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CHABAUM LEE JOINS FACULTY

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SELLS FAMILY ENDOWMENT AIDS IN CLASSROOM RENOVATION

MESSENGER

The newsletter for alumni, students and friends of the Department of Mechanical Engineering at Tennessee Tech

MESSAGE FROM THE CHAIR

Mohan Rao, Ph.D.

I am pleased to present the second annual ME newsletter. As I had mentioned in my previous MEssenger, our strategic plan is consistent with the College of Engineering's plan to educate 21st century Renaissance Engineers to solve societal problems. To achieve this goal, we continue to improve the quality of education offered to our undergraduate and graduate students and to grow our external research. With help from our outstanding faculty and graduate students, we are ramping up our efforts to modernize our curriculum and laboratories. I am committed to enhancing the recognition, visibility and ranking of our ME department both at the regional and national level so that our students can go anywhere in the nation for employment and are sought out by other graduate schools. Based on the accomplishments of our students and faculty as presented in this newsletter, you will see that we are moving closer and closer to achieving this goal.

The college has expanded and developed in numerous ways. Our undergraduate program continues to grow; in fact, we are ranked in the lower 30s among 250 undergraduate ME departments in the country! This demand speaks highly to the quality of our program. Our graduate enrollment now stands at 67 (47 M.S. and 20 Ph.D.), a healthy growth compared to 25 students two years ago when I joined. It should be noted that about 50 percent of M.S. students are domestic and 60 percent are funded through GTA or GRA; 30 percent of Ph.D. students are domestic, and almost all are funded. Our faculty is engaged to keep pace with the instructional demands and changing industry needs in Tennessee.

We are greatly expanding our research expertise and our undergraduate and graduate course offerings as well as our ability to address the changing needs of local and national industry and government agencies. Last year, over 20 design projects in the capstone design course were funded by industry. Moreover, the number of proposal activities has been increasing in the department; we now have several active research grants from NSF, ONR, DOE, and ASHREE.

We welcomed one new faculty member, C. Lee, who has a Ph.D. and post-doctoral experience in the area of sensors measurements and mechatronics. We also have some exciting new developments in the area of innovation and entrepreneurship (I&E) education for our students. For example, the iMakerSpace, located in the third floor of Library, was recently created under the leadership of Stephen Canfield as a focal point on campus to provide training, service, partnership, research and evaluation in I&E to all disciplines. The iMakerSpace encourages interdisciplinary activities and provides support and training to extend I&E activities into the classroom and research. In addition, we now also offer an I&E certificate and host an annual I&E competition similar to the "Shark Tank" program on TV.

Our challenge is to continue this growth with limited resources. It has become increasingly necessary for us to rely on support from our alumni and friends to sustain our growth and operation including funds to upgrade our laboratories and facilities. The ME external advisory board continues to be proactive in supporting our program, and we are discussing launching a new capital campaign to raise funds for the ME department.

We value your support and encouragement as we search for ways to help our students on their way to becoming 21st Century Renaissance Engineers. I invite you to contact us to schedule a visit and learn more about the department.

IN THIS ISSUE

Industrial Assessment Center news

Cunningham leads series of workshops

In August, Glenn Cunningham, Ph.D, P.E., associate professor of mechanical engineering and director of the Industrial Assessment Center, led a series of workshops across Tennessee on compressed air efficiencies. Almost 100 representatives of industry, local and regional electric distributors, and the Tennessee Valley Authority (TVA) attended the one-day course. Attendees learned the basics of air compressors as well more advanced topics such as controls, compressed air treatment and minimizing pressure drop. These workshops were funded by a partnership between TVA, electric distributors and TTU's Center for Manufacturing Research through a grant from the U.S. Department of Energy to increase workforce development in industrial energy efficiency.

Languri named associate director of Industrial Assessment Center

Ehsan Languri, mechanical engineering assistant professor, has been named the associate director of the Industrial Assessment Center in TTU's Center for Manufacturing Research. The Industrial Assessment Center is sponsored by the Department of Energy's Advanced Manufacturing Office. Under the direction of associate professor Glenn Cunningham since 2006, it has trained dozens of TTU engineering students in industrial energy efficiency and saved more than 73,000 megawatts of energy for manufacturers in the Southeast. Languri's background and expertise in energy efficiency will enhance its capabilities and resources, resulting in an increased number of energy assessments offered and ultimately, more energy savings for industry.

For more information about the IAC, contact Michelle Davis, mdavis@tntech.edu, 931-372-6386.

Lee joins ME faculty

ChaBum Lee earned his bachelor's in mechanical engineering in 2006 from Chung-Ang University. He earned his master's in 2008 and his doctorate in 2012 in mechatronics from Gwangju Institute of Science and Technology. He worked at LG Display as a senior researcher and did research related to retina display manufacturing technology afterward. Prior to joining Tennessee Tech, he studied manufacturing and metrology as an assistant research professor at the University of South Carolina. His research interests include precision manufacturing and metrology technology in optical measurement; sensors and actuators; smart materials and structures; precision machining; and optical analysis and fabrication of diffractive optical components.

ME FACULTY ACHIEVEMENTS AND ACCOMPLISHMENTS

- Jiahong Zhu, Ph.D., was the recipient of the Sissom Creativity & Innovation Award
- Ying Zhang, Ph.D., was the recipient of the Kinslow Engineering Research Award
- Stephen Canfield, Ph.D., was the Innovation and Techno-Entrepreneurship Faculty Fellows.
- Glenn Cunningham, Ph.D., earned $150,000 from the U.S. Department of Energy for a project "Public-Private Partnership for a Comprehensive Workforce Development Plan to Stimulate Industrial Energy Efficiency and Demand Reduction."
- Through NASA, Vanderbilt University awarded a grant for $22,100 to Corinne Darvennes for the project "Tennessee Space Grant Consortium 2010-15."

ASME awards presented to faculty and staff

The student chapter of ASME in the mechanical engineering department once again polled their members to present select awards to faculty and staff. This year, Outstanding Teacher was presented to Stephen Canfield, Outstanding Advisor was presented to Ahmed Abounassif, and Kacie Scruggs received Outstanding Staff for the second year. Congratulations to our dedicated faculty and staff! [Photo L-R: Mohan Rao, Ahmed Abounassif, Abigail Sawyer (ASME President), Kacie Scruggs, Stephen Canfield]

Anton named Air Force summer faculty fellow

Mechanical engineering assistant professor Steve Anton (left) was selected for the 2015 Air Force summer faculty fellowship program. This program, sponsored by the Air Force Office of Scientific Research, allows faculty to gain first-hand exposure to Air Force research challenges through summer residencies at participating Air Force research facilities. Anton, along with his doctoral student Ryan Kettle (right), spent 10 weeks beginning May 18 at Eglin Air Force Base in Florida performing research in the Munitions Directorate on a proposal titled “Real-Time Monitoring of Structures under Highly Dynamics Environments.”

Marquis retires after 37 years

Professor Jeffrey Marquis retired at the conclusion of the fall semester with over 37 years of service to the mechanical engineering department. Marquis has been an influence to students as an outstanding professor and mentor, and he has been an exceptional colleague offering his time and expertise to the department. A retirement party was held for Jeffrey Marquis on Dec. 11 in Brown Hall with current and past colleagues attending.

TTU to host Baja SAE 2016

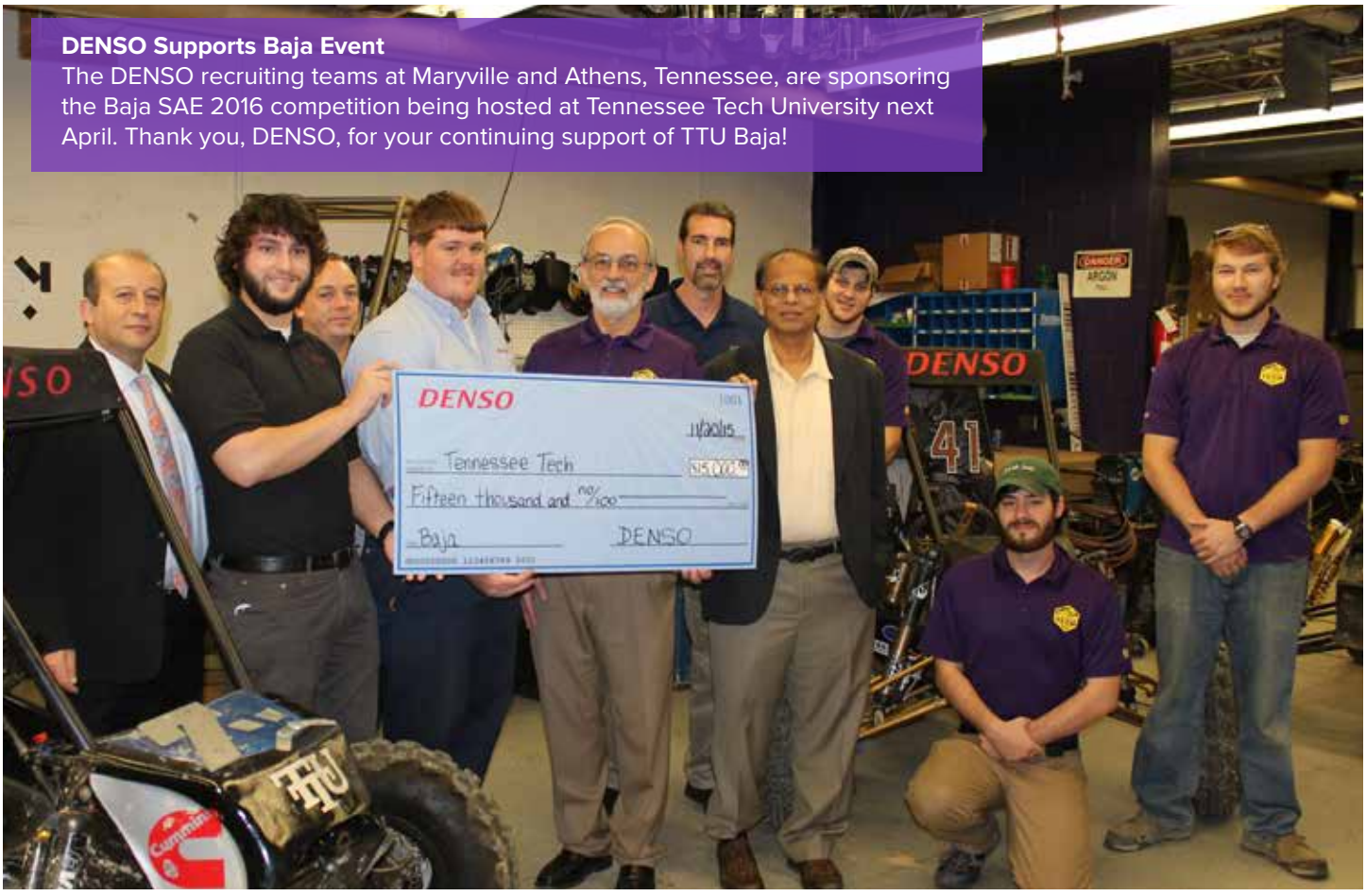
Tennessee Tech will host the international collegiate Baja SAE competition April 14-17 at the Hyder-Burks Agricultural Pavilion. When TTU hosted the event is 2013 there were more than 1,000 students from 100 teams in attendance.

Each team will be judged on technical inspection and design, acceleration and top speed, land maneuverability, the sled pull, suspension and traction, and various dynamic events. The endurance event will conclude the competition on Sunday. We encourage you to enjoy the event as designated spectator areas will be available. Volunteers are also needed for all four days.

If you or your organization would like to volunteer, please complete the volunteer registration at **www.bajasae.net/go/?vol=ttu2016**

We look forward to seeing you at BAJA SAE Tennessee Tech in April 2016!

DENSO Supports Baja Event
The DENSO recruiting teams at Maryville and Athens, Tennessee, are sponsoring the Baja SAE 2016 competition being hosted at Tennessee Tech University next April. Thank you, DENSO, for your continuing support of TTU Baja!



L-R: Vahid Motevalli, Tyrell Laxton, Brian Crawford – DENSO Maryville, Sam Keener, Dale Wilson, Brian Smith – DENSO Athens, Mohan Rao, Kurt Pierchoski, Brian Sharp, Logan Atkins

Three Tech students win best innovative design in ASME international competition

Scott Hill, Nikola Tepavac and Chas Davies won best innovative design in the Innovative Additive Manufacturing 3-D Challenge with their anthropomorphic robotic hand.

An anthropomorphic robotic hand designed by a team of Tennessee Tech University students was named a finalist in the Innovative Additive Manufacturing 3-D Challenge design competition sponsored by the American Society of Mechanical Engineers.

In the competition, teams of students from around the world presented inventions made from additive manufacturing, more commonly known as 3-D printing, to a panel of judges comprised of industry experts.

"Our design is what we call a compliant mechanism design, comprised entirely of flexible joints and members in a single, solid part," said mechanical engineering professor and team advisor Stephen Canfield. "The dexterity of a human hand made the product stand out."

Canfield provided guidance, oversight and direction on the research of the project, and students designed, fabricated and tested the hand.

The team consisted of Scott Hill of Nashville, Chas Davies of Mount Juliet, and Nikola Tepavac of Serbia. Their hand won best innovative design in the competition, which was held in Boston as part of an academic research conference.

The design's four fingers and thumb made the hand anthropomorphic, in comparison to the normal two-jaw gripper one would use for a robotic manipulator.

"One of the unique things that put us over the edge is traditionally when you design a mechanical product it's made of a bunch of parts and then you assemble the parts together with bearings and end up with more than 100 parts," said Hill, a mechanical engineering graduate student.

The team also used plastics instead of metal, thus making the hand safer for humans to work around.

"It is quite possible for humans to be shaking 'hands' with robots in the future because of our design concept," said Davies, a junior mechanical engineering student.

In the competition, teams of students must create a business plan using The Lean Startup Method to commercialize their product, along with inventing or revamping an existing product. Canfield's expertise in innovation and entrepreneurship education of The Lean Startup methodology played an important role in the students' experience. Canfield said he plans to have one or two teams compete in next year's challenge.

iMakerSpace is Open

The iMakerSpace is a partnership between the College of Engineering and College of Business with the goal of creating an interactive space for students and faculty to use collaboratively while working on innovation and entrepreneurship projects. The iMakerSpace has all the equipment needed for small-scale protyping and fabrications. It also includes a meeting space outfitted with modular accessories such as whiteboards, desks, chairs, presentation equipment and technologies, such as 3-D printers, that are available to all TTU students and faculty.

Collaboration is the driving force behind iMakerSpace activity. Working together, the colleges of Engineering and Business, along with the Pathways to Innovation Program team and other stakeholders, create sustainable strategies and models which foster a student-centered environment.

There are seven student organizations currently calling iMakerSpace home. Every week these clubs attract over 200 students that focus on a wide range of activities, ranging from learning fabrication, engineering design, programming robots, building and attaining certification for rocketry, to discussions and excercises about entrepreneurship and how to make the world a better place.

During the spring, there will be numerous incentives and initiatives encouraging cross-campus collaboration between disciplines, classes, faculty and other entities. One of the main focus areas will be recruiting new students and faculty to the iMakerSpace to work with projects and to facilitate use of all the recources available. For more information, please contact iMakerSpace@tntech.edu.

Capstone Design Update

Gerald Alexander, Jared Hughes, Chance Williams and April Parkison

The mechanical engineering program has seen tremendous growth in the last couple of years of the capstone design (ME4444) course. Consequently, the number of seniors taking ME4444 have been around 60 per semester. In fall 2015, the department had 10 sponsored projects. There were three external evaluators, all of whom have worked with the department in the past judging the projects. The general consensus was that the quality of capstone projects are definitely improving every semester.

The Best Project award was presented to “A Retrofit for a Tri-Cycle for Children with Visual Impairment.” This team project was sponsored by Stephen Canfield, Ph.D. The students who worked on the project were April Parkison, Chance Williams, Gerald Alexander and Jared Hughes. Congratulations to these graduating seniors!

If you are interested in sponsoring a capstone experience for students, please contact Meenakshi Sundaram at 931-372-3790 or msundaram@tntech.edu.

OTHER STUDENT ACHIEVEMENTS AND AWARDS

- Industrial Assessment Center (IAC) students Ian Swagerty (ME – Master’s) Anthony Taylor (ME – Master’s), and Melissa Moffet (CEE – undergraduate) for being one of the winners of the national IAC Video Submission contest. Students at 24 centers were invited to contribute a short video on an aspect of assessing energy efficiency. There were 15 submissions and our center was chosen as one of three winners. Their topic was Safe Methods of Taking Power Readings on Electric Panels. The video can be seen at www.facebook.com/TnTechIAC/videos
- April Parkison – 2015 Rising Renaissance Engineer Spectrum Award Winner
- Ramon Pellizzarro – 2015 Rising Renaissance Engineer Spectrum Award Winner
- Tyler Huffine – invited to become member of Omicron Delta Kappa , a national honor society.

Harold and Doris Sells meet with ME chair Mohan Rao in their home.

Sells Family Endowment aids in classroom renovation

Harold Ray Sells Sr. (Tennessee Polytechnic Institute, Mechanical Engineering, 1957) and his wife Doris B. Sells, along with their family, began a departmental endowment for the Department of Mechanical Engineering in 2009. The Ray and Doris Sells Family Mechanical Engineering Program Development Endowment is unique in that its intention is to assist the department at the ME chairman's discretion.

Sells, now retired after 34 years at NASA/Marshall Space Flight Center, was an engineer working with the space program. His work included the pioneering ventures of the '60s with the Saturn Apollo Space Program to safely land men on the moon and return them to earth, the Skylab Program, and the more recent Space Shuttle Spacelab missions. After retirement he was a consultant with Titan Systems (1988-1989) and Pace & Waite (1989-2002).

He attributes his start to the education he received in the mechanical engineering program at TTU. He is a believer that lifelong learning is essential for success and wishes to express the importance of communication and technical writing to future engineers.

When asked what advice he would give to students today, his response was "pick a job you like and enjoying going to work every day. I spent 34 years working in the space program and enjoyed it very much. I consider it a dream career being part of putting men on the moon, one of mankind's greatest achievements."

The Department of Mechanical Engineering would like to support his belief in lifelong learning by naming the renovation of a key classroom in Brown Hall in the Sells Family honor. We are very appreciative of his gift to the department through the endowment and our ability to utilize his contribution to its fullest by graduating 21st Century Renaissance Engineers.

During the upcoming winter break, room 315 in Brown Hall will be completely renovated. Mechanical engineering students will have the chance to utilize the new classroom beginning Spring 2016 for courses such as their Senior Capstone Design Course (ME4444) and have state-of-the-art audio visual equipment along with a workspace conducive to group projects, due to contributions from The Ray and Doris Sells Family Mechanical Engineering Program Development Endowment.

Speaking with Ray Sells, he mentioned Lee Iacocca said it best when he referred to three stages of life. The first is learning, the second is earning and the third is returning. Ray said he is in his returning phase now and wishes to show his appreciation to the mechanical engineering department for his learning experience.

Sells is a 1949 graduate of Livingston Academy in Livingston, Tennessee.

ME partners with Elephant Sanctuary to create an elephant hut prototype

The Department of Mechanical Engineering at Tennessee Tech has been working with the Elephant Sanctuary in Hohenwald, Tennessee, to design, model and test a prototype of an elephant hut. Assistant Professor Ehsan Languri and two graduate students are hoping to design and test a sustainable off-grid elephant hut which will provide a comfortable environment for elephants during harsh winter days and nights. Prior to Languri's research, Professor Meenakshi Sundaram and capstone design students were able to setup and test earlier versions of an elephant hut prototype.

An evacuated-tube water heater, which is being tested for the elephant hut prototype.

The elephant hut prototype is composed of evacuated tube solar heaters that are connected to a concrete hut to harvest the solar radiation for heating purposes. Languri's research team has been working on two new technologies to advance the existing prototype: Phase Change Materials (PCMs) are being used as a thermal battery to store the thermal solar radiation during day for later use during night or rainy hours; and graphene nanofluids with high thermal conductivity are being utilized to harvest larger amount of solar radiation compared to traditional carriers for a more efficient thermal energy system. These two technologies are being tested at TTU research laboratories before they are implemented to the prototype for field demonstration.

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Stay in touch with the Department of Mechanical Engineering

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