

Message from the chair

I hope you like our new newsletter format — part of an effort by the Samuel Ginn College of Engineering to unify publications and communications throughout the departments. If you have recently visited our Web site at www.eng.auburn.edu, you will also note major changes there.

In the last issue of the ME newsletter I mentioned that we were preparing for the Accreditation Board for Engineering and Technology (ABET) review, which took place in November. As per the new criteria established by ABET in 2000, your participation in providing feedback is essential to our continued success. This review is the first one for us under the new ABET criteria that mirrors the continuous improvement processes used by industry. The new process is based on an assessment of our program's educational objectives and outcomes, and involves all of our constituents. We are using more than a dozen assessment tools in this process and the assessment will be used as feedback to improve our program. Your input, as constituents of the program, is required as part of the assessment process established in 2000.

Our new Web site presents the accreditation report that we submitted to ABET: eng.auburn.edu/programs/mech/programs/accreditation/self-study-report.html. Please visit the site to find out more about our program and the assessment process. It also contains an archive of our recent newsletters. I believe it is particularly important for our alumni, as well as prospective students and parents, to be informed about our program's educational objectives:

- Graduates will have general problem solving capability to apply knowledge of the fundamental subject areas of mechanical engineering science to the design and operation of mechanical systems
- Graduates will have analysis and problem solution skills, oral and written communication skills, project management skills, team working skills, skills in engineering techniques and practices, and the ability to use modern engineering tools necessary to be effective, entry-level mechanical engineering professionals
- Graduates will have sufficient breadth and depth in the fundamentals of mechanical engineering science to be prepared for advanced or specialized postgraduate training in mechanical engineering
- Graduates will have a broad understanding of contemporary issues, particularly as they impact the mechanical engineering profession

Please review these objectives and let us know if they are appropriate and are being met by our graduates. These objectives are established for alumni who are within three to five years after graduation. If you fit into this category, or have knowledge of the performance of graduates who do, please complete the survey at eng.auburn.edu/mech/survey. If you prefer to complete the survey by phone, please call Liz Hartwick, program as-



David Dyer

sistant, at 334.844.3311. Survey results will be used to make objective and program modifications as needed.

Another great way to keep in touch is the annual Elements of Mechanical Engineering Conference. We had a very successful second conference in October. Keynote speaker and Auburn mechanical engineering alumnus James Kennedy, recently appointed director of Kennedy Space Center in Florida, gave a very informative talk about NASA's space shuttle program and its future. For conference highlights please visit our Web site at www.eng.auburn.edu/mech.

The next conference is planned for October 7-8, 2005 at the Lodge and Conference Center at Grand National in Opelika. We are reducing the cost to \$100 which covers six meals, eight PDH hours, and more.

This issue of the newsletter highlights accomplishments of our students, faculty and alumni. Thanks again for being a valuable part of our program. Finally, let me thank all those who have contributed monetarily or otherwise to our program. As state support continues to decrease, your support is becoming more and more important for the advancement of our program. Don't hesitate to contact us if you have questions or concerns.



Auburn to head center for airliner cabin air quality

The Federal Aviation Administration (FAA) has designated Auburn University to lead a consortium to research cabin air quality and conduct assessments of chemical and biological threats. The Center of Excellence for Airliner Cabin Environment Research (ACER) will involve a team of seven universities and a national laboratory.

"We have brought together some of the brightest minds science has to offer to focus on cabin air quality and chemical and biological threats to protect passengers and crew members," said FAA Administrator Marion Blakey. "This research will be of great benefit to the flying public."

Other participating institutions are Boise State University, Harvard University, Kansas State University, Purdue University, the University of California at Berkeley, the University of Medicine and Dentistry of New Jersey, and Lawrence Berkeley National Laboratory.

As lead institution, Auburn is charged with program administration and coordination. William Gale, alumni professor of materials engineering, will serve as principal investigator and administrator. Bart Prorok, assistant professor of materials engineering, will serve as co-principal investigator.

"Auburn's selection as administrative lead is the result of its assets in biological and chemical detection and decontamination," said Gale, adding that the direction of the research will be a true team effort among the participating institutions.

"This center was established to respond to the current needs to identify existing environmental conditions and protect against terrorist assaults



Bill Gale, materials engineering alumni professor (left), accepts a plaque from Nicholas Sabatini, FAA Associate Administrator for Regulation and Certification, at a November ceremony on the Auburn campus to mark the inception of a new FAA Center of Excellence for Airliner Cabin Environment Research, headed by Auburn University.

on airplanes,” said Gale. “As research faculty, we seek to serve the future needs of our country by advancing innovation through education and research.”

Initially focusing on airliner cabin environment research, the center is driven by a U.S. government appropriation of approximately \$1 million for start-up and leveraging funds for the first year and \$500,000 for the second and third years. In addition, the university consortium has acquired more than \$20 million in external research support commitments from corporate partners including Boeing, Delta Airlines, General Electric Aircraft Engines and Honeywell.

“At Auburn, we have sophisticated sensor development and analytical laboratories, test facilities and expert researchers,” added Gale. “The work here will be multi-disciplinary and will include researchers in the Samuel Ginn College of Engineering’s materials science, mechanical, aerospace and chemical engineering departments, the College of Sciences and Mathematics, the College of Veterinary Medicine, and the College of Agriculture. Working in concert with our peers we will be able to provide the FAA a rich opportunity to pursue complex research and elegant technical development for protecting passengers, crew and equipment, revising regulations as well as advancing the next generation of environmental control systems.”

Team members include experts in passenger and crew health issues, indoor air quality, chemical and biological detection (and other advanced sensor technologies) and system integration, to address issues related to security on aircraft and restoration of equipment.

The center plans to examine the relationship between the performance of aircraft environmental control systems and passenger/crew health and comfort. In the longer term, it is anticipated that this work will lead to improved environmental control systems. Simultaneously, the team intends to develop systems that will detect the use of chemical and biological agents by terrorists and hopes to investigate how to best to deploy these capabilities and enable a prompt and effective response by relevant authorities, ranging from protecting or treating passengers and crew to the safe clean-up of the aircraft involved.

Callender selected to lead graduation procession

Chad Callender, a 2004 materials engineering graduate from San Antonio, was chosen as marshal for the College of Engineering during graduation ceremonies this past summer. Students with the highest cumulative grade point average of all graduating engineering students are selected for the honor.

Callender graduated from Pemberton Township High School in Pemberton, N.J. and has been in active service in the U.S. Navy for 10 years. He enrolled at Auburn in 2001 and, after completing graduate school under a Navy scholarship, will report to the Naval Flight School in Pensacola, Fla.

Callender, who graduated summa cum laude, said he will always remember Auburn.

“One of the great things about the military is meeting new and interesting people every time you transfer to a new station,” he said. “It is also true at Auburn, which has a great environment and a rich past. I have loved Auburn football season and the exceptionally friendly people. I am proud to have been a part of it.”



Chad Callender

Loyd family establishes scholarship fund

Auburn alumni Raymond and Eleanor Loyd of Louisville, Ky. have established a \$1 million dollar scholarship fund in the Samuel Ginn College of Engineering, according to Larry Benefield, dean of engineering. The funding will provide four-year tuition scholarships with preference given to students from Eleanor Loyd's hometown of Tallassee and surrounding Elmore County. Scholarship recipients will be recognized as Loyd Scholars.



Raymond and Eleanor Loyd

"With the establishment of this endowment, the Loyds create a tremendous opportunity for the next generation of engineers," adds Benefield. "Scholarships serve as a powerful student recruiting tool, and support of alumni and friends makes those scholarships possible."

Raymond Loyd, a 1961 mechanical engineering graduate, and Eleanor Loyd, a 1959 physical education graduate, met as Auburn students and were married in 1959. While he completed his studies, she taught physical education at Tallassee High School.

During his career, Raymond Loyd was a design engineer at General Electric Co. in Louisville. He founded Derby Industries then Derby Fabricating of Louisville, one of the nation's leading fabricators and converters of non-metallic and insulation components used chiefly in the automotive industry. He attributes his successful career to his Auburn engineering education and wants to give something back.

"This scholarship was inspired by the quality education I received at Auburn and by my wife's devotion to and fond memories of Tallassee," he said.

Eleanor Loyd said she had to follow her heart and chose to establish the scholarship at Auburn.

"I hope that one day the recipients will give back as well, and help others who want to attend Auburn," she said.

The Loyds' gift is a term endowment open to all majors and will be expended over the next 20 years. Mary Lynn Saidla, scholarship coordinator for the College of Engineering, said the scholarship provides a wonderful opportunity for many students from Tallassee and Elmore County to attend Auburn University and pursue their goal of a quality education in the field of engineering.

"It is a tremendous honor to receive this tuition scholarship," she added. "The availability of this scholarship will greatly enhance our recruiting efforts to gain top students from this area."

The Loyd scholarship recipients for the 04-05 academic year, who will receive in-state tuition, have been selected.

Krueger honored with international scholarship

Darrell Krueger, a senior in mechanical engineering from Roswell, Ga., was one of six recipients worldwide to win the 2004 Society of Automotive Engineers (SAE) Long Term Member sponsored scholarship. The international scholarship, awarded each year to qualified seniors, requires students to demonstrate outstanding achievement in automotive



Mechanical engineering senior and SAE scholarship recipient Darrell Krueger (left) and the Auburn University Mini Baja team celebrate after a third place overall finish out of 136 teams at the Midwest competition in June.

engineering and exemplary service to SAE in general, the local section (Alabama, Tennessee and Kentucky), and the student chapter. Established in 1994, the scholarship is sponsored by the SAE Foundation and is funded through contributions from long-term members of SAE.

Krueger is the fifth Auburn student to receive the scholarship, and it was the third consecutive year that an Auburn student received it. The first Auburn recipient, Jacque Cole, received it in 1999, followed by Garon Griffiths in 2002 and Brian Audenert and Charlie Ping in 2003.

Krueger is starting his fifth year with the Mini Baja team, which he joined as a freshman in fall 2000. He served as chief engineer and drivetrain leader for the 2003 and 2004 teams and will continue in that capacity for the 2005 team.

“My most memorable moment on the team was winning the three-hour endurance race at Mini Baja Midwest this year,” he said. “That win was the product of an immeasurable amount of work, determination, and heart, from every member of our team.” Krueger led the AU Mini Baja team to a first place finish out of 136 teams in the endurance race of the competition, which took place in Milwaukee in June.

He plans to graduate in 2005 and is considering working in motorsports, preferably for a rally team.

“Later, I would like to work in the automotive, defense, or aerospace industry,” he added. “Mini Baja has been the single most important experience in my life. Nowhere else can you blend real-world engineering, teamwork, and outright fun into one package. The most important part that I will carry with me is that team spirit and project management skills are keys to success.”

Tippur receives **ASME** distinction of fellow

Hareesh Tippur has been selected as a fellow of the American Society of Mechanical Engineers (ASME), a designation that recognizes significant engineering achievements and contribution to the engineering profession. Tippur, who holds an alumni professorship in the department, joined Auburn as an assistant professor in 1990. After graduating from the



Hareesh Tippur

State University of New York at Stony Brook with a doctoral in mechanical engineering in 1988, he joined the California Institute of Technology as a postdoctoral fellow. He has a bachelor's degree from Bangalore University, India, and a master's degree from the Indian Institute of Science, Bangalore.

Tippur is credited with the development of an optical wave-front shearing interferometer called the Coherent Gradient Sensor (CGS) for investigating dynamic fracture behavior of polymers, metals and composites. CGS has recently been used for characterizing thin structures and films as well. His research has resulted in the development of an infrared interferometric sensor for failure characterization of solids with a high degree tolerance for surface damage and roughness.

His work in experimental fracture mechanics includes the demonstration of dynamic crack propagation along bimaterial interfaces close to sonic speeds, which subsequently inspired research on intersonic crack propagation in bimetals. Tippur has made several contributions to the understanding of fracture behavior of functionally graded composites and syntactic structural foams.

Other ASME fellows in the Department of Mechanical Engineering are Subhash Sinha (1997), Malcolm Crocker (2001) and Sushil Bhavnani (2003).

Garcia receives Auburn's Cliff Hare Award

Caesar Garcia, a senior in mechanical engineering from Baton Rouge, has been selected for the Cliff Hare Award — the most prestigious honor an Auburn student-athlete can receive. Garcia received the award during a halftime ceremony at Auburn's homecoming football game against Louisiana Tech. He is the first Auburn diver to win the award, which is given annually to student-athletes who, in addition to athletic and scholarship achievement, exhibit in great degree the qualities of leadership, integrity and courage.

The award is given in memory of Clifford Leroy Hare, a member of Auburn's first football team, professor of chemistry, president of the Southern Conference and longtime chairman of Auburn's Committee on Intercollegiate Athletics.

Garcia is one of the most successful divers in Auburn history. His two consecutive NCAA platform titles make him the first man to ever successfully defend his NCAA title. A nine-time All American, he helped lead the Tigers to two consecutive NCAA titles. He claimed back-to-back SEC titles on the platform, earning the NCAA and SEC Diver of the Year awards following the 2004 season, and was named USA Diving's Sportsman of the Year in 2003. After winning the Olympic trials, he represented the United States in the 2004 Olympics in Athens, Greece.

Garcia participates in a wide range of community service activities, including a character development program at Yarborough Elementary School in Auburn. He is a member of the Cupola Engineering Society student organization, serving as an ambassador of the Samuel Ginn College of Engineering.



Mechanical engineering senior and Cliff Hare Award recipient Caesar Garcia (right) with fellow members of the Cupola Engineering Society student organization.

Faculty explores uses for lunar dust on earth

If experiments prove successful, harvesting lunar dust for use on earth may become a reality. Richard Williams, associate research professor in the Materials Processing Center, has interests that involve the lunar Regolith (lunar soil), rich in minerals and fine particulate matter.

Williams received a bachelor's degree in 1982 and a master's degree in 1983, both from Georgia Tech. He served six years in a U.S. Navy submarine and taught at the Naval Academy in Annapolis. After leaving the Navy, he worked in the fiber optics department of Corning Inc., in Wilmington, N.C. As a supervisor of R&D engineering groups, he oversaw the manufacture of fiber optics at the manufacturing sector of Corning and obtained four patents in the manufacture of fiber optics.

After receiving his doctoral degree from Auburn in 2002, Williams joined the university's Materials Processing Center where he oversees the development of the spaceflight harbor experiment scheduled to be conducted on the International Space Station.

"We have successfully completed the safety certification required by NASA and are in a holding pattern until the shuttle is recertified to fly," he said.

Also of interest to Williams is NASA's new exploration initiative to make useful products using lunar resources. Scientists believe that the fine powder regolith behaves like cohesive powder and they are interested in studying the material to look for possibilities for harnessing it for use on earth. Williams's research interest involves the study of powder behavior.

"Cohesive powders, because of their small size (20 microns in diameter), are forced by surface forces to stick together," he said. "With the rise in micro and nanotechnology, the study of powder behavior and how surface forces act to keep them together is becoming very important and useful. The current biggest user of cohesive powder is the pharmaceutical industry."

"The use of powders in rapid prototyping has made Williams a valuable member of AU's solar car team," said Sushil Bhavnani, team advisor.

Williams added, "We have built three solar car models using this method and have tested them in wind-tunnel experiments to optimize vehicle aerodynamics."

Although his primary responsibility is research at the center, Williams teaches thermodynamics, heat transfer and fluids to undergraduates and guides student projects. He said his most memorable time was spent with students on their senior design project and the solar car.

Student project creates new filter cleaning methods

The comprehensive mechanical engineering design courses, MECH 4240 and MECH 4250, allow students to apply theoretical information to practical situations. The courses have grown into a successful hands-on experience for seniors to use classroom knowledge for problem solving. Company-sponsored projects give students a glimpse into an industrial environment, concepts of teamwork, time management and cost analysis, and an understanding of the complexities of real-world problems.

The current project, sponsored by Sears, Roebuck & Co., required seniors to design a machine to test and clean filters for Sears service centers across the country. On an average, the centers clean 100 filters for canister and upright vacuum cleaners daily. The team of Adam Alexander,



Richard Williams

Chris Ankersen, Andrew Barber, Jason Chandler, Jeff Duckworth, Stephen Fell, Danny Finley and Michael Fowler was charged with designing a machine that tests filters for their level of cleanliness and, if needed, cleans the filters. The design, called FEAR (Filter Evaluation And Restoration machine), is built to return a dirty filter to established standards within five minutes.

"Filters cost \$7 to \$45 to replace," said Rob Engle, graduate teaching assistant for the design courses. "Currently, the service centers are running the filters through a cleaning booth, regardless of whether they need to be cleaned. With our machine they will be able to test the filter first to determine if it needs cleaning, clean the unit, recheck it and return a clean unit to the customer in a very short time."

The scope of the HEPA (High Efficiency Particulate Arrestance) filter project was to develop a method to test filter flow restriction, establish a standard for a usable filter, quantify what is an acceptable filter, and create a method to clean the filter without damaging it. The refurbished filter would then be retested to ensure that it meets established standards. A motorized system moves the filters and compressed air lines remove dirt. The team had to take into consideration different shapes of filters, rectangular and cylindrical, and the unit had to be self-contained, comply with OSHA shop noise standards, and not emit dirt/dust into the working environment. The machine's operation chamber evaluates and restores the filter.

"The mechanics needed for running the cleaning process, such as the compressed air hookup and shop vacuum receptacle, are located in the operation chamber," said Engle. "The evaluation chamber uses two types of sensors to test the filter. A pressure transducer measures negative pressure pulled across the filter by a vacuum motor, and a series of optical photocells measures the light intensity.

"The template storage area is located within the lower section of the restoration chamber, which is designed to minimize the time required to complete an evaluation cycle. Providing storage area on the front of the machine allows quick access to use different templates when the operator needs to switch to a different sized filter. The design can be converted to cover a range of rectangular and cylindrical filters. Most of the structural materials used in the evaluation chamber were selected to balance costs and allow the operator to make quick changes between different filter sizes."

The team also used removable panels for easy access and maintenance. The finished unit weighs 150 pounds. The machine, powered by a 110V ground receptacle, has a footprint smaller than 36"x36".

Safety was another design consideration. A solenoid actuator locking mechanism was used to keep the door locked until the vacuum motor stops operating, and a switch ensures that the testing process does not start until the chamber is closed.

The team concentrated on a production line to build 50 units at a cost of no more than \$1,000 per unit.

Auburn research may help detect compounds on food

Few people may realize the dangers of pesticide residues in food. Despite washing and processing, pesticide residues remain in some fresh produce and processed foods, many of them composed of organophosphorus (OP) compounds known to cause potent harmful neurotoxic effects in humans and animals.

Recent research by Aleksandr Simonian, associate professor of materials engineering, has shown promise that enzymes such as organophosphate hydrolase (OPH) have on organophosphate detection. He and his col-

leagues at Texas A&M University have identified an OPH enzyme as an excellent biorecognition element to develop a biosensor for direct detection of OPs. Several electrochemical detection platforms were evaluated and adopted for the biosensor design.

The World Health Organization estimates that three million people worldwide suffer acute pesticide poisoning annually, and predicted that the demand for these chemicals would more than double during the 1990s (WHO/UNEP, 1998). The U.S. Environmental Protection Agency (EPA) evaluates pesticides thoroughly to ensure they will not harm human health or the environment, and has placed OP-based neurotoxins in the highest priority group. The standard for pesticide safety is based on the requirements of the Food Quality Protection Act of 1996. Pesticides that pass the evaluation are granted a license that permits their sale and use according to EPA requirements.

Currently, Simonian's team at AU is also developing fluorescence-based biosensors for identifying OP neurotoxins. The system design involves enzyme OPH conjugated with special fluorescent self-referencing dye as a reporter element. They anchor on the surface of a polymer waveguide of a hand-handled fluorimeter. In the near future, this highly specific system may detect the presence of organophosphate agriculture pesticides and chemical warfare agents.

The EPA uses biosensors to evaluate pesticide residues in soil. Biosensors, a technology still in development, have become a popular tool due to their exceptional performance capabilities, including high specificity, rapid response, low cost, and user-friendly operation. A biosensor is made from a biological sensing element attached to a signal transducer. The sensing, or biorecognition, element can be enzymes, antibodies, DNA, or microorganisms. The job of a sensing element is to recognize target molecules. The molecules interact with the sensing element and undergo physical-chemical changes, such as changes in color, acidity, and charge. The signal transducer may be electrochemical, optical or acoustic. Electrochemical transducers measure changes in current or voltage; optical measure changes in fluorescence, absorbance or reflectance; and acoustic measure changes in frequency resulting from small changes in mass bound to their surface. Signal transducers transfer this biorecognition event into an electrical signal.

Advancements in biochemistry, molecular biology and immunochemistry have expanded the range of biological recognition elements, and developments in fiber optics and microelectronics have expanded the capabilities of signal transducers. The durability, sensitivity, and low cost of signal transducers, and the growing availability of enzymes, antibodies, and genetically engineered microorganisms that interact with environmental pollutants, have contributed to the recent interest in applying biosensors to environmental monitoring.

Alumnus May to manage solar system missions

Todd May, a 1990 Auburn graduate with a bachelor's degree in materials engineering, has been selected as manager of NASA's Discovery and New Frontiers Program Office at Marshall Space Flight Center in Huntsville.

The Discovery and New Frontiers office provides opportunities for the science community to propose full scientific investigations to explore the solar system. Although investigations are the responsibility of NASA headquarters in Washington, D.C., the Marshall program office will assist the Science Mission Directorate at NASA headquarters with program management, technology planning, systems assessment, flight assurance and public outreach.

"I'm excited about the opportunities for this program to support NASA's



Aleksandr Simonian

Vision for Space Exploration and to launch unique science research missions throughout our solar system,” said May.

The Discovery initiative includes focused, scientific investigations that complement NASA’s larger planetary exploration. Its goal is to launch numerous small missions with a faster development phase — each for considerably less than the cost of larger missions. The program has launched numerous missions to date, including the Mars Pathfinder, Near Earth Asteroid Rendezvous-Shoemaker, and Genesis missions.

A native of Fairhope, Ala., May began his NASA career in 1991 as an engineer at Marshall’s Materials and Processes Laboratory. In 1994 he re

located to NASA’s Johnson Space Center in Houston, leading a team that evaluated materials and processes used for the International Space Station. In 1996 he became deputy manager of the team working with Russia on the space station and in 1998 returned to Marshall to lead the team constructing the space station’s “Quest” Airlock module.

Most recently, May served as the program integration manager for the Gravity Probe B Program. Launched in April, the mission is testing Einstein’s theory of relativity. May was responsible for managing cost, schedule and flight readiness of the spacecraft as well as education and public outreach for the mission.

As manager of the Discovery and New Frontiers Program Office, he will lead the team responsible for providing oversight of missions and assuring the availability of technical expertise to quickly assess and apply resources that enable scientific investigators to accomplish their missions.



The O’Neal Austin Best Student Award honors the late O’Neal Austin, a former Auburn mechanical engineering student who passed away in July 2003 and received his bachelor’s degree posthumously in December 2003. Established by Austin’s mother, Trudy Craft-Austin, the award recognizes outstanding students of individual mechanical engineering courses.

Fall 2004 winners pictured here with Trudy-Craft Austin (front row center) are (back row from left): Anthony Owens (MECH3140), John Derrick (MECH2120) and Bradley Treadwell (MECH3220); (front row left) Wendi Powell (MECH3020 and 3030) and (front row right) Leigh Pipkin (MECH3230). Not pictured are Anna Lambreth (MECH2210), Justin Ovson (MECH2110), Hasnain Meghani (MECH3130) and Luke Richardson (MECH3040).

Jackson studies methods to accurately model friction

Tribology, the science and technology of interacting surfaces in relative motion, embraces the study of friction, wear and lubrication. Leonardo Da Vinci (1452-1519) was one of the first scholars to study friction. Realizing how important it is for the operation of machines, he focused on all kinds of friction and drew a distinction between the sliding and rolling types.

According to Robert Jackson, assistant professor of mechanical engineering, although tribology has been studied for a long time there are very few models available to study it systematically.

The Stillwater, Fla. native graduated from Georgia Tech with a bachelor's degree in 1998, a master's degree in 2000 and a doctoral degree in 2004, all in mechanical engineering. His research interest lies in tribology and his goal is to model friction accurately.

"Tribology is a vast area that encompasses many engineering disciplines," he said. "If you look at the big picture, tribology involves heat transfer, mechanics, fluids, etc. There is a lot of fundamental research going on in these areas, especially in Micro-Electro-Mechanical Systems (MEMS) and nanoscale levels. I am working with professors in materials engineering and electrical engineering to study tribology from different perspectives."

According to Jackson, friction occurs at multiple scales in real-life situations. Much of his work involves looking at projects involving tribology on a small scale.

"In some cases, small scales are important," he said. "Concepts like indentation and contact mechanics come into play, where we indent surfaces to try to measure surface properties and try to determine the amount of friction generated."

According to Jackson there is not a good model available whereby one can predict friction for a given material, and researchers are looking at smaller scales to build better models. To do this, he and his student are building an experimental test rig. They will test friction and try to match numerical computer modeling to experimental results.

Jackson is interested in teaching machine design, dynamics, statics and mechanics of materials.

"My students use piezotropic materials to study the subject," he said. "Emerging technologies such as 'smart bearings' are being studied to control surface deformation, improve bearing performance, lubrication, friction, and wear."

Interested in tribology are industries such as aerospace, automotive, rail and marine, power generation, machine components, industrial and manufacturing, mining, agricultural and forest products, surface engineering, condition monitoring, lubricants and additives testing and analysis, materials processing and finishing, biomaterials and biomedical applications, health and personal care, magnetic data storage systems, and MEMS.



Robert Jackson

Auburn alumnus part of program to help disabled

Auburn alumnus Uday Vaidya, associate professor of materials science and engineering at the University of Alabama at Birmingham (UAB), recently participated in a NSF-Research Experiences for Undergraduates (REU) program. With help from engineering faculty and a physical therapist, UAB materials engineering students created a stair trainer to help



Uday Vaidya

make therapy fun for children.

“REU is designed to promote the development of low-cost therapy aids and help shape a bright future for children with cerebral palsy,” said Vaidya. “The stair trainer was donated to the United Cerebral Palsy Birmingham children’s center.”

After graduating with a doctoral degree from Auburn in 1993, where he worked with mechanical engineering faculty P.K. Raju and Malcolm Crocker, Vaidya joined Tuskegee University’s mechanical engineering department and Center for Advanced Materials until 1999. He then was associate professor of mechanical engineering at North Dakota State University until 2001. At UAB since then, Vaidya teaches process modeling, nondestructive evaluation, mechanical behavior of materials, engineering design, materials processing, plastics, and composites. His research area is thermoplastics and thermoset composites.

Department **dynamics** — research update



Sayavur Bakhtiyarov

Sayavur Bakhtiyarov, a senior research fellow in materials engineering, along with Geilani Panahov of the Azerbaijan Academy of Sciences, received a grant from the U.S. Civilian Research and Development Foundation for the Independent States of the Former Soviet Union (CRDF) and the Azerbaijan National Science Foundation (ANSF). The grant will support research to conduct Computational Fluid Dynamics (CFD) studies of rheological characteristics and transport properties of viscoelastic composite systems used in the oil industry. The proposed research is related to the development of new polymeric composites to be used in oil field operations, such as oil well drilling, storage and transportation. Experimental studies of the properties of this composite will be followed by field testing.

Bakhtiyarov also taught two sessions of a course on the design and production of magnesium casting organized by the Cast Metals Institute, Inc. in Livonia, Mich. It was the first course organized by the American Foundry Society (AFS) for metallurgists, quality control personnel, melt shop foremen, design and materials engineers, and casting buyers.



Z.-Y. Cheng

Z.-Y. Cheng, assistant professor of materials engineering, received a three-year research grant from Weld Star Technology, Inc., to develop new types of high performance sensors for chemical and biological detection. The research will involve the fabrication and characterization of biosensors that are capable of identifying a single bacterium. The first year of the grant is for exploratory research to investigate novel methods of detection.

Song-Yul (Ben) Choe, associate professor of mechanical engineering, received three grants from the Hyundai Corporation for projects supporting the production and design of vehicles. The first grant is related to the translation of production documents from Korean into English.

“These documents are crucial for American engineers to understand production processes to fabricate high quality products,” said Choe. “The translation requires expertise in not only manufacturing processes but also organization structure.”

The second grant, for Advanced Safety Vehicle, funds the study of different technologies in vehicle dynamics, sensors and controls. Choe will also study three major chassis systems with steering, braking and suspension to improve comfort and safety in vehicle design.

The third project is related to Proton Exchange Membrane (PEM) fuel cell technology, with emphasis on modeling, simulation and validation of fuel cell components and systems.



Song-Yul Choe

David Dyer, department chair, has been appointed chair of the new Alabama Board of Boilers and Pressure Vessels by state labor commissioner Jim Bennett. Dyer is registered with the State of Alabama as a professional engineer and is a member the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

According to labor department statistics, Alabama has an estimated 44,000 boilers and pressure vessels. Under law, boilers and pressure vessels operating in the state must be inspected and certified as being in safe operating condition.

"The potential impact of Alabama's new safety code is huge," Dyer said. "For Auburn, this is an important public service in which the university can provide its expertise to the state."

George Flowers, professor of mechanical engineering, along with Robert Dean of the Department of Electrical and Computer Engineering, received a grant from Morgan Research, a Huntsville-based company, and the National Science Foundation for packaging MEMS inertial sensors for mechanically harsh environments. The grant is administered through the small business technology transfer program (STTR), which fosters cooperation between nonprofit institutions and business. The research considers methods of vibration isolation for MEMS accelerometers and gyroscopes.

William Gale, professor of materials engineering, received a U.S. Air Force grant to study Munitions Delivery by Integrated Groups of Biometric Underground Systems (DIG-BUGS). Gale is also the principal investigator for the new Federal Aviation Administration Center of Excellence for Airliner Cabin Environment Research, headed by Auburn University.

Peter Jones, associate professor of mechanical engineering, and Alice Smith and John Evans of the Department of Industrial and Systems Engineering, received a NSF grant for their proposal, "Next Generation of Manufacturing Engineers for the Automotive Sector". The grant will provide scholarships to students at all degree levels who pursue a career in automotive engineering. In addition to 29 scholarships per year for four years, the fund will support community outreach to K-12 students and teachers, and enhance recruitment and retention of women and African-American undergraduate and graduate students.

Bart Prorok, assistant professor of materials engineering, is one of 25 recipients of Oak Ridge Associated Universities' Ralph E. Powe Junior Faculty Enhancement Award for the 2004-2005 academic year. Prorok was selected in the category of applied science for his research on thin film shape memory alloy actuators for microsensors/microdevices. The grant is intended to provide funding to allow faculty members in their first two years of tenure track to enhance their research during the early stages of their career.

Prorok also received a NSF instrumentation grant for a field emission scanning electron microscope. The microscope with differentially pumped chamber will greatly expand Auburn's capability to examine biological materials in addition to traditional inorganic materials, and enhance multidisciplinary research on the Auburn campus.

Prorok, George Flowers, Anwar Ahmed of the Department of Aerospace Engineering and Robert Dean of the Department of Electrical and Computer Engineering received a grant from the U.S. Army Space and Missile Defense Command to develop self-lubricating films for rotating MEMS gyroscopes.

P.K. Raju, professor of mechanical engineering, along with Chetan Sankar of the College of Business, received two grants from NSF to develop multimedia instructional materials for use in India and Chile. They will develop programs that use case studies, multimedia information technologies and cross-disciplinary teams to bring real-world problem solving experiences to students.



David Dyer



George Flowers



William Gale



Peter Jones



Bart Prorok



P.K. Raju



Hareesh Tippur

Raju will conduct a workshop in Chile in collaboration with the Center for Research in Creativity and Higher Education at the University of Santiago and develop associated materials in the Spanish language for use in Chile and the United States. The grant to be used in India, in collaboration with the Indian Institute of Technology in Chennai, will address problems that occur when engineers in the U.S. are called upon to work with their counterparts around the world to service customers, manage research teams, improve business processes and produce quality products.

Hareesh Tippur, professor of mechanical engineering, received a U.S. Army Research Office (ARO) and Defense Experimental Program to Stimulate Competitive Research (DEPSCoR) grant to study high-strain rate fracture of heterogeneous materials with micro- and nano-fillers. Tippur plans to conduct research on failure and damage evolution in light-weight composite structures during projectile impact. A laser-based, high-speed digital imaging facility capable of capturing images at rates of up to two million frames per second, developed by Tippur through a previous Department of Defense grant, will be used for this research.

Alumnus McCrary appointed as AU trustee

Auburn mechanical engineering alumnus Charles McCrary, at-large representative for the Auburn University board of trustees, was appointed as trustee in April 2004. His term expires in 2011.

McCrary joined Alabama Power Company following his freshman year at Auburn. After earning his bachelor's degree in mechanical engineering in 1973, he began his ascent to the top of the company. He remained with the utility through positions of increasing responsibility with its parent company, the Southern Company, until he was named president and CEO of Alabama Power. In addition to his Auburn degree, he holds a law degree from the Birmingham School of Law.

McCrary is active in many civic organizations in the Birmingham area, including the Metropolitan Arts Council, the Birmingham Regional Chamber of Commerce, where he serves on the board of directors and board of trustees, and the Children's Hospital, where he serves on the board of trustees. He is also a member of the AU Foundation board of directors.



Charles McCrary

Auburn University **research park** becomes a reality

Excerpts from the AU Report

At its October meeting, the Auburn University board of trustees decided to move ahead with establishing a research park, following a pledge from the state of Alabama and the city of Auburn. Alabama Governor Bob Riley and Auburn city Mayor Bill Ham agreed to pledge \$10 million and \$5 million, respectively, in support of the project and development of infrastructure.

Trustee approval of the research park follows some two years of preparatory work led by AU's Vice President for Research, Michael Moriarty, and a multi-disciplinary university task force, with the involvement of faculty and university administrative groups, private consultants experienced in university research park development, elected officials and local governments.

"This development provides a clear example of how linking a university with government and local communities can promote economic and edu-

cational growth,” said Ed Richardson, Auburn University interim president. “Research is central to the university’s mission, and a research park will enhance the potential to retain university-developed technologies and their associated jobs within the state of Alabama.

“The research park will enhance the image and reputation of Auburn University. As a high-profile, high-technology center of economic and academic activity, it will foster the recruitment of outstanding faculty, students and businesses, and offer them quality venues for collaboration in learning and discovery. It also will provide opportunities to develop new and needed revenue streams to the university.”

According to Moriarty, sponsored research and the commercialization of technologies developed through AU’s research programs also will be enhanced.

The park will be located on a 156-acre site in the southwest quadrant of the Auburn campus at the intersection of South College Street and Shug Jordan Parkway. Easily accessible from I-85, it will serve as a direct link to the evolving technology corridor extending from Atlanta to Montgomery. Initial tenants are projected to occupy the park in late 2006.



In memory

Edward O. Jones Jr., retired associate dean of engineering for academics, passed away on September 22 at the age of 82.

Born on June 18, 1922 in Dothan, Ala. to Edward O. and Maude Spiva Jones, Jones earned bachelor’s degrees in mechanical engineering and electrical engineering from Auburn University and a master’s degree in mechanical engineering from the University of Illinois. He began his teaching career at Auburn in 1946 and taught courses in engineering mechanics, metallurgy, mechanical vibrations, and applied mathematics. He also taught engineering applications short courses and seminars for practicing engineers and engineering technicians.

Jones, who retired in 1992, served as permanent secretary for the Auburn Alumni Engineering Council and as Engineering Accreditation Agency (ABET) coordinator during his career with the College of Engineering.

Jones is survived by his wife of 57 years, Eloise Ogilvie Jones of Auburn; daughter and son-in-law Margaret J. and Victor Rebois of Silver Springs, Maryland; son Edward O. Jones III, of Lavonia, Ga.; grandson Dylan Gates Rebois; and granddaughter Katherine Ann Rebois.

Herbert Stanley Hathcock, 74, of Huntsville passed away at Crestwood Hospital on June 19.

Hathcock was born in Sanford, Fla. and grew up in Auburn, graduating from the Alabama Polytechnic Institute School of Engineering in 1956. A veteran of the Korean War, he was awarded the Bronze Star for valor. He moved to Huntsville in 1958 and was employed as an engineer at Chrysler for 30 years.

Survivors include his wife, Barbara Bradford Hathcock; son Jeffrey Lee Hathcock; stepson Howard Scott Doner of Valdosta, Ga.; stepdaughter Kim Doner Dicus and husband John of Canton, Ga.; and step-grandson Robert Allen Doner of Valdosta, Ga.



Edward O. Jones Jr.



Herbert Stanley Hathcock

Hartwick joins department



Elizabeth Hartwick

Elizabeth Hartwick is the new administrative program assistant in the department following Brenda Wyatt's retirement in 2003.

An Alabama native, Hartwick graduated from high school in Enterprise, where she attended junior college. She graduated from Auburn University with a bachelor's degree in business in December 2002.

Prior to joining the department, she worked at the courthouse in Enterprise and completed an internship at Anderson Financial Network Incorporated (AFNI). She also worked as a customer service representative at Novice Tech in Auburn.

Hartwick's responsibilities include monitoring PAFs and payroll for materials and mechanical engineering department faculty, staff and students; working with faculty on funding, ME budget development and budget change orders; organizing the annual ME conference; managing the departmental Web site; organizing lunch meetings; booking rooms; and assuming accounting duties for May Justice, who will retire in January.

THE ME NEWSLETTER IS PUBLISHED TWICE YEARLY BY THE DEPARTMENT OF MECHANICAL ENGINEERING. ADDRESS CHANGES, NEWS ITEMS, AND SUGGESTIONS SHOULD BE SENT TO LATHA BHAVNANI, 201 ROSS HALL, AUBURN UNIVERSITY, AL, 36849-5341, BHAVNALS@ENG.AUBURN.EDU

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