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enVision MAGAZINE

Goswami gives a whole new meaning to "The Sunshine State"

by Janet Dawald

Oil spills. Gas prices. Declining fossil fuel reserves. Hostile regimes in petroleum producing countries. Carbon emissions. Pollution. Global climate change debated not by scientists, but by politicians. Oil and coal companies spend millions on public relations campaigns psychologically designed to lull us into believing their messages of social responsibility and clean energy. Energy efficient cars are luxury items, and solar power installations for a single home costs more than a decade of conventional utility bills. In this madness, where is the progress? Who is going to get us out of this fossil fueled dependency? Is anybody working on this stuff? In other words, where are the good guys in the white hats?

They are here at the University of South Florida, and can be found in large numbers in the College of Engineering. On any day, one of these good guys can be found associating with free radicals, making very small antennas and mixing various liquids to improve the venerable steam engine. He could also be directing multi-million dollar energy research centers. Everything under the sun interests Professor Yogi Goswami, PE, and he has devoted his professional career to the clean and limitless energy that the sun provides.

"My interests in clean energy are very broad. When I started teaching 35 years ago, clean energy was not a very important area at the time," Goswami recalls. "But I saw it as the future, not just for me, but for all people. So I decided to concentrate on solar energy." His early work involved solar thermal conversion, working with solar water and space heating and cooling. "Even though I got started in conversion, I quickly got into other fields that, in some cases, were totally unrelated to each other, except that the source of energy was the sun," he recalls.

One area that particularly fascinated Prof. Goswami was the century-old thermodynamic Rankine Cycle that converts heat into work. It is the method used by solar thermal, biomass, coal, oil and nuclear power plants to heat water. This water is boiled to produce high pressure steam, which spins a turbine to create electricity. About 80% of the world's power plants use this process, which is closely related to a simple steam engine. Looking at the system with a mechanical engineer's eye, instead of using just water, he pioneered using a mixture of fluids to produce a more efficient method of heat exchange. His method is to mix water and ammonia, which boils at a lower temperature than water. Known as the Goswami Cycle, it pioneered the use of multiple liquids that can work with some of the lower temperatures that fuels, such as biomass require. "In this case," he explains, "I felt rather than patent it, I just put it out in the literature so people could take advantage from it, it is public."

The segue from steam engines to concentrating solar power (CSP) technology boggles the mind, so Prof. Goswami takes over to gently explain some of the newest technologies he is working on. "Yes, CSP refers to the mirrors that concentrate sunlight onto collectors. It has the potential to achieve grid parity, which means that the cost of power using renewable or clean energy sources will become equal to the cost of using sources such as coal." But what about producing power during non-sunlight conditions? "Increase the size of the solar field and with that extra heat you collect you store it as a hot liquid in a tank. That liquid in storage is hot enough to create steam that in turn spins a turbine to create electricity." So not only does CSP technology hold the promise of become economically feasible, it has the potential for continuous production, what is called dispatchable power.

"And another reason why concentrating solar power is attractive to utilities around the world is you can use conventional fossil fuel as backup," he continues. "Because both use the same thermodynamic process to create steam, you can attach CSP to an existing conventional power plant." The U.S. Department of Energy recently granted USF $3.9 million dollars to develop thermal energy storage technology whose cost will be about one-fifth of the present cost of thermal energy storage. In this project, Goswami is working with CERC director Lee Stefanakos, and professors Rahman, Jotshi, Kuravi, Krakow, Ram, and several graduate students.

Just when you think you have the thermodynamic part figured out Goswami explains that you can create energy directly from sunlight and, evidently, not from your father's photovoltaic panels. "I call it beyond photovoltaics," he explains. "Traditional silicon-based systems use the quantum nature of light. They have limitations based on the band gap, or what portion of the solar spectrum it uses. What we are developing uses the wave nature of light." Again, Prof. Goswami comes to the rescue. "The wave nature of light is electromagnetic radiation. You are familiar with antennas for radio waves, right?" he asks. "Well those radio antennas pick up electromagnetic radiation, called radio waves, and convert them to electrical signals," he explains, "and then on to audio if you are listening to a radio. FM broadcast wavelength is about three meters. We are going to use exactly the same method except instead of having antennas a meter in length to catch radio waves. They will be a fraction of a micron to catch sunlight." With the advent of nanotechnology, the concept is becoming feasible. Will future panels have a forest of tiny antennas? "No," laughs Goswami, "The antennas will be so small you won't be able to see with the naked eye. The skin of a building may be covered with billions of such antennas providing electricity for the building." The group at USF

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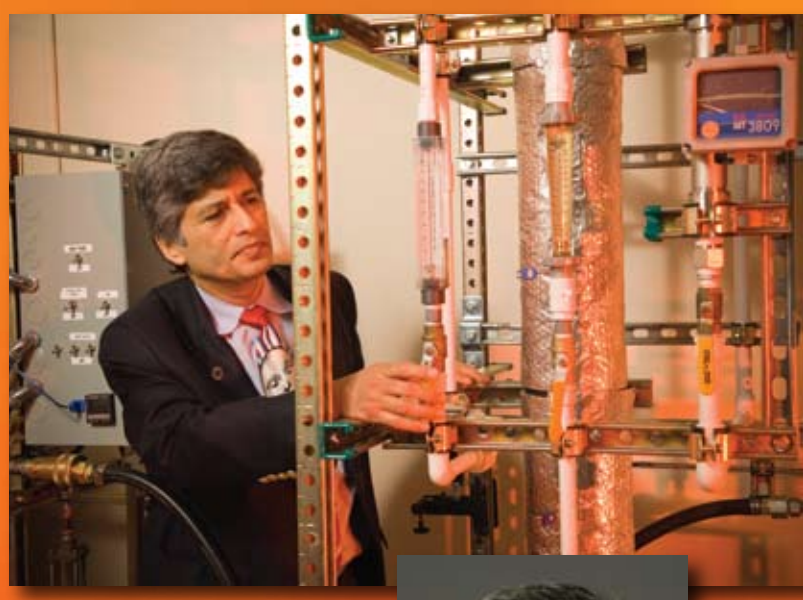

Top: Goswami adjusting the flow rate of chilled water at the combined power/cooling cycle

Right: Professor D. Yogi Goswami

working on this project includes Shekhar Bhansali (Principal Investigator), Lee Stefanakos (Director, CERC and Co-PI), Prof. Krishnan and a group of graduate students.

Air Purification and Disinfection using Photocatalytic Technology

While the sun is a clean source of energy, it can also clean things. Prof. Goswami has developed an innovative method to remove harmful bacteria, spores, mold, viruses and volatile organic compounds (VOC) from indoor air systems. Imagine a simple air filter like you purchase at a hardware store, coated with a thin layer of catalyst. Shine an inexpensive "black light" (almost the last wavelength humans can see before the ultra-violet part of the light spectrum) on to the filter as the air is forced through it. As the bacteria come in contact with the catalyst on the fibers, they are completely oxidized, burned completely. "This is an important distinction between just being killed and completely converted to carbon dioxide and water," Goswami explains. "Some bacteria may be more lethal after being killed than when they were alive. Some microorganisms have a poison just under their skin called endotoxins which they use to protect themselves while they are alive. But when they are dead, the remains are released into air, where some people have severe reactions to these toxins."

The catalyst used on the filter is a simple compound, titanium dioxide. A harmless white powder used for white paint pigment, toothpaste and sunscreens. Nanotechnology allows titanium dioxide to be layered onto the fibers of the filter. When installed into heating and air conditioning ductwork, the combination of the catalyst and the ultra-violet light removes pollutants and odors in a safe and economical manner. It can also protect against certain forms of bioterrorist attacks. It is interesting to note that in the nano world substances can behave in totally different ways than they do in standard quantities. In Prof. Goswami's thin layer of titanium dioxide the substance amplifies the ultra-violet light to kill cells and alter DNA. When used as a sunscreen, titanium dioxide protects cells from ultra-violet radiation.

These filters are available commercially, but Goswami and Stefanakos are currently working on a third-generation version that will be even more effective. This self-cleaning property of the catalyst can be applied to glass and even paint.

Solar Photocatalytic Detoxification and Disinfection in Water

Yogi Goswami has successfully demonstrated that his titanium dioxide catalyst method works in water as well as in the air. Years of leaking petroleum storage and aircraft refueling has contaminated the groundwater at Tyndall Air Force Base in western Florida. The polluted water was mixed with the titanium dioxide, forming a milky solution. It was then pumped through a solar reactor, a series of long slender transparent tubes that exposes the solution to the greatest amount of ultra violet radiation from the sun. The UV photons act on the suspended catalyst creating free hydroxyl radicals which break the chemical bonds of the hazardous organic chemicals and micro-organisms. Unlike some oxidation methods which can create another whole set of pollution issues, Prof. Goswami's goal is the complete destruction of the polluting hydrocarbons back into carbon dioxide and water. "Hydroxyl free radicals are one of the most potent oxidizing agents known to us," he explains. "Medical science people tell us our own internal aging process is because we produce these same free radicals inside our bodies. That is why we need to take antioxidants. But in this case, we use these free radicals to our advantage."

This process also works on industrial wastewater. A pharmaceutical manufacturer needed to clean up water that was very high in chemical oxygen demand, termed COD. This test measures the organic compounds such as dioxins and PCB's in water. The manufacturer had tried conventional methods to reduce the COD to no avail. Again, using the titanium dioxide catalyst and sunlight, Goswami successfully reduced the COD to the point where the water was so clean it could actually be re-used in the manufacturing process. "This safe detoxification technology has so many more applications than we first imagined," muses Goswami. "For a long time, chemists

Making a Difference

Dean John Wiencek

If there is one trait that pulls at each and every one of us, it is the desire to make a difference. Not only does this desire allow us to help each other achieve happy, successful lives, it also fulfills an inherit human need to be connected to others. It is hard to keep up the energy level needed to make a difference when so many of the events and environments around us seem so unstable or inadequate to support our requirements. The economy is, at best, stuck in neutral and the recent election cycle has left us with a mixed bag in leadership positions. Folks are getting worn down and worry less about making a difference and more about getting by.

Dr. Seuss speaks of the waiting place in one of my favorite books. This waiting place is not a place that one wants to visit. It does nothing and costs much. So, as time keeps ticking, our USF Engineering programs do not tread water waiting for better times. We keep moving. To stop and wait is not an option. In the following pages you will read a smattering of all that is happening here. In my own realm of the USF Engineering world, we are working diligently on expanding our international activities to include partnerships in Bolivia, Saudi Arabia, Columbia and Spain. We have a growing presence in Biomedical Engineering and all things having to do with water. We have a growing vision of a grand enterprise in the Gulf of Mexico as partners with the USF College of Marine Science as well as a rapidly evolving collaboration in the Aerospace and Defense related communications research arena.

Despite the multiple irons in the fire, we remain focused. Our mission statement is clear and our first priority is providing an excellent educational experience for our students. On campus, the current tagline in this regard is "Student Success." We have an established presence on campus in this regard, with our great traditions of fundraising and student recognition that you have all helped to maintain and grow through such activities as Bull-arney, the Heart of Gold Scholarship Luncheon, the Order of the Ring ceremony and the annual Engineering Expo. We are doing well but we still want to make a bigger difference. We are looking to provide more meaningful professional experiences for our students through internships, co-ops and research opportunities to name a few. To make this difference will require focus, a focus placed squarely on our students. Onward and upward!

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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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worked on these kinds of problems, but I brought an engineering point of view to make cleaning water with sunlight practical." He and Professor Stefanakos are now working on the next generation technology.

Goswami's next project is to build a pilot solar thermal power plant across the street from the Engineering II Building at USF. The Florida Energy Systems Consortium (FESA), created by the Florida State government to coordinate energy research among the 11 universities and energy technology, is helping fund this project. "We will use the technologies we have been working on at USF at this pilot plant," explains Goswami. "I am hoping we will have construction started within this year," he says with genuine enthusiasm. "It will be about 100 kilowatts, enough to power about 10-20 homes. We will start with a conventional cycle proceed to organic Rankine cycles, super-critical cycles and the Goswami cycle. We will do thermal energy storage technology. It will be a working model for students and industry, and it will allow us to experiment and demonstrate all the new technologies we have developed." In this area, Goswami is working with professors Stefanakos, Rahman, and Jotshi.

Prof. Goswami holds almost a dozen patents, and has published 16 books. He is a principal investigator on several projects ranging from fuel cells and hydrogen research to residential air conditioners. He has served as the president of the International Solar Energy Society (ISES), a governor of the American Society of Mechanical Engineers (ASME) and many other leadership positions in the professional world. With over 50 awards and certificates from major engineering and scientific societies, he has testified on energy policy matters to the U.S. Congress, the United Nations and the Government of India. He is the John & Naida Ramil Professor at the College of Engineering. Professor, researcher and inventor, Yogi may actually be a source of energy all by himself. Oh, and definitely one of the good guys.

Goswami is directing the USF portion of the Florida Energy Systems Consortium (FESC), which includes the efforts of about 50 faculty and 100 researchers spanning Engineering, Arts and Sciences, and Architecture. USF FESC projects include:

Power Generation Expansion *(Tapas Das, Industrial & Management Systems Engineering)*—Develop a comprehensive generation technology portfolio to expand educational resources and train a workforce.

Liquid Fuels from Biomass *(Babu Joseph, Chemical & Biomedical Engineering)*—Develop economical thermo-chemical conversion of nonfood grade biomass to clean burning liquid fuels.

Establishing PV Industry in Florida *(Don Morel, Electrical Engineering)*—Transitioning to solar PV will mitigate pollution, create jobs, and enhance energy security.

Solar thermal Power *(Yogi Goswami)*—Designing and constructing a pilot 100 kW concentrating solar power plant on campus.

Beyond Photovoltaics *(Shekhar Bhansali, Electrical Engineering)*—Rectenna (antenna and rectifying diode) concentrates a range of photon energies, obtaining high efficiencies.

Zero Energy Homes *(Stan Russell, USF School of Architectural & Community Design)*—Building affordable residential scale homes to use renewable energy systems and technologies.

Carbon Sequestration *(Mark Stewart, USF Department of Geology & Geophysics)*—Capturing CO_2 in geologic repository to meet State ordered reductions in greenhouse gas emissions.

Clean Drinking Water *(Lee Stefanakos)*—Solar powered water desalination for small community needs and photocatalytic air and water disinfection to remove contamination.

Global Warming: Greatest Hoax or Greatest Threat?

Remember your mother's warning not to discuss religion or politics in polite company? Add global warming to mom's list of topics best avoided at the dinner table. In today's media-charged environment, people will actually ask each other if they "believe" in global warming with the same curiosity as asking someone if they "believe" in a Supreme Being or life after death. Hotly and publicly debated by radio personalities and scientists alike, is it possible to make sense of the debate and form our own conclusions?

Asst. Professor Jeff Cunningham

Yes, at USF, it is possible. The class is called "Global Warming: Science and Politics of a Contemporary Issue." Led by Jeffrey Cunningham, assistant professor in the Department of Civil & Environmental Engineering, this class satisfies the USF general education requirements for a physical science. Open to all undergraduate students, both scientific research and political issues of greenhouse gas emissions are examined without prejudice.

"What I am doing is trying to get students to think about an important topic themselves," explains Cunningham. "The topic is global warming. It has been described as the greatest threat facing our society today. And it has been suggested that the notion of man-made global warming is the greatest hoax ever perpetrated on the American public." Students are expected to make up their own minds and are encouraged to back up their opinions, whatever they may be, with the scientific evidence and political knowledge they learn in this course.

"The science part of the class pertains to our climate and who is responsible for it. The political science part is what we should do about it as a society and a nation." The first part of the course deals with the science. Legitimate temperature records exist for the past 150 years. Sea level changes are also well documented, as is photographic evidence of glacial retreat. "The pollutants we are concerned about in this class are the greenhouse gases," continues Cunningham. "So I do talk about the theory—and it is a scientific theory—that global warming is being caused by man-made emissions of greenhouse gasses. Is this a sound scientific theory? Does it appear that human emissions of greenhouse gasses are responsible for global warming? We look at both arguments. I want students to make up their own mind as to the validity of this scientific theory."

The second half of the class deals with the political and legislative side of the issue. Cap-and-trade, Kyoto Protocol, the summit in Copenhagen, and the dormant energy bill in the U.S. Senate are just a few of the issues that are covered. How legislation is introduced, the process by which these bills become law, and the political environment which determines the success or failure of climate issues are also presented.

"I think there are two big reasons to take this class," explains Cunningham. "The first is the interdisciplinary combination of science and politics. The second reason is the ability of the students to make sense of a really complex topic. You know that if you listen to talk radio you will hear completely different arguments on the subject of global climate change. By taking this class, students can turn on the radio and identify what makes sense in an argument they hear, and what doesn't make sense. They have the scaffolding to be able to make their own informed decisions about a very complex topic. And I think that is a very valuable skill. Not only for the topic of global climate change, but for any complex topic that the students will encounter in their lifetime."

Prof. Cunningham's class may not get into the "heavy-duty" scientific and engineering concepts of greenhouse gas emissions, but his research is definitely cutting edge with the capture and sequestration of carbon dioxide. Working with Prof. Maya Trotz (Civil & Environmental Engineering), Prof. Mark Stewart (Geology), and Prof. Yogi Goswami (Chemical & Biomedical Engineering), the team is examining the feasibility of underground carbon dioxide storage in Florida. The state-of-the-art coal-fired integrated gasification combined cycle power plants found in Florida provide excellent opportunities to capture carbon dioxide and store it deep in the saltwater aquifers that exist over a mile below the surface.

For more information contact Jeff Cunningham at *cunning@usf.edu*.

The science of teaching science is an ART

In 2005, the National Academy of Engineering (NAE) issued a series of reports on engineering education in the United States. It stated that today's students may not be adequately educated to meet the demands of their profession by 2020. The NAE stressed the necessity of attracting students to the profession, developing positive images of engineers, and emphasizing the social aspects of engineering as a career choice. The NAE charged academic institutions to develop innovative curricula, with an emphasis on interdisciplinary approaches, while still teaching fundamental engineering principles.

How do you get from the high-altitude warnings of the NAE to the ground game in a class of eager undergraduates? It takes experience, creativity and imagination. The science of teaching science is an art.

Above: Asst. Professor Susana Lai-Yuen

Below: Asst. Professor Kingsley Reeves

Two assistant professors in the Department of Industrial and Management Systems Engineering are in that game and they are keeping score. Susana Lai-Yuen, PhD and Kingsley Reeves, Jr., PhD are Co-Principal Investigators on an NSF grant titled "Active Learning Laboratory for Medical Device Product Design and Manufacturing." This $75,000 grant addresses the mandate for innovative curricula and student retention.

Lai-Yuen and Reeves took the scientific approach to the NAE's recommendations and asked several questions. How can engineering be taught more effectively? How can we increase student engagement into the course? What is the impact of an active learning environment on student learning? And how does the introduction of social relevance into a course impact student learning and retention in engineering? To study the effects of an innovative course offering they analyzed two groups. The control group experienced the class in a traditional setting of lectures and laboratories. The treatment group had a completely re-engineered active learning environment structured around a project-based approach. Identical measurements such as weekly case reports and individual questionnaires were administered throughout the semester on both groups. A third party, Prof. Constance Hines and Corina Owens from USF's Center for Research, Evaluation, Assessment and Measurement (CREAM), tabulated these results.

Prof. Reeves' "New Product Development" and Prof. Lai-Yuen's "Manufacturing Processes" were taught first in a traditional style. In the second year, these courses were completely re-engineered to be a project-based active learning environment. Each professor taught both versions of their courses. In addition to the usual grading system, a series of identical questionnaires were presented to the students at precise intervals during the courses in both the control and treatment groups. The students' engagement, retention of material and conceptual understanding of the course were recorded for both groups. Only one course at a time was taught, and the course descriptions in the catalog remained exactly the same.

"The traditional method I used," explains Reeves, regarding his product development class, "was to have students analyze a particular product or service that had been introduced to the market within the last year. They put together a report that addresses the design, the materials used, the manufacturing processes employed, what the market need was, the novelty of the product, the intellectual property involved and the launch strategy. It gave them a good opportunity to synthesize a lot of topics covered in class and apply that knowledge to the analysis of their selected product." The students worked in teams and turned in a formidable report at the end of the semester. "But," Reeves says, "they never designed a thing."

In Lai-Yuen's traditional manufacturing processes course the students were allowed to pick their own project. "It was something that they wanted to make, like an iPod case," she explains, "students designed a product of their choice within size guidelines." The course mainly focused on the mechanical properties of materials and manufacturing processes.

To innovate their engineering courses, the professors wanted to test an active learning environment. The term "active learning" implies more than listening to a lecture. Proponents of this process believe that learning is by nature an active endeavor, and encourage students to be involved in teams, discussion groups, debates and hands-on activities.

For the project-based aspect, they chose to use the complete lifecycle of a medical device. Florida is ranked second in the nation in terms of medical device manufacturers, and Lai-Yuen is director of the USF VirtualMD Lab, a state-of-the-art product design and prototyping facility with a focus on medical devices.

Prof. Lai-Yuen's active learning treatment group class was presented with a specific need for a surgical tool by a medical doctor. Students observed the doctor in surgery and understood the need for a new medical device. In teams, the students came up with various design concepts, generated 3-D solid models, and fabricated the physical prototype of their devices.

Prof. Reeves did not have a lab, but he does have four children who go to the dentist. His active learning project involved his children's pediatric dentist who needed an improved piece of dental equipment that is used on small children. His students observed the dentist, surveyed other dentists, parents and even children.

The choice of medical devices was inspiring. They are relatively small, easily prototyped and can be tested locally in real-world environments. The courses were redesigned for students to learn about federal regulations pertaining to medical devices, especially the manner in which they are designed, tested and marketed. Students learned independently and collaboratively about not just design and manufacturing processes but medical procedures, patent laws and human anatomy.

The results between the control group and the active-learning group are still being studied.

Preliminary studies show that the active learning treatment group has a greater impact on learning experiences. "With the active-learning group," states Reeves, "the students are much more engaged in the process. They are actually living out the new product design cycle. They experience it first-hand."

Social relevance is also under analysis. Reeves explains that a body of literature points to better retention by women and minority students when they see that their studies result in tangible benefits for society. "Students can see how product development processes can have a direct impact on society," he explains. "In my case it is the delivery of dental care to young children and the ease by which the dentist can do her work." Lai-Yuen agrees and says "Students can actually see how their product can have an impact in surgery. Their ideas can help to make surgery easier and minimize recovery time for the patient. When students see that connection and its relevance to society, they are more engaged into the course."

Profs. Reeves and Lai-Yuen will finalize their results next year when the grant expires. The current data is encouraging for the new project-based class, but there are some surprises in the weekly analysis between the traditional and active learning groups. One group may not prevail over the other; statistics can be interpreted in many ways. But whatever the outcome, their students will all be winners.

If being a College of Engineering student at USF is in the future of someone you know, plan a visit to our campus for an informative visit. During that visit, we can discuss opportunities including programs, curriculum, types of engineering fields, scholarships, student organizations, academic support services, undergraduate research opportunities, etc., within the College of Engineering.
If you would like to find out more about our programs, visit us, or if you have any other questions or requests, please contact outreach@eng.usf.edu or (813) 974-0773.
We look forward to hearing from you!

DOCTORAL STUDENT ASSISTANTSHIPS FALL 2011

College of Engineering
University of South Florida

The College of Engineering is accepting applications for full-time doctoral students for Fall 2011. The appointments include tuition waiver and full financial support for the academic year Fall 2011 and Spring 2012. The sponsorship is renewable annually and is contingent upon satisfactory progress toward degree objectives.

USF, a top research university, offers an intellectually challenging environment in a diverse student and faculty population.

KEEPING ON TRACK WITH VEHICLE ASSIST AND AUTOMATION

You are the bus driver. No, this is not the joke about how many people got on or off and the bus driver's name. You are the driver, with 12 tons of steel and glass between your fingertips and the cold hard road. Darkness falls early here in Minnesota. Fifty tired commuters are depending upon you to get them home. A light snow has started to fall and obliterates the markings of your narrow bus lane. Passenger cars weave around you, impatient to pass, hiding in your blind spot. You bring thousands of hours of experience to bear on the moment. The massive machine communicates to your hands and the bottoms of your feet hundreds of small messages: drift, speed, traction, ice. It is getting darker and the falling snow is illuminated by headlights both in front and behind you.

But this is no ordinary bus. Equipped with a heads-up display, GPS, digital maps and radar, you flip a switch and a projection of a virtual bus lane appears on your windshield, superimposed over the snow-covered road. A video of your blind spot appears as another rear-view mirror on your display. You feel a slight vibration on the left side of your seat, similar to driving over the rumble strip. Gently, gently steer to the right. Your heads-up display makes a slight adjustment, and you drive with confidence into the night.

Welcome to the high-tech world of Vehicle Assist and Automation, VAA. This technology is relatively new to the United States, and the Federal Transit Administration (FTA) has asked the research planners at USF's National Bus Rapid Transit Institute (NBRTI) to study and evaluate four new installations of various kinds of VAA systems across the country. Housed within the College's Center for Urban Transportation Research (CUTR), the Institute specializes in Bus Rapid Transit (BRT) expertise and innovation (as well as other modes of transportation including roadway, rail, aviation and even transportation demand management). They will be evaluating four different transit agencies in San Diego and Alameda, California; Eugene, Oregon; and Minneapolis, Minnesota. Each study site reflects different environment populations, road infrastructure and climate conditions. The four transit agencies are trying out a wide range of new technologies and equipment, so the NBRTI's analysis will be rich in information and comparison data.

Rob Gregg, Director of Transit Management & Innovation at NBRTI, explains how VAA works.

"Simply put, VAA is assisting the driver with longitudinal and latitudinal precision control of the bus."

Longitudinal control assists the bus in the forward and backward movement of the vehicle. Longitudinal movement is involved with precision docking, so that the bus stops at exactly the right place where the customer will board. This is very helpful for disabled or wheelchair travelers. This type of control can enable multiple buses to platoon behind one another and perform like a train does with coupled cars.

Latitudinal control helps with the right and left movement. Very precise latitudinal control is helpful when going through toll booths, tunnels or keeping the bus centered in a very narrow lane and serves precision docking by moving the bus closer to the boarding curb or station. There are several methods of latitudinal control including magnetic markers in the pavement, GPS with inertial navigation sensors, cameras that read the painted lane markings, radar and lidar (similar to radar but uses light waves instead of radio waves). "I would describe it as a 'virtual track', almost like being guided on an invisible rail," says Gregg.

Latitudinal controls are crucial when buses must use narrow High Occupancy Vehicle (HOV) lanes and even the shoulders of existing highways. Brian Pessaro, AICP Senior Research Associate at NBRTI, explains the Minneapolis test case. "In Minneapolis, buses are allowed to drive on the highway shoulder when traffic gets congested in the regular lanes. However in the winter, the bus drivers tend to avoid using the shoulders because they can't see the painted boundaries underneath the snow. The transit agency out there wants to use GPS technology in combination with things like a Head-Up Display or HUD to help the bus driver be less worried about using the shoulder during inclement weather."

While driving on the shoulder with a 40-foot behemoth in rush hour traffic sounds like a nightmare, it is actually being done in several major cities. Minneapolis has over 200 miles of existing shoulder bus service. As Rob Gregg put it, "Highway right-of-way is expensive. If we can save a foot or two over miles and miles of highway, that saves a lot of money. On average, a road width is about 12 feet across, and the shoulders in Minnesota are 10 feet. Between the bus's rear view mirrors you have about 9½ feet. If technology can keep that bus within that lane or through that toll booth without knocking off those rear view mirrors, then a lot more road becomes available for bus rapid transit."

The NBRTI study will look at several different criteria, including customer satisfaction, bus operator satisfaction, and vehicle maintenance issues like fewer rear-view mirror replacements. Productivity and efficiency can be measured by increased riders and revenue. Safety, the most important issue, is at the heart of the study. Using existing technologies for precision control can make a bus ride that much safer. "No matter what we do with the technology, the driver is always in control," states Gregg. "The driver can always interrupt the VAA controls." Yet, with the assistance of this technology drivers will have enhanced vision, spatial judgment and reaction time to drive safer and more efficiently.

Located on the USF campus, CUTR is home to 45 full-time professionals in transportation research. Established in 1988, the center conducts $8 million annually in research for public and private sector sponsors in Florida and across the country. "We are a hybrid between a private consulting firm and academia," explains Pessaro. "Some private consultants get paid to provide what clients want to hear, CUTR conducts sound, principled research to provide an unbiased opinion on the situation or issue being studied. We have a national reputation for independent research that is not going to be slanted in any particular way." CUTR also behaves in an educational fashion with various training and learning programs that serve private and public transportation interests.

"When I started working in bus systems," Gregg recalls fondly, "Technology was having air conditioning! Now, technology is cutting edge communications, computerized control systems, alternative fuels and advanced operations equipment. These applications cross urban and rural boundaries; we just got a call from Yosemite National Park in California. They are looking at alternative transportation methods because the park is showing signs of deterioration caused by heavy visitor traffic, yet another opportunity for technological solutions. At CUTR, we tackle the big picture. We are about the environment, about energy, livability and sustainability, all connected to the concept of improving mobility. We have a niche that is just going to keep on growing as we serve the public good and explore smarter ways to be mobile."

For more information, contact Rob Gregg, *gregg@cutr.usf.edu*.

Delivering the Goods

You just know this going to be a great class. The first day the professor challenges you to grab a dollar bill before it falls to the floor. You learn that "A Tale of Two Cities" takes place not in London and Paris, but in Bologna and Pavia, two cities in Italy. There, in the 1790's, Alessandro Volta and Luigi Galvani made history trying to explain why a mysterious force made frog legs twitch. And don't forget the giant squid nerves that can be seen without a microscope that earned England's Alan Hodgkin and Andrew Huxley a Nobel Prize in 1963. Learn why puffer fish sashimi could be your last meal. Is this cool or what?

Welcome to Andrew "Drew" Hoff's class in bioelectricity. An associate professor in the Department of Electrical Engineering, Hoff received dual bachelor's degrees in biology and physics from the University of California, Irvine and received his PhD in electrical engineering from Penn State. While his definition of English literature might be a bit creative, the word "multidisciplinary" defines perfectly Prof. Hoff's teaching, professional experience and research projects.

"Basically, the bioelectric course I teach is about how nerves work," explains Hoff. As an example, he uses a dollar bill to demonstrate nerve conduction. While holding the bill at the very top, he asks a student to put his thumb and opposing finger right over George's face. "You shouldn't be able to grab it," he explains. "The distance between George's nose and the top edge of the bill is short enough that the amount of time it takes your brain to send the signal down the trunk and arm to make your muscles pinch your fingers together takes longer than for the bill to fall the few centimeters between the nose and the top edge of the bill."

"In electrical engineering we always think about electrons moving around in materials. As in a light bulb, the electrons go through the filament, lose energy, heat up the element which then glows with light," he explains. "In the bioelectric world, you don't have any free electrons moving around, everything is ions. Ions in solutions, ions compartmentalized by cell membranes, different ion densities in different cells. That's the neat stuff."

Hoff is a member of the USF Center for Molecular Delivery (CMD), where research in electroporation is being carried out by a multidisciplinary group of medical researchers, electrical, chemical and biomedical engineers, and graduate students. "For the last decade, since it was founded by Richard Gilbert professor of Chemical and Biomedical Engineering and professor Richard Heller in the USF College of Medicine, participants in the center have worked to transfer electroporation-driven drug or gene delivery methods from the laboratory to the clinic. "I recognized that my work in non-contact electronic materials characterization using ions might facilitate delivery and process characterization in tissue," explains Hoff.

Electroporation involves cells or tissues that are temporarily exposed to an electric field. At a crucial field, the cell membrane opens and allows drugs, DNA or other molecules into the cell. When the electric field is removed, the cell membrane heals with the desired molecules safely inside the cell. "You can inject DNA in solutions around cells but it won't go in," he explains. "Same thing with drugs - drug molecules are too big to get past the barrier that an interact cell membrane provides. When you apply this precise electric field, and get the cell membrane to disrupt a little, then you can transport things back and forth through the holes while the holes are open. But, "he warns, you don't want to hit it so hard that the cell wall permanently comes apart." Astonishingly, the cell wall will completely regenerate without damage in a very short time with the desired molecules safely inside. "This is a good example of nanotechnology, it is truly self-assembly," he adds.

The potential uses of electroporation are staggering. Cancer treatment is an obvious candidate, but vaccination therapy and autoimmune disease therapy are on the horizon. "When people think about bioelectricity, they think about eels," muses Prof. Hoff, "or sticking their finger in a light socket. But when you use gym equipment that shows your heart rate that is bioelectricity. Those scales that measure body fat use bioelectricity."

"We still have a long way to go with this process, there is a lot of research that has to be done," explains Hoff. "It is really exciting stuff. There is a lot of potential there."

Hoff is also involved in the ABET accreditation process for the electrical engineering program. ABET accreditation ensures that a program at a college or university meets the quality standards established by that profession. For example, the professional society IEEE is involved with accreditation of programs within electrical engineering at USF. "Everyone here contributes toward the quality of education we provide," Prof. Hoff explains. "Accreditation is a complicated process, but it is a means of quantifying and improving and controlling our product, which is education."

Readers interested in additional information regarding the activities of the USF Center for Molecular Delivery (CMD) may contact Prof. Richard Gilbert at *gilbert@eng.usf.edu*.

Associate Professor Drew Hoff

Fischer Tropsch biomass-based diesel and aviation fuel produced by Wolan's team.

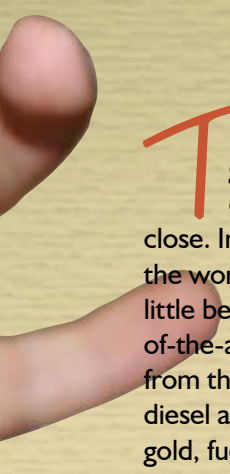
Jeff Fay ©

Professor John T. Wolan

Ali Gardezi, lead doctoral student working on the biomass to liquid fuels project.

Professor John Wolan (examines) by the Fischer Tropsch bench-scale reactor and control system.

From Yard Waste to JET FUEL



They might not be spinning straw into gold in the Department of Chemical & Biomedical Engineering, but it's close. In the fairy tale, a little man does all the work at night in a dark basement. Now, a little bench scale reactor, in a bright, state-of-the-art laboratory takes the gas produced from the straw and transforms it into clean diesel and jet fuel. While you might prefer gold, fuel is much more valuable, just ask any historian or modern industrial country dependent on foreign fossil fuels.

The non-fairy tale description for this serious research is "thermo-chemical conversion of lignocellulosic biomass to liquid hydrocarbon fuels." Technically speaking, you don't spin the straw, but dry it out a bit and burn it in an oxygen-reduced atmosphere to create synthesis gas. This syngas, which is mostly carbon monoxide and hydrogen, is then heated in our pressurized little reactor and forced through a one-inch pipe containing a catalyst made from cobalt and silica pellets. From the bottom of this pipe, which can get a bit warm and is hardly more than a foot long, comes precious drops of liquid fuel. While this is a rather simple retelling of the tale, the patented process is referred to as Fischer-Tropsch (FT) synthesis. And don't try this at home.

Both Rumpelstiltskin and the FT synthesis originated in Germany. Like many wartime projects that advance technology at warp speed, the FT conversion of carbon monoxide and hydrogen into liquid hydrocarbons was discovered by Franz Fischer and Hans Tropsch in the 1920's. Their process used coal, not biomass, as the feedstock. Iron served as the catalyst. Petroleum-poor Germany recognized the need for synthetic fuels and by the beginning of WWII had produced over 600,000 tons of liquid hydrocarbons using the FT process. When war was declared, Germany was importing about 60% of its fuel from foreign countries. The FT plants couldn't keep up with government production demands, and the decision was made to invade Russia in order to control its oil refineries and coal reserves. Many historians point to the Eastern Front as the primary reason for Germany's defeat. How history might have been changed if all of the FT plants went on line as planned. While it's mind-boggling that you could start a war on half the fuel you need, keep in mind that today the U.S. military gets 50% of its fuel from foreign sources.

These lessons of history are not lost on Professor John T. Wolan. Along with doctoral student Ali Gardezi, these chemical engineers keep their tabletop Fischer-Tropsch reactor humming with biomass consisting of pine sawdust and pine chips. Florida has more biomass waste than any other state. Pine chips, along with sugarcane bagasse, citrus pulp, grass, and municipal solid waste constitute just some of the available biomass feedstock for the new generation of FT syntheses. Even barnyard waste can fuel this process. Basically anything that is rich in lignin or cellulose can be used.

"We don't have to use corn, which people eat," explains Wolan. "We can use the dried corn stalks and corn grass." Unlike the fermentation process that creates ethanol from the sugar in the corn, the liquid hydrocarbon fuels created with FT synthesis are chemical rearrangements of the carbon found in the grassy parts of the corn plant. "Like making beer or wine, fermentation is a tricky process, best done in small batches. It is not easily scalable to a large refinery," he explains.

If the FT process works on both coal and biomass, why don't we have them all over the country? "That," says Professor Wolan, "is a good question, but there are many reasons. The plant itself is costly, a lot of capital is necessary to get started. And of course, investors want to know what their return will be. The break-even point is estimated when a barrel of oil reaches $100." It would be possible, he continues, to build a plant expecting to make fuel valued at $100 a barrel, and then the price of crude drops to $35. Since 2000, prices have ranged from $17 to $147 per barrel, so it has been difficult to predict what an investor can sell his biomass-based fuel for. "Remember the scare in the 70's, when a lot of research on these non-fossil fuel technologies started?" he asks. "The price of crude dropped. I don't think that was a coincidence."

Fraud is also involved when there is a potential for vast profits. "I have had to go so far as to have my fuel carbon-dated," he says with amazement. "People go to the gas station and get diesel and claim they made it from a biomass source. Investors want to see that the carbon is from a modern-day source, and not fossil based."

"The FT process works on coal, natural gas or biomass," explains Wolan, "but it is not necessarily interchangeable. Coal and natural gas are homogenous. Biomass is diverse, so you have to have a system that allows for that flexibility. For example, municipal solid waste (MSW) like cut grass or landscape waste here in the South contains a lot of sand. The sand particles will turn to glass at high temperatures. Also, you have to make both coal and biomass into smaller particles before gasification, which is not trivial."

At the core of the FT process is the type of catalyst used. This is where Wolan and Gardezi spend much of their testing and analyzing the precious liquid fuel that is produced. In simple terms, small silica pellets, about the size of a lentil, are impregnated with cobalt to a specific depth. Any deeper and you would be wasting both the cobalt and the gasses that come in contact with the pellet. Called an eggshell catalyst, the USF team is furthering the work started by Enrique Iglesia at the University of California, Berkeley. Within the small bench scale reactor, the pipe containing the pellets can reach undesired high temperatures, something which must be addressed when building a full-scale pilot reactor. However, heat produced by the catalyst coming in contact with the syngas can be harvested for other processes such as heating water to create steam to drive a turbine, or can help in the initial heating of the biomass.

So how much biomass does it take to produce fuel? "For every four tons of biomass, we produce one ton of fuel. The only byproduct we have is water and a small amount of high quality ash that is used in the cement industry," explains Wolan. "We can make a very high quality diesel fuel that is so low in sulfur that you have to add a substance to provide lubrication for diesel engines. We also make jet fuel, called JP-8." Because the formulation of diesel and JP-8 are very similar, the future of military fuel may be consolidated into a one fuel operation. In other words, jets, tanks, jeeps and more will all burn the exact same fuel which makes sense strategically.

Professor Wolan, graduate students Ali Gardezi and Jaideep Rajput of USF's Division of Patents and Licensing were among the finalists in the Global Venture Challenge 2010. It was sponsored by the U.S. Department of Energy and international venture capital organizations. Funding has been provided by several sources including the Florida Energy Systems Consortium (FESC). The FESC Principal Investigator at USF is the very distinguished Professor Yogi Goswami. The FESC was established and funded by the Florida Legislature in 2009 and is comprised of faculty from many different disciplines at 11 public universities in Florida. Funding is also being provided by the Bill Hinkley Center for Solid and Hazardous Waste Management. The Bill Hinkley Center is a state-wide research center created by the Florida Legislature in 1988. (Bill Hinkley is a remarkable man who worked for the Florida Department of Environmental Protection for almost 30 years and who was the architect of the way we recycle and manage waste here in Florida. Mr. Hinkley died in 2005.) The Hinkley Center provides funding for waste management research to professors at seven public and two private Florida universities. A tiny bit of the cost of buying a tire or a car battery goes to fund this very important research of turning waste into a valuable resource. The Hinkley Center is hosted by the University of Florida's College of Engineering and is the only center of its kind in the United States. The ultimate goal is to build a large pilot plant based on the small bench scale reactor and the analysis it provides.

Ash Engineering, Inc.

An interview with Jan Ash, Founder & President, Ash Engineering Inc.

The University of South Florida is many things to Janice Sands Ash, PE.—alma mater, a valued customer and a trusted source for the engineering talent that fuels her company's success.

Jan Ash

She holds a bachelor's degree in engineering science, a master's in civil engineering, and is the president and owner of Ash Engineering, Inc. In addition, she is a generous alumnus providing an endowed scholarship to the college. If you want to know what "Bulls pride" means, just ask Jan Ash.

"I was originally an electrical engineering major when I started at USF in1978," Jan explains. "In my junior year, I was a co-op at a power company that assigned me to work on a very sensitive ecological permitting project. Simultaneously, I also met Professors Robert Carnahan and Jerry Murphy, who were creating a new department within civil engineering called environmental engineering." Ditching the theoretical confines of electricity, the undergraduate fell in love with the tangible pipes, pumps and ponds of what was then referred to as sanitary engineering and the intangible and sometimes controversial work of environmental permitting.

Jan started Ash Engineering in 1993 after working as a chief design engineer for the City of Tampa. She was inspired by good friend Eileen Rodriguez, who had her own hydrology firm at the time. She told me, "You should try owning your own company … there is nothing like having your own sand-box," she remembers. "It was not exactly a dare, but if I didn't give it a try, I would never know if I could succeed." Rodriguez must be a good judge of business character because 17 years later Ash Engineering is still going strong and Eileen, an alum herself, is currently the Regional Director for the Small Business Development Center at USF.

"In the beginning, I was on my own and worked out of a spare room in my house. I was an adjunct professor at the College so I would hire students to work part time. I got cheap labor and the students got invaluable, practical experience. The business slowly but surely started to grow and I never looked back," she recalls. "At first, I thought: grow big. But now I grow smart. This is something you never learn in college. It is a part of maturing your business sense that comes with time. We have endured because we have moved from 'think big' to 'grow smart and profitable'. My company has survived some of the toughest times here lately, yet they have been some of the best years of the business."

For over 17 years, Ash Engineering has provided civil, construction, ecological and environmental engineering services. They also provide utilities engineering and field services, water/wastewater engineering and industrial/port engineering. The company has designed some of the largest utility projects in the Tampa Bay area. Ash was awarded the Federal Highway Administration's "Excellence in Utility Engineering" Award in 2007 for their utility relocation engineering at the new interchange adjacent to Tampa International Airport. The extremely complex project involved moving and coordinating 12 separate utilities simultaneously and placing them all within the same narrow right-of-way. Other projects include redesigning Rainbow Springs State Park in Dunnellon, Florida and the renovation of the waterfront facilities at USF's College of Marine Science in St. Petersburg, including all of the docks and moorings for research vessels now made famous by their monitoring of the BP Deepwater Horizon spill. They are currently working on several projects in Jacksonville for the U.S. Navy as well as the master plan for habitat restoration efforts at MacDill Air Force Base in Tampa.

"We are not just a civil engineering company," explains Jan. "But since we are civil engineers, we impact the environment whenever we do work, be it a road or bridge or campground. One forte is ecological permitting and designing ecologically friendly solutions." The company has in-house scientists who specialize in biology and zoology who work with endangered species relocation and habitat restoration.

Rich Piccininni, P.E., BSCE' 02 of Ash, has been the project manager for USF for the past 8 years. Jan believes that it's a great advantage for her young graduate engineers to be working on projects at their alma mater. "It's a great way to give back to the University." Of all the

Engineering a Better Engineer

An interview with Nick Albergo, President HSA Engineers & Scientists

Nick Albergo's 30-year relationship with the University of South Florida is not your dear old alma mater story. As a student, he was a frequent visitor to Dean Glenn Burdick's office for parking in the Dean's appointed space. Prof. Carlos Smith kicked the future PE out of thermodynamics class twice for bringing his dog, who was evidently a more attentive student. Having received a BS and MS in civil engineering from USF, he, along with long-time friend and USF graduate Dave Scott, opened their offices on Fowler Avenue directly across from the College of Engineering. His company, HSA Engineers & Scientists, has been in that same location for 20 years. As president of HSA, he employs 280 engineers, scientists and geologists, including 40 USF graduates. Having been a student, a teacher, and a patent-holder with USF, his views and experiences make him uniquely qualified to discuss, well, almost everything about engineering at USF.

Nick Albergo

"I run a technical company, but I would not call myself your traditional engineer," Nick prefaced his remarks. This was not going to be a traditional interview, either, but we could at least start with the basics: how had education changed in the last two decades? "Five words," he states. "Internet. Microsoft Office. Programmable Calculators." Microsoft Office? "Clearly the greatest change is in computing power and the birth of the Internet. The speed at which information can be accessed has changed the face of learning," he explains. "Tools such as Excel and PowerPoint have revolutionized the delivery and analysis of information in ways that we could never have imagined back then." Thinking back to his student days, he recalls Bernard E. Ross, professor emeritus in hydrology. "Dr. Ross was a great modeler who developed the first mathematical models of Tampa Bay. I wonder what he could have done with modern computing technology." He smiles and remembers another professor, Stanley Kranc " a great example of an academician with a very practical approach to engineering," Nick recalls.

As he speaks of other USF professors who have influenced him, a common thread appears. "I am of the opinion that engineering requires mentorship," he muses. "I am not totally prepared to embrace social facilitated learning, just yet. Engineering requires a one-on-one relationship with nurturing live mammals." His oldest daughter is a freshman at USF. "She takes this class. But she does not," he pauses, "ah, go to class. It is online with some kind of blackboard software," he adds. "Maybe I am old school, but I am just not all that hip with that methodology working in engineering. "I will give you a perfect example," he continues. "People die not from voltage, but from amps. If you just read on the screen the difference between voltage and amps, does it sink in"? Without missing a beat, he answers his own question, "You have to touch it, experience the difference. People's lives are at stake," he continues, "and a certain amount of stress is good in engineering. You have to perform under stress."

He also points out that much of the education he received was from professors who were actively involved in projects that provided practical opportunities to apply the science learned in the classroom. "These projects were not only instructive in terms of our development as engineers, but also shaped us as entrepreneurs and businessmen," he explained. "You had to learn to be innovative to remain competitive. There were people always vying for those same jobs. You were always mindful of the objective of the client, you had to work within a budget and there were deadlines to meet. That hands-on, very practical consulting side, really formed and shaped us."

When asked if he would have done anything different in his studies at USF, Nick had a ready answer. "I would have spent more time and placed more emphasis on non-engineering curricula. Technical writing, public speaking, marketing and psychology - these so-called electives are considered a distraction to most engineering students,

high-profile projects her company has worked on, some of Jan's favorites are on the USF campus. "We have performed at least 50 projects for the University," Jan recalls. "We were the civil engineering provider for the entire Marshall Center, including roadways, utilities, water, sewer and irrigation. We even worked on the new Bulls waterfalls!" The chiller plants which circulate cold water through an extensive network of underground pipes and provide air conditioning for many buildings are also part of the company's projects on campus. The Sessums Mall extension near the engineering buildings is one of the company's designs as well.

"It is one of the coolest things for us, working with our alma mater," says Jan. "We have been the contractual campus provider for civil engineering services for 10 years. It provides a great learning experience for the young USF engineers who work for me." She also gives a good deal of the credit to the USF facilities project managers. "They are excellent stewards of the money that is budgeted to facilities and maintenance. They maximize every dollar they get."

Jan readily acknowledges that her successful company is based on her people. "I totally give credit to every single staff member that works for Ash," she explains. "Their perseverance, their talents, their devotion makes it a phenomenal place to work. We all work hard, but the rewards are great. I have the best people." She pauses and adds: "It is easy to get the best people, but it is hard to keep them. You keep them by having the utmost integrity and giving them as much opportunity as you can. Bright people don't stay in a box for long."

As past president of the Engineering Alumni Society, Jan has seen many students over the course of several years, and is greatly encouraged by the diversity and minority participation. She and her husband, a marine biologist, have established the Thomas M. and Janice Sands Ash Endowed Scholarship fund. "I am pretty excited about this," she says. "It will be one of my lifetime gifts. It will be available this year and will go to engineering or marine science students."

Jan Ash -Your basic USF engineer, entrepreneur, professor, philanthropist, and purveyor of some serious Bulls pride.

yet later they become some of the most important tools toward career advancement." This brings Albergo to a conclusion that may surprise many. "The irony is at the end of the day what makes you most likely to advance in your career is not going to be that you are a good engineer. It is going to be that you write well. That you are good at speaking, that you understand how to market and develop business. That you are able to manage people and sense what they want," he continues. "And engineering provides little of these skills - all these things come from non-engineering curricula. And when newly-minted engineers go to work for him, "I'm all over them about their writing and their ability to express themselves."

He is also very supportive of the environment fostered by Dean John Wiencek. Like him, "Dean Wiencek believes that practical experience is important in order to be a quality engineer. He cares about tradition, and expanding projects like Engineering Expo and Heart of Gold scholarships. And he brings enthusiasm to the position."

"We are a community," Nick adds warmly. "Many USF alumni are our clients and friends. We have shared projects and we provide scholarships and contribute to USF functions. We are a stone's throw away from the engineering college and have been living and growing together for the last 20 years."

Any specific advice for the students of today? Characteristically, he does not mince words: "Because we are in the business of engineering, we are selling engineering services. You better darn well be able to communicate and convince someone that they should go with you versus someone else. Your ability to write proposals, to communicate, to be confident, to express enthusiasm –becomes very important." He pauses and adds, "And don't drink too much draft beer."

It's un-Retirement for CUTR's Director

Ed Mierzejewski, PhD, PE

"Retiring? I'm not retiring, I'm too young for that," responded Ed Mierzejewski,PhD and PE. "I'm not ready to give up 40 years of experience in transportation planning and engineering only to wake up every morning and decide whether I want to play golf or go fishing."

The unretiring, though outgoing, Director of the Center for Urban Transportation Research (CUTR) continues: "I have been at CUTR for 22 years, and for the last nine years as director. Some people feel like they've had jobs, but I have had a career in the transportation engineering profession," he explains. "So I have a hard time imagining being totally disengaged from my work." Before joining CUTR, Mierzejewski spent 18 years as a private consultant in transportation engineering and planning. "Maybe I'll go for something less than full-time," he muses, "but that's all being explored right now."

In 1988 the Center for Urban Transportation Research was established with Mierzejewski as one of the original staff. Located on the USF campus, it is a nationally recognized transportation research center with more than 40 experts in planning, engineering,and public policy. CUTR conducts research worth nearly $8 million annually for public and private sector sponsors in Florida and the United States. "We have built an amazing group of people here at CUTR," he says with genuine pride. "While we are nationally recognized, I have also enjoyed the opportunity to mentor individual students along the way. I still get mail from students from 10 to 15 years ago who believe we had a positive impact on their career and outlook on life."

Mierzejewski's advice for the next generation at CUTR is clear. "To be successful in an environment like CUTR you need to maintain an entrepreneurial attitude," he says. "We are almost exclusively dependent on contracts and grants to pay our salaries. So it is important that whoever follows me has that entrepreneurial bent. Fortunately, we have assembled a staff of professionals here that is very good at doing that." He explains that when he started, he asked "everyone in the building" about why they wanted to work here since the money was obviously somewhere else. The overwhelming response was that people felt like they could make a difference at CUTR. "So I feel particularly good about the staff we have here," he concludes, then pauses and adds, "Leaving something like this is always a little bittersweet."

So what does a civil engineer do with his unretirement? "My wife, Aline, and I celebrated our 40th anniversary this year spending a few weeks in Italy this fall. Italy's roads, bridges and aqueducts, some going back over 2,000 years, the engineering infrastructure in Italy is amazing," he explains. It is easy to visualize this modern transportation engineer, with gelato in hand, walking the ancient stones of the Appian Way. He has admiration for Italy's modern train system. An expert in traffic systems, he thoroughly enjoys watching the typical Italian driver's distain for traffic devices and loves to watch the Vespas swarm to the front of autos while stopped for a red light.

But it is not all stones and chariots or asphalt and automobiles for this engineer. Mierzejewski is also vice president of the Alpha House of Tampa, a non-profit founded in 1981 to assist pregnant women in times of crisis. He and his wife also counsel engaged couples prior to getting married and looks forward to spending more time on these pursuits.

He also hopes to "get back to my technical skills roots" in private consulting. His advice to students today is to keep active in professional organizations like the Institute of Transportation Engineers (from which he has received several awards for distinguished service) and to maintain good relationships starting with your fellow students and professors in college. "You never know," the transportation engineer says, "that down the road somewhere, you will be glad you did. The world moves on these relationships." And the rest of us also move on the roads and transit systems built by professional engineers like Ed Mierzejewski.

A Revolution in Calculus Education

Almost half of the students in the STEM (Science, Technology, Engineering and Mathematics) disciplines do not make it to the next calculus course. Many will change majors. The seven-year graduation rate for business, nursing and education majors at USF is about 80%, compared to 60% for STEM majors.

Like any self-respecting statistic, what is not said can be more important than what is said. A group of University of South Florida professors looked closer at these figures. They discovered that one of the biggest factors in graduation was how well students were doing in their required math classes. When mathematics or calculus classes were relevant to the student's major the success rate improved. Conversely, many engineering students enrolled in theory-based classes dropped out or changed majors, citing the lack of relevance between theory and the applied nature of their chosen field.

Armed with this information, Kandethody Ramachandran, Principal Investigator and mathematics and statistics professor put together a team of seven professors with the goal of increasing the success rate of these students by 20 percent. The result was a National Science Foundation grant, called "Science, Technology, Engineering and Mathematics Talent Expansion Program." The program has three components:

Project based Calculus Instruction Students in Engineering or Life Sciences Calculus classes are matched with projects in their desired areas of study. Students are given an option of using this project as a replacement for lowest exam score or even in lieu of a final calculus exam. The projects can come from a variety of sources: businesses, the community, other professors or even the students themselves. The students get an opportunity to work with other USF colleges, industry, government and entities within their area of interest. It is a win-win situation for everyone.

Peer Leading Instead of the traditional four hours of calculus lecture, the STEP program is three hours of faculty lecture followed by one hour of coaching and going through exercises with undergraduate peers. Peer leaders are trained by grant personnel and are given a curriculum in which concepts from the calculus courses are applied to practical problems.

Tutoring A "one-stop" tutoring center named STEM Mart was created for students taking calculus and basic sciences such as chemistry, physics and biology. Located in the University Tutoring Center in the USF Library, it is a place where students can get help in their science and math courses at a single location.

Professor Scott W. Campbell

Chemical engineering professor, Scott Campbell, PhD, is the engineering member on the panel of seven professors and works mostly in the project-based instruction area. "What I basically do is match students to the projects." Campbell explains. "A student will express interest in electrical engineering," he continues, "and I will ask him if there is a particular aspect he is interested in, such as power generation, solar energy, semi-conductors, or some other area. If they express an interest, I will send them to a faculty member who does research in that area."

"For example, I had a student who was building a Sterling Engine (a specific type of cyclic compression machine) in his garage. So I suggested a thermodynamics-related project that is based on the Sterling so that he could understand theoretically what is going on," explains Campbell. The key to this program is the thoughtful matching of a student with the theoretical side of his interest. "Sometimes they come in

Ovarian Cancer Early Detection Home Test

More than 30 years ago the first home pregnancy kits became available. In 1977 ten dollars got you a test tube containing red blood cells from sheep, a clear plastic test tube stand with a mirror on the bottom and a medicine dropper. Add some urine and results appeared in two hours. This revolutionized pre-natal care, giving women the opportunity to discontinue drugs, alcohol, smoking, or avoid X-rays.

Now there are home test kits for blood alcohol, glucose monitoring, drug screening, cholesterol, ovulation, HIV and even menopause. While accurate testing and monitoring for diabetics can lead to almost normal lifestyles, many of these home tests provide confirmations of suspected conditions.

But what if there was a home test kit for one of the most insidious, most silent killers of all: ovarian cancer? The deadliest of all gynecologic cancers, the mortality rate for ovarian cancer has not improved in 30 years. The symptoms are as vague as bloating, abdominal pain, unexplained weight gain or loss, menstrual changes or fatigue. These symptoms could describe a 50-year-old woman experiencing the first signs of menopause, hardly a reason to be concerned with cancer. However, that same woman has one chance in 71 of developing ovarian cancer, and one chance in 95 of dying from it.

But a simple, inexpensive and accurate home test for ovarian cancer? Prior to 1976, the concept of home pregnancy tests was unheard of. Now, for a whole new generation of child-bearing women, the possibility of living without home pregnancy tests is unthinkable. Could a simple test for cancer be at your local drugstore in a few years?

"Yes, we can do this. In three years our goal is to have a working prototype," explains Rasim Guldiken. An assistant professor of Mechanical Engineering, Guldiken is the principal investigator along with Patricia Kruk, PhD, and Santo Nicosia, MD, both from the Department of Pathology and Cell Biology at USF. They have been awarded a $400,000 grant from the Bankhead-Coley Cancer Research Program of the Florida Department of Health. Their project, "A Novel, Low Cost, Ultra-Sensitive Nanosensor for Early Detection of Ovarian Cancer" might well be the beginnings of a quantum leap in diagnostic medicine.

Asst. Professor Rasim Guldiken

"I believe that nanotechnology will revolutionize medicine," explains Prof. Guldiken. A passionate advocate for the early detection of ovarian cancer, he is quick to point out how other cancers, such as breast and skin cancer have excellent survival rates and generate a lot more media attention than ovarian cancer. "The survival rate for early detection of breast cancer is 89%, but for ovarian cancers, it is half that - only 46%. And of that, only about 20% of ovarian cancers are detected in the first stage, which is localized or confined to the primary site."

Guldiken believes that interdisciplinary relationships will provide the foundations for future advances in medicine, "Especially if we combine the experience of engineers and medical doctors. That's what's got to happen," he explains. "If the engineers do not talk to the medical doctors, and only talk to each other, it's not going to help much. I think engineers need to go out to medical doctors and see what's needed. Tell me what to look for so that I can guide my machines. This is needed."

At the heart of the concept is an inexpensive ultrasonic MEMS (micro electro mechanical systems) nanosensor that can detect elevated levels of Bcl-2 protein in urine. The heart of the device is smaller than a human hair. The test kit will require a simple battery and is expected to cost a few dollars. The current ELISA blood test, which looks for a concentration of the protein CA-125, is a complicated, expensive and expert procedure that must be performed at a medical facility.

The project will be developed and prototyped at USF's Nanotechnology Research and Education Center. The center's clean rooms, packaging facilities and high-tech equipment will provide a state-of-the-art manufacturing environment.

"My ultimate goal is to send this device to developing countries," Guldiken explains. In industrialized countries, the survival rates for ovarian cancer are dismal. "Think of what it means to be living in the mountains of Africa,

with their own interests," continues Professor Campbell. "A student into bicycling wanted to use data from an electronic speedometer to compute cumulative distance traveled. It was a classic calculus program, so he worked on that."

Like a high-tech employment agency, Professor Campbell matches engineering students with projects. "The program is really individual attention to what the student's interests are," he explains. "At the same time, we are on the look-out for projects suggested by members of the community that students can select from. If any business has an idea for a technical project that requires at least one concept of calculus to solve, contact Prof. Campbell. It will cost you about three hours of your time but will give you a chance to work with an engineering student on a problem that you might not otherwise have the time or resources to solve." A listing of completed projects and reports is available at *http://shell.cas.usf.edu/math/mug/ujac/*.

Professor Campbell explains that the current traditional order in which students take courses affects their perception of relevance. "We believe one of the reasons we lose so many in calculus is because of the way the curriculum is set up. The first year and a half you are not taking any engineering courses. Students think that they want to be engineers, but they don't always know what engineers do … not until after they start taking the actual courses. Meanwhile they are taking the calculus courses and they see no relevance of that material to engineering. Our group felt that there was a reasonable fraction of those who could make it through if they were interested in the course and motivated by it. So that's what we are trying to do."

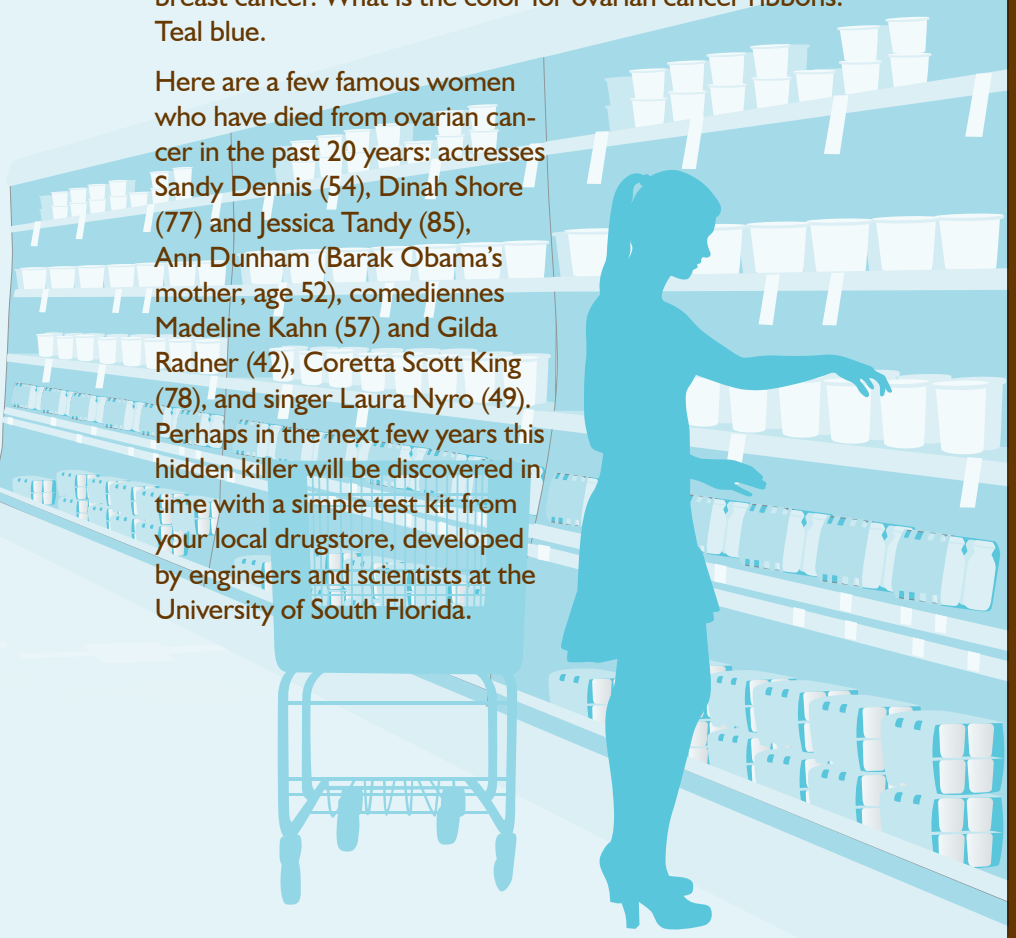
Campbell is the engineering contact in the STEP program. Professors Ramachandran (PI), Catherine Bénéteau, Marcus McWaters and Arcadii Grinshpan are the Mathematics and Statistics representatives. Professors Gordon Fox of Biology and Jennifer Lewis of Chemistry round out the group. For more information, call Campbell at 813-974-3907 or email at *campbell@usf.edu*.

what the incidence rate must be in the Third World." His concern for humanity is truly genuine.

Guldiken believes that using nanotechnology to measure biomarkers will be commonplace. It will not be limited to ovarian cancer, but could encompass HIV, prostate cancer and a host of other silent killers. A person will perform their own simple tests and take the results to their health care provider, who can zero in on the treatment without having to go through the costly process of testing for dozens of potential diagnoses.

Why target ovarian cancer for this research? Guldiken believes that the disease has taken a back seat to breast cancer, which is relatively easy to detect in the primary stage. Breast cancer is also more treatable and survivable than ovarian cancer. Everyone knows about the pink ribbons for breast cancer. What is the color for ovarian cancer ribbons? Teal blue.

Here are a few famous women who have died from ovarian cancer in the past 20 years: actresses Sandy Dennis (54), Dinah Shore (77) and Jessica Tandy (85), Ann Dunham (Barak Obama's mother, age 52), comediennes Madeline Kahn (57) and Gilda Radner (42), Coretta Scott King (78), and singer Laura Nyro (49). Perhaps in the next few years this hidden killer will be discovered in time with a simple test kit from your local drugstore, developed by engineers and scientists at the University of South Florida.



research

NEWS

The nanotechnology center has a new name. It is now called the **Nanotechnology Research and Education Center (NREC)**. Started in 2001 as the Nanomanufacturing and Nanomaterials Research Center (NNRC) the center was renamed to emphasize the interdisciplinary educational aspect of the center. Ashok Kumar, professor of mechanical engineering is the center's new director. For more information visit *http://nnrc.usf.edu/*.

AWARDS

Prestigious Grants Awarded

Two prestigious grants were awarded for thermal energy storage (TES) research to Prof. **Yogi Goswami**, director of the USF arm of FESC, and co-director of the USF Clean Energy Research Center (CERC). USF Co-PIs include CERC Director Prof. **Lee Stefanakos** and Mechanical Engineering's Prof. **Muhammad Rahman**.

Both awards address the groundbreaking science of concentrated solar power (CSP). CSP technology can be used to focus the sun's rays so as to generate heat, and later on, electricity. CSP plants combined with heat stores can then produce climate-friendly electricity around the clock as and when needed, even when the sun is not shining.

E-On International granted $814,108 for "Innovative Latent Thermal Energy Storage System for Concentrating Solar Power Plants." This project will produce encapsulated phase change material capsules of different sizes and melting ranges of use in several energy storage applications such as space heating and cooling, solar cooking, solar water heating, industrial process heat, greenhouse and waste heat recovery systems. Joining the Goswami-led USF research team, this project includes a research team from IMDEA Energía in Madrid headed by Prof. **Manuel Romero**.

US DOE granted $1.03M for "Development and Demonstration of an Innovative Thermal Energy Storage System for Baseload Solar Power Generation." The objective is to research and develop a thermal energy storage system based on encapsulated phase change materials to meet the utility-scale base-load CSP plant requirements at much lower system costs compared to the existing TES concepts, making it competitive with fossil fuels.

Professors **Dmitry Goldgof** and **Larry Hall**, Dept. of Computer Science and Engineering, have been awarded an NIH/SBIR grant funded for $799,812 (USF subcontract $309,842 in a collaborative effort with principal investigator Dr. Peter Mouton of Stereology Resource Center, Chester, MD.

Yicheng Tu, assistant professor of computer science and engineering and principal investigator has been awarded a five-year R01 grant from the National Institutes of Health (NIH), totaling $875,262 This is a collaborative project between Tu's group in CSE and those of **Sagar Pandit** from USF Department of Physics and Xingquan (Hill) Zhu from the Department of Computer Science and Engineering at Florida Atlantic University.

Craig Lusk, assistant professor of Mechanical Engineering and principal investigator in collaboration with **Alex Volinsky**, associate professor of Mechanical Engineering and Co-Principal investigator, received a three-year NSF grant totaling $368,000 to further their research on uncertainty quantification for compliant mechanisms.

Norma Alcantar, associate professor of chemical engineering, has received a $100,000 NSF grant to study the use of cactus mucilage to clean polluted water.

Mark Jaroszeski, associate professor in the Dept. of Chemical and Biomedical Engineering, recently received two grants to support his research on DNA delivery from the National Institutes of Health (NIH). A grant from the NIH funded by the National Institute of Allergy and Infectious Diseases is a two-year grant totaling $400,000 and a second NIH grant funded by the National Institute of Allergy and Infectious Diseases for a total amount of $367,500 over a two-year period.

The National Science Foundation has awarded USF scholarship funds for graduate students in civil and environmental engineering. The program will provide $150,000 in scholarship funding annually over a four-year period for a total of $600,000, providing up to 18 need-based scholarships every year to an integrated community of MS and PhD students who are educated in the water-energy-global nexus as related to sustainable water and transportation infrastructure. Professor **Jim Mihelcic** is PI, and co-PI's are Professors **Sarina Ergas**, **Qiong Zhang**, **Yu Zhang** (Civil & Environmental Engineering), **Amy Stuart** (Environmental & Occupational Health and Civil & Environmental Engineering), and **Allan Feldman** (Science Education).

alumni&students

ALUMNI NEWS

A Weekend Professional Masters' Degree Program in Electrical Engineering will soon begin. The program, specifically tailored for working professionals, consists of a 30-credit hour professional masters' degree in electrical engineering that can be completed in 10 months on weekends. For more information, contact the professors **Sal Morgera** (*sdmorgera@usf.edu*) or **Paris Wiley** (*wiley@usf.edu*).

Earn your certificate in one of these engineering areas and advance your career: Interdisciplinary Transportation Program, Materials Science and Engineering, Regulatory Affairs - Medical Devices, Systems Engineering, Technology Management, Total Quality Management, Transportation Systems Analysis, Water, Health and Sustainability, Wireless Engineering. For more information: *http://www.gradcerts.usf.edu/collegecertificates.asp*

Congratulations to **Athanasios "Sakis" Tsalatsanis**, a 2009 doctoral graduate in Industrial & Management Systems Engineering, is now an assistant professor of internal medicine at USF's College of Medicine. **Ali Yalcin** was Sakis' PhD advisor.

USF College of Engineering alum, **Robert "Bob" Higgins**, PE, is the new president of the Florida Engineering Society.

Henry Jean, of Tierra, Inc, sponsored the USF Alumni Reception of the Florida Engineering Society in Marco Island.

Congratulations to **John Ramil**, BS, MS. He recently took over as CEO of TECO Energy. Mr. Ramil began his career at Tampa Electric as USF student intern 34 years ago. He also is Chair of the USF Board of Trustees.

USF Professor Emeritus **Wayne Echelberger** was awarded the Guy E. March Medal, given annually in recognition by the Triangle Fraternity for positive interaction with the students, the institution and alumni, and for demonstrating the service and spirit of Guy E. March.

LEAN SIX SIGMA COURSE

A business process course aimed at improving a company's efficiency.

The College of Business is hosting the two-week executive education class January 10-14 (8:00 a.m. to 5 p.m.) and February 14-18 (8:00 a.m. to 5 p.m.). Registration is $3,500 and includes all meals, course materials, free software license, parking, and transportation to off-site activities.

Information can be found at *www.coba.usf.edu/leansixsigma.pdf*. Also, people can contact Ron Satterfield at *leansixsigma@usf.edu* or (813) 974-6756 for more information.

USF ALUMNI ASSOCIATION ENGINEERING

STUDENT NEWS

OUTSTANDING GRADUATING SENIORS SPRING 2010

Chemical & Biomedical Engineering:
Bradley James Ridder

Civil & Environmental Engineering:
Hong Ting Chiu

Computer Science & Engineering:
Francesco Di Natale and
Giuseppe Di Natale

Electrical Engineering:
Nathan Diego Quecan

Industrial & Management Systems Engineering:
Rezin Clark Howell

Mechanical Engineering:
Samuel McAmis

International Capstone Design Course civil engineering students **Angela Krause** and **Madelyn Rubin** won the Florida Water Environment Association FWEA Water/Wastewater Student Design Competition in Orlando.

Eva Williams, a doctoral student in the Department of Chemical and Biomedical Engineering, is the recipient of a pre-doctoral Ruth L. Kirschstein National Research Service Award from the National Cancer Institute /National Institutes of Health (NCI/NIH).

Jean Weatherwax, a sophomore majoring in Electrical Engineering and a Honors College participant, has been awarded a 2010 NASA MUST (Motivating Undergraduates in Science and Technology) scholarship.

Yang Tan, a doctoral student in the Department of Industrial and Management Systems Engineering, is the recipient of an inaugural USF Doctoral Dissertation Completion Fellowship.

Koustav Bhattacharya, a 2009 PhD graduate in Computer Science & Engineering received a USF Outstanding Dissertation Award for 2009.

Jayita Das, electrical engineering doctoral student, has been awarded the prestigious USF Presidential Doctoral Fellowship.

Roberto Donatto, a junior in the Department of Electrical Engineering, is the recipient of a prestigious national undergraduate scholarship from the U.S. Department of Homeland Security.

Jessica Weber, PhD, a recent graduate in the Department of Mechanical Engineering, is the recipient of a prestigious American Society of Engineering Education/National Science Foundation (ASEE/NSF) postdoctoral fellowship at the General Motors Global Research and Development Center in Warren, Michigan.

Leslie Rodriguez, a junior majoring in Computer Engineering, recently completed a summer internship at the National Science Foundation (NSF) in Arlington, Virginia. He worked in the Directorate of Computer & Information Science & Engineering (CISE) in the Division of Computer & Network Systems.

Javier Pulecio, a doctoral student in electrical engineering, has been selected as the recipient of the 2010 Hispanic Pathways Award in the student category.

Four current students and alumni were recognized by the 2010 National Science Foundation (NSF) Graduate Research Fellowship Program—**James Cooper**, **Joseph Register**, **Andre Garcia**, **Frank Alexander**.

David Cure, a PhD student in the Department of Electrical Engineering and a graduate research assistant in the Center for Wireless and Microwave Information Systems (WAMI), was awarded a 2010 NASA Graduate Student Researchers Program (GSRP) Fellowship.

Evelyn Benabe, a PhD student in the Department of Electrical Engineering and a research assistant in the Center for Wireless and Microwave Information Systems (WAMI), was awarded a 2010 IEEE Microwave Theory and Techniques Society (MTT-S) Graduate fellowship.

It's the 15th Anniversary of

BULL-ARNEY

Saturday, March 26, 2011

New location: **Wyndham Hotel**
700 N. Westshore Blvd.
(formerly the Quorum Hotel)

Sponsorships and Volunteer Positions Available

For more information contact
Joe Guida, jwguida53@verizon.net

USF Engineering Alumni Society

faculty&staff

Al-Aakhir Rogers, a PhD candidate in the Department of Electrical Engineering, was recognized as Honorable Mention/ Alternate by the Ford Foundation Diversity Dissertation Fellowship Program. He was elected to the USF Diversity Honor Roll for his leadership of activities that have expanded college awareness for students from disadvantaged and underrepresented backgrounds.

Michael Grady (Electrical Engineering) was awarded a GEM PhD fellowship by Corning, Inc.

Shamima Afroz (Electrical Engineering) was awarded a USF Graduate School Diverse Student Success Fellowship.

Michael Celestin, a PhD student in the Department of Chemical Engineering, was one of 10 students selected from a nationwide pool of applicants to participate in a NSF-funded graduate internship during summer 2010 at Sandia National Laboratory in Albuquerque.

Quenton Bonds, a PhD candidate in the Department of Electrical Engineering, received the best student poster award at the 11th Annual IEEE Wireless and Microwave Technology Conference.

Ophir Ortiz, a PhD candidate in the Department of Electrical Engineering, was awarded a National Research Service Award (NRSA) postdoctoral fellowship in Tissue Engineering and Biomaterials Science at the New Jersey Center for Biomaterials.

Trishelle Copeland-Johnson, a junior in the Department of Chemical and Biomedical Engineering, has been awarded an undergraduate summer internship at the U.S. Department of Energy Ames Research Laboratory.

MOUNTAIN BIKE ENTHUSIASTS

Larry Hall, professor and chair, Computer Science and Engineering created an app for—iPod and iPhone users called MT BikeQuest. It contains county park information, addresses and useful maps of mountain bike parks in the Central Florida area. It's a free download in iTunes, so give it a try.

RECOGNITIONS

Computer Science & Engineering Professors **Larry Hall** and **Dmitry Goldgof** have been named Fellows of the International Association of Pattern Recognition (IAPR).

Linda Phillips, Lecturer and Patel Associate at the University of South Florida (USF) in the Department of Civil and Environmental Engineering, was awarded the American Society of Engineering Education (ASEE) International Division's "Global Engineering and Engineering Technology Educator Award."

Miguel Labrador, associate professor in the dept. of Computer Science and Engineering, has been selected as the recipient of the 2010 Hispanic Pathways Award in the faculty category.

Alex Domijan, PE, PhD, professor of electrical engineering and director of the Power Center for Utility Exploration (PCUE), was named chair of the Florida Bioenergy Association.

Stephen Saddow, professor in the departments of Electrical, and Molecular Pharmacology and Physiology, delivered a Keynote Lecture to the 32nd Annual International Conference of the IEEE (Institute of Electrical and Electronics Engineers) Engineering in Medicine and Biology Society on September 3, in Buenos Aries.

Shekhar Bhansali, electrical engineering professor, was selected Alfred P. Sloan Foundation Minority Ph.D. Program Faculty Mentor of the Year for his role in encouraging and supporting minority students in their quest for doctoral degrees.

Associate Professor **Miguel Labrador**, Assistant Professor **Maya Trotz**, and Professor and Associate Dean **Thomas Weller** were elected to the USF Diversity Honor Roll.

Three College staff members received USF Outstanding Staff Awards. Congratulations to **Dee Allen**, Resource Management; **Sandy Van Etten**, Chemical & Biomedical Engineering; **Ali Akram**, Center for Urban Transportation Research.

Department of Computer Science & Engineering Ranks High in Graduate Program Review

A comprehensive review of the nation's graduate programs shows that the University of South Florida made notable progress by the year 2005, a time when many of USF's graduate programs were in the middle of a steep growth curve. The National Research Council released its "2010 Data-Based Assessment of Research-Doctorate Programs in the United States. The review studied 5,000 doctoral programs in 62 disciplines at 212 universities, using data up to 2005-2006.

Notably, in the 2005-2006 data-set:

- Psychology and Computer Science Engineering were ranked within the upper third of all programs in the discipline with respect to research activity.

USF STUDENT TEAM WINS ENGINEERING NATIONAL CHAMPIONSHIP

"Design it, build it and break it. And be the best."

A team of University of South Florida civil engineering students from the class of Professor Rajan Sen, won First Place - National Championship in the recently completed Student Engineering Design Competition also known as the "Big Beam Contest." In this annual design competition sponsored by the Precast Concrete Institute (PCI), teams compete within the seven PCI zones with the first-place winners from each zone going on to compete for the overall championship. This year, 30 universities competed in the seven zones with the USF's teams finishing first and third in PCI's Zone six.

The objective of the competition is for teams of students to take a real world engineering design problem and, with the supervision of a faculty advisor and the support of a local pre-stressed concrete producer, design, help to fabricate, and then test until failure their precast/pre-stressed concrete beam. After the beam testing, the students then complete a detailed report which is sent to PCI. Based on their report, the teams are judged on the basis of design accuracy, cost, accurate prediction of load capacity, report quality, innovation and practicality of design.

The winning student team members from USF's Department of Civil & Environmental Engineering are: Rick Cole, Justin Duncan, Frank Holz, Joe Paleveda, Jonida Pone, and Christopher Snee. Faculty advisor was: Prof. Rajan Sen. The sponsoring precast concrete producer was: Standard Concrete Products Inc., Tampa (John Robertson, Assistant V.P.). Mr. Robertson is a USF graduate and a former student of Prof. Sen.

USF Students from the winning team will share $2,000 in prize money awarded by the SIKA Corporation. The local sponsor, the Florida Prestressed Concrete Association (FPCA) though the FPCA Education Foundation will award USF's Department of Civil and Environmental Engineering an unrestricted gift of $2,000 for the student team's winning efforts.

The students from the winning team, faculty from USF's College of Engineering and representatives of Standard Concrete Products were honored at an awards ceremony in Tampa, October 29.

In addition to this year's National Championship winner, USF teams with Professor Sen as Faculty Advisor have won 1st Place Nationally, 2009 Best Report and 1st Place Nationally, 2008 Innovative Design in previous Big Beam competitions.

A video showing the fabrication and testing of the winning team's beam design (with music by Paul Okenfold) can be found at this YouTube site: *http://www.youtube.com/watch?v=-s8Z-djxEpo*.

Alum Renata Engel: Educator and Engineer

The current President of the American Society for Engineering Education (ASEE), Renata S. Engel, received her PhD in Engineering Mechanics from USF in 1988. "The department had a different name back then," she explains. "It was called Civil Engineering and Mechanics. At the time I was a graduate student at USF the environmental engineering program was just beginning to take off. And mechanics was aligned with civil engineering at the time because the roots of mechanics are in materials. I was happy to be there at a time when the transition was taking place." Prof. Engel has seen many transitions in education as a student, a research engineer and a professor. She is currently Associate Dean for Academic Programs at Penn State University. As a successful alumni and award-winning engineering educator, her story is especially appropriate for this issue of Envision.

Alum Leland Engel, Dean Wiencek, Renata Engel

"Being a graduate student is a marvelous time. You are able to focus on a particular area of interest. It is a time I will always treasure for that reason," Engel recalls fondly. "The faculty at USF played a significant role in how I viewed engineering and research and education. My advisor, Norman C. Small, was a phenomenal educator in every sense of the word. There was not a time that I did not learn something from him. I always walked away with something new. I still recall those interactions today – I think of him and wonder how he would have handled this situation or how he would have approached that problem." She also remembers how Small would take a complicated problem and make it as simple as possible without losing the essence. "What can we remove from this, how can we get it down to the bare bones," she continues. "He was successful in getting students to focus on what the important things were and how to avoid getting caught up in the distractors," she explains with sincere admiration and adds, "It was an art form."

Another USF professor was also instrumental in getting Engel interested in engineering education. "Stanley Kranc got me involved in outreach efforts with high school students. I was working with him on a summer high school program for local students to come to the campus. We did a number of engineering-type classes for them, and we would use the math and science that they already knew to introduce them to the elements of engineering." Working with the high school students, Prof. Engel surely must have felt a bond. "It was my high school physics teacher who inspired me to study the discipline of engineering," she explains. "I knew I wanted to be an engineer, even though I was not exactly sure what an engineer did," she laughs. "And I think a lot of our students today are still that way."

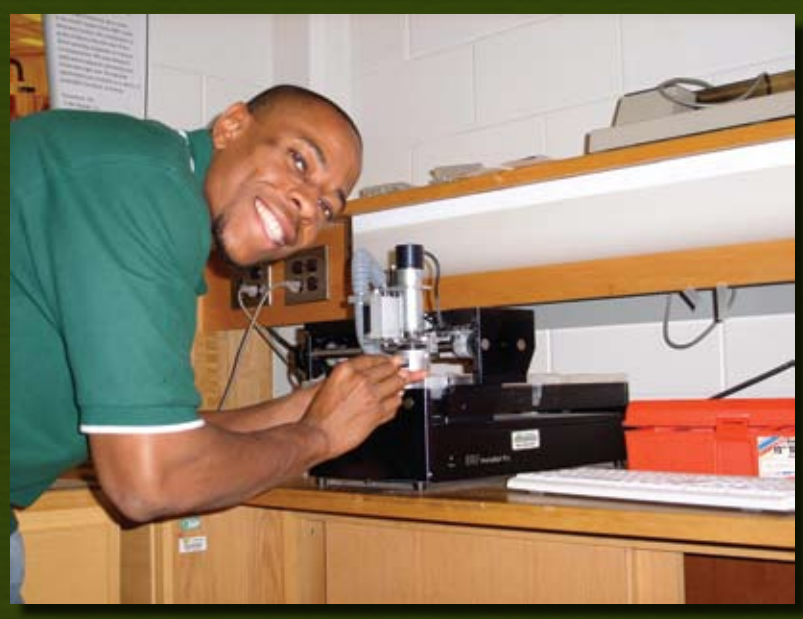
Prof. Kranc also encouraged her to join ASEE as a graduate student. She believes this advice is especially useful today. "It is a great way to network but also a way to learn about the varied roles that a faculty member has, what to expect in an academic career," she explains. ASEE also is a clearinghouse of fellowships such as DOD and NSF and you don't have to be a member to get this information. Another bit of advice she offers to graduate students is to attend as many seminars as possible. "People in universities are creators of new knowledge. That is what they do," she explains. "When you attend seminars you walk into a room, for free, and learn. That's pretty impressive." While enrolled in first-year numerical methods, she attended a required seminar in Approximation Theory. "It was not an engineering seminar. I was the sole engineer in the room. But I thoroughly enjoyed learning from all those mathematicians and I will always remember that."

When the inevitable question of how engineering students have changed in the last two decades, Prof. Engel is upbeat and encouraging. "Our students now come with a much better sense of community and being connected to society. Look at Engineers Without Borders

The "Artificial Astronaut"

Everyone has seen the pictures of astronauts cocooned within a space suit, easing a satellite from the space shuttle's bay, or watched the videos of scientists in T-shirt and shorts, careening about the International Space Station, weightless and free. What we don't see is the equipment that constantly monitors the astronaut's body temperature, heartbeat and a host of other biometric data. Uncomfortable, annoying and downright invasive, these probes, wires and even mechanical pills are the only way that critical biometric data is sent back to Mission Control.

Quenton Bonds, a PhD candidate (Bonds will graduate in December) in electrical engineering, has been awarded a NASA fellowship program to design a new non-invasive system for monitoring biometrics in space. Using microwave radiometers placed a few centimeters from locations about the astronaut's body, the system wirelessly relays data on surface and core temperature to local antennas which is then transmitted back to medical teams on Earth. Like a satellite-mounted radiometer that maps the earth's ocean, this technology will map the human body. Like the surface of the earth, the human body is mostly water.



Quenton Bonds working at the milling bench

Quenton and his advisor, Thomas Weller, professor and associate dean for research, are also working on a test bed consisting of different tissue sample materials with the same electrical properties as human skin, bone and muscle. This "artificial astronaut" will enable them to accurately measure the temperatures of the body and the air layer between the body and the sensor.

It is a long way from Montgomery, Alabama to NASA. The young man who was advised by a high school counselor to "go to trade school" has been awarded the NASA Harriet Jenkins Pre-doctoral Fellowship in 2006 and the NASA Graduate Student Researchers Program in 2009. He has interned at AMES Research Center, in Moffett Field, California, Goddard Space Flight Center in Maryland, and Glenn Research Center in Cleveland, Ohio. He will join the NASA's Microwave Instruments Branch at Goddard upon graduation.

Fortunately, Quenton did not listen to the counselor; he wanted to go to college. Boosting his GPA by getting straight A's as a high school senior, he convinced the Chair of the Math Department, Dr. Wallace Maryland, to give him a chance at Alabama State University. He made the grades his first semester and was awarded a scholarship. Quenton served as president of the NSF Louis Stokes Alliance for Minority Participation (LSAMP) student organization and graduated from ASU with a bachelor's in mathematics and a minor in computer science - with honors.

"When I graduated, I decided to give back," he explains. "I was always big on my neighborhood and community. My mom worked for the state and my dad drove a cab. So after graduating, I taught high school for three years. I taught math, science, algebra and computer networking at one of the poorest schools in the state." He then set his sights on a master's in electrical engineering. When he was in high school and college, he had a small business selling stereo equipment. Always fascinated by electronics, he says, "I made some money selling amplifiers and speakers, but now I wanted to learn how to make them."

and Engineers for a Sustainable World. Our students are studying engineering but they are also working on outreach to junior and senior high schools," she explains. "I don't remember having those opportunities when I was an undergraduate."

Looking both ahead 20 years and back to her experience, Engel channels Prof. Small and cuts out all the distractors. "The education that was devised for me 20 years ago as undergraduate was the right education for me at the time," she says without hesitation. "Somebody was paying attention then, and I think that's what is happening now," she adds. "But students are also changing, so the picture keeps changing." She emphasizes that the class you teach today has got to prepare them not for today, but for the uncertain future. "More than just teaching content, it is how to teach students to approach learning itself, including content and technology."

"The opportunities students have today are different than the ones I had when I graduated," Engel allows. "So as educators we need to keep in mind the 'piece in the middle' – the curriculum that accommodates both incoming student sensibilities and future educational needs."

"When you see the light bulb go on above a student's head," she says, "there is no greater sense of reward. They get it, and they can move on with it, they don't have to revisit it." A pause and she adds a bit wistfully: "It is a fleeting reward. But it is also a thing of beauty."

While looking for a graduate program, Quenton attended the Society of Women Engineers (SWE) national conference in Birmingham and was encouraged by College of Engineering student ambassadors to apply to USF and explore research opportunities with the Center for Wireless and Microwave Information Systems (WAMI). He was subsequently awarded an NSF Florida Georgia LSAMP Bridge to the Doctorate fellowship in Fall 2004.

According to Quenton, "my graduate school experience in the College of Engineering has been ideal - the relationships with both NASA and my major professor have enabled me to address real-world engineering problems. I am fortunate to have the opportunity to complete my Ph.D. work in exactly the area that I have always been interested (wireless technology) and to make a scientific contribution that is interdisciplinary. Both the Bridge to the Doctorate and WAMI programs have been instrumental in my success. I am extremely grateful for the support and mentoring that I received here at USF."

With unshakable faith, Quenton believes that the opportunities given to him are for a purpose. His inspiration comes from helping young people, exposing them to technology, and being a role model himself. His motivation? "I have a responsibility," he says simply, "I can't waste it."

2010 Heart of Gold Scholarship Luncheon

$150,000 in scholarships to 113 deserving engineering students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1 - Dean Wiencek and Past Dean Burdick present Kimberlee Fraser with the Glenn & Joyce Burdick Fellowship for Graduate Study in Engineering

2 - Student Speaker, Casey Forner, FACERS Scholarship Recipient

3 - Traditions Hall at the Alumni Association Center

4 - Robert Garcia speaks about the scholarship he endowed in memory of his sister

5 - Dept. of Civil & Environmental Engineering Chair, Bill Carpenter, Dean John Wiencek and Bob Gordon, present Casey Forner and Shirley Suprina with the FACERS Scholarship

6 - Dean John Wiencek and Barbara and Len McCue present Kyle Jeffries and Brandon Marks with the Q Motor Sports Family Student Racer Scholarship

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

USF: UNSTOPPABLE
College of Engineering

Mandi Alexander, Associate Director of Development

Alumni and Friends,

We've had a busy summer and strong start this fall. Between our annual lunch for donors and scholarship students called "Heart of Gold" where we announced $150,000.00 in scholarship awards to 113 students to attending the Florida Engineering Society/USF College of Engineering reception in Marco Island hosted by Tierra – we've had the chance to meet and talk with many of you. At both events it was wonderful to see friends, alumni and students sharing their passions, memories and aspirations.

The University of South Florida and the College of Engineering have grown tremendously over the time that I have been a part of the Bulls family. I have seen a new student success center, new teaching and research labs, new faculty, a new web site and a new publication. These all indicate a place on the move. Witnessing these things while meeting the many new students joining our ever-growing family is just a part of what makes this campus feel like home.

Over the past three and a half years, it has been my pleasure to meet and visit with many of our dedicated Engineering alumni and friends. If we haven't met yet, please feel free to contact me . I am still making my rounds and look forward to visiting you soon to share all the new excitement involving the College.

I often tell people the best part of my job is being able to visit with those who love the University of South Florida and the College of Engineering. Your stories are a powerful reminder of what USF and the College mean to you. We share a common bond as we have walked the same sidewalks and hallways – interacted with some of the same faculty and maybe even had coffee in the Hall of Flags.

As part of the Bulls family, I encourage you to come back, share your stories with us and visit campus. When you do visit, bring your family and friends to show them why you are proud to an alumnus of the College of Engineering. If you are not already involved, we'd love to have you. Opportunities abound with the Engineering Alumni Society, our Corporate Ambassadors program, Engineering EXPO during Engineering Week and of course, Bull-arney!

Our director Brett Woods and I take great pride in being your development officers and working with you to make your great College greater; whether it is through your gifts, your increased involvement or both. As you have likely heard, the University is in the midst of its largest comprehensive fundraising campaign in its history—the UNSTOPPABLE campaign. We look forward to grabbing coffee with you, hearing your stories and discussing with you the ways in which you can make a difference by leaving your own UNSTOPPABLE imprint on the College of Engineering.

Fall is in full swing with football season upon us; please look for us in the Bulls Zone tailgate on November 20 and December 4. We'll show you how to "engineer a touchdown"!