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*Department of*

# Mechanical & Aerospace Engineering



NaviGATOR  
Photo by Bryan Ridgeway



Photo by Carl Crane

# Crane and Crew Put Robot Car to the Test

By Matthew Clark

Ask Carl Crane at the Center for Intelligent Machines and Robotics (CIMAR) how important ten seconds is.

Ten seconds cost Team Gator Nation a slot in the finals of the 2007 DARPA Urban Challenge, an honor they easily obtained in the 2005 off-road competition.

The DARPA Challenge is an event sponsored by the U. S. Air Force to support research and innovation of “autonomous” or unmanned vehicles. Team Gator Nation competed along side other institutions such as Carnegie Mellon, Stanford and the Massachusetts Institute of Technology to produce a vehicle that could navigate through a city-like environment and could perform simulated supply missions while merging into traffic, passing through intersections and avoiding obstacles all on its own. Essentially, it had to maneuver without a driver through a course set up on an old Air Force base in California.

“It’s very similar to driving on campus,” Crane said. “We didn’t know they were going to do [the second DARPA challenge]. [The research] was trying to guess where you wanted to put your effort.”

Crane and his team developed the NaviGATOR, a hybrid Toyota Highlander, with sensors, a computer and GPS unit that could determine its location and identify obstacles to maneuver around them.

The system contains four basic components in its programming to direct the vehicle. They all work in conjunction with one another to allow the vehicle to drive itself. It was an extension of the Joint Architecture for Unmanned Systems (JAUS) network that the group used in the 2005 DARPA competition. This programming allows different components to talk and interact with one another.

The first component is a planning element, which includes files directing the vehicle with simple navigation on roads, lanes and intersections. The planning element also contained mission file data that sets coordinates for the vehicle to travel upon.

Second is a control element to keep the vehicle on a specified course. This includes the immediate course it is on and perceiving the course ahead of it.

Third is a perception element that performs the car’s sensing tasks, including cameras and GPS. These elements create grids for the vehicle to travel on based upon coded regions with error codes. Working with the other components the vehicle judges a path and decides whether or not to travel on it.

Lastly, the intelligence element combines all of the above to allow the NaviGATOR to interpret data and to drive according to specific behaviors, such as driving under normal conditions, changing lanes and turning into traffic.

The team was also part of a marketing effort on behalf of the University of Florida during the 2007 BCS National Championship game. In conjunction with the UF marketing, Team Gator Nation was recognized with a Golden Gator award from UF 's University Relations. The Golden Gator awards recognized "outstanding examples of public relations tactics, techniques, products or other elements of programs of campaigns executed by UFCN members." The group received first place in the Communications Program category for the research display set up at the BCS Championship game in Glendale, Ariz. in January 2007.

DARPA allotted a 10-second window of opportunity to turn into traffic with other cars. Unfortunately, the NaviGATOR failed to turn across and into oncoming traffic during that window.

Crane explained that The NaviGATOR performed well, saying that the vehicle accurately determined a safe time to turn, it just didn't do so fast enough.

"The sensors were just picking up traffic in both directions and taking too much precaution to turn," he said. "We've changed parameters to make it more responsive."

"It's a good challenge. You're given a problem and you decide how you are going to attack it with the resources you have."

With more improved technology, the NaviGATOR will be better equipped to process information at a faster rate, Crane says.

"That's going to be a big outlet of where our working is going," Crane said.

Funding for this project came from Smiths Aerospace (acquired by General Electric in May 2007), Eigenpoint Co. and the U.S. Air Force

"The military mandated that they wanted a percent of their vehicles unmanned [in order to] preserve life," said Eric Thorn, a graduate student and member of Team Gator Nation who worked on the project. "That's the driving force behind this work."

Even though this technology is for military use, it has many applications in the commercial industry as well. General Motors has already been showing off its prototype autonomous vehicle that also competed in the DARPA challenge.

Crane sees many commercial applications in the future, including cars being able to communicate with one another at intersections and with magnetic sensors in road lanes.

In the 2005 DARPA Off Road competition, Team Gator Nation developed a similar autonomous vehicle with four-wheel drive. They spent a month in Arizona testing and advanced to the finals in that competition. It was a GPS error in tracking causing the vehicle to go off course that caused them to lose that competition.

A lot of the problems these vehicles face have to do with technology errors and minor glitches, Crane says. These can be improved with more fieldwork and better funding.

Smaller technologies have already made their way to the factory lines in the form of rear-view cameras and blind-spot sensors, Crane says.

It is the kind of scientific investigation that makes the UF a keystone research institution.

"You get a certain caliber of students who see us working on projects like this," Team Gator Nation member Nicholas Johnson said. "That's why I came here."

"It brings prestige not just to the College but to the University."

# UF Society of Automotive Engineers

By Lori Harrington

The UFSAE Formula team achieved a rolling chassis in late December and completed their first drive on February 23. Currently, test schemes are being developed to validate each system and prove their reliability. The brand-new Honda CBR600RR motor is proving to have a lot of potential, making in excess of 85 horsepower and 45 foot pounds of torque, which is more than any year in the program's history. By the end of March, the newly designed fiberglass composite body will be complete and sent off for paint and graphics. The team is planning a rigorous testing schedule to ensure vehicle reliability and optimize system performance at the competition. During testing, a mobile data acquisition system will be used to monitor and analyze important engine and vehicle data.

In a collaborative effort, Michigan State University came to UF for testing in March and the UFSAE team will join MSU for testing at their campus during the week prior to the final competition in May. Working together has helped both teams improve their overall performance and ranking at the international competition.

The UFSAE Baja team is coming to the

completion of their new chassis, while working on finishing the front suspension and drivetrain. Once the car is complete and drivable, the team plans to focus on testing and tuning the vehicle's suspension and continuously variable transmission (CVT). Last year's fifth place finish was due largely to the analysis and tuning of the CVT, therefore the team will be searching for further improvements. The Baja team will join the University of South Florida for testing and comparison of their cars at locations throughout central Florida. As with MSU, collaborative testing with USF has enhanced the performance and ranking of the UF Baja team at the international competition.

During the last two semesters SAE hosted three field trips for Teen Zone, an after-school program for middle school students, as well as a GatorTrax session. This was an opportunity for the students to tour our facilities, learn about the Baja and Formula car projects and gain exposure to hands-on engineering. Students were placed in groups and given the SAE Foundation's "A World in Motion" electric vehicle component kits. Volunteers explained the relationship between

torque and applied power to the students and how to select the proper size and location of gears and wheels to meet certain goals.

In February, SAE participated in the College of Engineering's Engineering Week by giving tours to middle school and high school students, displaying the Formula and Baja cars at the Engineering Fair and competing and finishing in fourth place in the Engineering Bowl. SAE also partnered with the Society of Women Engineers for the National Introduce a Girl to Engineering Day, by giving tours of our facility to 40 middle school girls.



SAE team members conducting engine and drivetrain development.

## Faculty News

**S.A. Sherif**, Director of the Wayne K. and Lyla L. Masur HVAC Laboratory, has been selected by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) as a Distinguished Lecturer for the period of July 1, 2008 - June 30, 2010. The program was developed 11 years ago to provide ASHRAE chapters with top-notch lecturers equipped to speak on relevant subjects of interest to members and guests. In 2008, eight ASHRAE Distinguished Lecturers were selected. Contact Sherif at [sasherif@ufl.edu](mailto:sasherif@ufl.edu).

**Lou Cattafesta** delivered a series of invited lectures on modern flow control at the University of Southampton School of Engineering Sciences, Southampton, U.K., February 26-29. Contact Cattafesta at [cattafes@ufl.edu](mailto:cattafes@ufl.edu)

**B.J. Fregly** was recently awarded a grant from the National Institutes of Health to use computational methods to teach people with knee arthritis to walk differently. The goal is to use patient-specific computer models to predict what each patient should do to offload the diseased side of the knee. The method will allow doctors to provide real-time feedback to help patients achieve their optimal walking motions. Contact Fregly at [fregly@ufl.edu](mailto:fregly@ufl.edu).

In 2007, **Scott Banks** traveled the globe giving invited lectures in Switzerland, South Africa, Japan and Australia. In October 2007, Banks gave the Tewkesbury Fellowship Lecture in the Department of Mechanical Engineering at the University



Doctoral student Dipankar Ghosh, Ghatu Subhash, and American Ceramic Society Chair Dongming Zhu.

**Ghatu Subhash** and doctoral students **Dipankar Ghosh** and **S. Maiti** received second prize for Best Paper at the 31st International Conference on Advanced Ceramics and Composites for their paper, "Static and Dynamic Indentation Response of Fine Grained Boron Carbide." Contact Sughash at [subhash@ufl.edu](mailto:subhash@ufl.edu). Contact Professor Subhash at [subhash@ufl.edu](mailto:subhash@ufl.edu)

of Melbourne, Australia. He was the Presidential Guest Lecturer at JOSKAS, the combined meeting of Japanese orthopedic societies for knee surgery, arthroscopy and sports medicine in Sapporo, Japan, where he presented "Dynamic radiographic characterization of knee kinematics." In April 2007, he was one of four invited guest lecturers, and the only engineer, at the South African Arthroplasty Congress in Drakensberg, South Africa, where he gave four presentations. Banks also presented "Knee Arthroplasty Design Does Make A Difference in Patient Function" at a March 2007 symposium on current issues in the management of knee osteoarthritis in Basel, Switzerland. This symposium is a gathering of 18 experts in the field, only two from the U.S., to discuss current treatments for knee OA and the potential for future advances. Approximately 300 surgeons and researchers participated. Contact Banks at [banks@ufl.edu](mailto:banks@ufl.edu)

## New Faculty

### Hitomi Yamaguchi Greenslet



Hitomi Yamaguchi Greenslet was born in Aichi, Japan. She received her B.S., M.S., and engineering doctorate from Utsunomiya University, Japan. She has previously

worked as an associate professor in the Department of Mechanical Systems Engineering at Utsunomiya University, and as a visiting researcher at Georgia Tech and NASA-Glenn Research Center in Cleveland, Ohio. Her current research interests are in magnetic field-assisted machining processes, ultra-precision finishing processes and micro-machining processes. Her personal interests are playing piano and flute, listening to classical music and attending live orchestra performances.



W. Gregory Sawyer and Tony Schmitz have had a recent resurgence of interest in the “Pigskin Professor” videos they made in collaboration with Digital Worlds Institute in 2003. The series of entertaining videos describes fundamental engineering concepts in the language of football. The project was funded by the National Science Foundation and originally aired on the electronic scoreboards at Ben Hill Griffin Stadium during the six UF home football games of the 2003 season. Recently the videos have been posted on YouTube and are available for unlimited viewing. The videos can be located by using the search term “pigskin professor.” The videos can also be found at the following address: <http://highspeedmachining.mae.ufl.edu>. Contact Sawyer at [wgsawyer@ufl.edu](mailto:wgsawyer@ufl.edu), or Schmitz at [tschmitz@ufl.edu](mailto:tschmitz@ufl.edu).

Professor **Tony Schmitz**’s work as part of the Smart Machining Platform Initiative will be featured in the April edition of ASME’s Mechanical Engineering magazine. The story will be available online at <http://www.memagazine.org>.

**Oana Cazacu** and Director of UF REEF **Row Rogacki** have established the International Center for Applied Computational Mechanics (ICACM). The purpose of ICACM is “to facilitate the exchange and application of the world’s most advanced knowledge in applied mechanics and mathematical sciences and in interdisciplinary fields like robotics, energetics, biomechanics and environmental engineering.” The first ICACME Workshop was held March 28-30, 2007, at UF-REEF. The second workshop is scheduled for May 28-30, 2008, in Rocamadour, France. For more information visit [www.icacm2008.hmg.inpg.fr](http://www.icacm2008.hmg.inpg.fr). Contact Cazacu at [cazacu@gerc.eng.ufl.edu](mailto:cazacu@gerc.eng.ufl.edu) or Rogacki at [jrogacki@gerc.eng.ufl.edu](mailto:jrogacki@gerc.eng.ufl.edu)

UF was Awarded \$500,000 in a research and development grant to develop a catalytic chemical reactor system to convert woody biomass to biodiesel. **Jacob N. Chung**, Eminent Scholar and Andrew H. Hines, Jr. / Progress Energy Professor is the project director and principal investigator. The Co-PI’s are **H. A. Ingley**, MAE, along with Hagelin-Weaver and J. Weaver from chemical engineering. The objectives of the proposed project are to develop the most efficient and effective catalyst for the conversion of synthesis gas to biodiesel and to design a scale-up/optimization plan for industrial operation. Engineers and technicians from the NU Power Technology, Inc. will also participate in the research. John Anderson, CEO of NU Power Technology, Inc. in Live Oak, cost-shared \$1 million of the project. Florida is the top producer of biomass in the country and ranks third in the nation in energy consumption. Therefore, the project will focus on the potential of producing nine million gallons of biofuels per year from an estimated 93 million tons of dry biomass

created each year in Florida, allowing the state to move forward in its quest for energy independence. Contact Chung at [jchung@ufl.edu](mailto:jchung@ufl.edu) or Ingley at [ingley@ufl.edu](mailto:ingley@ufl.edu).

The Florida Institute for Research in Energetics (FIRE) is a research/educational institute focusing on computational energetics. UF, Purdue, Georgia Tech, the University of Illinois Urbana-Champaign and the Air Force Research Lab at Eglin Air Force Base are formulating FIRE. **Andreas Haselbacher** and **S. Balachandar** are two of the research PIs. **Row Rogacki**, director of UF REEF, is administrative director.

Four professors received the MAE Endowed Term Professorships. They are: **James Klausner**, Ebaugh Professor, **Greg Sawyer**, Ebaugh Professor, **Ghatu Subhash**, Millsaps Professor and **David Hahn**, Millsaps Professor. The professorships are named by an interdepartmental selection committee and carry a five-year term.

**Vernon P. Roan Jr.**, professor emeritus at the University of Florida, is among the 2007-08 class of 27 engineers and scientists from industry and academia to be recognized by SAE International with Fellow grade status. Roan will receive an award commemorating his status during the SAE 2008 World Congress Awards Ceremony in Detroit this April.

The SAE Fellowship is the highest grade of membership issued by SAE International. It recognizes outstanding engineering and scientific accomplishments by an individual that have resulted in meaningful advances in automotive, aerospace and commercial vehicle technology. This honor, established in 1975, is bestowed upon an average of 20 worldwide recipients each year. Roan is being recognized for his 35 years of pioneering research and development of hybrid and fuel cell vehicles.

# THE *Curie* LECTURE SERIES



The 50 meter high Coops Shot Tower in downtown Melbourne was built in 1890 to manufacture lead shot balls for shotguns. Closed in 1961, the tower was covered with an 84 meter high glass dome in 1991 when it was incorporated into the architecture of Melbourne Central shopping complex. Professor B.J. Fregly spent three months of his recent sabbatical at the University of Melbourne in Melbourne, Australia, where he worked on developing new computational technologies to improve the treatment of knee osteoarthritis and cerebral palsy. In his free time, he and his family enjoyed seeing the many fascinating animals in Australia and even chased kangaroos at a state park. Photo by B.J. Fregly



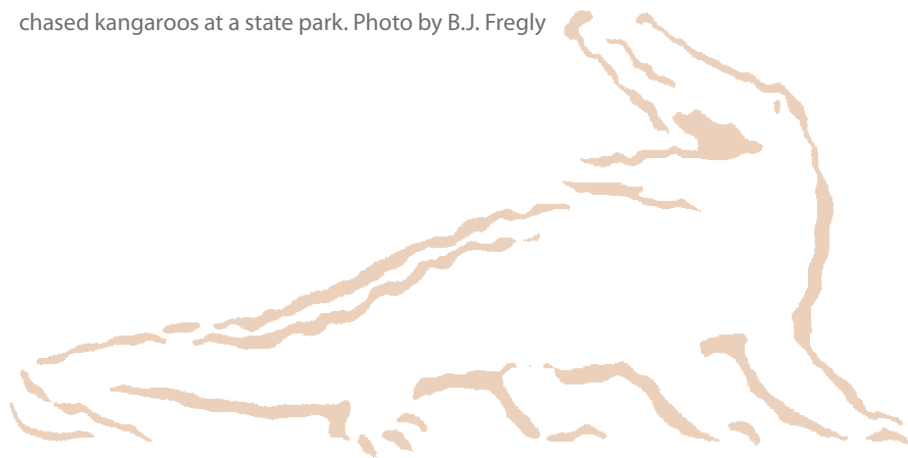
**Nancy R. Sottos**

**Nancy R. Sottos** of the Department of Materials Science at the University of Illinois at Urbana-Champaign, was the 2008 Curie Lecture Series speaker. Sottos, who is the Donald B. Willet Professor of Engineering at IUC, attended a

luncheon and presented a seminar entitled, "Self-healing Materials Systems." Professors **Malisa Sarntinoranont, Youping Chen, Peter Ifju** and **Greg Sawyer** organized the events. At the luncheon, Sottos candidly answered questions from the female faculty and students in attendance. The questions ranged from the personal to the professional, and feedback from those in attendance was enthusiastic. Sottos' seminar covered innovations her research group has made in self-healing polymer materials, or first generation materials included a microencapsulated monomer and a catalyst within a brittle matrix. Sottos explained that material released from the microcapsules mend the host material upon cracking. Second generation materials utilize a vascular system to distribute the healing agent, much like biological equivalents. The Curie Lecture was established in honor of Marie Curie. She was both a physicist and chemist and the first female winner (1903) of the Nobel Prize. Curie is still the only person to have been awarded the prize in two different sciences.

## MAE Lecture Series

Each semester the department is host to many interesting and distinguished speakers as a part of the MAE Lecture Series. These one-hour seminars are free and open to all MAE faculty, students, alumni, and other interested parties. For a complete list of scheduled speakers please visit [www.mae.ufl.edu/seminars.asp](http://www.mae.ufl.edu/seminars.asp).



# Student News



Members of the MAE Graduate Student Council. (L to R) Fotouh Al-Raqom, Jignesh Sutariya, Sydni Credle, Marcus Johnson, Rachel Colbert, Ben Griffin and Shawn Allgeier.

The MAE Graduate Student Council (GSC) was formed during the Fall 2007 semester by a group of seven student volunteers with the mission to provide social and professional networking opportunities for graduate students in MAE. The GSC kick-off event was the Fall 2007 MAE Picnic at Lake Wauburg. Members of the GSC helped to organize the transportation to and from the park as well as coordinate a wide range of fun activities throughout the day. Recently, the GSC helped to facilitate the MAE Recruitment Weekend held February 21-23, 2008. The two-day event brought prospective graduate students from across the country to visit the MAE Department, interact with professors and hopefully decide to continue their academic studies here as a part of the Gator Nation. The next GSC event is the MAE graduate student movie night scheduled for March 27. Beverages and refreshments will be served. For more information, contact Marcus Johnson at [marcus1518@yahoo.com](mailto:marcus1518@yahoo.com).



Kenneth Rivard, Ryan Cardillo, Katherine Faist, Ivana Kennedy, Jimmy Roark, Christina Mills, Garrett Pataky, Jon Runyon and Travis Vitello.

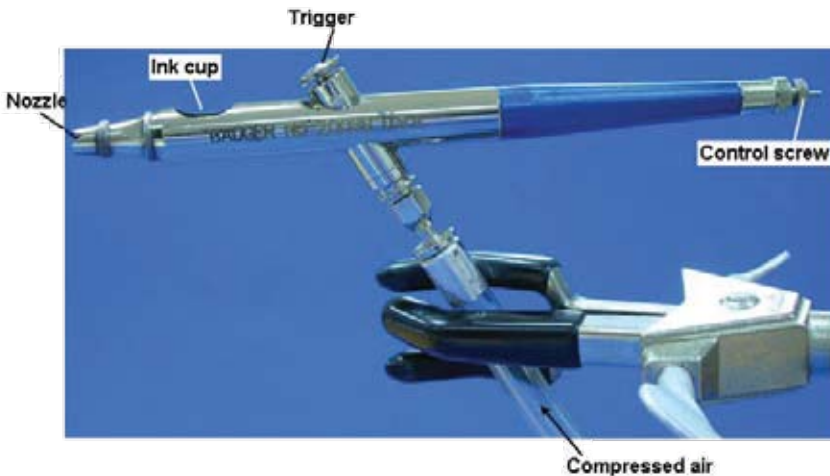
Officers and members of the Florida Sigma Omicron chapter of Pi Tau Sigma, the mechanical engineering honor society, attended the national PTS convention in February at Georgia Tech, where their chapter received the outstanding service award. **Gloria Weins** is the faculty adviser for the UF chapter, as well as the International Vice President of the honor society. Future UF chapter PTS events include helping organize the First Annual MAE Undergraduate Research Symposium, which will coincide with the department's MAE Alumni and Awards Weekend. Contact PTS president Kenneth Rivard at [kr9197@ufl.edu](mailto:kr9197@ufl.edu) or Weins at [gweins@ufl.edu](mailto:gweins@ufl.edu).



The UF Small Satellite Design Club (SSDC) is a student-led organization whose primary goals are to create awareness of space systems and operations while preparing students for their professional careers. They are technically supported by the Space Systems Group (SSG) and advised by **Norman Fitz-Coy**. The SSDC team is participating in the Fourth Annual Florida University Satellite (FUNSAT) Competition with an end goal of launching UF's first student-built satellite, "Cubesat." On the basis of a conceptual design report, the team was awarded \$1,000 to assemble a detailed design report. For the latest on their mission, please refer to their Web site at [www.ufsmallsat.com](http://www.ufsmallsat.com).



UF Small Satellite Design Club E-Fair team.



**Corey Walker**, an MAE undergraduate working with **Hugh Fan**, is the lead author of a paper entitled, "Investigation of Airbrushing for Fabricating Microelectrodes in Microfluidic Devices." The paper, which appeared in the February 2008 online edition of the journal *Electroanalysis*, presents a method for using an airbrush to make microelectrodes—highly sensitive, fingernail-sized devices used in an increasing range of consumer, research and medical products, such as off-the-shelf glucose monitors for diabetics. Contact Fan at [hfan@ufl.edu](mailto:hfan@ufl.edu).

**Victor Picheny** and **Christian Gogu** are participating in a joint doctoral program with the Ecole des Mines of St. Etienne in France. Picheny had spent the past two years at UF, and Gogu had been at UF for 18 months. Now, both are in France to continue their studies. They participate in regular video conferences via the Internet with their respective committees. Picheny is directed by **Rafi Haftka** and **Nam-Ho Kim**. Gogu is directed by Haftka and **Bhavani Sankar**. Both students have two French professors who also direct them.

**Matt Williams**, **Benjamin Griffin**, and **Brian Homeijer**, together with professors **Bhavani Sankar** and **Mark Sheplak**, co-authored three conference papers on circular plate mechanics. The papers entitled, "Vibration of Post-Buckled Homogeneous Circular

Plates" and "The Nonlinear Behavior of a Post-Buckled Circular Plate," were accepted for poster sessions at the IEEE Ultrasonics Symposium and the Sixth IEEE Conference on Sensors in October 2007. The third paper, "Large Deflections of Clamped Composite Circular Plates with Initial In-Plane Tension," was presented at IMAC XXVI, a conference and exposition on structural dynamics in February 2008. The results of these works will support the optimal design of MEMS microphones, ultrasonic radiators and proximity sensors that utilize circular plates.

**Jonathan Walter**, a doctoral student under **B.J. Fregly**, will be spending the summer at the University of Melbourne, Australia, to continue a collaboration started by Fregly.

In December, UF's ASME student organization, led by **William Lear**, toured E-one in Ocala. ASME students were able to witness the entire design process of assembling and testing emergency vehicles. The E-one staff led students through three of their plants and performed a few manufacturer-specified tests with their 110-ft. aerial ladder that is capable of holding 300 pounds. Spring semester events for ASME include the first general body meeting, a tour of Anheuser Busch, GatorTrax (a program to help middle and high school students with math and science), Relay for Life, a tour of Tropicana, the Engineering Bowl and the Second Annual Car Show. For more information contact Lear at [lear@ufl.edu](mailto:lear@ufl.edu)



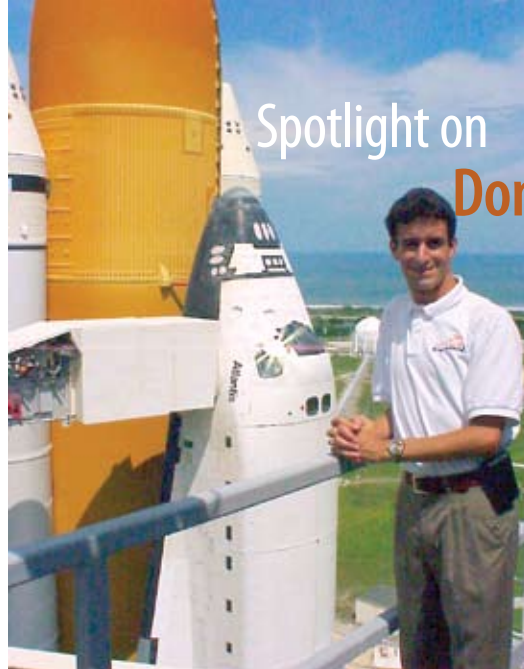
**Current Residence:** Titusville, Fla.

**Graduation:** B.S. in Aerospace Engineering, May 2002

**Current Employer:** Booz Allen Hamilton, Melbourne, FL

**Current Job Title:** Senior Consultant

Alumni updates are always encouraged and accepted. Please send yours to the MAE newsletter editor, Christine Schmitz, at [chrischm@ufl.edu](mailto:chrischm@ufl.edu).



## Spotlight on

# Domenico Anthony Ruggiero

### Background information

Domenico Ruggiero was an undergraduate researcher for **Rafi Haftka**. He also was involved in the flight test engineering program with **Edward K. Walsh**, where he developed a LabView Virtual Instrumentation (VIN) that was used to view recorded or real-time data from the department's Cessna 152 experimental test bed. During his senior year, he was the remote pilot of the micro air vehicle and successfully captured the target image during the 2002 MAV Competition. At graduation, Ruggiero was the recipient of the Dean Weil Engineering Leadership Award.

### Professional Update

Following graduation, Ruggiero began working at NASA's Kennedy Space Center in the orbiter structures engineering department of United Space Alliance (USA), a NASA contractor responsible for the processing of NASA's fleet of space shuttles. In addition to participating in the orbiter major modification (OMM) of OV-103 Discovery, his experience in the group was utilized during the STS-107 Columbia reconstruction effort in a hangar at the Kennedy Space Center following the loss of Columbia's crew on February 1, 2003. Ruggiero's work at NASA included efforts leading up to STS-114 "Return to Flight" in 2005, where he also played a part in the resolution of an in-flight anomaly for OV-103 during STS-121, and the borescope inspection efforts following the mission. Ruggiero can be seen in a video depicting the sequence of events leading up to the in-flight anomaly, (which was determined to be due to a series of process escapes, or errors). The video can be found at [www.countdownonline.tv/cdc01\\_link06\\_full.htm](http://www.countdownonline.tv/cdc01_link06_full.htm).

Ruggiero was able to apply his programming skills toward developing an enterprise software application, the Shuttle Engineering Disposition System (SEDS), which is now utilized by

more than 30 systems engineering groups within USA and by their respective NASA and Boeing counterparts. For this effort, Ruggiero received internal company awards, as well as a NASA Software Award. His SEDS work led to a new position with the Collaborative Integrated Processing Solution Team (CIPS), a team targeted to develop business systems in support of procuring new contracts with NASA's Constellation Program.

Ruggiero has served the local section of the American Institute of Aeronautics and Astronautics (AIAA), first as the Young Professional Chairperson, and later as Vice-Chairman and then Chairman. During his time with AIAA, his section received numerous awards. At the AIAA regional student conference in Nashville, Tenn., Ruggiero served as a graduate student oral presentation judge, an industry panelist related to working in the real world, and as a recruiter for USA.

In November 2007, he began working as a senior consultant with Booz Allen Hamilton, a leading global strategy and technology consulting firm. He is based out of Melbourne and works on-site with clients at the NASA Kennedy Space Center. He performs a variety of systems engineering assessments of the ground systems being developed for the NASA Constellation Program, the next generation of NASA's space vehicles, with the goal of providing continued access to the International Space Station, a return to the moon, and onwards to exploration of Mars.

### Personal Update

Ruggiero says that despite his professional success, the titles for which he is most proud are that of husband and father. He married his wife Sonia in September 2005 and celebrated with a two-week tour of Italy and the Vatican. Nine months later they welcomed their son Michael into the world. In June, they will welcome their second child.

Ruggiero says, "Being married with a family has been the most life-changing experience of my life. Regardless of my past professional success and the unknown details of my future, I have

# Andrew H. Hines

Alumnus **Andrew H. Hines, Jr.** received an honorary Ph.D. from the University of Florida's College of Engineering at the Fall 2007 Commencement Ceremonies. A luncheon was held in the Arredondo Room at the Reitz Union in honor of Hines. College of Engineering Dean Pramod Khargonekar presented Hines with a commemorative Gator statue in honor of the event.

Hines was born and educated in Florida and has devoted much of his life to making Florida a better place to live, work and receive an education. He was born in Lake City and grew up in Trenton and Alachua. A self-made man, his journey to the top of many professions didn't come easy.

"I was a child of the Depression," Hines said. "I learned early in life that nothing is really free. If you want something, you have to work for it. No one will give it to you, so don't waste your opportunities."

He received a bachelor's degree in mechanical engineering with high honors from UF in 1947. He has since received honorary degrees from the Stetson University College of Law, Rollins College, the University of South Florida and Florida Southern College.

Before he could wear regalia at any of those ceremonies, however, he wore a different uniform: the uniform of a U.S. soldier, a uniform that ultimately landed him in a POW camp.

"For a while, I was a prisoner of war. This brings you face to face with reality," Hines said. "I went down over Austria, was captured and spent seven and a half



months in a prison camp. It's only when you lose your freedom that you realize how important freedom is. Most of us take it for granted."

Hines began his business career with General Electric in research and development in 1947. He joined Florida Power Corp. as assistant production engineer in 1951. After receiving several promotions he became president of Florida Power and then chairman of Florida Progress Corp. He was named chairman emeritus of Florida Progress Corp. when he retired in 1990. He then formed Triangle Consulting Group in St. Petersburg.

Hines' professional, business, educational, religious and civic activities and awards take many pages to enumerate. He is past director of several Templeton Mutual Funds and Mutual Series Funds. He is a past member of the Board of Trustees of the Florida Council on Economic Education, and he is a life trustee of Asbury Theological Seminary. He served for 11 years as an executive in residence at Eckerd College.

Hines served on the Leadership Gifts Committee in the Embrace Excellence campaign and the business advisory council, the Committee of Engineers and the UF Alumni Association board (president, 1975). He has served on the UF Foundation board in various capacities since 1973, and was named a UF distinguished alumnus in 1973.

Just a few of Hines' past charitable affiliations include the University of Florida; University of South Florida; Rollins College, where he was chairman of the board; the Boy Scouts of America, where he received a Silver Beaver Award, Urban League, PRIDE, YMCA, All Children's Hospital and St. Anthony's Hospital.

"If we are fortunate, we can begin to believe we are successful because of our efforts alone, but life has a way of catching up with you and cutting you down to size," Hines said. "One thing I have learned in life is that others help you along the way. In my case this has been very true."

## ► Domenico Anthony Ruggiero

come to understand that the most important goals I could ever hope to pursue in life are that of being a great, loving husband to my wife and a loving, supportive father to my children. Jobs and success will come and go, but my faith in God and the integrity of my family will be forever."

In closing, he says, "I used to dream that it would be my foot that would be the first to settle on the rusty-red soil of Mars and to be known in the way that Neil Armstrong is known to have been the first person to set foot on the moon. Now, as I contemplate my re-discovered Christian faith and my vocation

as a husband and father, it is my hope to leave behind a legacy that simply involves a selfless service to others and the raising of well-educated, faithful children, all of which need not come with any fame or fanfare. That is not to say that I have abandoned the driving force behind my career,

for I will always apply my gifts and talents as best I am able, but I hope to convey that my vision and aspirations for my family are magnitudes greater in importance and that my motivations have moved away from the buildup of myself to a complete giving of myself."

**Patricia Miller** writes to say she has recently started work at the IS&GS Lockheed Martin campus in Goodyear, Ariz. Miller will be working on advanced SAR systems for various aircraft.

“I absolutely love working here and for Lockheed,” Miller said. “The people are amazing and the company as a whole is extremely flexible and welcoming.”

Miller plans to eventually pursue a master’s degree and hopes to transfer into the Space Systems group at Lockheed and work towards supporting the private and commercial space travel industry. Miller is also working towards her private pilot’s license and considering joining the Air National Guard as a pilot.

Miller says that she has Pat Sforza to thank for the support and advice during her last year at UF. She says that the amount of knowledge she gained in both design and propulsions course she took was “massive.”

To Sforza she writes, “You have seemingly a bottomless pit of information, and it was great having the opportunity to learn from you. I sincerely appreciated the ‘up-to-date’ and relevant links to the real world throughout all three courses. Furthermore, thank you for all of your advice about my direction in life and the helpful contacts to guide me there. Yours was a very welcoming office to broach; it was a great and respected resource to have.”



**G. Scott Duncan**, who received his Ph.D. in mechanical engineering in 2006, is currently an assistant professor in mechanical engineering at Valparaiso University in Valparaiso, Ind. Duncan is currently teaching mechatronics, mechanical

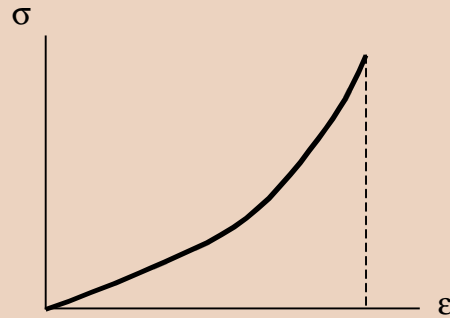
vibrations, senior design projects, and manufacturing system design. He is also an adviser to Tau Beta Pi. Duncan writes that his current research interests are in two different areas. First, he is working with an electrical engineering professor and psychology professor to develop an unobtrusive device to help autistic children integrate into the classroom. The device is approximately the size of a watch and vibrates on demand. The vibration provides non-obtrusive, spatial stimulation to the children, which has been shown in the past to provide a calming effect and reducing disruptive behaviors. The challenges of the project include providing small electronics that are capable of maintaining charge over an extended period of time, determining the most effective frequency and amplitude of device vibration and performing studies on autistic children to determine the optimum placement location for the device and implementation method. He is also involved in a solar thermal reactor project. The project consists of designing a heliostat to track the sun and reflect its rays into a concentrator. The project also includes the concentrator design, which takes the rays from the heliostat and focuses them to a point, where a solar thermal reactor is located. The energy from the sun is used in conjunction with an electrolysis process to separate zinc-oxide into zinc and oxygen, where the zinc can be used to create a zinc-air fuel cell.



# Test Your Knowledge

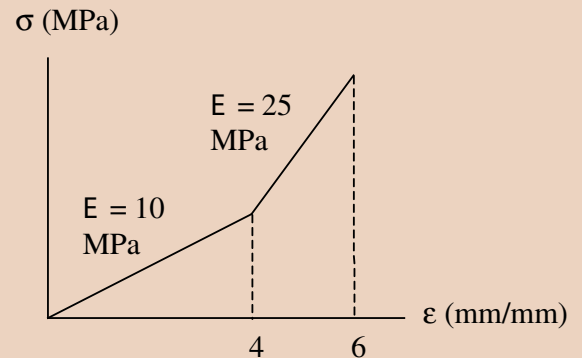
## In the classroom with Professor Tony Schmitz

1. Nike engineers recently started using a new elastomer for shoe soles. The true stress-true strain curve is shown below.



a. Why is the curve nonlinear?

b. If the nonlinear curve can be modeled as two linear segments as shown, determine the volumetric specific work (or toughness) if the true strain is  $\epsilon_1 = 6 \text{ mm/mm}$ . Express your answer in MPa.



The solution to this problem can be found at [http://highspeedmachining.mae.ufl.edu/htmlsite/individual/schmitz\\_courses.html](http://highspeedmachining.mae.ufl.edu/htmlsite/individual/schmitz_courses.html), as the solution to "Exam 1".

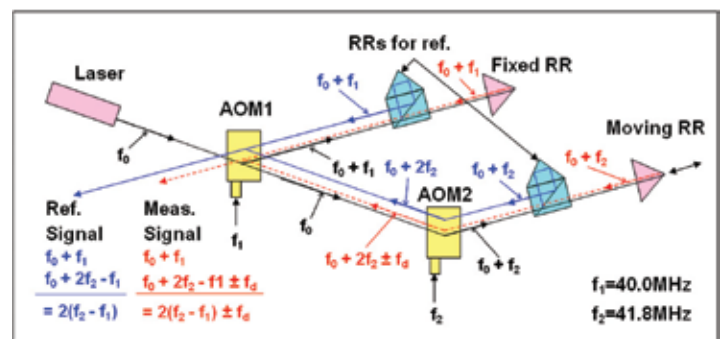
## Current Research

### A new heterodyne interferometer with zero periodic error and tunable beat frequency

Hyo Soo Kim, doctoral student  
Tony L. Schmitz, professor

The purpose of this study is to construct, test and verify a new heterodyne displacement measuring interferometer design that eliminates the current accuracy limitation imposed by periodic error, which appears as a cyclical oscillation of the measured displacement about the true value during target motion. Typical error levels are a few nanometers for carefully aligned setups. In the new design, the two (heterodyne) frequencies are generated and spatially separated using two acousto-optic modulators. By removing the potential for overlap and frequency mixing within the interferometer, the periodic error is eliminated. The new concept replaces the traditional method of 'polarization coding,' where the two optical frequencies are initially coincident with orthogonal polarization states and then separated using polarization-dependent optics.

It is anticipated that the new interferometer design will enable improved measurement accuracy for various applications, including position feedback for lithographic stepper stages, precision cutting machines, and coordinate measuring machines, as well as transducer calibration.



# New MAE Building

UF Alumnus William W. Gay, founder and CEO of W.W. Gay Mechanical Contractor, Inc., and his wife, Eloise D. Gay, are the first major contributors to the new mechanical and aerospace engineering building. Mr. and Mrs. Gay pledged \$250,000, which will be matched by state funding. In addition, a lecture hall will be named for them in honor of their contribution.

Gay, B.S.E., 1949, began his career in mechanical contracting as a part-time worker for Henley & Beckwith while still an undergraduate at UF. After graduating, he worked full-time for Henley & Beckwith on commercial projects in Florida and Georgia. He continued to work in the field until he organized his own company in 1962.

The Gays are native Floridians and reside in Jacksonville. Through their own charitable organization, the W.W. & Eloise D. Gay Foundation, they have generously supported both civic and professional organizations. When asked what motivates his generosity, Gay cites his heritage and the influence of his mentor, Mr. Henry Beckwith, Sr., for whom Gay first worked.

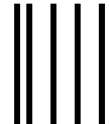
Most recently, Gay received the Ernst & Young Entrepreneur of the Year award in the category of real estate, hospitality and construction. This national award recognized "leaders and visionaries in 10 categories who demonstrate innovation, financial success and personal commitment of creating a world-class business."



The College of Engineering, and particularly the Department of Mechanical & Aerospace Engineering, is honored to have W.W. and Eloise Gay as our first contributors toward building the future home of the MAE program at UF.

If you are interested in learning more about the new MAE building campaign, part of the university-wide Florida Tomorrow campaign, please contact Rebecca Hoover, director of development at (352) 392-6795, [bhoov@eng.ufl.edu](mailto:bhoov@eng.ufl.edu) or S. Balachandar, Department chair at 352.392.0961, [bala1s@ufl.edu](mailto:bala1s@ufl.edu).





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## Alumni and Awards Weekend

*The Perfect Weekend to Visit Your Alma Mater!*

### FRIDAY, April 11, 2008

**8:30 a.m. – 1:30 p.m.** External Advisory Board Meeting  
221 MAE-A

**2 p.m. – 4 p.m.** Undergraduate Research Symposium  
361-363 Reitz Union

**6 p.m. – 7 p.m.** New Building Campaign  
Kick-off Reception  
UF Hilton Conference Center

**7 p.m. – 9 p.m.** MAE Awards Banquet  
Buffer dinner  
UF Hilton Conference Center

**1 p.m.**

Orange & Blue Debut  
Football Game  
Ben Hill Griffin Stadium  
ESPN Gameday  
[www.gatorzone.com/football/spring](http://www.gatorzone.com/football/spring)

**7 p.m.**

Gator Gymnastics NCAA  
Southeast Region Championships  
[www.gatorzone.com/gymnastics/sched.php?sport=gymna](http://www.gatorzone.com/gymnastics/sched.php?sport=gymna)

**7 p.m. – 9:30 p.m.**

UF Foundation Silver Society  
Emerson Alumni Hall  
[www.ufalumni.ufl.edu/events/silversociety](http://www.ufalumni.ufl.edu/events/silversociety)

### SATURDAY, April 12, 2008

**9 a.m.** Outstanding Young Alumni  
Breakfast, Emerson Alumni Hall

**2 hrs prior to game** UF Alumni Association Barbecue  
prior to the Orange & Blue Game  
[www.ufalumni.ufl.edu/events/barbecue](http://www.ufalumni.ufl.edu/events/barbecue)

**7:30 p.m.**

Broadway production of  
Chicago  
Phillips Center for the  
Performing Arts  
<http://performingarts.ufl.edu/events/2007/chicago>

All alumni, faculty and students are invited to attend. Prior registration is a must for the MAE Awards Banquet. For registration and information regarding MAE Events, contact Jan Rockey at [jfrockey@ufl.edu](mailto:jfrockey@ufl.edu) or 352-392-0961. For UF Alumni Association Events, go to [www.ufalumni.ufl.edu](http://www.ufalumni.ufl.edu)

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# Give us a clue! 'What's Happening' with you?

Please complete our alumni update card, so that your information can be included in future newsletters. Go Gators!

Name (first, last) Maiden Name

e-mail Address

Address City State zipcode

Degree and Year of Graduation

Employer

Job Title

Spouse

Children

Personal Update

Professional Update

**WHAT'S HAPPENING HERE** — *Your Guess?* The winning entries will be put in a drawing for an MAE Alumni T-Shirt.



## WHAT'S HAPPENING HERE?

Guess what's happening in this picture and you could win an MAE Alumni T-shirt.



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