FALL 2014 MNE NEWSLETTER

Message from the MNE Department Head

Well, we broke another record this fall—reaching an undergraduate enrollment of 870 students in the mechanical and nuclear engineering (MNE) department! The trend over the last five years in undergraduate enrollment is shown in the chart below. In addition, we now have 63 graduate students, a number we are working to increase significantly over the coming years. To help us deal with this growth, we have active searches ongoing for three new faculty members and we will soon advertise two new staff positions. I am delighted to say that our search committees have done great jobs and we are interviewing eight very promising candidates to fill these new faculty positions. I expect to introduce some new faculty members to you in our next newsletter.

Our new dean of the college, Darren Dawson, has hit the ground running. He is a “numbers man” and is pushing all the departments to establish goals and strategies to achieve them. One of my stated goals is to increase the number of Ph.D. students from 27 last year and 30 this year, to at least 50 in 2019. This is required if our department is to do its part in realizing the 2025 Vision that President Kirk Schulz has established. In order for K-State to become a top 50 public research institution by 2025, the College of Engineering goal is to increase its Ph.D. enrollment up to 310. The MNE Department accounts for, by most measures, about 25% of the College of Engineering. This means that we must have about 78 Ph.D. students in our program by 2025. This is an ambitious goal for us because we must also deal with the increasing undergraduate enrollments, but your MNE Department is prepared to meet the challenges.

In this newsletter, you will read about some of the significant awards and achievements of our students and our faculty. Mo Hosni, professor and former department head, was recognized as K-State’s International Educator of the Year. Also, Professor Douglas McGregor received his third R&D 100 award in his 12 years here. This is an astounding achievement. I hope you will enjoy reading about these and other accomplishments of members of our department. And I also hope you will feel free to visit us anytime you can.

Bill Dunn, Professor and Department Head

Steven M. and Kay L. Theede Chair in Engineering
dunn@k-state.edu
**Segbot**
A Kansas State University professor and a group of students designed and built a Segway Style Balancing Robot (Segbot). A two-wheeled, balancing robot, it is an example of an underactuated, nonlinear, nonholonomic dynamic system.

Warren White, MNE associate professor, led the development team. The microcontroller is called the myRIO and is manufactured by National Instruments. The K-State team is the first to develop an application of the myRIO to the Segbot.
This robot can turn, tilt, travel across the floor, and each of its wheels can turn independently of one another. A user can measure the turn angle, the tilt angle, the wheel positions, and the coordinates of the Segbot location.

Turn and tilt angles determine the Segbot’s orientation. The wheel positions and the turn angle are related. Five pieces of information—wheel angles, tilt, and location coordinates—are needed to measure the Segbot’s orientation and position. There are only two motors or actuators, one on each wheel as well as five things that can vary using only two motors.

The Segbot is underactuated because there are more things it can do than available motors. It is nonholonomic because it can only move in one direction at a time. Its wheels can drive it forward, but not sideways.

The dynamic equations relate the voltages sent to the motors to the Segbot location acceleration and the angular accelerations of the Segbot tilt and wheels. These dynamic equations are mathematically nonlinear which results in the Segbot being a nonlinear dynamic system.

Many current and former MNE students contributed to this project. Matt Migchelbrink, Jacob Wagner and Brain Blankenau are responsible for the control system design. Lucas Gorentz designed the physical structure and completed all of the CAD work. Skyler Butler and Kristine Larson made the video. Alan Ramirez and Sergio Ortiz created and manage the website. The wiring diagram was developed by Cameron Lucero.

**Hosni named International Educator of the Year**
Mo Hosni, MNE professer, was honored as the International Educator of the Year by Kansas State University in a ceremony on Nov. 18, 2014.

The award recognizes Hosni not only for his distinguished record, but also for his key involvement in the Gujurat University (India) summer exchange program; his mentoring of students from Austria, Hong Kong, and many other countries; and his dedicated efforts at distance education that allow students from around the world to experience classes taught by K-State faculty members.

Hosni has been with the MNE department since 1991 and since that time his achievements include the following:
• Director, Institute for Environmental Research, 1993 – 2001
• Myers-Alfred Teaching Excellence Award, 1997
• Department head, 2001-2009
• Distinguished Service Award, ASHRAE, 2003
• Distinguished Fellow, Mississippi State University Bagley College of Engineering, 2004
• Dedicated Service Award, American Society of Mechanical Engineers, 2008
• Director, University Engineering Alliance, 2009-present
• Exceptional Service Award, ASHRAE, 2013

**R&D 100 Award**

Douglas S. McGregor, MNE professor and director of K-State’s Semiconductor Materials and Radiological Technologies (SMART) laboratory and his colleagues, have been awarded an R&D 100 Award for their research on lithium-based neutron detectors. The R&D 100 Award, selected by R&D Magazine, denotes the 100 most technologically significant new products of the year.

McGregor joined the MNE faculty in 2002 and has since established a strong research program. This is his third R&D 100 Award during 12 years at K-State. The winning team consisted of McGregor, Kyle Nelson, Steven Bellinger, Benjamin Montag and Niklas Hinson, all from K-State, as well as Saint-Gobain Crystal and the Defense Threat Reduction Agency, who funded the research. More information about the SMART lab can be found at www.mne.ksu/research/centers/SMARTlab.

The R&D100 program describes his research on Lithium-based neutron detectors as follows:

As the need to monitor radioactive materials grows, so does the market for detectors capable of quickly and reliably finding them. However, this demand may be thwarted by a shortage of raw materials and rising prices. Traditional neutron detectors, for example, rely on helium gas, which has suffered from interruptions in supply in recent years. Fortunately, lithium foil technology has progressed rapidly thanks to the battery industry, and this metal is reasonably priced.

Scientists at Kansas State Univ.’s SMART Laboratory and Saint-Gobain Crystals have capitalized on the availability of 6Li (lithium) to produce Lithium Foil Neutron Detectors that offer equivalent or better detection efficiencies compared to present-day helium (3He) detectors. The detector design, called a multi-wire proportional counter (MWC), utilizes the suspension of multiple thin 6Li foils between anode banks to create a high-efficiency, large-area, low-cost gas-filled neutron detector. They have similar gamma-ray rejection, comparable compactness and up to an order of magnitude lower cost, which should appeal to users who require them in nuclear security, scientific experiments or petroleum searches.

*Pictured: Dr. Douglas McGregor, Kyle Nelson, Steven Bellinger, Benjamin Montag and Niklas Hinson*
HONOR ROLL OF GIVING – JULY 1, 2013 – JUNE 30, 2014

$100,000 and above
Jane Neff

$50,000 – $99,999
Jean Myers*

$10,000 – $49,999
Marlin Breer and Joan Russell
Jim and Suzanne Jaax
Steve and Kay Theede

$5,000 – $9,999
Sylvia Apple
Neal and Susan Johnson
Faye Kaul*

$1,000 – $4,999
Dave and Tammy Douglass
Patrick and Rita Ervin
Joe and Nancy Farrar
Ken and Cynthia Habiger
Brent and Bonnie Heidebrecht
Emily Jones
William and Rebecca Kennedy
Charles and Linda Kuhn
John and Mildred Lindholm
Mike Rogers
Ray and Meghan Schieferecke
Charles and Arlene Steichen
Marlin* and Peggy Taylor
Bradford and Cynthia Wick

$500 – $999
N K and Veena Anand
Norman and Malinda Anderson

Chance* and Donna Bahadur
Steve and Patty Bauerband
Larry Beil and Hedy Devero-Beil
David and Heather Bradford
Robert Debes
Matthew Dickson
John and Mary Ensz
Darin George
Richard and Angella Heitmeyer
Bryan and Angie Long
Tom and Joan Mistler
Haven and Barbara Rolander
Philip Solomon
Donald Tonn
Brian and Cheryl Wichman

$250 – $499
Rebecca Anderson
Steven and L B Clark
Chris Erickson
Vernon and Carol Fish
Marvin and Jan Gearhart
Lisa Jones
Jim and Mary Kent
Nancy and Clayton Landers
Tim Mourlam
Rod and Beverly Nash
Gregory and Pamela Spaulding
Thomas and Amanda Vehlewald

$100 – $249
Brian Anderson
Michael Anderson
Jeff and Sarah Arroyo
Kurt and Erin Balthazor
Taylor and Julie Bozarth

John and Brenda Bridson
James and Judith Callen
Alan and Amanda Cebula
Eric Cunningham
John and Jenny Curtis
Rodney Davignon
William and Karen Dunn
Thomas and Debra Edwards
Michael and Linda Estes
Tony Ferguson
Scott and Michelle Flaming
Richard and Joyce Franz
Shawn Georg
Jeffrey Geuther
Ken and Dolores Gowdy
Ron and Brenda Haky
Loren and Phyllis Harris
Alec Hendryx
Mo and Fakhry Hosni
Byron and Melanie Jones
Justin Kaeberle
Mark Kedzierski
Eric and Julia Keen
Michael McEwan
Jim McKinnis
Ronda and Marc Olson
Ethan and Emily Pauly
Bob Phillips
Thomas and Leah+ Pollock
Roy and Sharon Rathbun
Gary and LuAnn Sauber
Ken and Margaret Schmanke
Amy and Joe Schmitz
Michael Schupp
Gerald and Donna Shafer
Bill and Christine Smiley
Shaun Thiessen
Matthew and Sara VanDeCreek
Brian and Kelly Vandorn
Janessa Wedel
Richard and Ellen Willis
Spring 2014 Undergraduate Research Poster Forum

The first Engineering Undergraduate Research Poster Forum on April 22 in the College of Engineering Atrium included 22 poster presentations from five different engineering departments. Research topics included advanced manufacturing and materials, energy, nuclear engineering and sensors, and systems and networks, among other topics. Twenty-six faculty, staff and graduate students were involved in judging the posters, and many others stopped by to view the research posters. Winners at the spring 2014 contest were Caleb Chiroy and Andres Martinez (top picture right and left, respectively, with Assoc. Dean Noel Schulz), both mechanical engineering, splitting the first-place $300 scholarship for their work with Asst. professor Amy Betz, “Effects of micro-structured surface geometries on condensation heat transfer”; Taylor Ochs (above with Assoc. Dean Noel Schulz), mechanical and nuclear engineering, with Professor Douglas McGregor, “Fabrication of current-generation microstructured semiconductor neutron detectors.”

Where are our MNEs?
We would like to hear from you. Email Mitzi Farmer at mwfarmer@k-state.edu with information about your career, family or other post-graduation updates. When you send news be sure to include your name, graduation year, a photo if available and your location.

Employer’s matching gift helps grad’s giving go further
Emily Jones has built a racecar’s suspension, led research and development, coordinated public relations events and recruited corporate sponsors — all before completing her bachelor’s degree.

The mechanical engineering graduate is quick to point out that her involvement with Powercat Motorsports Formula SAE Team transformed her K-State education from textbook information to “a physical representation of what I’d learned.”

Now employed as a Facilities Engineer for ConocoPhillips, Jones has given back to the team that gave so much to her. Her employer matches her charitable giving, doubling the support for today’s team members.
“I want future students to take advantage of the opportunities presented by design teams at K-State,” Jones said. “It creates better engineers, and employers appreciate that.”

Jones is proud to work for ConocoPhillips, one of many companies that enhance employee generosity through a matching gift program.

“We are highly encouraged to give back to our communities, because where we work is also where we live,” she said. “This means a lot to me personally and many others in my company, because those are the type of people we like to do business with.”

Caption: 2012 mechanical engineering graduate Emily Jones, third from right, learned about everything from suspension systems to team sponsorships during her time on K-State’s Powercat Motorsports student team. Now she’s giving back, combined with a match from employer ConocoPhillips, to help others enjoy the same experience.

MNE faculty recognition

Melanie Derby received K-State’s Office of Research and Sponsored Programs Spring 2014 Faculty Development and University Small Research Grant Award.

Douglas McGregor, Kenneth Shultis and Steven Bellinger received a $368,705 funding award from the U.S. Department of Defense for their project “Advanced Trenched Structure for Solid-State Neutron Detectors.”

Douglas McGregor received a $50,000 funding award from Schlumberger Technology Corporation for his project “SIC Materials for Neutron Detectors.”

Douglas McGregor and Kenneth Shultis received a $307,175 funding award from the U.S. Department of Defense for their project “Wearable Detection Device (WDD) — Low Visibility Gamma Neutron Detectors.”

Youqi Wang received a $43,000 funding award from NASA for her project “Stress Prediction for 3D Woven Preforms and Composites.”

Warren White received a $500 funding award from the FDA, KSU Office of Research and Sponsored Programs, for his presentation “A Nonlinear Control Scheme for Extremum Power Seeking in Wind Turbine Energy Conversion Systems” at the American Control Conference in Oregon.

Steven Eckels received an ASHRAE Distinguished Service Award at the ASHRAE Annual Conference in Seattle, Washington.

Dale Schinstock received a $163,096 funding award from NASA — with collaborators Thomas J. Barstow, Kinesiology, and Steven Warren, ECE — for the project “Standardized ‘Pre-Flight’ Exercise Tests to Predict Performance During Extravehicular Activities in a Lunar Environment.”

Bill Dunn, Hitesh Bindra and Jeremy Roberts received a $396,740 funding award from the Nuclear Regulatory Commission for their “Kansas State University Nuclear Research Fellowship Program.”
Bill Dunn received a $287,125 funding award from the National Nuclear Security Administration for a project titled “Proposal for a Consortium for Nonproliferation-Enabling Capabilities.” This project is a sub-award from North Carolina State University on a project of the same name.

MNE student accomplishments
The Baja team placed in the top 20 in a recent competition in Pittsburg, Kansas. Faculty adviser is Greg Spaulding.

The unmanned aerial systems team finished fourth at the 12th annual Association of Unmanned Vehicle Systems International’s student competition. Faculty advisers are Dale Schinstock and Garth Thompson.