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MECHANICAL, MATERIALS, AND AEROSPACE ENGINEERING DEPARTMENT NEWSLETTER

ALUMNUS SUCCESS STORY

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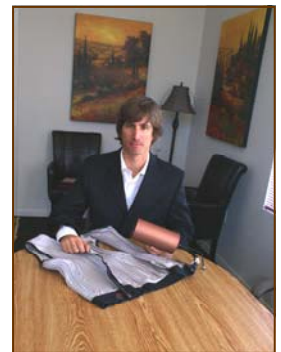
S In 1990 UCF had a freshman on campus destined for extraordinary accomplishments. Dan Rini came to UCF on an athletic scholarship in waterskiing from Ontario, Canada, not realizing the path he was on. It did not take long, however, for a dream to come to him and then for the dream to come to fruition. Working as a graduate student under Dr. Louis Chow provided him in-depth mastery of cooling technology, and so after earning his bachelor's and halfway through his master's degree in Mechanical Engineering, he realized that he wanted to commercialize the technology he had been studying.

Under Dr. Chow, he successfully wrote a proposal to the military, highlighting how cooling technology would be useful for laser weapons. He continued his education at UCF earning a Ph.D. in Mechanical Engineering. During the same month that he graduated with his doctorate (May 2000), he was awarded a

\$100,000 research contract from the Missile Defense Agency. This was at the same time that UCF started the technology incubator (www.incubator.ucf.edu). Dan was interviewed and accepted into this program where Rini Technologies (www.rinitech.com) was born.

Over the past 8 years, Rini Technologies has been heavily focused in R&D and has grown its staff to 20 people. They have six patents with five more pending. With such accomplishments already under his belt, Dan was able to branch his company into additional directions such as evaporative spray cooling technology, electronic cooling, laser cooling, and personal cooling for people, just to name a few. The personal cooling system is funded by the Army and NASA. It is the world's smallest and lightest cooling machine, just weighing four pounds. It acts like a small refrigerator, and it is built into a vest. Rini Technologies is close to mass production of this

amazing device, and the Army is the biggest customer waiting to buy the vests for our soldiers. So to say that this several year research project is a success would be an understatement. Its applications are only limited by our imaginations.



Dan Rini and his personal cooling vest

CHAIR SEARCH

The Mechanical, Materials and Aerospace Engineering (MMAE) Department at the University of Central Florida (UCF) is seeking nominations and applications for Department Chair. The successful candidate should have an earned doctoral degree in one of the department's disciplines or closely related fields and must qualify for tenure as a full professor. He/She will have the unique opportunity to lead one of the fastest growing departments at UCF and in the nation.

With approximately 1,400 undergraduate and 200 graduate students, the department offers doctoral programs in mechanical engineering (ME) and materials science and engineering (MSE), master's programs in ME, MSE and aerospace engineering (AE), and bachelor's programs in ME and AE (both accredited by ABET Inc.). The instructional and research activities are conducted by 31 tenured/tenure-

track faculty members, many of whom have joint appointments with UCF's research units, including Institute for Simulation and Training (IST), Advanced Materials Processing and Analysis Center (AMPAC), Center for Research and Education in Optics and Lasers (CREOL), and Florida Solar Energy Center (FSEC).

The department's annual research funding exceeds \$5M, and four of its faculty members have received NSF CAREER awards during the past six years. Recently the department took leadership roles in multi-campus energy initiatives that led to federal and state funding. With existing collaborative relationships with local energy/turbine companies such as Siemens Power Generation, Mitsubishi and Alstom, there is significant potential for the Department to further establish national prominence in this area. The Central Florida Research Park

is located adjacent to the UCF campus and is home to the nation's largest cluster of government agencies and industries specialized in training and simulation R&D. The recently established College of Medicine at UCF is expected to offer collaborative opportunities in biomedical research. Located in the heart of the I-4 high tech corridor, UCF has one of the largest enrollments among U.S. universities. For more details regarding the department, visit www.mmae.ucf.edu. Candidates should submit a letter of interest, a vision statement, a CV, and contact information of four references to mmaechairsearch@mail.ucf.edu. Screening began on November 24, 2008 and will continue until the position is filled. The expected starting date is August 8, 2009.—*The University of Central Florida is an equal opportunity/affirmative action employer.*

STEPHANIE GAVARRETE, CHIEF EDITOR

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SENIOR DESIGN PROJECT I: THREE POINT BENDING LOADING DEVICE

Senior Design Project: "In-situ three point bending loading device to study the vibrational properties of the materials under load".

The research group of Dr. Nina Orlovskaya concentrates its efforts on the development of materials for Solid Oxide Fuel Cells, Oxygen Separation Membranes, Sensors, Catalysts, as well as Hard and Tough Ceramic Materials for different engineering applications. One of the research interests that the research group is pursuing is to study the vibrational properties of ceramics such as LaCoO_3 , LaMnO_3 , LaGaO_3 , LaFeO_3 , LaCrO_3 , B_4C , SiC , Si_3N_4 , using micro-Raman spectroscopy. The vibrational properties of ceramics can be studied under different conditions, such as at high or low temperatures, different atmospheres such as oxygen rich or reducing environments, or under pressure. One of the exciting areas of the research is to study how stress affects the structure of the ceramics. One obstacle that has prevented the performance of doing

FACULTY SEARCH

The Department of Mechanical, Materials and Aerospace Engineering (MMAE) of the University of Central Florida (UCF), Orlando, Florida, invites applications for one tenure-track faculty position with a preference for Propulsion and related areas, to start August 2009. Of particular interest are candidates who can support our teaching mission in established curricula while building an experimental research program in aerodynamics/propulsion. It is anticipated that the position will be filled at the Assistant/Associate Professor level, but candidates with exceptional qualifications for senior appointments are encouraged to apply. Minimum qualifications include a doctoral degree in Aerospace Engineering or a closely related discipline by the start of the appointment. Responsibilities of the successful candidate include (1) establishing a viable externally funded research program, (2) supervising students in research projects, and (3) teaching undergraduate and graduate courses. Prior teaching, industrial and/or post-doctoral experience is desirable but not required.

such in-situ research on the effect of stress on vibrational response of ceramics has been a lack of loading device capable of fitting below the optical microscope in order to collect scattered light during the sample's deformation. This is where a team of three senior design students from our department became instrumental. The in-situ loading device senior design team was comprised of three Mechanical Engineering undergraduate students - Rosemary Vega, Bryan John, and Robert McNaughton. The task at hand was to design an in-situ loading device that would place ceramic samples in three-point bending while simultaneously collecting the Raman vibrations of the material using a Renishaw InVia Raman spectrometer. The most challenging parts of this project were the constraints and size restrictions. The loading device was required to fit below the 50x long working distance objective lens of the optical microscope which is coupled to the Renishaw InVia spectrometer.

With more than 1,400 undergraduate and 200 graduate students, the Department offers doctoral programs in Mechanical Engineering (ME) and Materials Science and Engineering (MSE), master's programs in ME, MSE and Aerospace Engineering (AE), and bachelor's programs in ME and AE (both accredited by ABET Inc.). The instructional and research activities are conducted by 31 tenured/tenure-track faculty members, many of whom have joint appointments with UCF's research units, including the Institute for Simulation and Training (IST), the Advanced Materials Processing and Analysis Center (AMPAC), the Center for Research and Education in Optics and Lasers (CREOL), and the Florida Solar Energy Center (FSEC). The Department's annual research funding exceeds \$5M, and five of its faculty members have received NSF CAREER awards during the past six years. Recently the Department took leadership roles in multi-campus energy initiatives that led to federal and state funding. The Department is one of the partners of Florida Center for Advanced Aero-Propulsion (FCAAP).

With only four inches of space available to fit this device it became very difficult to design around this constraint. Most parts of the in-situ bending device had to be custom designed and machined in order to meet the design requirement. Due to meticulous designing and high-quality machining, the students' finished product required no modifications. With today's cutting edge technology it was satisfying for them to see the conceptual design come to life. The design project was such a success that the students team started looking into filing a patent for the in-situ loading device and are working with Dr. Orlovskaya on patenting the device.

Article by Bryan John

UCF is near the Kennedy Space Center as well as major facilities of Lockheed-Martin, Siemens Power Corporation, Boeing and Harris Corporations. The Central Florida Research Park is located adjacent to the UCF campus and is home to the nation's largest cluster of government agencies and industries specialized in training and simulation R&D. Located in the heart of the I-4 high tech corridor, UCF has one of the largest enrollments among U.S. universities. For more details regarding the department, visit www.mmae.ucf.edu. Review of candidates began on December 15, 2008 and will continue until the position is filled. Candidates should submit (a) curriculum vitae, (b) a brief description of research and teaching plans, and (c) the names and contact information of three referees to: Faculty Search Committee Chair, Mechanical, Materials and Aerospace Engineering, University of Central Florida, 4000 University Blvd, Orlando, FL 32816-2450, or electronically to mmae-search08@mail.ucf.edu. —The University of Central Florida is an equal opportunity/affirmative action employer.



Left to Right: Rosemary Vega, Bryan John, Robert McNaughton, and Dr. Orlovskaya.

"The design project was such a success that the students team started looking into filing a patent for the in-situ loading device and are working with Dr. Orlovskaya on patenting the device."

SENIOR DESIGN PROJECT II: SAIC-SPONSORED UCF ENGINEERING TEAM CREATES M1A1 TANK GUNNERY TRAINER

One of UCF's Mechanical Engineering Senior Design Projects was sponsored by Science Applications International Corporation (SAIC – www.saic.com/). The objective of the two-semester project was to build a portable tank gunnery training system for the M1A1 main battle tank in three phases: 1) design the gunner station hardware 2) fabricate the gunner station, and 3) interface the gunner station to the highly acclaimed tank simulation by eSim Games, known as "Steel Beasts". One particularly challenging and interesting aspect of the project was the requirement that the system include a 2 DOF motion base, that could be driven by the simulation software to enhance realism - most notably by simulating recoil when the main gun is fired. To help the students gain an appreciation for engineering in the "real world" the team was required to

manage customer requirements, budget, schedule, periodic reporting, weekly customer meetings, interfacing with subcontractors and vendors, in addition to the usual engineering tasks of analysis, design, fabrication, and testing. The team's "customer interaction" culminated when, at about 95% complete, the team demonstrated and briefed the system to Dr. Dave Pratt, Seay BU Chief Scientist and financial sponsor for the project. Later Dr. Pratt remarked, "[w]ith a very small budget and with minimal guidance from Charlie [Charlie Ragusa is SAIC's Chief Software Engineer], the students have created a remarkably robust and credible prototype training system. We look forward to doing this type of thing again next year". Not surprisingly the students generated a long list of "lessons learned", and all were amazed by how things actually get done in the "real

world". They unanimously agreed that they had learned more on this project than in all their other classes combined, and at least one student from the team is planning on applying for a position with SAIC.

As for SAIC, the Orlando office will take possession of the system at the conclusion of the semester, and Dutch Sley's division already has at least one marketing/demonstration opportunity lined up for the simulator prototype.



Left to Right: Justin Tijoe, Steve Lubbers, Seth Balo, Mike Lebby, Charlie Ragusa (SAIC)

Article provided by Charlie Ragusa

SIEMENS ENERGY CENTER

Due to the skillful work of Dr. Jay Kapat and others, the University of Central Florida and Siemens dedicated the new Siemens Energy Center and celebrated a partnership that benefits America's energy needs and the Central Florida economy. Research at the Siemens Energy Center focuses on increasing the efficiency of power generation equipment, helping to conserve energy and reduce costs. For example, a one-percent increase in efficiency of a single power generation unit resulting from advanced cooling methods provides enough additional output to provide electricity to 1,800 homes.

With the increased efficiency, utilities can produce more electricity using the same amount of fuel, limiting the impact on the environment and climate change.

The Siemens Energy Center will provide much-needed space to allow the university to expand energy research and provide more educational and research opportunities for students in the College of Engineering and Computer Science. The new laboratory will triple the amount of space available for such research. About six UCF faculty members, more than 30 students and approximately 25 Siemens engineers will

conduct research projects in this facility. The turbine research will help to position Central Florida as a leader in power generation and energy conversion, particularly in advanced materials development, cooling concepts, heat transfer and combustion. The new laboratory will help UCF train more engineers and strengthen a key sector of Central Florida's economy. Jay Kapat, a professor of Mechanical, Materials and Aerospace Engineering, serves as director of the Siemens Energy Center. Construction on the \$850,000 Siemens Energy Center began in January 2008. Siemens donated approximately \$1 million in funding and test equipment. Faculty and students already are working in the new space. UCF expects to move the wind tunnels where turbine components are tested into the research lab. During the past 10 years, Siemens has donated more than \$3 million to UCF for research and development. Siemens Energy employs about 3,500 people in Orlando, and nearly 400 of them are UCF graduates. Siemens Energy partners regularly with UCF to address strategic academic and corporate business interests, including research and development, recruiting and other commu-

nity initiatives. The partnership began 25 years ago when Siemens, then known as Westinghouse, moved across the street from the university. "I think it (our partnership) has even exceeded the expectations and vision that we had 25 years ago," said Siemens Energy President and CEO Randy Zwirn. "I'm confident that we're going to find answers together to some of the toughest questions the world demands of us."

The Siemens Energy Sector is the world's leading supplier of a complete spectrum of products, services and solutions for the generation, transmission and distribution of power and for the extraction, conversion and transport of oil and gas. In fiscal 2007 (ended September 30, based on IFRS), the Energy Sector had revenues of approximately EUR20 billion and received new orders totaling around EUR28 billion and posted a profit of EUR1.8 billion. The Energy Sector had a work force of 73,500 at the beginning of fiscal 2008. Further information is available at: www.siemens.com/energy.

Abstracted article from UCF News and Information, written by Chad Binette. Oct. 9, 2008

"With a very small budget and with minimal guidance..., the students have created a remarkably robust and credible prototype training system. We look forward to doing this type of thing again next year."

-Dr. Dave Pratt

MMAE WELCOMES NEW FACULTY AND STAFF



Rodney Baker was born in Baton Rouge, Louisiana to LSU accounting (Dad) and history (Mom) professors. After high school, he served in U.S. Navy for four years, including 11 months as electronics technician for the Blue Angels in Pensacola.

He holds an Extra class amateur radio license and periodically helps write and update backyard astronomy books for Lowell House Publishing in Los Angeles.

He has worked as a banker and project manager for banking software firms., and obtained a Project Management Professional (PMP) certification in 2002 and led banking implementation projects in New York for Dime Bank, American Express, General Electric Capital Corp, CIBC, and MetLife.

Rod holds an AA in accounting from Valencia Community College and a BS in public accounting from UCF. He has been working in the MMAE Department since October 2007. His hobbies include biking, hiking in the Wekiwa Springs State Park (2 miles from his home) and playing bass trombone.



Patricia "Patti" Colyer is married with one daughter. She has worked at UCF since January of 2008 starting out at

the F & A Travel office. Her excellent work in the Travel office was quickly rewarded with a promotion over to MMAE in July of 2008 as an Office Assistant, and she is very quick to tell everyone that she loves working here.



Stephanie Gavarrete came to UCF in 2003. Over the years she received promotions while earning a Bachelor of Arts in Political Science from UCF. She also

holds an Associate in Arts (with a concentration in management) coupled with a certificate in Management Supervision from the College of DuPage. Her many years of hard work paid off when she was hired in July 2008 as the Coordinator of Administrative Services in the MMAE Department. She was responsible for hand picking the new staff, and she could not be happier with them. Each of them brings a wealth of knowledge and a skill-set which perfectly complements the needs of the department. Being married to an engineer, she feels at home in the MMAE Department, and she looks forward to a long tenure with the wonderful faculty and staff here.



Sue Mroz started at UCF in January of 2000; she was quickly promoted in the Accounts Payable department in May of 2000. A year later she was promoted again Accountant. After taking some time to live in Arizona, she came back to Orlando where she

was quickly hired into the MMAE Department. She has been married to her husband, Kevin, for 22 years. She is the proud Mom of Kevin Jr., 20, and Brittany, 18. Kevin Jr. is a certified auto body technician. Sue's daughter Brittany will be graduating in May from University High School, and she is planning on attending Valencia Community College and then UCF to become a nurse.



Dr. Seetha Raghavan received her bachelor's degree in Mechanical Engineering from Nanyang Technological University in Singapore and her Master's Degree in Aerospace Engineering from SUPAERO in Toulouse,

France. She worked in the aerospace industry for over 7 years in France and Singapore

specializing in aircraft structural design and analysis. She obtained her PhD from the School of Aeronautics and Astronautics at Purdue University in Indiana. Currently an Assistant Professor in the MMAE Department, her research interests are in the areas of mechanics of aerospace structures and materials, piezo-spectroscopy, thermal barrier coatings, spectral analysis using generic algorithms, strain measurements using in-situ synchrotron radiation and non-destructive evaluation.



Dr. Yunjun Xu obtained his bachelor's degree in Aircraft Design and his master's degree in Automatic Control in 1996 and 1999, respectively, from Nanjing University of Aeronautics and Astronautics in China.

In May 2002 and Dec. 2003, he received his master's degree in Electrical and Computer Engineering and Ph.D. in Mechanical and Aerospace Engineering from the University of Florida. After completing his doctoral studies he spent seven months working as an Engineer in the Digital Worlds Institute in Gainesville, FL. From August of 2004 to August 2008, Dr. Xu was an Assistant Professor at the University of Oklahoma in the School of Aerospace and Mechanical Engineering. Currently he is an Assistant Professor at the University of Central Florida in the MMAE Department. His research interests include space vehicles' guidance, navigation and control, nonlinear constrained optimal control, nonlinear robust control, modeling, visualization, and virtual reality, and nonlinear filtering and stochastic control.

ACCREDITATION

In October 2008, the MMAE undergraduate programs were reviewed by ABET Inc. (www.abet.org) for accreditation.

Thanks to our Alumni, Industrial Advisory Board, faculty and students for responding to the surveys, with valuable information for the accreditation process. The reviewers were very thorough in their review, examining over 120

course binders, visiting instructional laboratories, courses, and meeting with faculty, staff, alumni and members of our Industrial Advisory Board.

We are still awaiting official notification. However, preliminary feedback was positive and we anticipate renewed accreditation.

Article by Waheeda Illasarie

CONGRATULATIONS TO JEANINE CLEMENTS

The USPS Staff Council (pegasus.cc.ucf.edu/~uspsstaf/) constantly raises funds to provide scholarships for UCF USPS staff members.

Among the scholarships is a \$100 book award. The criterion for this award is that the USPS employee must be a degree seeking student at UCF or at a community college with at least a 2.5 GPA. Consideration is based on staff longevity at UCF.

There were 48 applicants for the book award, and 10 scholarships were granted.

Jeanine Clements, MMAE's Program Assistant for Graduate Studies, far exceeded the criteria in that she earned a 4.0 GPA during the Fall 2008 term earning a place on the President's List, and holds an overall GPA of 3.0 at Valencia Community College majoring in English. She has been working at UCF for 19 years.

INTERNSHIPS AND COOPERATIVES

Several well known companies employ our students and alumni. During the Fall 2008 term, Boeing, Harris Corporation, Lockheed Martin, Mitsubishi, Motorola, NASA, Siemens Power Generation, United Space Alliance, U.S. Army, and others employed several of our Aerospace Engineering students. Some of these companies plus General Electric, Orlando Utilities Commission, Philips Electronics, City of Orlando, PepsiCo, Walt Disney World, and others employed several of our Mechanical Engineering students. Our Materials Engineering students also had employment opportunities this fall. The MMAE Department appreciates the relationship with these companies and government agencies, and we look forward to even having more relationships with organizations in the future for more

employment opportunities for our students.

MMAE has the leadership role in multi-university energy initiatives that led to federal and state funding concerned with energy generation most importantly the State of Florida Turbomachinery Initiative: Advanced Turbines, Energy and Environment. We are also one of the partners in the Florida Center for Advanced Aero-Propulsion (FCAAP) which among other thrusts involves research on alternative fuels for aircraft.

If you would like to hire one of our students, contact the MMAE Department, UCF's Experiential Learning Department (www.coop.ucf.edu), or UCF's Career Services (www.career.ucf.edu) for assistance.



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