

UAHuntsville College of Engineering



Engineering the Future with
Innovation, Integrity, & Inspiration



Special points of interest:

- *Message from Dean Mahalingam*
- *Dr. Timothy Boykin named APS Fellow*
- *Dr. Keith Hollingsworth is new MAE Chair*
- *InSPIRESS Program links Senior Design with high schools*
- *COE Alumnus restores communications in Libya*
- *College seeking candidates for Open Faculty Positions*



Message from the Dean

The 2010-2011 year has been an exceptionally good year for the College of Engineering at the University of Alabama in Huntsville. I am privileged to report on some of the extraordinary accomplishments of our faculty and students.

In 2010, UAHuntsville was one of three universities chosen from a group of fifteen to participate in the NASA University Student Launch Initiative Level 2 program. Our team of students successfully launched and recovered their Aethon rocket at the NASA Wallops Test Flight Center.

Professor Tim Boykin was elected Fellow of the American Physical Society for contributions to the theory and full-bandstructure modeling of semiconductor nanostructures. Professor Ramon Cerro was named the recipient of the John A. Tallmadge Award (jointly sponsored by Eastman Kodak Company, International Society of Coating Science and Technology, and the American Institute of Chemical Engineers) for his contributions to coating technology. Professor Houssam Toutanji received funding as PI for a project from NASA focused on extracting water from lunar soil. The InSPIRESS project led by Professor Phil Farrington has expanded to include eight area high schools, providing an opportunity for over hundred high school students to design a payload for a spacecraft designed by our seniors working on the Integrated Product Team. Dr. Christina Carmen received the prestigious SAE Ralph R. Teetor Educational Award. Graduate students. Alireza Hassanzadeh and Vladimir Uzelac won best paper awards at the 2011 IEEE Sensors Application Symposium, and the 2010 Proceedings of the International Conference on Compilers, Architectures and Synthesis of Embedded Systems, respectively.

These are just a few examples of the amazing accomplishments that I would like to invite you to read about in this first *Annual College of Engineering Newsletter*. I am particularly pleased to note that our accomplishments are only possible through very strong support our College enjoys from the University leadership, academic colleges and research centers on our campus, the Huntsville community, federal, state, and corporate research sponsors, our students and their families, our alumni, and our friends of the University.

Sincerely



Shankar Mahalingam

Dean, and Professor of Mechanical and Aerospace Engineering
December 2011



ECE Professor named American Physical Society Fellow

The College of Engineering is pleased to announce that Professor Timothy Boykin was elected Fellow of the American Physical Society (APS). Dr. Boykin is a Professor in the Electrical and Computer Engineering Department. He joined UAHuntsville in 1992 after receiving his Bachelor's Degree in Electrical Engineering from Rice University in 1987 and his Master's and Ph.D. in Electrical Engineering from Stanford University in 1988 and 1992,



respectively.

The Council of the American Physical Society made this determination "for contributions to the theory and full-bandstructure modeling of semiconductor nanostructures." Election to the APS Fellowship is recognition of outstanding contributions to physics, and is limited to no more than one half of one percent of the society's membership.

Dr. Boykin is also a UAHuntsville Foundation Research Award winner. His most recent publications include: "Accurate six-band nearest-neighbor

tight-binding and in-gauge model for the π -bands of bulk graphene and graphene nanoribbons (Boykin, et al, Journal of Applied Physics 109, 104304 2011) and *Full Three-Dimensional Quantum Transport Simulation of Atomistic Interface Roughness in Silicon Nanowire FETs* (Kim, et all, IEEE Transactions on Electron Devices 58, 1371, 2011).

Engineering Faculty Awards and Recognition

Professor Ramon Cerro in the Chemical and Materials Engineering Department received the John A. Tallmadge Award for Contributions to Coating Technology. The award recognizes an individual's significant contributions to the understanding or improvement of the technology of the coating of continuous webs.



Water Resources Institute's (WWRI) Outstanding Achievement Award at the EWRI World Environmental and Water Resources Congress in Providence, RI in May 2011.

Professor Krishnan Chittur in the Chemical and Materials Engineering (CME) Department and his group, SLP Diagnostics won first place in the 2010 Alabama Launchpad Initiative. The group is developing a product for the medical and biotech industry that will provide a simple, rapid, accurate diagnosis of specific infectious agents.



Professor Kathleen Leonard in the Civil and Environmental (CEE) Department received the 2010 Environmental &

Dr. Christina L. Carmen, Lecturer in the Mechanical and Aerospace Engineering Department (MAE), was selected as a Society of Automotive Engineers (SAE) Ralph R. Teetor Educational Award recipient. SAE International

is a global association of more than 128,000 engineers and related technical experts in the aerospace, automotive and commercial-vehicle industries. The SAE Teetor Program stimulates contacts between younger engineering educators and practicing engineers in industry and government.



Faculty Research Highlights

Professor Chien Pin Chen (CME) received a \$796,792 award from the Missile Defense Agency (MDA) for Computational Aero-Optics Simulation Development.

Professors Jeffrey Kulick and David Coe (ECE) have received over \$300,000 of Department of Defense support for software safety engineering analysis and are currently developing a software safety engineering program at UAHuntsville to

cultivate expertise in the design, implementation, and verification of safety and security critical systems. The ECE Software Safety Laboratory includes a variety of hardware and computing resources to support research and education at the graduate and undergraduate levels.

Professor Kathleen Leonard (CEE) was awarded \$43,137 from the University Transportation Center of Alabama for her

proposal "Transportation Engineering Advancement and Mentoring (TEAM)."

Professor Houssam Toutanji (CEE), along with NASA scientist Dr. Ed Ethridge, is working on a research grant funded by NASA which involves extraction of water from lunar regolith.

College Faculty and Research Centers co-Host Workshops



The College of Engineering and the UAHuntsville Propulsion Research Center hosted a Propulsion Research Workshop in October 2011. UAHuntsville has been asked to serve on the planning team for the new NASA National Institute for Rocket Propulsion Systems (NIRPS). Select propulsion leaders from universities around the nation gathered to discuss: 1) What is the state of Industry? 2) What is the state of the art in academia? and 3) Where should we be going in the future? The key organizers were Professor Robert

Frederick, Interim Director of the Propulsion Research Center and Professor from the Mechanical and Aerospace Engineering Department and COE Dean Shankar Mahalingam.

The Industrial and Systems Engineering and Engineering Management Department, the College of Engineering and the Center for Systems Studies organized a Systems Engineering Workshop in December 2011. The workshop featured leading systems engineering researchers from major universities in the United States.

The theme of this workshop was Understanding the Role of Elegance in Engineered Complex Systems: Engineering for System Effectiveness, Efficiency, Robustness and Behavior. The workshop will establish the groundwork for a consortium that will examine the fundamental question of what is elegant in engineered complex systems, how do we better understand and measure it, and how do we utilize it to improve the performance and affordability of modern systems.

Engineering Faculty Highlights

Professor Emil Jovanov (ECE), organized the first IEEE/EMBS Unconference on Wearable & Ubiquitous Technology for Health and Wellness in Boston, MA in August 2011. (<http://embc2011.embs.org/unconference/introduction/>)

Professor John Jarem (ECE), with his co-author, Partha Bannerjee released a second edition of the book Computational Methods for Electromagnetic and Optical

Systems published by CRC Press.

Professor and CME Chair C. P. Chen presented an invited lecture: “*Multiscale Modeling of Multi-component Evaporating Spray*”, as part of a Distinguished Lecture Series of the Chemical Engineering Department at Tennessee Tech University in October 2011.

UAH Propulsion Research Center
named third “Most Awesome Lab in
2010” by Popular Science

NSF Award help UAHuntsville Acquire Advanced Optical Fabrication Capabilities

With a recent NSF Major Research Instrumentation award, Drs. Lindquist and Fork from the Electrical and Computer Engineering department and Drs. Reardon, Robinson, and Geary from the Center for Applied Optics (CAO) are integrating novel optical fabrication capabilities costing ~\$850k into its graduate and undergraduate optical engineering programs. The CAO has invested an additional \$600k in precision diamond turning capability and a curve generation tool thus creating a world class advanced optical fabrication capability unique to academic environments. Recent advances in optical fabrication equipment,



particularly with the acquired deterministic polishing tools, have enabled the making of non-traditional optical components such as “free-form” (not rotationally symmetric) optics. The ability to reliably produce complex wavefronts will in turn alter the paradigm of optical design.



New Electronics Manufacturing Systems Lab

The Industrial and System Engineering Department in cooperation with the UAHuntsville College of Business’s Center for Management and Economic Research has established an Electronics Manufacturing Systems Laboratory (EMSL). The EMSL was made possible with the donation of a \$2 million surface-mount circuit board assembly line to UAHuntsville. The equipment includes a modern screen printing machine (MPM), three placement machines, and a 10-zone reflow oven (Rehm) which can provide accurate reflow profiles for almost any surface-mount application. The lab will be used to develop prototype circuit cards for local companies and organizations as well as short run production runs. The Director of EMSL is Dr. Phillip A. Farrington, Professor of Industrial and Systems Engineering and Engineering Management.



COE Welcomes New MAE Department Chair

The College of Engineering is pleased to welcome Dr. Keith Hollingsworth who joined the Mechanical and Aerospace Engineering Department as its new Chair in August, 2011. He received his Ph.D. in Mechanical Engineering from Stanford University in 1989, and his B.S. and M.S. degrees are from North Carolina State University.

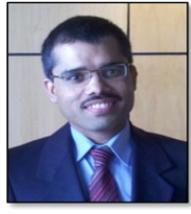


Prior to joining UAHuntsville, Dr. Hollingsworth was a faculty

member in Mechanical Engineering at the University of Houston where he graduated 35 research students at the Ph.D., M.S., and Honors Thesis levels. Dr. Hollingsworth's research interests span several areas of thermal science including boiling and two-phase flows, turbulent convection, liquid crystal thermography, and biomedical heat transfer. His years of teaching in Houston, largely in an undergraduate laboratory setting, have been recognized with three College teaching awards, the University teaching award, and the University research mentoring award. Dr. Hollingsworth is a Fellow of the American Society of Mechanical Engineers.

COE Welcomes New Faculty

Dr. Sarma Rani joined the MAE Faculty as an Assistant Professor in August, 2011. He obtained his Ph.D. in Mechanical



Engineering from the University of Illinois at Urbana-Champaign, and subsequently did his post-doctoral fellowship at the Cornell University. Both at Illinois and Cornell, his research focus was on direct numerical simulation and large-eddy simulation of particle-laden turbulent flows. Prior to joining UAHuntsville, he was at CFD Research Corporation for six

years. His interests continue to include simulations of turbulent flows with application to propulsion systems and energy systems, as well as analytical modeling of combustion instabilities and analytical and computational models of radiative heat transfer.

Dr. Rodrigo Teixeira joined the CME Department in April 2011 after obtaining his Ph.D (2005) and M.S (2002) degrees in Chemical Engineering from Stanford University. He obtained his B.S. (1999) from the school of



Chemical Engineering at Georgia Institute of Technology. Dr. Teixeira obtained his Ph.D. in Chemical Engineering under physics Nobel laureate Steven Chu. His interests include biochemical, optic and microfluidic techniques to observe individual polymer molecules in flow, stochastic modeling and sequential Monte Carlo probabilistic inference (machine learning) with emphasis on diagnosis and prognosis of human physiology and other electromechanical systems, and the production of renewable fuels at fossil fuel prices.

Multidisciplinary Research: Real-Time Physiological Monitoring Laboratory

Dr. Emil Jovanov (ECE) in collaboration with the College of Nursing has received two infrastructure awards for the establishment of a real-time physiological monitoring laboratory and the utilization of such a facility for research into real-time monitoring of occupational stress. The Lab allows a comprehensive evaluation of activity of the heart, brain, muscles, blood oxygen saturation, and autonomic nervous system using state-of-the-art sensors and monitoring equipment. Custom developed software integrates data from individual devices and automatically

stores time-stamped data into unanimous research databases to protect the privacy of subjects. The stressful work environment of hospitals has long been recognized, but the sources of workplace stress are not the same for all groups of healthcare professionals including nurses. The goal of this research is to quantify sources of stress in nurses in hospitals that lead to episodes of missed nursing care.

<http://www.ece.uah.edu/~jovanov/labs/RTPLab/>



Emil Jovanov, Karen Frith, Faye Anderson, Mladen Milosevic, Michael T. Shrove, "Real-time Monitoring of Occupational Stress of Nurses," Proc. 33rd IEEE EMBS, Boston, MA, USA, September 2011, pp. 3640-3643.

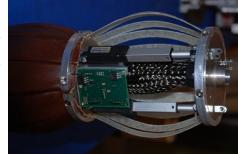
COE Students and Student Groups Nationally Recognized

The UAH Moonbuggy Team competed in the 18th annual NASA Great Moonbuggy Race at the U.S. Space and Rocket Center in Huntsville in April, 2011. Our team finished in second place overall in the college/university division. The competition requires teams to design, build and race a simulated lunar rover while adhering to similar design requirements and constraints as those encountered by the original NASA and Boeing engineers over 40 years ago. More than 80 teams from around the world entered the 2011 competition. First place went to the University of Puerto Rico. The UAH team also won the System Safety Competition.


Moonbuggy at competition, Apr 2011

The MAE Lunar Wormbot Team was the overall 1st place winner of the 2011 NASA

Exploration Systems/Mission Directorate Systems Engineering Design Competition. The Lunar Wormbot is intended to burrow into lunar regolith for exploratory and sample collection purposes. The project was part of the Product Realization capstone design class. The Wormbot team worked with a technical advisor from Johns Hopkins University and another senior design team from Louisiana Tech.



Lunar Wormbot Prototype

The CEE Department's Environmental Engineering Students Anna Campbell, Jason Haraway, and Justin Marks won 2nd prize in the national ASCE-EWRI PB (Parsons Brinckerhoff) Student Design



Students: Haraway and Marks

Competition in Palm Springs, CA, in May 2011. Dr. Kathleen Leonard was the sponsor for the UAH team.

The UA Huntsville Concrete Team won the 2011 Regional Concrete Canoe Competition held this spring at Tennessee Tech. In addition to rowing their canoe in numerous races, UAH team members were required to provide written and oral design reports. The UAH canoe was 23 feet long, and weighed only 49 pounds. Team UAH has won the national title in 1993, 1994, and in 1996. Dr. John Gilbert is the Faculty Advisor of the UAH ASCE Student Chapter.

Annette Fisher, MAE Graduate Student was chosen as the 2011 winner of the Director of National Intelligence's Exceptional Analyst Program.

2011 ECE Outstanding Design Awards

In memory of Paul Michael Salmon, the Department of Electrical and Computer Engineering recognizes the top three senior design projects with the 2011 Paul Michael Salmon Outstanding Engineering Design Award. This year's awardees are:

1st Place: HelpAR.Drone
(Ryan Tilly, Chase Jones, and Matt Truex advised by Dr. Emil Jovanov)

The HelpAR.Drone project involves both computing hardware and software. The students succeeded in developing and

demonstrating an AR Drone that can autonomously follow a person at a safe distance.

2nd Place: xPar Planetary Rover
(Coulter Broadway, Eric Shickel, Falco Girgis, and Hunter Adams, advised by Dr. Emil Jovanov and Charles Tullock from Dynetics).

The xPar Planetary Rover project was selected to be shown in the ADTRAN Senior Design Showcase event. It succeeded in the wireless communication and software control of a robot that could

travel as required in the Google Lunar X competition.

3rd Place: Automation of a Commercial Boom Truck

(Paula Yting, Jeff Richeson, and Colin Murphy advised by Dr. Charles Corsetti)

The Automation of a Commercial Boom Truck project involves both control algorithms and hardware to remotely control a commercial boom. The effort was sponsored by NASA.

Engineering Graduate Students Win Symposium Awards

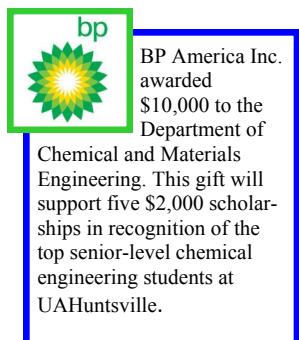
Alireza Hassanzadeh, ECE Graduate Student won the best paper award at the 2011 IEEE Sensors Application Symposium for paper "LC Sensor Microchip". The paper is co-authored by his advisor, Professor Robert Lindquist.

Omud Samimi Abianeh, CME graduate student was selected for the I&EC Graduate Student Award Symposium at the American Chemical Society's National Meeting in Denver CO. His paper, "Discrete multi-component evaporation model of gasoline-ethanol blended fuel with liquid turbulence effects", was co-authored by his faculty advisor Professor C. P. Chen.

Scholarship Highlights

Morgan Chamberlain (MSE 2010) was awarded a scholarship from the NSERC (National Sciences and Engineering Research Council of Canada). NSERC awards the Alexander Graham Bell scholarships to the top-ranked postgraduate scholarship applicants based on their academic excellence, research potential, communication skills, and interpersonal and leadership abilities.

Stephen Sanders, MAE student, is the 2011 recipient of the Tennessee Valley Air Force Association \$1000 Scholarship.



COE InSPIRESS Program Brings Engineering Design Challenges to High School Students

Faculty and staff from Center for Modeling, Simulation, and Analysis (CMSA) and the College of Engineering are working with high school students across north Alabama in the Innovative Student Project for the Increased Recruitment of Engineering and Science Students (InSPIRESS) program in concert with the Integrated Product Team (IPT) program for seniors in MAE and ISEEM. The InSPIRESS program gives high school students a realistic engineering project that could one day fly on an actual NASA mission.

With over twenty teams of high school students competing for the NASA mission, high school students are learning about the design process but also the project management side of engineering design. The high school teams work with UAH Engineering students through the IPT Senior Design program giving UAH students a unique mentoring experience.

The InSPIRESS program is led by College of Engineering faculty member, Dr. Phil Farrington of the ISEEM department and by CMSA scientists, Dr.

P.J. Benfield and Dr. Matt Turner.



Students from Austin High School in Decatur explain their design concept to Gene Goldman, Deputy Director of MSFC

Rebel and Humanitarian Effort in Libya Aided by ECE Graduate

Ousama Abushagur (ECE '06) had a pivotal role in the successful rebel effort in Libya. In August 2011, after only a six month struggle, rebel forces prevailed and this success is due in no small part by Mr. Ousama Abushagur. He masterminded the successful launch of a new cell phone network to provide telephone access to areas under rebel control in Libya. Approximately a month earlier, the Libyan government jammed satellite phones and cut phone and



Ousama Abushagur
Photo by Ravindra K

internet service to disrupt rebel communications. Using his telecommunication and business expertise, Mr. Abushagur leveraged a network of engineers and Middle East contacts to hack into a database of phone numbers, integrate new equipment into existing networks, and re-route calls to the new system in less than a month. The network that reaches about 2 million was critical to support not only the rebel effort but also to enable humanitarian support.

NASA MSFC Chief Technologist teaches Photonics Class

Dr. Andrew S. Keys (Ph.D. EE '02) gives his leadership, experience, and insight to future engineering challenges at NASA and in society in the classroom by teaching Photonics. The course has an application focus with a significant amount of hands-on experience with photonics hardware. Dr. Keys' knowledge and experience is invaluable resource to our undergraduate students.



Andrew Keys
NASA Photo

As MSFC Chief Technologist, Dr. Keys is principal advisor to center leadership on matters concerning center-wide technology development.

Other Alumni Notes

Ashley Walden (BSE-CME '09) works at the Missile Defense Agency, doing research with MIT Lincoln Labs to find a way for radars to better discriminate unknown objects in the endo- and exo-atmosphere.

Randy McGuire (BSE-MAE '99) became President of Fontaine Trailer's Heavy Haul Business Unit.

Former ECE Professor holds Libyan Government Post

Former UAHuntsville ECE Professor, **Dr. Mustafa A.G. Abushagur**, was named Deputy Prime Minister of Libya in November. He was an ECE Professor from 1985 to 2002 and one of the originators of the Optical Engineering Program at UAHuntsville. He joins his former colleague, Dr. Abdurrahim El-Keib, who was a Professor of Electrical Engineering at The University of Alabama and is now the Prime Minister of Libya.



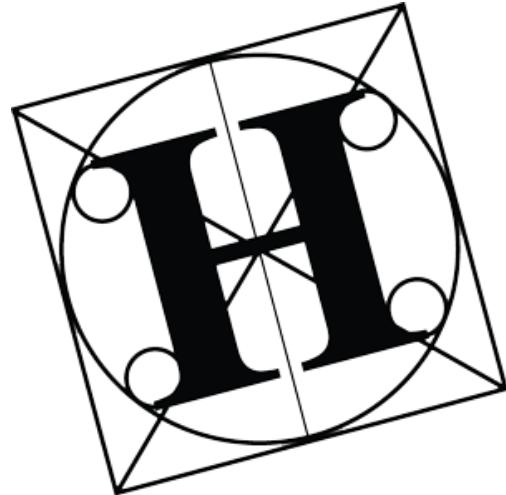
Mustafa Abushagur
Wikipedia Photo

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College Seeks Candidates for Open Faculty Positions

The College of Engineering seeks applicants for tenured and tenure track faculty positions. The College of Engineering is the largest of five academic colleges in terms of student enrollment and currently has a research focus that addresses three National Academy of Engineering Grand Challenge problems. They are to (1) secure cyberspace, (2) restore and improve urban infrastructure, and (3) engineer tools of scientific discovery. UAHuntsville is located in the midst of a high technology community consisting of Fortune 500 corporations, NASA's Marshall Space Flight Center, and the Redstone Arsenal.

The anticipated starting date for all positions is August 22, 2012. Women and candidates who are members of minority groups are especially encouraged to apply. UAHuntsville is an Affirmative Action/Equal Opportunity Employer.

POSITION 1: The Department of Mechanical and Aerospace Engineering in the College of Engineering at the University of Alabama in Huntsville invites applications for a faculty position in the area of Unmanned Aerial Systems (UAS). Applicants for positions at the rank of tenure track Assistant Professor or tenured Associate Professor will be considered. Along with experience in UAS applications, the candidate should have teaching and research interests and experience in at least one of the following disciplines: aerodynamics, flight mechanics and controls, vehicle system design and analysis, flight operations including aviation safety and security.

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POSITION 2: The Department of Mechanical and Aerospace Engineering in the College of Engineering at the University of Alabama in Huntsville invites applications for a faculty position in the area of Propulsion Energy Systems. Applicants for positions at the rank of tenure-track Assistant Professor or tenured Associate Professor will be considered. The candidate should have teaching and research interests and experience in at least one of the following disciplines: liquid, solid, or air breathing propulsion systems and/or advanced propulsion concepts (electric/plasma). Related areas of interest include plasma engineering for power, combustion, and high energy density physics. Expertise in experimentation is preferred.

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POSITION 3: The Department of Chemical and Materials Engineering in the College of Engineering at the University of Alabama in Huntsville invites applications for a tenure-track or tenured faculty position in the area of sustainable energy with emphasis in bio-related processes. The position is open to all ranks but ideally we seek to attract an established Associate or Full Professor in this dynamic area. A complementary search in the area of sustainable energy conversion and storage is also underway in the department of Mechanical and Aerospace Engineering.

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POSITION 4: The Department of Mechanical and Aerospace Engineering in the College of Engineering at the University of Alabama in Huntsville invites

applications for a faculty position in the area of Energy Conversion and Storage. Applicants for positions at the rank of tenure-track Assistant Professor or tenured Associate Professor will be considered. The candidate should have teaching and research interests in fundamental and applied issues relating to energy systems and their underlying scientific and engineering disciplines, with particular interest in sustainable energy conversion and energy storage. A complementary search in the area of bio-related energy conversion processes is underway in the department of Chemical and Materials Engineering.

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POSITION 5: The Department of Civil and Environmental Engineering in the College of Engineering invites applications for a tenure/tenure track faculty position in structural engineering with a preferred focus in the areas of structural health monitoring, structural dynamics, conceptual design of structural systems, expertise in composite materials, and familiarity with experimental techniques and equipment for structural evaluation and measurements. Strong candidates in other emerging areas will be considered. The position can be filled at either the assistant or associate professor level.

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