

A vertical sequence of four rocket launch trails is shown against a dramatic sunset sky. The sun is low on the horizon, creating a bright orange and yellow glow that transitions into a deep blue at the top. The trails are dark with a bright orange flame at the base of each rocket. The text is overlaid on the upper portion of the image.

*Department of*  
**Mechanical & Aerospace Engineering**

SPRING 2011

[www.mae.ufl.edu](http://www.mae.ufl.edu)

Dear Colleagues, Alumni and Friends,

Despite the current state of the economy, I am happy to report that the College of Engineering and our Department of Mechanical and Aerospace Engineering have done quite well over the past year. For one, our Mechanical and Aerospace Engineering undergraduate program continues to be very popular. Our total enrollment last year was in excess of 1430, which makes us by far the largest department in the College of Engineering. Last fall the college introduced a formal commencement ceremony as a way to welcoming all incoming freshmen. We gathered in the large Reitz Union Ball Room and each chair introduced their incoming class by requesting them to stand up. I was shocked, and pleasantly delighted, that when I called Mechanical and Aerospace Freshmen more than half of the room stood up. The real challenge is to ensure that every one of our outstanding students gets the best educational experience.

On that note, I am also pleased to write that, as our student enrollment is increasing, we have also done well to expand the size of our faculty by welcoming five new members to our department: Tommy Angelini, Mrinal Kumar, Saeed Moghaddam, Kamran Mohseni and Henry Sodano. They are all outstanding additions to our current faculty and in most cases we have won them against stiff competition. While Tommy, Mrinal and Saeed are starting their academic careers as assistant professors; Henry and Kamran have already established highly visible and successful research programs and we have lured them from Arizona State University and University of Colorado, respectively. Also Henry and Kamran are the recipients of the prestigious NSF CAREER Award and the DARPA CAREER Award, respectively. Not to be out done, within a month of joining the department Saeed has won a million dollar research contract from the DOE ARPA-E program. This is an outstanding accomplishment for a young faculty who is just starting. We are now in the process of carefully expanding our high quality staff in order to support the growing student and faculty needs.

Much has changed over the past five years. If you have not visited recently I invite you to join us and take a tour of the vibrant department - you will be thoroughly impressed. On Friday, April 8th we will be having our 3rd Annual Undergraduate Research Poster Presentation and Awards Banquet. This will be a perfect setting for you to visit the department. I look forward to seeing you soon.

Go Gators!

  
S. Balachandar

## Acknowledgements

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Cover Caption: Professor Rick Lind's EAS 4700 Aerospace Design course, a required course for aerospace majors, were put into groups of four and tasked with designing a rocket to achieve a mission. Each group needed to conceive a payload (scaled to be representative of a real mission), choose a customer to whom they needed to sell this mission, then design a rocket to fly the mission. Students used parametric optimization for the design, simulated performance, guaranteed stability, evaluated sensitivities and lastly, built and launched their rockets. There were two types of rocket options, a hybrid-fuel rocket or a solid-fuel rocket.

The cover photograph was taken on November 20, 2010 at a field near Madison, FL, which had been reserved and given official FAA approval with airspace cleared. The North Florida Community College Sentinel Rocketeers Club organized the event. Four teams flew their solid-fuel rockets to altitudes between 1700 and 2500 feet. The photographer was a student in the class, Tamas Kolos-Lakatos.

# Professor Dixon chosen for Defense Science Study Group

Professor Warren Dixon was nominated for and has been serving a two-year term with the Defense Science Study Group (DSSG), an interdisciplinary group of academics sponsored by the Defense Advanced Research Program Agency (DARPA) and the Institute for Defense Analysis (IDA), to gain a first-hand understanding of the technical dimensions of national security issues and an appreciation for the people and operations that comprise the national security community.

Dixon has spent the past year completing four itineraries that included in-depth visits with US Special Operations Command and US Central Command at MacDill AFB, Submarine Group 10 at

Kings Bay, GA, MAGTF Training Command at Twentynine Palms, CA, the USAF Flight Test Center at Edwards AFB, the Central Intelligence Agency (CIA), the National Security Agency (NSA) the National Geospatial Intelligence Agency (NGA), the Office of the Director of National Intelligence and the National Counter-Terrorism Center (NCTC) among others.

Members of the DSSG work and travel with agency-appointed mentors of the highest rank. Among the 16 current DSSG mentors are former Acting Homeland Security Advisor to the President, Admiral Steve Abbot, USN



Dr. Dixon is not the only "Gator" aboard the USS Carl Vinson.

(Ret.), former Chief of Staff of the US Air Force, General Larry D. Welch, USAF (Ret.), and former Deputy Director of the National Security Agency, Barbara McNamara.

Over the course of the two-year program, participants focus on defense policy, related research and development, and the systems, missions and operations of the US armed forces. Upon completion of the program, participants are required to submit a think piece to DARPA related



The 2010-2011 DSSG group posed in front of "Iron Mike" at Fort Bragg.



DSSG members fly military air during sessions. During this flight, members were able to lay beside the boom operator as he refueled B1 bombers.

Dixon said, "It is impossible to go through this experience and not come away with an enormous sense of patriotism. The level of professionalism, dedication, education and commitment of the people that make up the US armed forces is at the highest level. It really motivates me to want to give service back to my country."

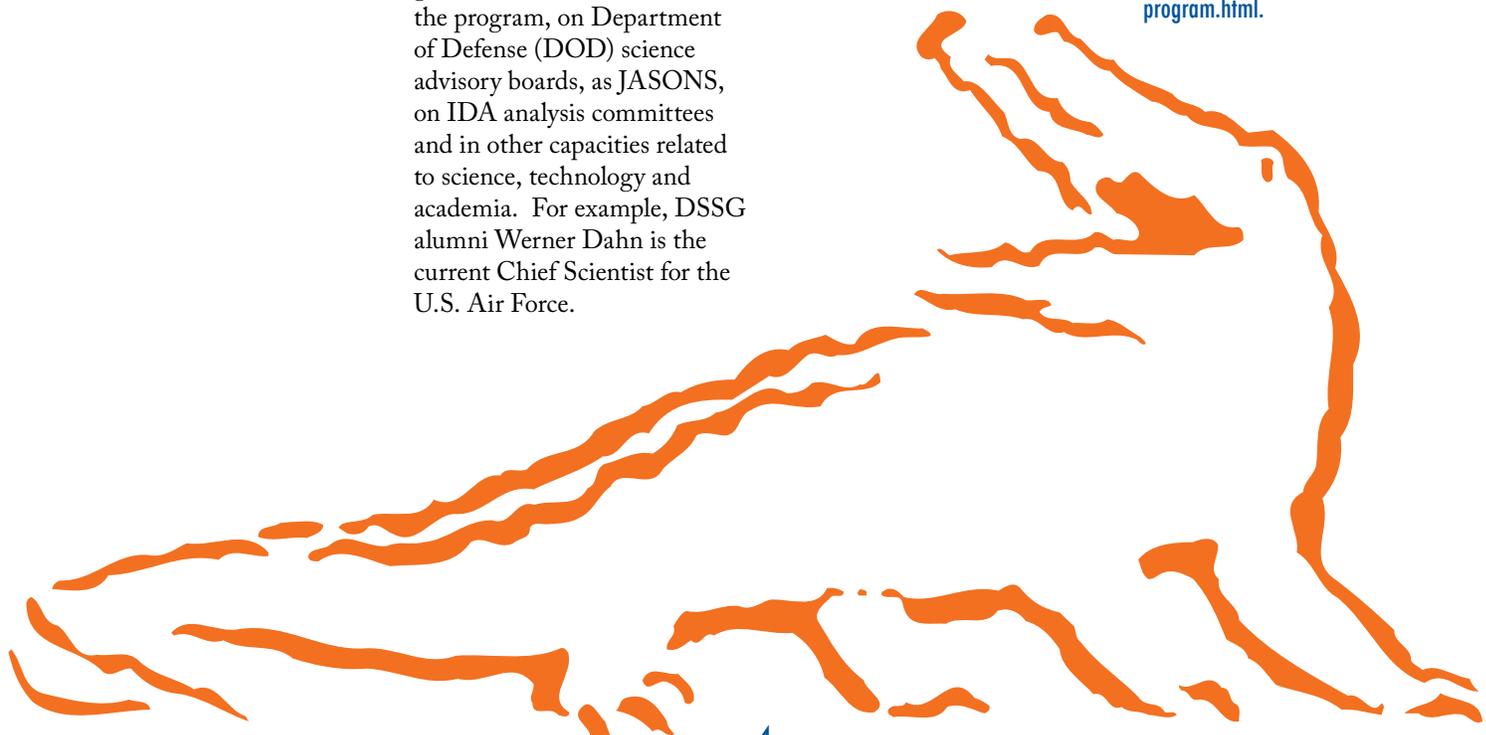
California Institute of Technology, Columbia, Cornell, Northwestern, Princeton, Rice, Tufts, UC-Berkeley, UCLA, The University of Colorado Boulder, The University of Illinois Urbana-Champaign, UMASS, and Yale.

The 2010-2011 DSSG members include a diverse group of 12 men and five women from various universities including the

The second year itineraries include meeting with Congress and visiting the national laboratories, among other events. For more information on the DSSG program visit the website <http://dssg.ida.org/open/program.html>.

Dr. Dixon preparing to jump out of the three story tower at Ft. Bragg Paratrooper Training Facility - that first step is a doozy!

to their experience. Many former DSSG participants go on to serve as mentors in the program, on Department of Defense (DOD) science advisory boards, as JASONS, on IDA analysis committees and in other capacities related to science, technology and academia. For example, DSSG alumni Werner Dahn is the current Chief Scientist for the U.S. Air Force.



# Faculty Updates

Professor **B.J. Fregly** was formally awarded a \$2.25 million NIH R01 grant.

The project, which began in August, involves collaborators at Scripps Clinic in San Diego, Stanford University, the University of Griffith in Australia, and the University of Melbourne in Australia.

Additionally, Fregly gave the keynote lecture at the annual Biomedical Computation at Stanford (BCATS) conference held November 6, 2010, on the campus of Stanford University. (<http://bcats.stanford.edu/>)

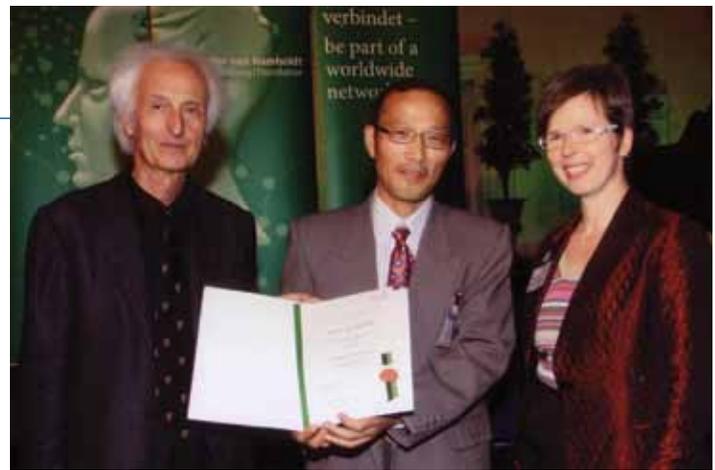
In October, Fregly also completed a one-week tour of research labs in Europe for the National Science Foundation to identify new "Technologies to Improve Mobility" and help the Research to Aid Persons with Disabilities program director identify new funding opportunities/directions for his program. Fregly followed up by giving a presentation to the NSF program director and program directors of other funding agencies.

Professor **S.A. Sherif** was awarded the 2010 ASHRAE Exceptional Service Award during the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Annual Conference held in Albuquerque, New Mexico, June 26-30, 2010. He was also a keynote speaker at several international events including the 1st Workshop on Aviation Safety held in Rio de Janeiro, Brazil, June 1, 2010 (organized by the Federal University of Rio de Janeiro on the 1st anniversary of the Air France flight accident over Brazil in 2009), and the 3rd International Conference on Hydrogen Production, held in Istanbul, Turkey, June 16-18, 2010.

Additionally, Sherif was recently appointed on the Advisory Council of the Egyptian National Authority for Quality Assurance and Accreditation in Education, which held its first meeting in Cairo, Egypt, June 9-10, 2010. He also served as an external evaluator for Assiut University's Faculty of Engineering programs earlier this summer and gave a series of nine lectures on engineering accreditation related issues while in Egypt." He and His Ph.D. student Fotouh Al-Raqom (jointly supervised with Professor J.F. Klausner) participated in the 18th World Hydrogen Energy Conference held in Essen, Germany, where she presented a paper related to her Ph.D. work.

Professor **Tony Schmitz** served as the science advisor for the "Science of NFL Football" video series, collaboration between the National Science Foundation (NSF), NBC Learn (the education division of NBC News), and the National Football League (NFL). This 10-part series explores: concepts from physics, biology, mathematics, chemistry, and engineering; and demonstrates how these concepts are integral to football. The three to five-minute segments will be used by 5th to 12th grade science teachers and college-level instructors. The goal of the project is to use exciting and relevant sports content to teach fundamental science and engineering concepts. The videos (and corresponding lesson plans) are available at [www.nbclearn.com](http://www.nbclearn.com) by clicking on the "Science of NFL Football" link.

Additionally, Schmitz had a new book chapter published in *Interferometers: Research,*



Professor **Z. Hugh Fan** was bestowed with Fraunhofer-Besser Award on June 22, 2010 at the Annual Meeting of Alexander von Humboldt Foundation in Berlin, Germany. The award was given by Professor Dr. Helmut Schwarz, President of the Foundation (left) and Dr. Anke Hellwig, the representative of the Fraunhofer Society (right).



S.A. Sherif with ASHRAE President Gordon Holness (left) and ASHRAE Executive Vice President and Secretary Jeff Littleton (right) in Albuquerque.)

Technology and Applications, D. Halsey and W. Raynor, Eds., Nova Science Publishers, Inc., Hauppauge, NY, 2010. His chapter was entitled "Periodic Error in Heterodyne Interferometry: Examination and Elimination" and was co-authored by H.S. Kim (former UF graduate student) and J. Beckwith.

Schmitz also organized and chaired an NSF-sponsored workshop entitled "Uncertainty in Machining" from February 24 to 26, 2010, in Arlington, VA. The conference was co-chaired by

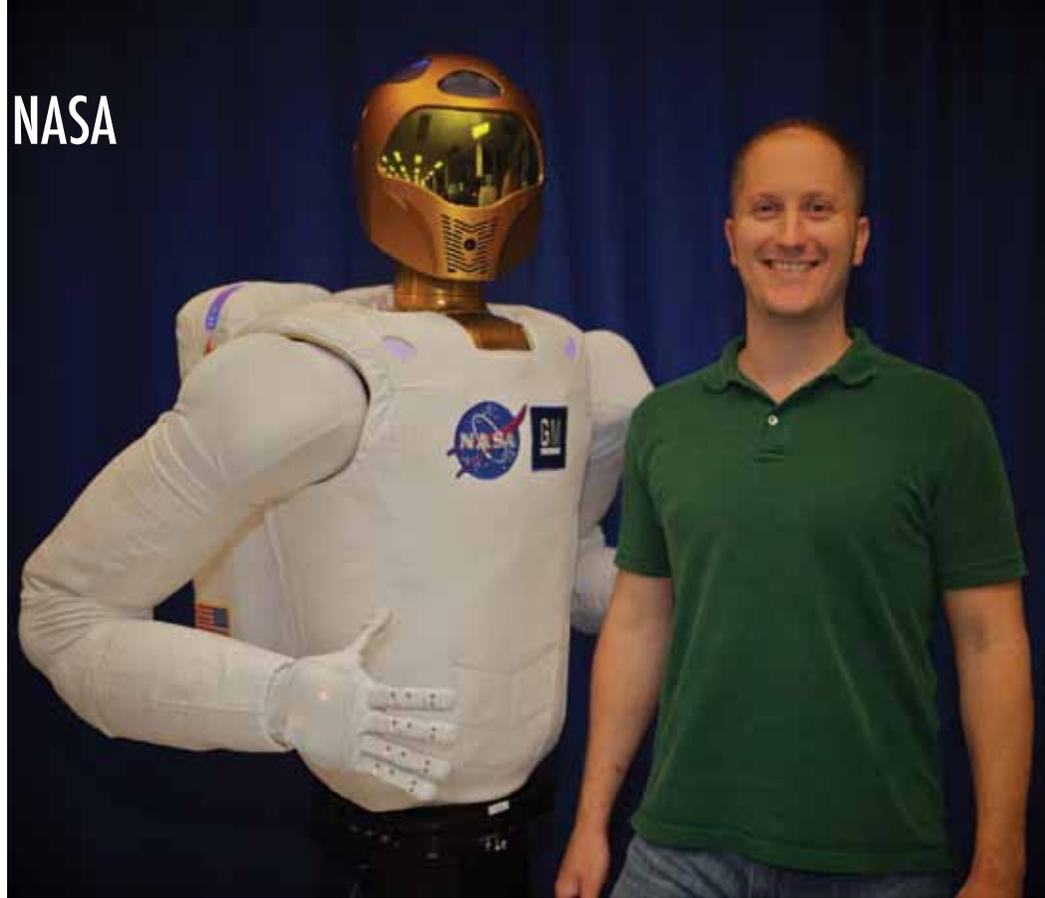
Dr. Ali Abbas, University of Illinois at Urbana-Champaign, Dr. O. Burak Ozdoganlar, Carnegie Mellon University, K. Scott Smith, University of North Carolina at Charlotte, and John Ziegert, Clemson University. The purpose of this workshop was to discuss and address uncertainty and risk in machining and related manufacturing operations. More information is available at the workshop website: [http://highspeedmachining.mae.ufl.edu/htmlsite/individual/nsf\\_workshop.html](http://highspeedmachining.mae.ufl.edu/htmlsite/individual/nsf_workshop.html).



# Alumni Yamokoski Joins NASA Humanoid Robot Project

J.D. Yamokoski received his PhD in Dec. 2009 and immediately joined an exciting NASA project, the Robonaut 2 humanoid robot (R2). Yamokoski joined the Dexterous Robotics Laboratory in January of 2010, right after the decision was made to prepare R2 for launch to the Space Station. He very quickly became an integral member of the software and controls teams and worked on enhancing R2's software safety systems, tuning controller performance, and verifying R2's software to NASA flight specifications.

Developed by NASA and General Motors, the R2 will launch to the International Space Station (ISS) on space shuttle Discovery as part of the STS-133 mission, which is currently scheduled for February 2011, and will become the first dexterous humanoid robot in space, and the first US-built robot at the space station. R2's primary function will be assisting human astronauts in orbit, for instance taking over cleaning-related responsibilities at the station. Yamokoski explained, "Astronauts spend a majority of their Saturday mornings each week cleaning handrails found all throughout the station. R2 is more than happy to help take over that task so that astronauts can do more important work such as



R2 and J.D. Yamokoski

tending to the various science experiments aboard the ISS."

R2 consists of an upper torso, head, arms, hands and fingers. It is 2 feet, 4 inches tall and weighs 330 pounds, made of aluminum and nickel-plated carbon fiber and has padding on the torso, arms, hands and fingers for protection. The joints contain springs and 350 electrical sensors for grabbing and touching. The

"brain" is located in the stomach. Four visible light cameras sit behind R2's visor with an infrared camera inside the mouth for depth perception. R2 carries a backpack that holds its power conversion, which can be plugged into the space station, and may one day be capable of containing batteries in case R2 needs to leave the station. R2 is capable of withstanding extreme hot and cold

## Q & A with J.D. Yamokoski

**Q:** How did you get involved with NASA.

**A:** I first joined the JSC community after completion of my bachelor's degree from Purdue University in 2000. I worked for both United Space Alliance, where I trained as a robotics ground controller in Mission Control, and for Oceaneering Space Systems, where I worked as a design engineer on space hardware for extra-vehicular activities (EVAs). In 2003, I decided to continue my education by pursuing my PhD at the University of Florida.

**Q:** How did you get the job working on R2?

**A:** During my time at the University of Florida, I kept in contact with co-workers and friends in the JSC community. As completion of my PhD neared, I learned about an opening in the lab from a former co-worker and friend in the area.

**Q:** In November 2010, the launch of Discovery (which would have taken R2 to the ISS) was scrubbed. Were you there?

**A:** The R2 team, the second R2 unit and I all traveled to the Cape in November in support of the first launch attempt. That attempt was ultimately scrubbed due to problems with Discovery's external fuel tank. Nevertheless, the trip was very productive as we conducted several media events as well as some outreach activities. STS-133 is currently scheduled to launch in February of 2011.

**Q:** Is R2 a good housekeeper?

**A:** R2 is potentially a great housekeeper. Like most robots, R2's tasks on Station will revolve around the three D's: dull, dirty or dangerous. And, being a robot, it will do those tasks and never complain. The objective of R2 is to allow the crew to focus on more important and complex tasks such as tending to the various

science experiments that are aboard the ISS.

**Q:** What is next for you?

**A:** After completing the effort to get R2 ready for Station, I was promoted to Controls Lead for the R2 project where I am now managing efforts to improve performance of and add more autonomous capability to both the lab and ISS versions of R2. I am also very involved in the R2 leg design effort currently underway at JSC. Outside of work, I am also involved in education outreach activities such as the FIRST robotics competition.

**Q:** Do you have any personal update you would like to share with the Alumni community?

**A:** Our family just welcomed its newest "gator" to the world. Our son Luke was born this past October. Luke and our daughter Julia are both enjoying Texas!

conditions, assisting astronauts with tools and handling emergencies like fires or toxic leaks.

As part of his job, Yamokoski interacts with R2 on a daily basis to test new software loads or autonomous features, tune controllers, or simply give demonstrations to lab guests. Yamokoski says, "One of the great things about R2 is that it was built in the same room in which all of its designer's sit. The mechanical, electrical, software and control engineers literally all work together in the same room with R2. You'd be hard-pressed to find as much diversity in talent and engineering prowess as this lab has to offer."

Initially R2 will be deployed on a fixed pedestal inside the ISS. In late 2011, NASA plans to send R2 legs so it can

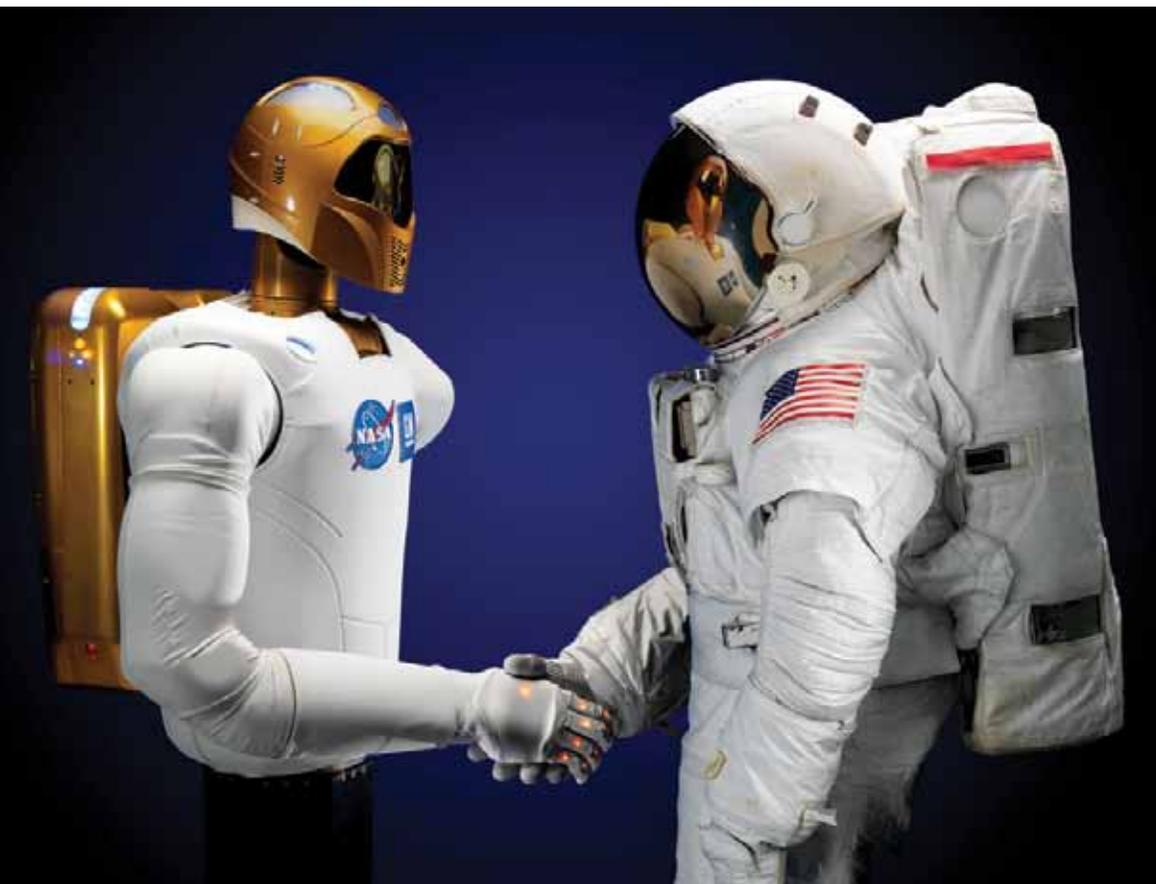
take on more advanced and complex tasks on the station. In 2012, torso and computer enhancements will be sent as well. Future upgrades include adding lower bodies such as legs and wheels to propel the R2 across Lunar and Martian terrain. A four wheeled rover called Centaur 2 is being evaluated at the 2010 Desert Field Test in Arizona as an example of these future lower bodies for R2 with the hopes that someday R2 could even venture outside into the vacuum of space to explore Mars, asteroids or other space-related realms.

NASA officials noted that R2 was made to assist, not replace, human astronauts. Yamokoski stated that, "R2 is often explained using the relationship between a nurse and doctor. In this example



the nurse is R2, capable of holding tools, preparing a worksite, or otherwise doing fairly simple tasks. The human is the doctor, capable of doing the complex tasks or tasks which require dexterity and skill that surpasses that of R2."

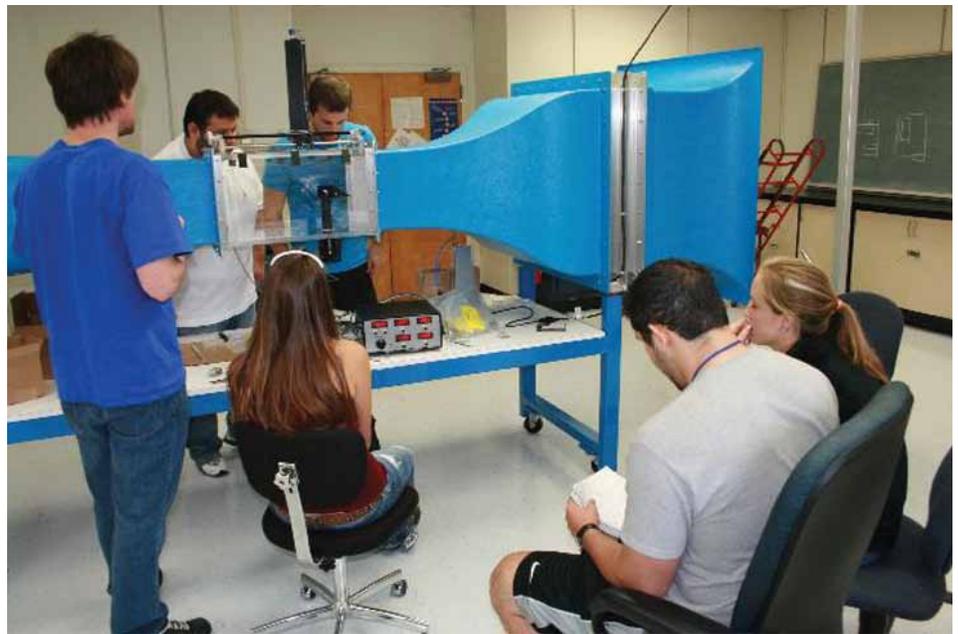
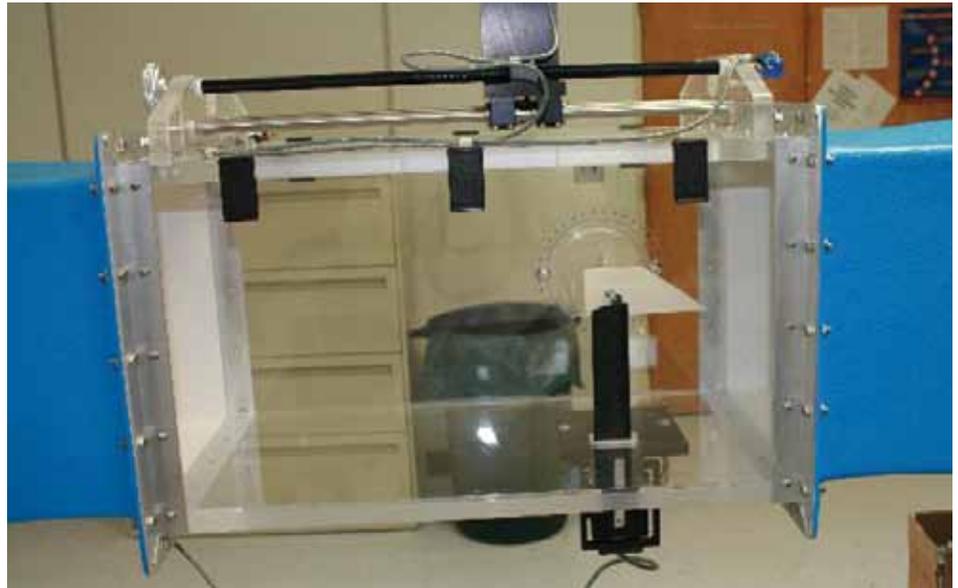
R2 is scheduled to stay at the space station until NASA ceases to operate that particular station sometime after 2020. Describing the impact of the R2 robot, Rob Ambrose, acting chief of Jonson Space Center's automation, robotics and simulation division in Houston said, "While it might be just a single step for this robot, it's really a giant leap forward for tin mankind."



A close-up of R2's helmet while outside at Kennedy Space Center, with a reflection of the Vertical Assembly Building in the visor. Photo by Joe Bibby

# Student News

The department purchased a wind tunnel for use by graduates and managed by John Abbitt. For the first experiment, the AIAA ULSI rocket team measured the effect of different paints and surface finishes on the drag of various fin shapes. Currently they are doing similar measurements on nosecones. In addition, the content of the EAS 4700/4710 Aerospace Design I/II courses has been altered to integrate use of the wind tunnel and there are plans to use it in many more classes next year. The wind tunnel provides a great capability for our students to get hands-on experience.



Space Systems Group (SSG) graduate student, **Neeraj Kohli**, served as a technical expert/judge for the 17th Annual International Space Settlement Design Competition (ISSDC) at NASA's Johnson Space Center, July 31 – Aug. 2 2010. ISSDC is an industry simulation for high school students, set in the future. This competition emulates the experience of working as a member of an aerospace industry proposal design team. The students are assigned to four teams

consisting of 24-48 members, and each team is provided with a senior manager from industry or NASA to serve as company CEO. The teams also receive technical and management training and literature beforehand to prepare them for the 43-hour competition. A total of sixteen high school teams consisting of eight students per team attended from various countries including USA, Australia, UK, India, Pakistan, Romania, and Uruguay. The technical experts included industry

# Student News



Student Neeraj Kohli judging the 17th Annual ISSDC Competition.

representatives from NASA, Boeing, Digitex, Lockheed Martin, ExxonMobil, Jacobs Engineering, Odyssey Space Research, United Space Alliance, and various universities.

Kohli is a 2006 alumnus of this competition. Describing the event and how it relates to his interests at UF, Kohli commented, "It (the competition) is very similar to the kind of challenges faced in the aerospace industry including academia. It's a wonderful experience to interact with renowned experts in different areas and discuss their "space" perspective. Observing the high school kids from all over the world working together and answering their questions from my own experience was a humbling experience and I hope UF and others play a role in the future success of this rewarding program."

Undergraduate **Robert Kidd** and graduate student **Jonathon Jeske** studied at Kookmin University in Seoul, Korea during the 2010 summer semester. This was as part of a Reciprocal Agreement between UF and Kookmin where up to four students per year may attend the other

university for a semester. Kidd and Jeske studied under the supervision of Dr. Jungha Kim who is a Professor in Kookmin University's Graduate School for Automotive Engineering. Kim's research parallels that of Kidd and Jeske in the area of autonomous ground vehicle systems.

Graduate Student **Sanketh Bhat** was awarded the inaugural 2010-2011 Attributes of a Gator Engineer Recognition Award for Service to the Global Community (Ph.D. division). This new award is designated by the College of Engineering Selection Committee and Dean Cammy Abernathy. Bhat was honored at the New Student Convocation on August 20, 2010.

Graduate Student **Raul E. Riveros** was awarded second runner-up for the Best Paper Award at the ASME 2010 International Manufacturing Science and Engineering Conference, held October 12-15. His paper was titled, "Magnetic Field Assisted Finishing of Silicon MEMS Micro-Pore X-Ray Optics," Raul E. Riveros, Hitomi Yamaguchi, Taylor Boggs, Ikuyuki Mitsuishi, Kazuhisa



Students Robert Kidd (left) and Jonathon Jeske hold a Gator flag in front of the Kookmin University English logo.



Jaydeep Karandikar (left) received the NAMRI/SME Outstanding Paper Award

Mitsuda, Utako Takagi, Yuichiro Exoe, Kensuke Ishizu and Teppei Moriyama.

**Jaydeep Karandikar**, received two recent awards: the ASME Manufacturing Science and Engineering (MSEC) Student Travel Award to the 2010 MSEC conference in Erie, PA, October 12-15, 2010; and the NAMRI/SME Outstanding Paper Award

at the 38th North American Manufacturing Research Conference, held May 25-28, 2010 in Kingston, Ontario, Canada. The title of his paper, co-authored with Schmitz and Raul Zapata (a former UF graduate student), was "Incorporating Stability, Surface Location Error, Tool Wear, and Uncertainty in the Milling Super Diagram".



## ERICH FARBER: SOLAR ENERGY PIONEER

Professor Emeritus Erich Farber's favorite phrase, "There's nothing new under the sun," seems most appropriate considering Farber, an inaugural inductee to the Solar Energy Hall of Fame in 1976, made his name as the "Sunshine Superman" having established the UF Solar Energy and Energy Conversion Laboratory (SEECL) and, at one point, putting Gainesville on the map as the Solar Capital of the World.

Farber served as director of the SEECL for 37 years. In 2003, the lab was named an historical landmark by the American Society of Mechanical Engineers.

Farber's list of personal and professional achievements seems almost impossible for one man's lifetime. Born in Austria, he arrived in the US in 1939 with \$10 in his pocket (which was given to him by an American physician on the boat), he worked in junk yards, construction sites and a paper mill, learning English along the way.

While attending the University of Missouri he applied for US citizenship, which he received, and then was concurrently drafted into the US Army during World War II. He served with General George S. Patton's 3rd Army and received a Battlefield Commission, the Silver Star, Purple Hearts and other decorations.

Farber joined UF in 1954 where he gained an international reputation for establishing

the UF Solar Energy Lab. He assisted universities, industries, governments and individuals throughout the world as an energy consultant, most prominently during the energy crisis of the 1970's. Farber led a NASA team in fundamental research on Liquid Rocket Propellant Characteristics, which influenced some of the largest rocket designs and helped NASA get a man on the moon.

He developed the "Boiling Curve", which is quoted in all books on heat transfer, and developed a method of heat transfer surface treatment referred to in literature as "Farberizing". Farber has over 600 publications, six co-authored books and three contributed sections in Marks Standard Handbook for Mechanical Engineers. He has received many honors, awards, gold medals and the Presidential Medallion.

Farber retired from UF in 1985 yet he remains active in the educational community by maintaining his office, meeting with students and faculty, answering correspondence and welcoming visitors.

Farber's opinion on the current state of energy is, as he says, "Nothing new: Fossil fuels should be avoided because alternative forms of energy are available." He says, "It is a new generation of the same problem." Professor Farber can be reached at [erichf@ufl.edu](mailto:erichf@ufl.edu).



# 2010-2011 MAE Outstanding Alumnus Award

For the academic year 2010-2011 we encourage nominations for both the MAE Outstanding Young Alumnus Award and the MAE Outstanding Alumnus Award. These awards are the highest honor the department bestows upon an alumnus/a, and are in recognition of a particular achievement of noteworthy value, a series of such achievements, or a career of noteworthy accomplishments. The Outstanding Young Alumnus Award recognizes the budding accomplishments of young alumni under the age of 40 on April 1st of the year they will be bestowed the award. The Outstanding Alumnus Award is established to recognize the significant accomplishments of senior alumni.

Nomination forms are due by February 2011 and will be evaluated by an award committee. Decisions will be reached by the end of February 2011, and the Awards will be bestowed on the awardees at the MAE Annual Awards Banquet on April 8, 2011. We request the nomination process to be discreet and without the involvement of the nominee. Nominations can be done over the web at [www.mae.ufl.edu/MAE-OAA](http://www.mae.ufl.edu/MAE-OAA) or mailed to:

MAE Outstanding Alumnus Award  
Engineering  
231 MAE-A, PO Box 116250  
Gainesville, FL, 32611.

## MAE Christmas Party



1. Santa and Bala Balachandar 2. Tony, Christine and Jake Schmitz 3. Sarthak, Manjari, Saayon and Subrata Roy 4. Chuck and Nikki Taylor, Gene and Richard Sowls 5. Curtis and Desmond Taylor, Gene and Evelyn Hemp, Oana Cazacu



## Alumni Updates

We would like to extend thanks to our most recent alumni who updated their profiles via our new on-line form. If you have not had a chance to check out our new MAE web page, which includes our on-line alumni update form, please do so. The web page is at [www.mae.ufl.edu](http://www.mae.ufl.edu), and the form can be accessed directly at [www.mae.ufl.edu/alumni/request/index.php](http://www.mae.ufl.edu/alumni/request/index.php)

**Edward M. Duran, Jr.** (BSME '78) is currently the General Manager of Customer Service Engineering at GE Aviation in Cincinnati, Ohio.

**Richard Traverse** (BSAE '71) is the President and Owner of Construction Engineering, Inc., in Naples, FL. Traverse also received his ME in Civil Engineering from UF in 1993.

**Kurt Steven Stresau** (MSAE '91) is a Project Engineer for United Space Alliance, Cape Canaveral, FL. He is also an Adjunct Professor at Brevard Community College.

**Jay Goya** (BSAE '96) is currently a Manager of Business Development and Strategy at Pratt & Whitney, Glastonbury, CT.

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