community of your efforts."

The cohort's current mid-term progress report is excellent. Several students are working in the K-12 schools to demonstrate and encourage kids to use technology to create sustainable environments. The rewards of this are twofold: some kids may decide that science and engineering are pretty cool. But for the graduate students, they get real hands-on experience in teaching techniques, how to evaluate and measure what has been taught, anexperience that will enable them to become leaders in academia in the future.

"We focus on sustainability," says Durham. "We are promoting ways to accomplish a truly interdisciplinary approach. The GAANN students participated in an interdisciplinary course last year that included projects directed at creating a solution through green design and evaluating it with life cycle assessment tools. We watch how the students are taking to the projects, and what they are getting out of them, and how it differs from a disciplinary doctoral program."

Integrating new science with the human factor is built into the program. The students support each other, and in the process, learn how they will be working with communities in their chosen professions. One example was the group tour of a wastewater facility where each could envision how to integrate the process and equipment with their chosen field. While some are involved with materials, energy, or water, the social context is built over top of the program, providing the human nexus that will give them not only an excellent engineering education, but a proven ability to work with the communities who will need them the most.

Getting involved in the campus community and spearheading the rooftop solar project is just one cohort's efforts at sustainability. Students Jamie Trahan, Brian Bell, Alden Earle and Trina Halfhide will monitor the monetary aspects of the savings, the amount of power generated and the amount of carbon dioxide mitigated. Carlos Wilfong is investigating graphene enhanced polyaniline electrode supercapacitors. While Carlos' project may sound daunting, he is going to be part of the effort to replace traditional batteries used in everything from cars to cell phones with supercapacitors that do not use toxic materials

L. to R.: GAANN students Michael Bell, Alden Earle, Jamie Trahan, Trina Halfhide.

such as lead or lithium. Oh, and also provide a lot more power for longer periods at a shorter charge time, too. Doctoral student Ivy Cormier might have what qualifies as the worst "dirty job" of this cohort, she is working on growing algae in wastewater. Her concept of wastewater as a renewable resource that will grow algae for biodiesel manufacture illustrates how these students have set their goals into uncharted waters. This is the future of engineering: creating sustainable science that benefits the community and the planet.

"Im just so proud of all of them," says Durham. "The courses they take, the research projects, the community engagement, all of this is hard work." The GAANN project is just one of many initiatives at the College of Engineering that emphasizes a multidisciplinary approach to engineering.

For more information about GAANN use the QR reader on your smart phone and snap this.

Marie Chenowith's Long Journey to NASA

By Janet Dawald

Photos courtesy NASA and Marie Chenowith

Marie Chenowith is worried. The College of Engineering senior is about to receive her Bachelor's degree in Mechanical Engineering, has three interviews with international companies, and just finished an internship at NASA designing Mars space vehicles.

"This is so unreal, I am just waiting for some kind of setback to come along," Marie laughs, "I have had so many in my life, I don't believe I am finally graduating. For ten years, all I thought of was to get through school, and now, it is finally happening." She speaks guardedly, as if talking about good fortune will somehow bring bad. Marie's future appears bright, but she has had more than her share of dark days.

"I am a carnie," Marie explains, "I worked in my father's carnival since I was a small child. I have spent a lifetime explaining that we were not a circus, and not a fair." Carnivals are rides and attractions with complicated machinery, and Marie grew up in grease, hydraulic fluid and serious electrical systems. The carnival season requires traveling and she changed elementary schools often. To offset her erratic attendance records, she put everything she had into getting good grades. In high school, her son Zachary was born, and then a difficult divorce left her mother without resources. So the little family started over, Marie, her sister Louise and mother Bernadette settled in Metairie, in Jefferson Parish, Louisiana. Marie was three years into a program at Loyola/Tulane when Katrina hit in 2005.

"We were wiped out, and evacuated to Houston," she recalls sadly. The battered family decided to move closer to their only remaining relatives, who lived in the Bahamas, so they set out for Florida. They did not wait for FEMA or other agencies, Marie explains. "I got on the Internet and found people who were willing to help us, and a family in Palm Coast Florida offered to put us up for six months." The kindness of strangers provided the family with yet another chance to start over again. "We had to ask them for gas money to get there," she adds sadly. For three years, Marie worked two jobs, and knew she had to get back to school. She had senior standing but was turned down by two Florida schools and told to go back and get an associate's degree. So she took the required classes online while working. She applied at USF and was accepted. However, her son remained in Palm Coast with Bernadette. For a year, she made the 3 hour drive three weekends a month to see her family.

At USF, Marie joined Theta Tau and learned that NASA was interviewing for internships. On a whim, she applied and was overjoyed to be accepted, but almost turned it down. "I had depended on my mother and sister for taking care of Zachary, I just could not ask for more," she recalls. However, mom and sis were adamant, and Marie was back in Houston, working on modular space vehicles. "Take a cabin," she explains enthusiastically, "for two astronauts and place it on a rocket booster module to Mars. Then when it gets there, disconnect and attach the cabin to a wheelbase chassis with robotic wheels. I worked on improving the mechanical systems for that." She also worked testing the thermal properties of foam, including designing and using a test bed for experiments in porosity and density.

"I used to think I wanted to design new carnival rides," the mechanical engineer says wistfully, "but so many things have changed in my life." That long ago ability to keep roller coasters on their tracks has evolved into Martian rovers making tracks. That's quite a change for a carnie girl with bad school attendance.

Alicia Billington:
The First MD / Engineering PHD

By Janet Gillis

Alicia Billington is

one of those rare individuals whose limits seem to be endless. She's the type of person you went to high school with who was simultaneously class president, prom queen, valedictorian, and still had time to volunteer in the community, all while being the nicest person you ever met.

Alicia is USF's first MD / Engineering PhD student linking the College of Engineering to USF Health with a joint PhD biomedical engineering project. Each year approximately 200 persons in the United States graduate with both an MD and PhD, a very small number.

After receiving both her bachelors' and master's degrees in biomedical engineering from Cornell, Alicia enrolled in USF's College of Medicine. At the same time, she decided to pursue a PhD in biomedical engineering, working with co-major professors, William Lee of the Chemical and Biomedical Engineering Dept. and Peter J. Fabri, MD, who holds joint appointments in the Colleges of Medicine and Engineering. Lee is the founder of the Interdepartmental BME Graduate Program at USF.

A third-year medical student and Medical Student Council President, Alicia received the 2012 Leadership Award for Excellence in Medicine from the American Medical Association. Only 30 students, medical residents, fellows and young physicians across the country received this honor and she is the only one from Florida.

"The reason that I got the award is for my work on graduate medical education advocacy," says Alicia. "I co-authored a resolution on increasing residency spaces at our national AMA conference." She was the Region 4 AMA Legislation and Advocacy Co-Chair, also having served for two years on the Council of Public Health for the Florida Medical Association, and was a student debater the past two years at the Hillsborough County Med Assn.

As the Medical Student Vice President (she recently was elected president) she created the "Leadership in Medicine Lecture Series," with such notables as the Florida Surgeon General giving talks to health students.

"I was just elected president a few weeks ago and I started a Facebook group called '52 Weeks of Medical Advocacy' where students can log onto FB between patients and read about what is going on in healthcare." She added, "My goal as president this year is to help our students become informed about the health care changes that are happening."

The project that Alicia has been working on recently received a competitive USF award for multidisciplinary research. Titled "Mathematical Pressure Modeling of Continuous Movement in Seated Individuals," it focuses on how the lack of movement in paralyzed, bed-ridden or otherwise immobile patients can lead to significant health issues, including bed sores, skin ulcers, infections, and, in severe cases, even death.

Her research is aimed at characterizing and modeling body movements in normal and paralyzed patients, so that procedures can be put into place that will ensure immobile patients undergo necessary body movements to avoid such health problems.

Sound like a full schedule? Not for Alicia who also serves as teaching assistant for Professor Robert Frisina, Jr., director of the biomedical engineering program. "She works diligently and effectively, and gives several lectures in this course (ECH 4931). Alicia's lectures are excellent, and the engineering students really like her presentations," says Frisina.

"I will be giving a lecture in the College of Medicine on Statistics next year in our Evidence Based Medicine Course," says Alicia. "This will allow me to combine my two favorite things - medicine and engineering. I am really excited about this because most med students hate math, and boy do I love it!"

We need your support for the Engineering II Renovation project

Engineering II first opened its doors in 1987. At that time it was a state of the art learning facility awash in sunlight from the many windows in the Hall of Flags, affectionately known as the Fish Bowl. Many educational and technological advances have taken place over the last 25 years, making many areas of the Engineering II obsolete and ineffective for our students and faculty. Space continues to be a challenge as the College of Engineering seeks to grow its faculty size. Compared to other engineering programs in the Big East Conference, it is clear that our college is under-resourced in space by a factor of two. Under the direction of Dean Wiencek, the College recently undertook a major renovation project to the first floor of Engineering II that provided 14,000 square feet of space for improved learning and educational experiences to serve the College's 4,000 students. The major spaces that were renovated include the Engineering Alumni Associations Conference Room, Hall of Flags, Collaborative Research Lab, and an 80-seat Lecture Hall.

While most of the construction is finished, there is still a vital need to furnish and equip the collaborative laboratory and provide technological enhancements to all the areas. Through the support and generosity of its alumni, friends and corporate partners, the College seeks donors interested in supporting this important project. We invite you to participation in the renovation through a donation to the Engineering Building Facility Fund. Please use the enclosed envelope to send your donation. Donors contributing at one of the levels on the right will be listed on the donor board in the Hall of Flags.

Platinum	$25,000
Diamond	$10,000 – 24,999
Gold	$5,000 – 9,999
Silver	$2,500-4,999
Bonze	$1,000 – 2,499
Pearl	$500 – 999
Jewel	$25 – $499

Naming Opportunities still exist for the Hall of Flags, Collaborative Lab, Classroom, and Dean's Office. We appreciate your consideration of a gift which will help create a lasting legacy for the College of Engineering and the next generation of engineers.

For more information or a tour, call Beth Creed Fontes at 974-9992.

alumni&students

ALUMNI NEWS

William Bracken, PE, '89, '94 MSCE, president and principal engineer of Bracken Engineering, Inc, was appointed by Governor Rick Scott to the Florida Board of Professional Engineers.

Radenko Dobras, '97, a former USF men's basketball player had his number (31) retired. Dobras, is still the only Bull to lead USF in scoring in four consecutive seasons. He held a 3.6 GPA while scoring 1,935 points, third most in USF history.

Lee Dodd, '80, was honored by Boeing with the company's annual Special Invention Award for his role as part of the team that invented "Apparatus and Methods for Strategic Planning. Dodd is a software engineering for Boeing.

Scott Garth, '93, is now the New Office Leader for the Tampa / West Florida Region of Dyer, Riddle, Mills and Precourt, Inc.

The following alums are new members of the College of Engineering Advisory Board: **Frank Busot**, '90 (TECO), **Bob DeMaio** '88 (Honeywell), **Dave Scott** '83, '86 MSCE (HSA Engineering), **William Bracken**, '89, '94 MSCE.

John Shelton, a PhD graduate in the Department of Mechanical Engineering, has been awarded a prestigious Energy Efficiency & Renewable Energy (EERE) Postdoctoral Fellowship from the U.S. Department of Energy. Shelton will Carnegie Mellon University and the National Energy Technology Laboratory (NETL), both located in Pittsburgh, PA.

Humberto Gomez, PhD '11 is the new chair of Mechanical Engineering at Universidad del Norte, Baranquilla, Colombia.

STUDENT NEWS

At the December 9, 2011 Commencement Ceremonies, the College Conferred these degrees. BS: 177 MS: 264 PhD: 18

Outstanding Graduating Seniors December 2011

Chemical Engineering:
Musaga Wasi Frombad

Computer Science & Engineering:
Stephen Luke Coder

Electrical Engineering:
Timothy Joseph Palomo Delgado

Industrial Engineering:
Ryan Boyd Cartwright

Mechanical Engineering:
Kevin Steckbauer

Four graduate students were recognized as a 2011 Successful Latino/a Student during Hispanic Heritage Celebration in October: **Humberto Gomez**, a PhD student in Mechanical Engineering, **David Cure**, a PhD student in Electrical Engineering, **Ana Rioja**, a master's student in Biomedical Engineering, **Florentino Rico Fontalvo**, PhD student in Industrial and Management Systems Engineering.

Six students received awards at the 2011 Great Minds in STEM Conference. **Mandek Richardson**, a doctoral student, in the Department of Chemical and Biomedical Engineering, placed first in the category Graduate Engineering/ Technology with his poster, titled "Delay Path Modification of a Surface Acoustic Wave Biosensor for Enhanced Biosensing." **Trishelle Copeland-Johnson**, a junior in the Department of Chemical and Biomedical Engineering, placed first in the category Undergraduate Science/ Mathematics with her poster, titled "Optimization of Steam Methane Reformer Furnace Performance Strength through Process Modeling and Case Studies."

These USF student winners received cash awards ranging from $400 to $1,200.

The list of USF student winners, titles, and advisors included:

Graduate, Science/Mathematics
Second Place:
Julio Medrano, Electrical Engineering

In-vivo Bioimpedance Change during Electroporation as an Indicator of DNA Delivery Effectiveness

Advisors: **Richard Gitlin** (EE), **Mark Jaroszeski** (CHBME)

Third Place:
Dorielle Price, Electrical Engineering

Use of Electrical Impedance to refine biological assays for chemotherapeutic drug discovery

Advisor: **Shekhar Bhansali**, Florida International University (formerly USF)

Graduate, Engineering/Technology
First Place:
Mandek Richardson, Chemical and Biomedical Engineering

Delay Path Modification of a Surface Acoustic Wave Biosensor for Enhanced Biosensing

Advisor: **Venkat Bhethanabotla** (CHBME)

Second Place:
David Cure, Electrical Engineering

Low profile antennas for biomedical applications

Advisors: **Thomas Weller** (EE), **Felix Miranda**, NASA Glenn Research Center.

Third Place:
Caesar Morales, Electrical Engineering,

Bandwidth Enhancement and Miniaturization of Antennas Based on Magneto- Dielectric Polymer Nanocomposite Substrates

Advisors: **Jing Wang**, **Thomas Weller** (EE).

Undergraduate, Science/Mathematics
First Place:
Trishelle Copeland-Johnson, Chemical and Biomedical Engineering

Optimization of Steam Methane Reformer Furnace Performance Strength Through Process Modeling and Case Studies

Advisor: **David Edwards**, Air Liquide Delaware Research and Technology Center

Michael Celestin, doctoral student in chemical engineering took first place at the NanoFlorida 2011 conference for his poster titled "Current Trends in Micro and Nanotechnology-based Energy Harvestin."

The Automatic RF Techniques Group (ARTFG) awarded electrical engineering doctoral candidate, **Evelyn Benabe** a $5,000 Silver Student Fellowship. Benabe is a student of Professor Thomas Weller.

Ibrahim Nassar, a PhD student in the WAMI Center, won the Best Paper Award at the recent IMAPS Advanced Technology workshop with his paper titled *An Electrically-Small, 3-D Cube Antenna Fabricated with Additive Manufacturing.* He also received a $1,000 check.

USF Engineering students received 2011 Student Engineer of the Year Awards during the Tampa Bay Engineers Week Banquet held on February 24at the A La Carte Event Pavilion in Tampa.

Trishelle Copeland-Johnson, Senior - Chemical and Biomedical Engineering (American Institute of Chemical Engineers - AIChE)

Christopher Cox, Senior - Civil and Environmental Engineering (Florida Engineering Society, Tampa Chapter - FES)

Michelle Feduccia, Senior – Civil and Environmental Engineering (Society of Women Engineers, SWE)

Trent Liguori, Senior – Civil and Environmental Engineering (American Society of Civil Engineers - ASCE)

Abigail Lambert, Senior – Mechanical Engineering (American Society of Mechanical Engineers - ASME)

Alexandra Oliveros Villalba, Doctoral candidate – Electrical Engineering (Institute of Electrical and Electronics Engineers – IEEE)

The **Chi Epsilon Student Chapter** received the 2012 Susan C. Brown Outstanding Student Award at the National Conclave. Chi Epsilon is the national civil engineering honor society founded in 1922. Professor **Mark Ross** is the group's faculty advisor.

Sarah Ness, Environmental Engineering graduate student received the AAEE William Brewster Snow Award.

Engineering Science doctoral student **Trina Halfhide** was selected as a Fulbright Fellow.

faculty&staff

Jean Weatherwax, senior electrical engineering major, received a Marshall Scholarship. She is the first student in USF history to receive this prestigious postgraduate honor. She will study at the Imperial College – London. Jean, also an Honors College student, is the recipient of a Goldwater Scholarship and a NASA MUST Scholar.

Three doctoral students have received NSF Graduate Research Fellowship, one of the most prestigious awards a PhD student can receive. Recipients are **Joel Cooper** (ME), **Héctor Jose Machín Machín** (CSE), and **Matthew Verbyla**, (CE). Recipients receive a $30,000 annual stipend and full tuition and fees for three to five years.

The **ChemE Car Team** placed second in the Southeastern Regionals. This is the first time USF has placed in this event. Nineteen chemical engineering students participated in the event held at Clemson University.

FACULTY & STAFF NEWS

The Commission on Accreditation of Athletic Training Education (CAATE) elected **John Giannoni**, COE Fiscal and Business Analyst, as their treasurer. This volunteer position serves as the organization's CFO.

Electrical Engineering Professor **Stephen Saddow** received the 2011 Outstanding Engineering Educator by the Florida Council of the Institute of Electrical and Electronics Engineers (IEEE). The Florida Council is comprised of 12 sections, representing over 9,500 IEEE members.

The Florida Motorcycle Safety Coalition, housed at the **Center for Urban Transportation Research** (CUTR) received the John W. Barr District 10 Transportation Achievement Award from the Florida Section Institute of Transportation Engineers (ITE). This award recognizes the significant achievements and outstanding contributions from the Florida Motorcycle Safety Coalition to reduce motorcycle related fatalities, injuries and crashes in Florida. **Pei-Sung Lin**, PhD, is Program Director.

Professor **Yogi Goswami** of the Department of Chemical and Biomedical Engineering has been named a Fellow of the American Association for the Advancement of Science (AAAS). Election as an AAAS Fellow is an honor bestowed upon AAAS members by their peers.

Five active professors and four retired professors were honored at the annual USF Faculty Honors & Awards Reception hosted by President Judy Genshaft on November 15. The following professors were recognized at the reception.

Lawrence Hall, professor and chair of the Computer Science & Engineering Dept., received the Distinguished University Professor honor.

Huseyin Arslan, associate professor of electrical engineering, received an Excellence in Innovation Award.

Babu Joseph, professor of chemical and biomedical engineering, and **Jing Wang**, instructor of computer science and engineering, received Outstanding Undergraduate Teaching Awards.

Yogi Goswami, professor of chemical and biomedical engineering and co-director of the Clean Energy Research Center, received the Theodore and Venette Askounes-Ashford Distinguished Scholar Award.

Four retired faculty were granted the Emeritus designation. Those professors are:

William Carpenter, professor and chair, Civil and Environmental Engineering Dept.

Yun-Lee Chiou, professor, electrical engineering.

Edward Kellner, professor, computer science and engineering.

Ed Mierzejewski, director of Center for Urban Transportation Research

ASCE Student Chapter Takes First Place Overall at the Southeastern Steel Bridge Competition

The USF Student Chapter of the American Society of Civil Engineers took first place overall in the Steel Bridge Competition held during the ASCE Southeastern Student Conference at the FAMU – FSU College of Engineering in Tallahassee in April 14. The Steel Bridge team placed first in Visual Display; second in lightness and construction speed; first in efficiency, economy and stiffness. They also won the Conference Spirit Award and placed 8th overall for the conference (combination of all competitions). The Concrete Canoe team finished 10th overall and 4th in final product. With this first place win, the team heads to the National Competition at Clemson University in May – their third trip in the past four years.

Photo by Roger Cox

USF Racing Unveils Its 2012 Formula SAE Competition Race Car

The USF Racing Team showed off its newest Formula SAE car at an unveiling ceremony on April 14. The team builds its own cars from the ground up. The SAE team races in competitions all summer.
Next up: Formula SAE competition in Michigan in May.

Front Row
(L. to R.) Adane Edmund, Trey Moore, Chris Smith, Shane Moore

Back Row
(L. to R.) Blake Burton, Mike Vigorita, Travis Strammer, Jeffrey Michalsky, Sean Burcham, Mateusz Malinowski, Jake Loebenberg, Simon Restrepo, Sam Steele, Sam Sweetman, Brandon Demers, Jackie LeBrun.

COLLEGE OF ENGINEERING at the UNIVERSITY OF SOUTH FLORIDA
4202 E. Fowler Ave. ENB 118
Tampa, FL 33620

NON-PROFIT
ORGANIZATION
U.S. POSTAGE
PAID
TAMPA, FL
PERMIT #257

USF: UNSTOPPABLE
College of Engineering

Beth Creed Fontes
Associate Director of Development

The first half of the school year is over and the students and faculty are enjoying the renovations to the Engineering II Building. Life size wall paper featuring students adorn the Hall of Flags along with brightly colored furniture and comfortable seating areas. The new 80-seat classroom is packed every day. The Engineering Alumni Society Conference Room has been the meeting space for many gatherings. These newly renovated spaces have been a great improvement for the students and faculty here at the College and we couldn't have done it without the support of our community partners. Special thanks go to **Bracken Engineering**, a Platinum level sponsor and **HDR** a Diamond Level Sponsor, along with our own **Dean and Mrs. John Wiencek** who personally are donating at the Diamond level. While there is much to celebrate, there is much more to be done. The Collaborative Lab is still under construction and in need of furnishings and equipment. The Engineering Alumni Society Conference Room can be enhanced with state-of-the-art audio visual equipment. We still have naming opportunities available for theClassroom, Hall of Flags and the Collaborative Laboratory. How can you help? This renovation needs your support and there are available levels for everyone.

Donors will be recognized on a recognition wall in the lobby of Engineering II. This issue of Envision includes an envelope with the Building Fund on the flap. Enclose your donation for the renovation fund and mail it in. You will be included in the recognition and will be helping the College of Engineering complete this most important project. See page 13 for photos and more information.

As the new Associate Director of Development, I am excited to be here at a time of such change and renewal. The excitement of the students, faculty and staff is rewarding to see. While I am a new employee at the University of South Florida, I have lived in the Tampa area since 1976. My family moved to Brandon when it was a small town, cows grazed where there is now a mall and I-75 didn't exist. Like the entire Tampa Bay area, USF is barely recognizable compared to what it looked like back then. I am happy to be a part of the USF family and look forward to bringing my years of experience in the development field to the College of Engineering. I would welcome a chance to meet with any of you who may be interested in hearing about these new changes at the College. If you are near campus, please stop by the College for a visit. I will give you a personal tour. Or call me for an appointment and I will be happy to come visit you.

bethfontes@usf.edu or 813-974-9992