The only constant is change

p.2
by bye birdie

David Gribbin, left, and James Graves, both seniors in electrical and computer engineering, prepare to launch an ornithopter at Jordan-Hare Stadium, a venue that more commonly hosts the flights of war eagle Nova. The ornithopter, a kit-built mechanical bird that mimics winged flight to propel itself, is flown by radio control through a joystick pad held by Gribbin. He and Graves are working on an automated bird that will fly by itself as part of a senior design team working under faculty member Thad Roppel.

They are adding a microprocessor-linked gyroscopic sensor that can control pitch and yaw to achieve level flight without any correction from the remote control pad. An autonomous ornithopter could be used for roles such as military surveillance because it resembles a bird in flight rather than a winged craft. Could it fly with Nova? Not likely, says Roy Crowe from the university’s raptor center. It would be attacked by Auburn’s war eagle, which is hard wired to hunt. Also pictured, videographer Greg Ruff.

Watch the flight at www.eng.auburn.edu/robo-nova
Women have played a pivotal role in the history of Auburn Engineering. Though their presence on campus was not considerable until they briefly outnumbered men during the war years, female students made strides in academics, and when opportunity came knocking were unafraid to enter the trenches with male classmates. In 1945, these co-eds were likely a few of many thousands of individuals trained in wartime programs conducted by the college.
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This edition of Auburn Engineering looks again to our history, this time from our official founding as a college in 1908-09, to the depression, through two world wars and into the ‘50s, when we suddenly found Sputnik challenging everything we thought and did.

As any alum knows, Auburn’s programs have grown and prospered over the past century, from the institution’s official recognition of its engineering program as a college to today’s push to build a program truly national in scope.

But it hasn’t always been an easy ride. While the first two decades of the new college reflected prosperous years for Auburn and the role of engineering at Auburn assumed great prominence, the institution as a whole suffered in the years leading up and into the Great Depression.

Contracts for new buildings gave a much-needed boost to Auburn’s physical plant, but their maintenance turned into a drag on lean budgets when funding dried up – and a lot was tied to engineering, which comprised about half of the institution’s enrollment in the roaring ‘20s, and not much less in the years leading to the second world war.

Indeed, at one point in the ‘30s Auburn’s leadership felt it was dealt “a blow to the institution from which it will not recover for years to come [and that] to dismantle the work here at Auburn at the present time would be a crime.”

I probably can’t communicate how true those words can sound to an engineering dean in the current economic climate, although I know full well that the economic pain is spread fairly evenly across all sectors of the economy as we pull through what are arguably the most difficult times in decades.

At the same time, John Jenkins Wilmore, an iconic figure in the history of Auburn Engineering, noted in his tenure as dean that the attitude of the student body was ‘fine’ and their behavior ‘good’ as they remained ‘attentive’ and availed themselves to ‘a decided increase in the use of the library.’

I walked through the library this morning, and to be honest, it was ... full. Students were in the stacks, at study carrels, on the digital card catalog and on their laptops, studying away. It struck me to see how engaged they were with their monitors on this midweek day, an hour away from lunch. So much has changed, yet so little.

Our determination to build one of the best engineering programs in the nation hasn’t changed at all. As you look through this issue of Auburn Engineering, I invite you to pause and think about the many positive things going on at Auburn today. I won’t list them here, they are in the pages that follow.

I will say this – our students are building and growing on a legacy that you as alumni, have created. Stay engaged with us and help us build Auburn Engineering to levels never before seen. I know the students I see here today will do the same.
Again this summer, Auburn Engineering faculty members hosted camps that introduce K-12 students to various engineering fields, as well as encourage them to pursue careers in engineering at Auburn.

**Engineering 101**

Teams and Individuals Guided by Engineering Resources (TIGERs) camps provided students in grades 7-10 with an introduction into the world of engineering. The camps educated students about each engineering department at Auburn through workshops, tours, hands-on activities and lectures guided by engineers and engineering students. They also discussed courses to prepare middle and high school students for success in college.

**Domo Aricato, MRS. ROBOTO**

Daniela Marghitu, faculty member in the Department of Computer Science and Software Engineering, directed two successful camps again this summer: Robo Camp, which she created in 2007 to encourage K-12 students to increase their computer literacy, and the Computer Literacy Academy (CLA), which has helped more than 150 children learn about computers and the Internet since 2005.

Robo campers built a platform for problem- or project-based learning and integrated knowledge from many disciplines, including mathematics, science, social studies, English and art. They learned advanced computer concepts and hands-on applications of computer programming and robotics. Marghitu’s CLA campers learned to browse, navigate and search the Web, as well as how to use Microsoft Office 2007 – including Word, Excel and Power Point. They also learned more sophisticated functions such as designing and publishing a Web page and programming computers.

**Tiniest Little Camp**

Because it has only recently grown into a field of study, K-12 students typically have little access to lessons on nanotechnology and the control of matter on a molecular scale. As a part of the College of Sciences and Mathematics’ summer Youth Experiences in Sciences (Y.E.S.) program, Virginia Davis, faculty member in the Department of Chemical Engineering, once again offered a nanotechnology camp to help students explore current innovations in nanotechnology, spark their interests in engineering and science and encourage them to pursue a career in science, math, technology or engineering. Davis’ camp introduces and teaches how nanotechnology can be used in everyday life.
Aero prof helps 4-H soar

Seventeen-year-old Azeem Ahmed recently coordinated a monumental recognition for 4-H. With the help of his father, Anwar Ahmed, associate professor in aerospace engineering, he managed to have a 4-H flag hitch a ride on the space shuttle Endeavour, which launched this summer and returned home on July 31. He came up with the idea to launch the flag with the space shuttle to publicize his club.

“We wanted people to know that 4-H isn’t just about agriculture,” says Azeem. “It offers many areas to explore, like science, technology, citizenship or engineering.”

Azeem’s father connected him to astronaut Stephen Robinson because the two worked together at NASA's Langley Research Center in 1992. Robinson helped Azeem coordinate the flag’s trip to space. When the shuttle returned home, the flag was taken to the national 4-H headquarters. Azeem is an Auburn freshman this fall.

Her: Emmylou Harris has sold more than 15 million albums and is a member of the Country Music Hall of Fame. Him: But it was her older brother Walter Rutledge “Rutty” Harris who first attracted her to country and folk music more than 30 years ago. Back in those days, he was an Auburn aerospace engineering student studying aerodynamics and propulsion.

Today, Rutty’s a senior aerospace engineer at Analytic Services Inc. in Arlington, Va., with both a bachelor’s (’65) and master’s degree (’70) in aerospace engineering from Auburn. Earlier this year, he accompanied Emmylou to the College of Human Sciences’ International Quality of Life Awards ceremony at the United Nations in New York, where she was honored while her appreciative brother offered his continuing support. That’s a story sweet enough for even the oldest of classic country tunes.

You are HERE

New this fall, visitors to the college can navigate the Shelby Center with the touch of a button. The facility now has three 46-inch LCD touch screen directories containing actualist smart boards, which allow visitors to quickly find engineering faculty, staff and departments housed in its buildings. Located on the first floor in each wing and the center building, the screens are easily accessible to everyone who enters the Shelby Center. Visitors can view a map that shows them the best route to their destination, as well as contact information and a photo of each engineering employee. The screens will also communicate emergency and severe weather alerts broadcast through Auburn’s AU Alert system. Users can catch up on the latest news from Auburn Engineering through a real-time news feed that scrolls across the main screen, as well as view recent photos of engineering students and professors in action. Next time you’re on campus, come by the Shelby Center to give the screens a test drive.
**Safety first**

It’s a sign. Red means stop. Green means go. But there are many more signs and symbols that keep us safe, wherever we go. Adam Piper, doctoral student in industrial and systems engineering, and his adviser, faculty member Jerry Davis, are working to improve protection and health in the workplace with better, simpler safety symbols. They’re using freehand drawings plus artificially intelligent software to design symbols that can be used on machinery labels or placed on signs around the manufacturing floor. By recruiting dozens of diverse research participants, they start with a volunteer’s own version of three safety symbols they’ve been instructed to draw by hand. Then, Piper and Davis teach an artificially intelligent system to produce additional, more universally recognized symbol designs that users might better understand at first glance.

Piper and Davis recently received a $12,000 grant from the Centers for Disease Control and Prevention’s National Institute for Occupational Safety and Health (CDC/NIOSH) through the Deep South Center for Occupational Safety and Health’s Pilot Project Research and Training program. Symbols such as “Warning: Hot Exhaust,” “Risk of Falling” and “Do Not Touch with Wet Hands” may not be as common as “Exit,” but they might just save someone’s life.

A partnership that provides for the future

Auburn University is maintaining its position as a leader in the hot mix asphalt industry through a recent gift from the National Asphalt Paving Association Research and Education Foundation (NAPA REF).

NAPA REF has committed a $10 million endowment to the Auburn University Foundation (AUF). NAPA REF has already provided $4.7 million and has committed an additional $5.3 million over the next five years. The gift will provide funding for research, education and information services provided by the National Center for Asphalt Technology (NCAT) at Auburn University.

“This fund solidifies what has already been a wonderful relationship between Auburn University and NAPA,” says Al Giffin, director of Auburn’s Transportation Research Center. “This partnership puts NCAT on long-term footing for continued work with the asphalt industry.”

The endowment had been under management by NAPA as part of an agreement with Auburn and was used to provide seed funding for the work done by NCAT. The transfer of the NAPA REF funding to the Auburn University Foundation was made in part to take advantage of the economies of scale allowed by consolidating fund management to Auburn’s larger investment program.

“It is an ideal collaboration,” Giffin says. “NAPA can continue to look out for the needs of the asphalt industry and NCAT can continue to provide research and education.”

**Advantage: Engineers**

According to a recent survey from the National Association of Colleges and Employers, engineering degrees account for 12 of the 15 highest paying undergraduate majors.

Petroleum engineering was the highest-paying degree, with an average starting offer of $83,121. Chemical engineers came in second, with an average starting offer of $64,902. Mining engineers and computer engineers were close behind.

Graduates are feeling the pinch of fewer job offers, but in this tough economy, engineering graduates continue to have the advantage because far fewer people are receiving science and math degrees. Engineering and computer science graduates each make up about 4 percent of all college graduates, while social science and history each comprise 16 percent.

*Source: CNNMoney.com*
The future of biofuels?  
Just turn to the fish tank.

Seaweed may put a damper on a summer beach trip, but its cousin algae is at the forefront of biofuels research. According to a study conducted by Ron Putt, associate research professor at Auburn’s Center for Microfibrous Materials Manufacturing in the Department of Chemical Engineering, widespread cultivation of microalgae has the potential to make Alabama and the U.S. self-sufficient in terms of liquid fuels for transport. Alabama has the potential to produce its three billion gallons of transportation fuels a year from one million acres of algae ponds that comprise only 3 percent of the state’s land.

“This amount of acreage is not unreasonable to consider, since the state currently has more than 150,000 acres of man-made ponds, including recreational, farm and aquaculture ponds,” says Putt.

Algal fuels do not affect freshwater resources and can be produced using ocean and wastewater. They are also biodegradable and relatively harmless to the environment if spilled. Though the cost per pound is greater, algae can yield more than 30 times the energy for each acre than other second-generation biofuel crops.

Algal biomass can be converted to transportation fuels because of the low cost and efficient process of anaerobic digestion, which produces a biogas rich in methane. Methane can then be purified and dried for injection into the natural gas pipeline or liquefied to natural gas, a cleaner alternative to petroleum-based fuels.

Putt and a growing number of individuals and organizations in the Southeast share a vision of producing 80 billion gallons per year of transportation fuels, half the nation’s requirement, on 30 millions of acres of ponds stretching from Florida to Texas.

Source: Engineering News Online at engineeringnews.co.za
Sure, times are hard. Wallets might be thinner than this time last year. But the college’s Global Education Initiatives are continuing to create affordable opportunities for students to connect with the emerging global community. And our students are ready for the adventure.

Welcome Home
For four weeks this summer, 20 Auburn engineers participated in a course called Engineering, Technology and Society, taught by professional Spanish engineers – in English – at Pamplona Learning Spanish Institute (PLSI) in Pamplona, Spain. From June 1-27, they worked on engineering projects related to their particular interest and studied basic Spanish language, engineering terms and culture. Four days a week they attended classroom sessions, spending a fifth day on-site in a lab setting related to their project topic.

Earlier this spring, students in Auburn’s Business-Engineering-Technology (B-E-T) class traveled to India and the UK to work on projects with students from local universities. B-E-T students Anthony Caltabiano and Katie Captain visited the Indian Institute of Technology-Delhi (IITD) with mechanical engineering faculty member Pradeep Lall to develop a low-cost GPS navigation system with elements of global positioning and inertial navigation. B-E-T students Pat Awbrey, Alison Barksdale, Mike Marsocci, Caitlyn Rummer and Blake Wager went to the University of Plymouth, UK, with Charlotte Sutton, a professor of management in the College of Business, to create a continuous tire pressure adjustment system for passenger vehicles, which maintains the manufacturer-specified pressure by using a pressurizing system incorporated in the wheel spokes.

Reaching across borders
More than 1.4 billion people live below the poverty line in the developing world and many lack adequate housing, transportation, clean water and sanitation. Auburn Engineering students are addressing these needs with the formation of an Engineers Without Borders (EWB) chapter, which partners with disadvantaged communities to improve their quality of life through education and implementation of sustainable engineering projects, while promoting new dimensions of experience for engineers, engineering students and similarly motivated non-engineers.

Every EWB program begins with a trip to the proposed location to perform a community needs assessment and identify priorities. During the following years, the chapter returns to implement the project, train the local community and develop the financial structure to ensure the project can be properly maintained and operated, working with communities for a minimum of five years. Auburn’s group is now meeting regularly and working with the national organization to identify its first project.

“EWB-USA’s unique grassroots approach requires that all program proposals come directly from the community in need,” says Steve Duke, chemical engineering faculty member and faculty adviser to the group. “This increases the likelihood of success by ensuring that the needs addressed by our chapters are being identified and driven by the community.”

In 2009 Auburn EWB will begin work on projects with local programs such as the Boys and Girls Club and Reading is Fundamental. In 2010, the group hopes to kick off its first spring break project in the Gulf Coast region and begin international work, most likely in Bolivia.

With help from Tip Bradford, senior in industrial and systems engineering and native of Alpharetta, Ga., Auburn University’s club tennis team finished in the top 40 at the United States Tennis Association’s (USTA) Tennis on Campus nationals this spring. After three days of competition, the Tigers finished 39th out of 64 teams. The team earned its first ever bid to compete in the national competition in Surprise, Ariz., after winning the USTA Tennis on Campus Southern Section tournament with victories over top-seeded University of North Carolina-Chapel Hill, Clemson, South Carolina and NC State. Bradford, a four-year member of the team, is one of seven traveling team members and is the team’s only engineering student.
Northrop Grumman Corporation recently presented a $125,000 check to the college to fund two grants in information technology (IT) research. A $60,000 grant was given to the Department of Computer Science and Software Engineering for research on mission and business effects of technical risks and the Department of Defense Architecture Framework. A separate $65,000 grant was given to the Department of Electrical and Computer Engineering for research on intrusion resilience and real-time forensics.

Highlighting the occasion were remarks from Timothy McKnight, vice president and chief information security officer for Northrop Grumman; Keith Glennan, vice president for strategy and technology for Northrop Grumman Information Systems’ Civil Systems Division; and Dean Larry Benefield.

Northrop Grumman’s National Work Force Center opened in Auburn Research Park in September 2008 as part of an initiative by the company to provide high-quality, cost effective technology centers within the United States. Auburn Research Park is one of seven such facilities in the country. Northrop Grumman Corporation is a leading global security company whose 120,000 employees provide innovative systems, products and solutions in aerospace, electronics, information systems, shipbuilding and technical services to government and commercial customers worldwide.

Nursing’s Kid Check program allows Auburn nursing students to conduct health screenings of K-12 children in Lee, Limestone, Lowndes and Bullock counties. The free health assessments identify children at risk for chronic health issues and diseases and provide them with health education to modify the identified risk factors as well as referrals to area physicians.

One of the hurdles to the efficiency of screenings and security of patient information has been the paperwork each nurse uses to record patient data. Under the direction of CSSE faculty member Richard Chapman, wireless engineering students have proposed a system that will automate data gathering during the Kid Check assessments. Through the use of portable wireless devices, the system will permit instant statistical analysis of the data by Auburn nurses and students in order to recommend appropriate referrals, lifestyle changes and other information for the children who need them.

“This is a nice opportunity for the two colleges to be involved in an interdisciplinary project,” says Chapman. “This project gets the developers and designers out of the vacuum and working with the professionals who will really use the technology.”

While the primary focus is the accurate, confidential and instantaneous analysis of data in the field, the automated data collection system will also make important health data accessible to public health professionals, as well as state policy makers, while maintaining patient privacy. The system will be used by nursing students to conduct Kid Check during fall 2009 and spring 2010.

Through a $25,000 grant from the Verizon Foundation, researchers in the Department of Computer Science and Software Engineering are teaming up with the School of Nursing to improve a program that provides health screenings to kids in poor rural communities.

Nursing + Engineering = TEAM KID CHECK

IT + Times 2
Auburn Engineering in the spotlight

The college was recently the star of "On the Job," a half-hour show on Alabama Public Television. The episode, which aired on Sunday, July 7, was devoted to showcasing Auburn Engineering’s new automotive engineering and manufacturing systems minor and graduate program, as well as the Baja SAE Alabama competition.

Dean Larry Benefield was interviewed about the importance of both the new minor and graduate program and the Baja team, as well as the future of the state’s economy and its growth in the automotive manufacturing sector. The minor focuses on vehicle quality, logistics, design and planning while focusing on a polymer or fiber option. The polymer option emphasizes polymer characterization, processing and chemistry, while the fiber option focuses on mechanics and composite materials. The department also offers a master’s degree, as well as a doctoral degree in integrated textile and apparel science in conjunction with Auburn’s Department of Consumer Affairs. Faculty members are currently developing a doctoral program solely in polymer and fiber engineering.

To discuss the Baja SAE program, "On the Job" host Bobby Jon Drinkard went into the engineering shop, where several of the Baja team members, including faculty adviser Peter Jones, explained the year-long process of making a Baja car and emphasized the value of hands-on engineering design-build-race teams.

Livin’ Large

Based on recently released enrollment data for fall 2009, engineering is officially the largest college at Auburn University. Engineering boasts 4,352 total students, with 3,598 undergraduate students and 754 enrolled in graduate programs. The College of Liberal Arts and the College of Business are the second and third largest, respectively.

This year’s engineering freshman class received an average ACT score of 27.8. In total, engineering students received more than $5,648,397 in scholarship funding for the 2009-2010 school year.

University-wide, enrollment is 24,602 among all students groups – undergraduates, graduate students and those enrolled in professional schools – up from 24,530 in fall 2008. New freshman enrollment consists of 3,918 students, who compiled an average score of 26.2 on the ACT college entrance exam, outpacing last year’s then-record of 25.9. This year 477 new minority students are enrolled, up 15 percent from last year’s 416.

View the show at onthejobtv.org/site/2009/07/show-213
CAREER paths

Virginia Davis, assistant professor in the Department of Chemical Engineering, and Xiao Qin, assistant professor in the Department of Computer Science and Software Engineering, have both been recognized as National Science Foundation (NSF) Faculty Early Development CAREER award winners. The CAREER award is NSF’s most prestigious honor, recognizing outstanding junior faculty members and supporting their research and outreach activities with funding for five years.

Davis has been granted $400,000 by the agency for her research, “Microstructure and Processing of Cylindrical Nanomaterial Dispersions.” She will explore how nanomaterials can be assembled into newer, more advanced materials, including macroelectronic devices, sensors, electro-optical devices and antimicrobial coatings. As part of her award, Davis will continue to mentor and educate future scientists and engineers through outreach activities, such as nanocamps for middle school girls and international research opportunities for chemical engineering undergraduate and graduate students.

Qin also received $400,000 for his research, “Multicore-Based Parallel Disk Systems for Large-Scale Data-Intensive Computing.” He will investigate parallel disk architectures that put substantial multicore computing power on disks. Qin will bridge the technology gap between multicore computing and parallel disk systems by addressing fundamental issues of multicore computing, data processing and performance analysis for data-intensive computing systems. If successful, Qin’s research will provide the first parallel disk system in which large parts of data and I/O processing are offloaded to multicore processors embedded in disk drives.

Aerospace alums honored

Aerospace engineering alumni Robert G. Pitts ’33 and Col. James S. Voss ’72 have been chosen for induction into the Alabama Aviation Hall of Fame’s class of 2010, which is the centennial of powered flight in the state of Alabama. Pitts and Voss join 15 Auburn alumni who have been inducted in the organization’s Hall of Fame in its 28 years of existence.

The organization plans to honor Pitts and Voss during the centennial celebration with a formal induction ceremony and a permanent recognition in the Southern Museum of Flight’s Hall of Fame in Birmingham.

“The university should be very proud of the contributions of Auburn graduates to the aviation and aerospace industry,” says Billy Singleton, chairman of the Alabama Aviation Hall of Fame. “Auburn University has, by far, a greater representation in the Alabama Aviation Hall of Fame than any other institution or entity.”

The climb

Once again, the Samuel Ginn College of Engineering has moved up in the graduate program rankings, climbing to 41st among public engineering schools and 69th overall in U.S. News and World Report’s 2010 edition of “America’s Best Graduate Schools.” In the 2009 edition, Auburn Engineering ranked 42nd and 73rd, respectively. The continued rankings improvement is a reflection of the college’s growing reputation.

Six engineering departments were ranked in the 2010 numbers. Among public institutions, chemical engineering ranked 32nd, civil engineering ranked 38th, computer science and software engineering ranked 33rd, electrical engineering ranked 29th, industrial and systems engineering ranked 19th and mechanical engineering ranked 37th.

The college’s undergraduate program is ranked 64th nationally overall and 36th among public universities that offer doctoral programs in engineering. Rankings of other programs are released at various times during the year by U.S. News & World Report.
It’s my job

Emily Johnson Zieman
‘02, ‘04, Aerospace Engineering
Lead Systems Engineer
Legacy HELLFIRE Missile Launcher
U.S. Army, Redstone Arsenal, Huntsville, Ala.

 Typical day . . . troubleshooting components and engineering — designing, problem solving and testing the four-rail launcher that flies on the Apache helicopter.

 Engineering challenge . . . military systems require so much precision; it’s easy to get lost in the details, a specific problem or a part, and forget about the whole system.

 My Auburn Engineering . . . three years on the Baja SAE team taught me how to build things, not just to fabricate parts but make them work.

 Geek moment . . . my husband Mike and I wrote a software program to control our Christmas lights — sometimes they blink or fade or the colors vary and rotate — the control box is bigger than most computers.

 Early on . . . I learned to love mechanical things working on a twelfth-generation cattle farm in Southboro, Massachusetts.

 Turning point . . . in high school, I realized that physics made the world make sense to me.

 Sense of pride . . . realizing that what we work on everyday helps keep our nation safe and knowing that it is important to the defense of our country.

 Interviewed by Beth Smith
Don’t let the hunk of metal fool you. Inside the launcher are circuits and computer cards and internal sensors. There are probes that “talk” and built-in tests that allow the launcher to check itself and transfer information to the pilot. A launcher must have a remarkable degree of compatibility with its missile. As one of the smaller guided missiles, the HELLFIRE continues to be refined to enhance performance characteristics and decrease the possibility of collateral damage.

This launcher has seen a great deal of action in the Gulf War theater and the conflicts in Iraq and Afghanistan. “Even in non-traditional conditions, this missile still does what it needs to do,” says Zieman. “The technology behind it is incredible.”

Are you smarter than a freshman?

There are probably more than a few college graduates on Auburn’s campus, especially those of us in engineering, who often ask themselves this question.

Try your hand at this freshman physics problem and find out for yourself.

**Question:**

A small object of mass $m = 0.4 \text{ kg}$ is traveling along a horizontal surface. The only horizontal force acting on the object is a resistive drag force proportional to the speed of the object such that $F_D = -cV$ where $F_D$ is the drag force, $V$ is the speed, and $c$ is the coefficient of proportionality such that $c = 8 \text{ kg/s}$. The object passes point $P$ with a speed $V_0$ equal to $2 \text{ m/s}$. How far beyond the point $P$ does the object travel before it comes to rest?

**Answer:**

The acceleration of the object is proportional to the net force such that:

$$m a = F_D = -cV$$

In this case, we want to find the speed, $V$, as a function of position, $X$. Thus, the acceleration is given by:

$$a = \frac{dV}{dx} = \frac{dV}{dX} = \frac{dV}{dt} = \frac{m}{m} dx = c$$

Thus:

$$\Delta X = \frac{m}{c} - \frac{V_0}{c} = \frac{m}{c} - \frac{V_0}{c} = \frac{m}{c} = \frac{2 \text{ m/s}}{8 \text{ kg/s}} = 0.1 \text{ m}$$

Aeburn Engineering 13
Auburn University and Siemens have signed a research agreement to develop the Magnetic Resonance Imaging (MRI) Research Center at the Auburn Research Park. This alliance, with one of the world’s largest suppliers to the health care industry, advances the university to the forefront of biomedical engineering and has the potential to bring lifesaving technologies to the citizens of Alabama and the region.
“Auburn’s College of Engineering has a number of faculty engaged in research with MRI,” explains Dean Larry Benefield. “The same is true for other units across campus. Creation of this center is the first step in a broader initiative designed to bring together Alabama’s intellectual and business capital to advance Auburn University to the forefront of biomedical engineering and to create a one-of-a-kind resource for the state.”

The center, which will be housed in a building to be constructed in the Auburn University Research Park, brings together Auburn’s expertise in engineering, science, pharmaceutics, agriculture, veterinary medicine and business with Siemens’ expertise in magnetic resonance imaging. Construction of the new facility is expected to begin in January 2010, with planned completion by September. The building, currently under design, will house two Siemens’ MRI units. It will also include office space for associated Auburn units and local medical clinics.

A 3T unit, the most powerful MRI currently cleared for clinical use with humans, will be used during the day, Monday through Friday, by EAMC. On weekends and evenings,
the unit will be available for research use. A 7T unit, not yet cleared for use on humans, will be available to researchers 24-7.

According to MRI Research Center Director Thomas Denney, faculty member in the Department of Electrical and Computer Engineering, the center will support the discovery of new technologies and their transfer to a broad spectrum of medical and pharmaceutical markets. An alliance with Siemens’s MRI Research and Development groups will drive research, technology development and intellectual property commercialization. Al Zhang, Siemens’s zone business development director, will serve as center co-director, providing on-site technology management for the units.

Pulling together the partnerships needed to make the MRI center a reality has been a challenge spearheaded by Auburn Engineering alum Ed Lewis, special projects officer for technology advancement in the college.

“Ed brings to the table a keen business sense learned from his many years as a manager with Mars, Inc.,” says Benefield. “His energy and expertise have been critical to turning the MRI center from dream to reality and building the partnerships that will be essential for its success.”

In today’s high-tech economy, the correlation between a state’s economic well-being and the strength of its research and development capabilities is well documented. A recent report found that of the top 30 high-technology metropolitan areas, 29 were home to or within close proximity of a major research university.

“It is not surprising that most states consider their universities to be critical components of their intellectual infrastructure,” says Lewis. “The importance of research and development capacity to the economic prosperity of a state and nation is predicted to increase in the coming years, and the research center is designed to address this reality.”

Existing and proposed partnerships with other institutions, such as the University of Alabama at Birmingham, U.S. Army Aeromedical Research Laboratory at Fort Rucker and the Andrews-
“The creation of this center is the first step in a broader initiative designed to bring together Alabama’s intellectual and business capital to advance Auburn University to the forefront of biomedical engineering and to create a unique resource for the state.”

– Dean Larry Benefield
Paulous Research Institute, will provide the clinical network to support work on biomedical applications of the imaging technologies being developed at Auburn.

For example, Denney cites potential research in partnership with Fort Rucker on soldiers with neck and spinal injuries, as well as those with traumatic head injuries and post traumatic stress syndrome.

Commercialization of these newly developed technologies will support expansion of the center’s capability and increase its impact in the research and development arena.

“This collaboration will provide a research platform of the highest level,” adds Zhang. “We believe this alliance will result in improvements in health, education and economic growth for the state of Alabama and the nation.”

Around the globe, MRI-related research is being conducted on cognitive neuroscience, metabolic imaging and pharmaceuticals, as well as diabetes and cardiac research. A new seminar series, the Ginn MRI Distinguished Lecture Series, will provide Auburn faculty and graduate students the opportunity to interface with leading MRI researchers from around the world.

“The MRI Research Center and the supporting alliances are prime examples of how state funds can be invested and institutions collaborate with the private sector to develop a world-class research center to advance science and technology,” says Auburn University President Jay Gogue. “We believe that this collaboration establishes a precedent on which cooperation between Auburn and other institutions can build to improve the quality of life in the global community and promote economic development for Alabama.”
A Centennial of Auburn Engineering: From Red Clay to Red Satellite
By Art Slotkin

The last fall/winter edition of Auburn Engineering detailed the transition of the university’s engineering programs into a formal college of engineering, as the first decade of a new century drew to a close. We continue the story in this issue through two world wars and into a cold war symbolized by the shocking launch of the Soviet-era Sputnik. Auburn Engineering would play a crucial role in shaping solutions to the greatest engineering challenges that faced America in the postwar era and into our current day. It was never an easy ride for the faculty and administration, who had to contend not only with the ongoing challenge of preparing students for new careers, but also major dislocations such as the Great Depression.
A century ago – in the 1909 academic year – civil, electrical, mechanical, mining, telephone and architectural engineering were being taught at API, as Auburn was known from 1898 through 1960. Enrollments were on the rise and Broun Hall was enlarged to accommodate growth.

The role of technology was increasingly being felt when World War I came to America, and Auburn, in 1917. In June, the institute granted degrees to the “Senior Class who reported for military service, or went back to the farm.” The arrival from training camp of 42 new recruits in khaki to get their diplomas gave a military air to Auburn’s wartime commencement ceremonies.

As summer turned to fall and students returned to campus, the Orange and Blue claimed, “Despite the ravages of war, Auburn’s enrollment … promised to fall little short of last year’s.” The Army held an officer’s training camp for both students and graduates to prepare them “for appointment as officers to fill vacancies that may occur,” and almost 2,500 college men from around the nation entered the training program as America continued in its fifteenth month of war in June 1918.

While overall enrollment declined, engineering numbers increased because as a critical skill these students received deferments, “not granted to the individual, but as a measure for the Defense of the Nation.” In all, about 1,100 Auburn men served during the first year of the war, with more than 225 men enlisting directly out of the ranks of the student body. On Nov. 11, the allies signed an armistice with the Germans and at 11 a.m. hostilities ceased. They held celebrations in Auburn, as they did across the nation, as peace returned.

Overall enrollment in 1919 grew to almost 1,300 regular students and a record-breaking 676 freshmen, more than two-and-a-half times the number in 1918.

It was June 1912 and Charles Coleman Thach – in his tenth year as president – was to confer 119 degrees. Sadly, engineering student W.W. Johnson did not get one. Johnson, who was living and working in Barcelona, Spain, as a civil engineer, lost his thesis in the mail hold of the ill-fated Titanic, which sank just a month before graduation ceremonies.

It earned him not only some aggravation – it certainly wasn’t saved to disk – but perhaps the best-ever excuse for a late paper. In the end, Johnson resubmitted his paper and finally received his professional degree in 1916.

Professor Arthur St. Charles Dunstan in mid-career with a class of electrical engineering students. He would teach at Auburn for 51 years.

Mechanical engineering students stand in formation for cadet training in 1918. While courses in military tactics dominated student life in the 19th century, the retooling of Auburn as a land grant institution would add a new emphasis on ‘the agriculture and mechanic arts.’
The Army reorganized its campus ROTC companies into infantry, field artillery and engineering units and replaced the cadet grey uniforms with the army khaki of the doughboy. They trained “engineering students in the duties of the Corps of Engineers . . . so that the future wars will find a trained body of Engineer officers to assist in the formation of new armies.” Cadets took courses in the military aspects of engineering practices including “roads, railroads, bridges, maps and map making, fortifications, engineer’s organizations, river and harbor work, and demolitions.” The demolition course was “of particular interest” because it allowed students “to actually handle the paraphernalia of explosive works.”

The decade leading to 1920 was mainly prosperous for Auburn. Under the leadership of Thach, the College of Engineering came to prominence, leading some to accuse the president of favoring engineering at the expense others, something he always denied. Whether it was with bias or foresight, Thach oversaw the establishment and the first decade of growth of the College of Engineering. However, due to ill health, he retired in 1920 and soon died. Spright Dowell, an educator and administrator, took over the presidency but not Thach’s place in the hearts of alumni.

After the economic boom caused by the war, recession hit Alabama, which led to years of scarcity for Auburn. Using money from foundations, alumni and friends, the new president expanded campus programs and built several new buildings. The “engineering division,” as he called it, represented about half of the students and received its fair share of money for new construction. With a generous donation from Birmingham industrialist and mining engineer Erskine Ramsay, the institute built a large new engineering hall named for its benefactor. But API never had enough money for salaries, equipment and supplies, and after Dowell had a dustup over football, powerful alumni precipitated a crisis and hounded him out of office.

On July 1, 1928, Dr. Bradford Knapp, an agricultural specialist and renowned educator, became president. The new president, as it turned out, had a brief honeymoon followed by a stormy, six-year tenure. Knapp, expecting to receive $750,000 in construction funds appropriated by the 1927 legislature, proposed using the money to build a new chemistry laboratory, a textile engineering building and other new buildings in a multimillion-dollar spending spree at the start of the Great Depression. He suggested that work begin on the chemistry building “almost immediately” and pushed to establish a textile engineering program “as soon as possible.” John J. Wilmore, named dean in 1908, remained dean of engineering as Knapp reorganized API and turned its colleges into schools, including the School of Engineering. Storm clouds formed on the economic horizon but the new college president, along with just about everyone else, failed to see them until the stock market began to decline on Oct. 21, 1929. A few days later, panic set in.

The situation worsened and by April 1930 Knapp admitted, “Auburn didn’t have funds to meet the May 1 payroll.” However, he had already let contracts for the textile engineering and new shop buildings. They completed construction of the former in 1930, outfitted it in 1931, and with the help of the local industry, obtained needed equipment. They also opened the new shop building containing woodworking and sheet metal workshops.

Wilmore established an aeronautical option in mechanical engineering and announced plans to establish a curriculum in industrial engineering, which offered “suitable courses in business and economics . . . added to a sound basic engineering training [to] qualify men for positions in the management side of industry.”

In early 1932, API was about five months late in paying salaries, but despite the
worsening depression, enrollment increased. The lack of funds for 1933 caused more concern as the legislature considered balancing the state budget by further cutting educational expenses. Knapp explained that if this occurred, he would have to cut salaries across the board. Then on July 28, 1932, he issued his valedictory report, which said, “to dismantle the work here at Auburn at the present time would be a crime.”

The president said the institute owed $563,000 in debt for the “instructional division,” with 61 percent of this in unpaid salaries. When he was done with his report, he resigned. The trustees appointed an administrative committee of three men to discharge the duties of the office of president, including Luther N. Duncan, director of the Agricultural Extension Service; Bolling Hall Crenshaw, head professor of mathematics – and engineering’s John J. Wilmore. The mild mannered 69-year-old dean of engineering, who did not like to speak in public, began by recapping the dismal financial situation. One of the most urgent needs of the institute was money for maintenance because Knapp had neglected old buildings while he built new ones. Roofs leaked, walls needed painting and the campus needed general maintenance.

During the 1934 academic year, API awarded the largest number of degrees it had ever granted, but enrollment during the fall semester of 1934 dropped to the lowest level since the start of the depression. Engineering enrollment remained at about 41 percent of the total student body, after peaking at 52 percent in 1926. However, the engineering freshman class in 1934 was large, which augured well for future growth. Auburn limped along paying less than half of faculty salaries and the typical faculty member lived on $67.50 per month, or about $1,100 in today’s inflation-adjusted dollars. Resignations increased and despite a shortage of teachers, they hired few replacements. Wilmore appointed Charles Hixon as temporary assistant dean of engineering since his duties as chair took up most of his time.

When Bibb Graves returned as governor in 1935, he appointed a presidential selection committee that picked Luther N. Duncan as president. Wilmore, 71 and obviously relieved to return to the School of Engineering, expressed his “genuine pleasure” with the
Seventy years ago, during a brief stop in Auburn on March 30, 1939, President Franklin D. Roosevelt spoke to students, challenging them to improve the world around them.

“You are near neighbors of mine for, from the top of the hill behind my cottage at Warm Springs, I can see into Alabama. I am glad to come here. My contacts with Auburn in the past have been the famous football games held every autumn in Columbus and in those games I have to exercise very strict neutrality.

“I am glad to come here and see the work that is being done. You young men and women who go through Auburn and go out into every county in this State have a great responsibility, not only to put into practice what you have learned here but also to try to devise new methods, new means — experiments, if you like — in order to improve the conditions during your own lifetime. I believe you can do it because you are getting the fundamentals, the essential training, that will give you the personal capacity to use your imagination. We shall never get anywhere until we do more and more of that.

“I am glad to have been with you here today and next fall I shall—well, perhaps I shall lean a little bit more toward Auburn than I have before.”

new president, who named him to chair the institute’s executive council. By the spring of 1937, the college had recovered sufficiently to pay faculty and staff 90 percent of their salaries; in 1938, they were paid in full. Duncan called for renewed state support for the engineering school and its experiment station, as well as for the adoption of a cooperative engineering education plan. He also asked for an expansion of the graduate program by increasing the number of fellowships and the adoption of uniform regulations governing graduate education.

In 1938, the 74-year-old dean of engineering hired an assistant dean, Joshua Eyre Hannum, a graduate of Pennsylvania State College with bachelor’s and master’s degrees in mechanical engineering. In 1939, for the first time, the School of Engineering received accreditation of the mechanical and electrical engineering curricula from the Engineers’ Council for Professional Development (ECPD). Formed in 1932 by seven engineering societies, ECPD would become an important factor in the growth and survival of engineering at Auburn, what we know today as ABET, the accrediting body for college and university programs in applied science, computing, engineering and technology. In his report to the accreditation agency, Wilmore said that more than 3,000 students had graduated in engineering since API’s founding in 1872.

The dean wrote that Auburn engineering graduates worked in private industry, the military, government and academia, and that almost all of them were men, with the exception of “Miss Maria R. Whitson,” who the report listed as “the First girl to graduate in Electrical Engineering.” Indeed, with a bachelor’s degree in 1923 and an electrical engineer professional degree in 1931, Whitson began her career with the Alabama Power Company; in 1939, she switched careers and taught elementary school in Talladega.

The 77-year-old dean of engineering prepared a report reviewing the progress made by the School of Engineering during the five-year period between 1935 and 1940. The school’s enrollment increased by two-thirds to 833 students and he wrote, “Practically every industry doing a national business in the United States has one or more Auburn graduates with them.”

As the nation again considered the possibility of war in 1940, API began a flight-training program as part of the Civilian Pilot Training program and enrollment in aeronautical engineering — begun in 1930 — grew by more than 60 percent. As the School of Engineering expanded its involvement in the federal Engineering, Science and Management Training Program in 1941, API organized classes in Birmingham, Montgomery and Mobile to train a thousand men in night classes.

On that Sunday afternoon in December when the Japanese Navy bombed Pearl Harbor, the management of the Tiger Theater stopped the film to announce to a house packed full of students that America had been attacked. The next day, Duncan called an executive council meeting “to determine API’s role in the war effort and to stress the need for calm among students and faculty.” As in 1917, the war would change life at Auburn, but nobody could predict by how much in the early days of World War II.
The 1942 Catalogue announced Auburn’s change to the quarter system and on June 8, API began year-round operation, permitting students to graduate in three instead of four calendar years by attending classes in summer. “The entire curriculum has been revised and strengthened in accordance to wartime requirements,” said the catalogue, and “More than 95 percent of the men enrolled . . . are preparing themselves to meet the Nation’s wartime need for college-trained officers . . . or for special service in ‘critical occupations.’”

In 1943, Hannum became acting dean following the death of Wilmore at age 79, after 55 years at API. The trustees passed a resolution noting with “a measure of sadness and grief” the passing of the long-serving teacher, mentor and administrator. They said, “Death has come at last to Dean John J. Wilmore after a full life of distinguished service to Auburn, to Alabama and to the nation . . . the Engineering School was his life, and it remains his monument.”

At the time of Wilmore’s death, regular engineering enrollment shrank by almost half as students were called into the service. Meanwhile, total college enrollment peaked at 4,616 during the winter of 1942-1943 but fell to 2,290 the following year when women outnumbered men as regular students for the first time. In addition to their normal academic teaching loads, the engineering faculty were called upon to manage defense training programs. By June 1944, Auburn had trained nearly 35,000 men and women in wartime training programs, most administered and taught by the School of Engineering.

In 1944, Duncan promoted Hannum to dean of engineering and director of the Engineering Extension Station. Shortly after Duncan appointed him, the dean sat down with the head professors of each engineering department because, as he wrote, “An entirely new day was dawning in engineering education.” The dean and faculty set out to work “continuously for six months until API’s engineering curricula had been redesigned to meet postwar needs.”

The 1944 Catalogue reflected the changed attitude about women brought about by the war, and urged them to “enter courses affording training for the critical occupations.” Women responded and enrolled in engineering and aviation management. However, besides the traditional curricula targeted at women, such as home economics and education, the college added courses in “Red Cross Sewing and Knitting, Canteen Hostess and Pattern Making,” alongside other courses in “Foundry, Machine Shop and Welding.”

With the end of the war approaching, the School of Engineering reorganized into five engineering degree granting departments – aeronautical, civil, electrical, industrial and mechanical engineering – and two management degree granting programs – aviation and industrial management. The department of textile engineering became the “School of Textile Technology,” although it remained a part of the School of Engineering and offered degrees in textile chemistry and textile engineering. The Auburn School of Aviation separated from the Department of Aeronautical Engineering and the Department of Industrial Management separated from the Department of
Industrial Engineering. Indeed, industrial engineering ceased to be a department in 1945, only to reopen later.

By the winter quarter of 1946, there were 1,600 veterans enrolled and soon, in addition to 194 temporary apartments for married students and faculty, temporary buildings included 15 two-story dormitories for men and 13 classroom buildings, two cafeterias, a supply store and pharmacy laboratory. New temporary, semi-temporary and permanent buildings covered the campus and one student who graduated in 1952 recalled taking freshman English in 1948 in a temporary building located outside the Alumni Gymnasium, where the Foy building is located today. Auburn enrollment during the 1946 academic year grew to almost 5,500 students, with more than a quarter of them being women. Engineering enrollment increased to a third of the total student body including 33 women and eighty-five percent of the engineering students were freshmen or sophomores, leaving only 15 percent in the two upper classes, a remnant of the low enrollment during the war.

Moreover, the veterans attending Auburn under the G.I. Bill were quite interested in learning. Some of them had college training before the war; many had some technical training in the military. Many more had some engineering experience in the military. They had relatively good backgrounds and were serious students. One professor said, “It was a challenge teaching them because they did their homework and they weren’t interested in anything but really learning fast so they could make up for the time they’d lost in the military.”

The boom of the postwar years would not end with the returning World War II veterans, however. On July 26, 1947, Duncan, 72 years old, died unexpectedly. Meeting in the governor’s office two days later, Ralph B. Draughon was named “Executive Officer for the Board of Trustees” and later was named president. With the boom in engineering enrollment following the war, the state built the first major engineering building on campus since before the Great Depression. Named for Dean Wilmore, construction of Wilmore Laboratories got under way in 1948. Although the building first opened in fall 1949, the institute formally dedicated the John Jenkins Wilmore Engineering Laboratories on Oct. 11, 1952.

By 1950, Auburn began to resemble the pre-war period when young men and some young women dominated the college and the town. However, America was soon at war again and the graduation of World War II veterans, combined with the mobilization for the Korean War, meant fewer students. As registration for the fall quarter of 1952 began, it became apparent that enrollment would increase with returning Korean War veterans.

The Auburn Graduate Placement Service said that the average engineering graduate in June 1953 interviewed with “eight or ten companies . . . from all sections of the country.” However, while undergraduate engineering enrollment exploded, there were few graduate students in engineering because there was no money for research or fellowships and no member of the engineering faculty held a doctorate at that time.

Three years before Sputnik, as the Cold War heated up, a report from the National Research Council published in the Auburn Engineer said, “America is rapidly falling behind Russia in the race to produce engineers.” While 19,000 engineers graduated in the United States in 1954, the USSR graduated more than 50,000.

The fear of losing technological superiority to the Soviet Union continued as a theme in science and engineering circles.
Auburn alum Art Slotkin is a 1968 aerospace engineering graduate with a master’s in civil engineering and flight structures from Columbia University. After a diverse career, he retired from the computer services industry in 2003. He then attended Georgia Tech to obtain a master’s in sociology and history of technology and science. Slotkin has conducted much of the research for his book and this article in the Auburn University Library, Archives and Special Collections Department, with help from the university’s professional team of archivists.

but without state funding, Auburn’s engineering school fell further and further behind. Between 1951 and 1955, enrollment grew by 76 percent, but the dean was unable to add faculty.

In 1956, enrollment increased again and it was noted that “the pressures of enrollment have not been distributed equally among the schools, and most of the increase has been in the School of Engineering,” which grew by a factor of two and a half since 1951. This caused problems in obtaining qualified engineering faculty, equipment and supplies necessary to satisfy the rapid growth. With inadequate funding and increasing enrollment, the School of Engineering found itself in an untenable position. All of it came to a head with several significant events in 1957.

In October of that year, the Soviet Union launched Sputnik I, a small, unmanned satellite, which most Americans saw as a direct threat to national security. Then, just after Auburn won the Associated Press national football championship poll, the Engineers Council for Professional Development informed the institute that they “temporarily withdrew” accreditation for the electrical and mechanical engineering curricula, precipitating a crisis at Auburn.

The action came about because teaching loads were “considered excessive” and faculty salaries “too low in the judgment of the council,” conditions which had existed since 1949. The national press howled at Auburn’s loss of engineering accreditation at a time when it won the national football championship and they accused API and the state of Alabama of having more interest in football than in academics.

What came to be Auburn’s “engineering crisis” led to soul searching and major changes at the School of Engineering – changes that we will look at when we resume the final segment of the history of Auburn Engineering. It goes without saying that Auburn pulled itself up by its bootstraps.

In 1949, Arthur St. Charles Dunstan completed his 60th year as the department head of electrical engineering and retired after 51 years on the faculty.

Michael Thomas Fullan, class of ’99, the first head of the department of engineering drawing and design, taught at Auburn for 46 years, while Albert L. Thomas, class of ’04, professor of engineering drawing and design, remained on the faculty for more than 50 years.

Professor Charles R. Hixon, class of ’07, joined the mechanical engineering faculty in 1908 right after graduation, became the department head in 1936 and “spent his entire life teaching and working at Auburn,” remaining for 46 years until 1954.

Another long-serving member of the faculty, Dan T. Jones, class of ’13, continued as the head of the industrial laboratories department, and remained until his retirement in June 1961 after teaching at Auburn for more than 40 years.

The Methuselah Factor

Long service to the college began with its inception. Over the years, dedication by few to the school became a commitment among many to a growing institution.

Gen. James H. Lane joined the School of Engineering faculty in 1882 and remained professor of civil engineering for 25 years.

Dean John J. Wilmore served for 55 years, and in 1948 professor of electrical engineering William Welch Hill, class of ’98, retired after teaching at Auburn for 49 years.

In 1949, Arthur St. Charles Dunstan completed his 60th year as the department head of electrical engineering and retired after 51 years on the faculty.

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Another long-serving member of the faculty, Dan T. Jones, class of ’13, continued as the head of the industrial laboratories department, and remained until his retirement in June 1961 after teaching at Auburn for more than 40 years.
Auburn’s Canine Detection Research Institute turned to the college for help with instrumentation and materials in discovering new ways for dogs to detect hazardous substances.
Man’s Best Friend Goes it Alone  By Sara Borchik

While people most often see dogs as pets, we all know that they can be used in many other areas of our daily lives. They can be trained to guide someone with impaired vision or to guard a family’s safety; they can search for drugs, bombs or even missing people after a disaster. But until now, they have always needed a master or human trainer to accompany them into situations that could quickly turn perilous. Enter the first autonomously controlled dog.

Using a computer and a sensor-activated vest recently developed at Auburn, canines can now be autonomously guided using various tones and vibrations. This collaborative project between the departments of Mechanical Engineering and Computer Science and Software Engineering, as well as the Auburn University College of Veterinary Medicine, is led by engineering doctoral student Winard “Win” Britt.

These sensor-guided dogs have already attracted a great deal of attention from government and industry. By keeping humans out of harm’s way, these dogs – and the researchers who developed the technology – are saving lives.

Dave Bevly, faculty member in mechanical engineering, had applied for a grant from the Office of Naval Research (ONR) Young Investigator Program. He submitted several possible topics, mostly focusing on the work he was already doing with guided autonomous vehicles in Auburn engineering’s GPS and vehicle dynamics lab (GAVLAB), which includes control and navigation of vehicles using GPS in conjunction with other sensors, such as Inertial Navigation System (INS) sensors. The lab has several research thrusts, including sensor fusion and integration, online system identification, adaptive and robust control algorithms and vehicle state and parameter estimation. The work is focused toward vehicle dynamics and transportation systems – such as heavy trucks, passenger cars, off-road vehicles, autonomous and unmanned vehicles and, as with Britt’s project, even canines.

“I got a call from someone at the ONR saying they weren’t really interested in any of the things I suggested, but they did have an interest in using GPS to guide trained dogs,” Bevly said. “This fit perfectly with the work the College of Veterinary Medicine was already doing, and they had no idea that we’d just had the discussion about the same thing.”

The only program in the U.S. with the unique combination of veterinary, behavioral science and canine detection training professionals, Auburn’s Canine Detection Research Institute (CDRI) has a history of collaboration with Auburn Engineering. It began in the 1990s due to the commonality between engineering’s sensor technology development activities – which eventually became a part of the university’s food safety focus – and CDRI’s investigations of canine sensory capabilities. In the early 2000s, CDRI turned to the College of Engineering to provide instrumentation and materials for developing new ways of using dogs for the detection of hazardous substances. This resulted in direct collaborations on government contracts with Auburn engineering faculty members such as Bruce Tatarchuk and Dan Marghitu.

“In 2005, I was approached by members of materials and mechanical engineering and asked how they might be able to build on this research using dogs for various security and defense related tasks,” said
Paul Waggoner, senior scientist with the CDRI. “The goals of engineering and CDRI were very similar: to integrate technology in the use of working dogs to enhance and expand their uses in military and homeland security operations and to increase the safety of military and first-responder personnel, as well as the general public.”

Many ideas were passed back and forth among the group – which included engineering faculty members George Flowers and Tony Overfelt – and each was considered for its utility, practicality and potential of interest for governmental research and development funding. When the idea was presented to use GPS and autonomous guidance with canine training, the CDRI was more than interested; as a program that had started with bomb detection, faculty and staff understood the need for a method of handling detection canines remotely.

Bevly had been invited to sit in on the discussion and decided to use those topics to finalize his ONR proposal. He amended his plan and was awarded funding based on an idea to research the use of dogs for security assistance without the immediate presence of a handler. The project would use GPS and a microcontroller to automatically guide trained dogs to specific locations.

“The technology was much like that used with unmanned ground vehicles, but the modeling of the system and the design of a unique control algorithm for a dog would be the focus of the research,” said Bevly. “This project was similar to others our lab had worked on, but now our focus would be a canine instead of a vehicle.”

With funding in hand, Bevly immediately began looking for graduate students who could assist with the project. Because the plan was to actually build a pack for the dog to wear, as well as develop a software program, he began the hunt for an electrical and computer engineering graduate student who would be up to the task. However, it was a computer science and software engineering faculty member whose research caught his eye, leading him to then doctoral student Win Britt.

“I went to faculty member Gerry Dozier to see about using neural networks to guide the dogs,” Bevly said.

Meet Major:
A four-year-old labrador retriever trained in blind retrieves. Major was the ideal canine candidate for the autonomous guidance project.
“Then Win came on board with a plan to use an artificial intelligence method.”

As a budding computer scientist, Britt jumped right to artificial intelligence as a means for guiding the dog.

“I just began by asking the question, ‘How can we model and control a dog?’” said Britt.

The plan was simple. Or at least simple to explain.

The team would develop a suite of models and algorithms that could autonomously direct a canine to a specified point, using GPS coordinates. The canine, would wear a device that would utilize the programmed directions to lead him to that position.

Britt and his team spent the better part of three years making it all come together.

He focused specifically on the modeling and software systems that would autonomously control the canine and worked side-by-side with mechanical engineering graduate student Jeffrey Miller, who was responsible for the GPS-related aspects of the program.

“To be able to automate the remote control of a canine, we needed to attach sensors to the canine that would give the computer knowledge about the canine’s position and heading in reference to given way points,” said Miller. “My job was to incorporate GPS with inertial sensors to give that information.”

The team also included two undergraduate research assistants, computer science’s William Lyles and electrical engineering’s Stephan Henning.

“What became really interesting was how to build the controller,” Britt said. “It was fascinating what we could learn from those little sensors and how we could use the data that they retrieved.”

They worked countless hours putting together a canine vest that would receive the signals to direct the dog. Through the use of tones and vibrations, the team discovered a system that could direct the dog to go left or right, forward, come to a stop or return to its base and trainer.

But they couldn’t just place the outfit on a dog without trial.

“Oh, yes,” Britt said with a chuckle, “we definitely spent some time testing the equipment on ourselves first.”

After numerous rounds of lab testing, the team decided it was time to take their equipment out into the field. For this stage of testing, the team chose a 4-year-old yellow lab named Major from the Canine Detection Training Center, part of the CRDI.

Major was already well trained in “blind retrieves,” a method often used by hunters to retrieve game fowl, such as duck, pheasant or quail. In a blind retrieve, a hunter uses sounds or hand signals to direct the canine to the desired point to retrieve its quarry. This way, the dog isn’t confused if he loses his line of sight. This training made Major a perfect choice for the project.

“Major already knew the mechanics that went along with being directed to a specific goal,” said Britt. “That made our job easier in that all we had to do was change the source of the stimuli he was used to.”

Once he adjusted to the sensor vest, Major was ready to test his skills at finding his hidden “dummies.”

Britt arranged for two different types of tests. The first, which he calls the “fair test,” involves a situation where a person with remote access can accurately provide the same directions as the control computer. The second, the “unfair test,” involves placing the dog in a setting where the
computer must give all the directions, such as a situation in which a building or similar distraction blocks the trainer’s line of sight.

For the most part, the field trials went smoothly.

“Occasionally, we’d forget that the dog didn’t really have a sense that he was carrying one-of-a-kind equipment in a vest on his back,” Britt said. “So, he’d run too close to the side of a building and clip the electronics pack, or he’d slide through a mud puddle and soak the equipment.”

Overall, the project was successful. The computer correctly issued directional commands 99 percent of the time. However, Major’s response to left and right directional commands was only accurate about 80 percent of the time.

“You have to understand that dogs see left and right a little differently than we do,” Britt said. “You could give perfect directions, but you didn’t always get the ‘left’ or ‘right’ that you wanted.”

Britt used this research project as the topic for his doctoral dissertation.

“The most significant thing about this research is that no one has ever autonomously controlled a canine in the manner we demonstrated,” he said. “I guess you could call Major the first autonomous remote-controlled dog.”

In August, Britt graduated with a doctorate in computer science and software engineering. His research project will continue under his former team.

“We’ve asked for an additional year on the funding from the ONR,” said Bevly. “There won’t be any more funding through that particular program project, but we can tack another year of work onto the resources we already have and then can search for further funding from other sources.”

Miller and the undergraduate researchers will take the project to the next level, working towards a better understanding of the directional issues Britt encountered.

“Now that we can accurately locate the position and orientation of the canine, the question becomes what algorithms will be effective in getting the canine where I want it?” Miller said. “Other companies are showing interest in the work now as well, and that gives us the opportunity to expand from our initial goals.”

While Britt focused on the use of GPS and machine learning to autonomously control Major, Miller plans to add the use of inertial sensors to the vest and investigate other control strategies. GPS gives position, velocity and course measurements with excellent accuracy, as long as there are enough satellites in view and the location of the satellites is conducive to good estimates.

However, GPS measurements are taken at relatively low rates and can be non-existent if the canine moves into areas that have low satellite visibility. So, inertial sensors and magnetometers can be used along with GPS to help out. Low grade inertial sensors, such as gyroscopes and accelerometers, give measurements at high rates and continue to do so even when the canine is indoors and out of
The autonomous canine system’s hardware is surprisingly small. The smaller box (right) is a custom-made lithium-polymer battery, developed by undergraduate researcher Stephan Henning. The larger black box is the system’s microcomputer – built and programmed by the team – while the smaller orange box contains accelerometers, gyroscopes and magnetometers.

Meanwhile, back at the lab…

Similar sensor-guided GAVLAB projects are being conducted to test ultra-tight GPS/INS coupling for the Army and develop positioning technologies for vehicle convoys for Future Combat Systems (FCS). The lab equipment consists of various GPS receivers; a programmable software receiver; Inertial Measurement Units (IMUs); an instrumented Infiniti G35; two unmanned ATVs, which were used for the Defense Advanced Research Projects Agency (DARPA) Grand Challenge; and an autonomous Ford Explorer, which was used in the DARPA Urban Challenge.

The GAVLAB often utilizes the National Center for Asphalt Technology (NCAT) test track for its research projects. The 1.7-mile oval track has four trucks driving on the track 16 hours a day and is divided into 200-foot sections of different pavement types. The test track serves as an excellent facility for testing the algorithms developed in the GAVLAB. Validation of navigation and control algorithms for various projects, along with parameter and state estimation algorithms, can be performed using the vehicles on the NCAT track.
In a quiet office on campus, Auburn’s technology transfer gurus lay the groundwork to bridge the gap between engineering ideas and the average citizen.

Technology transfer and licensing by universities has come a long way since the passing of the Bayh-Dole Act 30 years ago, which allowed academic institutions to own and commercialize technologies developed with federal funds. Since then, many academic institutions, including Auburn University, have established technology transfer offices or have designated a manager of marketing and licensing technology invented at the university… and with good reason.

By Cheryl Cobb
Encouraging Technology Transfer

1940s Roosevelt administration recognizes the value of technological advances to the nation’s military and begins to contract research to companies, universities and non-profits. However, lack of formal procedure for securing technologies results in few moving into the marketplace.

1963 Kennedy administration recognizes need for improved policy on intellectual property. Begins to develop inter-institutional patent agreements with some universities permitting them to own inventions made under government-funded research, opening the door for private industry to license and develop the technologies.

1980s Success of these limited agreements leads to passage of Patent and Trademark Law Amendment Act (Bayh-Dole Act) which provides an incentive for universities to protect their innovations and industry to make high-risk investments resulting in products made from those innovations.

The protection of research-based intellectual property (IP) and its subsequent movement into the marketplace not only brings improved products to the general public but also creates jobs related to the development and sale of those products. One such product was created by Auburn aerospace engineering faculty member Roy Hartfield and graduate student Christoph Burger. They recently designed and developed a device that allows for optimized positioning of a propeller blade without the need for the heavy or complex systems that typically accompany variable pitch propellers used on unmanned aerial vehicles (UAV). This technology translates into more power and better fuel efficiency, which in turn improves performance and range.

Hartfield and Burger did not have a company in mind for their propeller device but wanted to make it available through licensing. Auburn’s Office of Technology Transfer (OTT) worked with them to facilitate their application to patent the technology and license it to Aerovate, a Canadian company that creates aerial solutions for civilian markets, including geophysical exploration and surveillance. The company is currently testing an operational prototype.

“This device is based on a straightforward physical concept and offers the prospect for improving the performance of a class of aerospace vehicles of high current interest,” says Hartfield. “The opportunity to fundamentally improve the human condition through your work, if only in a small way, is truly a gift of fulfillment.”

The university also benefits through recognition for the discoveries, which in turn helps to attract and retain talented faculty, as well as entice corporate research support. Inventors receive a significant portion of the revenues from licensing activities, while some is used to support further research and education initiatives. A recent report from the National Institute of Standards and Technology estimates that new technologies account for half of our nation’s gross domestic product. Many of these technologies are born in our nation’s research universities.

“The Auburn University Office of Technology Transfer is implementing a new business plan that focuses on communication, marketing and commercializing IP developed by faculty and students,” explains John Weete, assistant vice president for technology transfer and commercialization. “The OTT works with faculty to move research-based IP into the marketplace by creating a bridge between the university and established companies and entrepreneurs to develop early-stage technology. We do it while still maintaining the core values of publication and sharing of information, research results, materials and know-how. It is a myth that one must either publish or
Another engineering transfer effort that is beginning to bear fruit is IntraMicron, an Auburn spin-off formed in 2001 that traces its origin to the Department of Chemical Engineering. In exchange for a license to the portfolio of microfibrous materials patents developed by chemical engineering professor Bruce Tatarchuk and his graduate students, Auburn receives a royalty on commercial sales.

IntraMicron currently occupies 16,000 square feet of manufacturing space in the Auburn Industrial Park and employs six full-time employees, as well as a number of contract support service providers.

“It has taken a while, but IntraMicron is finally turning a profit and has enough orders to keep it busy for the next three years,” says Tatarchuk. The firm’s specialized microfibrous technologies are currently being used in advanced aerospace materials, as well as in research and development programs focused on producing the next generation of filtration products. Applications include chemical filters for personal protection devices such as those worn by firemen and for air flow in large buildings, as well as for sensitive fuel cells.

“IntraMicron enjoys a close working relationship with OTT and has a number of exciting joint projects in the planning and implementation stages,” continues Tatarchuk. “While required to be on different sides of the profit/non-profit fence, IntraMicron and OTT are both committed to the same end goal – economic development in the community through the harvesting and conversion of cutting edge research and development activities into value creation and high-tech jobs.”

Unlike industry, where transfer often takes place with the sale of an intellectual property asset, universities most often accomplish the transfer through the option or licensing process. OTT helps faculty, such as those in the college, with the evaluation of discoveries for commercial potential; protects IP through patenting, copyrights, trademarks and trade secrets; markets technologies; develops partners for commercialization and collaborative research; and commercializes IP through licensing and start-up companies, while protecting the university and inventors.

“Our office has done a lot of training across campus to ensure faculty members understand the disclosure and patent process,” explains Weete. “In the rush to publish findings, it is easy to overlook the impact that this can have on their ability to protect related IP.”

Filing a disclosure form with the OTT office is a first step. The second – filing for a provisional patent – protects the intellectual property before it is shared publicly. This filing gives faculty and OTT time to evaluate the technology and to determine if a full patent application should be filed.

“We help the faculty member ensure that the IP meets the criteria for patentability, and, if it does, begin to evaluate its marketability by identifying potential partners,” says Weete. “If after a thorough check, the technology still looks promising, OTT personnel will help faculty navigate the patent process, working with the inventor to identify a potential partner to begin the development and commercialization phases of the process.”

Once the IP is protected, the invention can be brought to market. This three-tier process involves the financing of the start-up process, translation of the invention into a commercial product and marketing of that product.

While some technologies that come to OTT can be turned into products relatively quickly, others are promising but need additional development. When this occurs, OTT may work with an interested party to help them secure necessary funding – possibly through a small business innovation research grant or other vehicle, such as an angel investor who provides early-stage research and development funding for small technology companies.

“Time to market typically averages seven years,” explains Brian Wright, an associate director for commercialization in OTT. “The process from this point on is as variable as the list of technologies. In some cases, a partner needs to be identified and in other cases faculty already have a relationship with an interested party that wishes to license or form a start-up company.”

Whatever the steps in the transfer process, the staff in Auburn’s OTT ensures that the appropriate agreements are executed in order to protect the university and the inventors through intellectual property, collaborative research, material transfer and confidentiality agreements.

Weete cites a number of engineering success stories that range from a carpet recycling technology to next generation network security integrated into high-performance protocols to address new and expanding communications platforms and related Internet security threats. With implementation of the new business plan, revenue from these and other projects is beginning to flow into the university to the tune of $500,000 to $750,000 annually. Weete expects to see steady growth in revenue over the next few years.

“Engineering routinely accounts for just under half of Auburn’s research expenditures,” says Dean Larry Benefield. “Our faculty members generate a lot of IP and work closely with the Office of Technology Transfer to begin the commercialization process that can result in job creation. University discoveries will play an increasingly important role in the growth of the knowledge-based economy and in ensuring the vitality of Alabama and the nation.”

University Research:
An Engine for Economic Development

$3.4 billion in industry research performed at U.S. institutions
686 new products introduced to the market
555 new start-up companies
5,109 licenses and options signed
3,622 patents issued

* 2007 survey of nationwide universities conducted by Association of University Technology Managers
Sure, million dollar gifts are important ... but so are gifts to the engineering annual fund – no matter what size. Together, these gifts provide critical support for high-priority needs, such as:

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You have the power to help us engineer the future.
Faculty member Anton Schindler and graduate student Benjamin Byard, left, are researching the effect of lightweight aggregates (LWA) and curing temperature on the cracking tendency of bridge deck concrete.

Cracking of concrete occurs when the induced tensile stress exceeds the tensile strength of the concrete. The strength of concrete is impacted by concrete composition, the properties of its ingredients, the curing method and the temperature history that the concrete experiences. The development of in-place stresses is affected by shrinkage, stiffness, the coefficient of thermal expansions, the application and restraint conditions, the stress relaxation and the temperature history of the concrete. Because the properties of concrete are always changing due to the hydration of the cementing system, it can be difficult to capture their combined effect. Rigid cracking frame testing techniques use instrumented frames that restrain concrete samples from shrinking. The stress in the concrete that is measured is due to the net behavior of all of the aforementioned effects.

This research evaluates the effect of LWA and placement temperature using rigid cracking frame testing techniques. Using concrete temperature modeling software, the temperature history of a given concrete mixture can be modeled for a specific application, place and time of year. Software was used to develop a temperature profile of a bridge deck construction in Montgomery for summer and fall conditions. The concrete samples were tested under constant temperature curing condition and were match-cured to the bridge deck temperature profile. The use of LWA was found to be effective in reducing the stress in the concrete, which should improve the performance of bridge decks placed with this concrete type.
AEROSPACE

Tornados are lethal whirling masses of air that evoke fear because of their destructive power. In the atmosphere, tornados are created by a combination of pressure fronts, humidity, temperature differences and the Earth’s rotation.

The scientific term for a tornado is a “line vortex” or simply “vortex.” These vortices are often encountered in the wake of airplanes and are sometimes visible as contrails. At busy airports, these vortices can pose a serious hazard for planes landing in rapid succession.

Graduate student Manjul Gupta observes the vortex she created in a water tunnel.

The Federal Aviation Administration therefore requires large separation distance between landing aircraft to minimize wake induced turbulence, which results in an increase in time between landings and loss of landing fee revenue to the airports.

A number of research efforts have focused on destroying these tornado-like vortices. In the Department of Aerospace Engineering, one such project is creating a vortex that originates from the tip of an airplane wing and then weakens.

BIOSYSTEMS

The Department of Energy (DOE) has awarded Auburn researchers a $4.9 million grant to develop new production systems that collect woody biomass for making bioenergy. Auburn faculty will work with equipment designers on machine improvements and will develop and implement new sensors and GPS-based systems to help improve the performance of forest-harvesting machines and the quality of the final biomass product. One of five DOE projects for biomass logistics research, it is the only project targeted at southern forests.

Auburn’s Center for Bioenergy and Bioproducts will lead the project and work with faculty in the Department of Biosystems Engineering and the School of Forestry and Wildlife Sciences. Other collaborators include the U.S. Department of Agriculture Forest Service, as well as companies from across the U.S. and Canada, including Corley Land Services, TigerCat, Barnes Enterprises, Blue Ox Forestry and Dixie Pellet.

The production process involves harvesting pine trees, allowing them to partially dry, chipping them and transporting the material to a biorefinery to process it into cellulosic biofuels. Specific project objectives are to improve the design of tree-length harvesting machines to increase productivity and minimize their environmental impacts; assemble a high-productivity, lowest-cost harvesting and transportation system for biomass; and demonstrate and document the performance of this system at an industrial scale.

CHEMICAL

As part of a joint venture agreement between Auburn University and the U.S. Department of Agriculture’s Forest Service Forest Products Laboratory, faculty members Harry Cullinan and Gopal Krishnagopalan have developed a selective and efficient pre-extraction and modified pulping process for softwood that maintains yield and pulp quality.

A large fraction of hemicelluloses in wood chips is dissolved into black liquor during the pulping process. This portion is basically wasted, as only its fuel value is recovered. Integrating biorefineries with existing forest based industries would allow for significant economic growth through new value-added products and higher resource utilization. Recovery of the hemicelluloses was achieved by prehydrolyzing the wood chips using hot water, steam or acid to remove the hemicelluloses before the actual pulping process. The major effect that needed to be researched was the quality of the pulp and paper products produced from prehydrolyzed wood chips.

The process will now be scaled up for testing in a lab digester. This will involve additional work to screen less expensive additives for pretreatment and optimize pretreatment and cooking conditions.
Faculty member N. Hari Narayanan is collaborating with colleagues at Washington State University and University of Hawaii to study a way of teaching computing concepts to undergraduates called studio-based learning (SBL). The project is supported by a two-year grant to the three universities from the National Science Foundation (NSF) totaling almost $550,000.

Studio-based instruction is adapted from design-oriented disciplines, such as architecture, and is aimed at empowering students to learn collaboratively.

At Auburn, Narayanan worked with Margaret Ross in educational foundations, leadership and technology, and Dean Hendrix in computer science and software engineering, to test the efficacy of SBL in undergraduate courses over the past two years.

Preliminary analyses of data collected from these courses indicate that not only do students learn more, but also that their sense of community, self-regulation, motivation and critical thinking skills increases significantly.

Encouraged by results, the investigators have submitted a proposal to the NSF to support the implementation and evaluation of SBL on a national scale. They have secured participation of faculty from 15 colleges and universities in 10 states and are awaiting NSF review of their proposal.

The Department of Electrical and Computer Engineering and the Wireless Engineering Research and Education Center recently participated in the Jules Collins Smith Museum’s Sixth Birthday Bash. Faculty member Thad Roppel and students from the department hosted an activity table where kids could build crystal radios and use them to listen to Elvis’ music from a low-power AM transmitter.

Eight electrical and computer engineering student volunteers helped dozens of children do just that, making the activity, “10-minute radio,” the hit of the show. The team was equipped to build five radios at a time, and the activity table remained full throughout the three-hour event. Many of the participants were younger children, with both boys and girls showing interest in building a radio. The activity had a large impact on the kids, as seen from the expressions on their faces when they heard Elvis’ music through their earphones.

ECE student volunteers did an outstanding job, working with even the youngest children, and it was obvious that the parents were just as thrilled as the kids. With the success of this event, the department plans to use the 10-minute radio project for future recruiting and outreach events, such as E-Day and elementary school classroom and extracurricular programs.

Instructions on building a 10-minute radio can be found at sci-toys.com/scitoys/scitoys/radio/ten_minute_radio.html

Faculty member Kevin Gue, left, and Oklahoma State University colleague Bryan Edwards were recently awarded a $54,000 grant to initiate a broad-based study of the material handling industry by the Material Handling Industry of America and the College-Industry Council on Material Handling Education. The primary objectives of the grant are to examine factors that affect turnover, satisfaction, commitment and performance, as well as acceptance or resistance to technology adoption. The grant will fund two graduate students for one year. This work is part of a large-scale effort to understand worker-centric design in the context of distribution centers.

Gue’s research interests include logistics modeling and optimization, warehousing, distribution and material handling. Edwards’ areas of expertise include personnel recruitment, selection and training, group dynamics and organizational change and development. Gue is the immediate past president of the College-Industry Council on Material Handling Education.
MECHANICAL

Faculty member Sushil Bhavnani was recently awarded grants from the National Science Foundation Chemical, Biological, Environmental and Thermal Systems Directorate, and the NASA Headquarters Exploration Systems Mission Directorate to support his research efforts in electronics packaging.

This project will focus on boiling mechanisms during thermally-actuated pumping using asymmetric microscopic surface structures. This is a collaborative research and educational program between investigators at Oregon State University and Auburn in the general area of phase-change heat transfer enhancement. The goal is to characterize the effect of a passively imposed asymmetric force on a bubble during the boiling process. Such asymmetry is created by the use of a surface with repeated ratchet structures and pyramidal re-entrant cavities located on one of its sides. The hypothesis is that with several ratchets, this local asymmetric motion can be translated to a net fluid pumping. This will enable the efficient dissipation of heat from microelectronic components. As part of the funding agreement, educational activities will provide a synergy between research and education, as well as between several universities.

POLYMER AND FIBER

Fuel cells are the most promising alternative energy sources for transportation vehicles and electronic devices. However, they are prone to poisoning with certain chemicals in contaminated areas even more than human lungs. This becomes especially critical for the operation of fuel cell powered vehicles and electronics in battlefield conditions. In a proton exchange membrane fuel cell (PEMFC), ambient air rather than pure oxygen is the most economical way to feed the cathode. However, impurities in air, such as sodium dioxide (SO2), may contaminate a fuel cell, resulting in membrane electrode assembly damage and performance degradation by occupying reactive sites on catalysts. The severity of the effects of these impurities varies.

Using a wet laying process, faculty member Sabit Adanur and graduate student Wei Liu are developing activated carbon fiber (ACF) filters for fuel cell cathodes to absorb contaminants from the air and reduce or eliminate fuel cell poisoning. Through their research, the team has found that potassium permanganate (KMnO4) modified fibers are suitable for the wet-laying method to fabricate ACF filter media without losing SO2 capacity.

From top, a scanning electron microscope image shows activated carbon fibers loaded with KMnO4 for fuel cell cathode filters before reaction with SO2 and after.
E-DAY 2010
Feb. 26

2010 E-Day Spotlight Program:
Electrical and Computer Engineering

Each year, hundreds of middle and high school students considering a career in engineering visit Auburn’s campus to learn more about Alabama’s premier engineering educational experience. E-Day, Auburn Engineering’s annual open house, provides students with a chance to explore campus, engineering programs and the incredible opportunities the college offers.

Visiting students can chat one-on-one with students and faculty, experience interactive exhibits and tour classes and labs. They can also gather information about admissions, scholarships, financial aid and residence life.

Find out more about E-Day and Auburn Engineering student recruitment at www.eng.auburn.edu/eday
SC: Terri, how are things coming along with the construction of Phase II? It's gone from a sea of red clay to what looks like the skeleton of a building almost overnight.

TC: The project is proceeding well. We are currently tracking ahead of schedule. Demolition of the old physical plant in March marked the beginning of site prep and construction. Foundations for both the Advanced Engineering Research Laboratory and Dwight L. Wiggins Mechanical Engineering Hall are now complete, and the above-grade work on the structures started in August.

SC: Who are the contractors working on the project?

TC: Birmingham-based Hoar Program Management is the construction management firm providing oversight for eight primes: Rabren General Contractors, AMCO, Zebra Construction Company, Wayne J. Griffin Electric, TAC Americas, Scott Laboratory Solutions, FC Fire Protection and Mowrey Elevator. HOK of Atlanta is the architect.

SC: What will they be working on next?

TC: The buildings are being constructed simultaneously. Due to site and access constraints, the phasing of work is planned for the structure of the Advanced Engineering Research Laboratory to flow slightly ahead of Wiggins Hall. We anticipate the shell of the buildings to be complete in February. Then the building envelope, which includes the roof, masonry, doors and windows, should begin in March and be complete in September.

SC: That's a lot of progress. What's the next step?

TC: The substantial completion date is targeted for June 2011. Once the building is released, furniture and equipment delivery and installation and final punch list corrections and inspection will take place to allow the building to be occupied. We plan to have faculty, staff and students ready to begin classes in the new buildings in January 2012. The commons and outdoor quad area will also open at that time.

SC: There are many gathering areas in Phase I of Shelby for students to study and interact between classes. Can we expect the same interior design in Phase II?

TC: There will be open galleries inside the Phase II buildings similar to those in Phase I. However, those in the new phase will be treated somewhat differently. In Phase I, there is seating and student study space. In Wiggins Hall, there will be a designated student study space off of the main gallery as well as upstairs. There is also space for student organization offices and much of the lower level is dedicated to student projects. However, the first floor galleries of both buildings will be used as display and reception areas with some bench seating.

Terri Carson, a ‘90 Auburn civil engineering grad, is the college’s facilities development engineer. Working on projects such as the Shelby Center for Engineering Technology, she acts as the college’s liaison between various university groups, designers, contractors and vendors, ensuring the best quality of work is achieved and the needs of the college are met on time and within budget. She is one of many folks working to oversee completion of the Shelby Center’s newest buildings. I met with her recently to catch up on the progress.
SC: I’ve heard that the old generator that once lit all of Auburn will have a new home in Phase II… is that true?

TC: That’s true. The old dynamo, which has been temporarily relocated behind Broun Hall due to construction, will have a new home in the gallery of the lab building. It will be part of a larger historical display that will include images from the college’s past.

SC: Phase II will be home to the Department of Mechanical Engineering and the Advanced Engineering Research Lab. Can you tell me about any features that will be found in the new labs?

TC: Phase II will include more than 45,000 square feet of lab space in both buildings. The advanced lab building will include a nanoelectronics clean room on the lower level for use by several departments. The upper floors are reserved for flexible lab space, which has been designed for a variety of research needs that the college might have at any given time. In the past, labs like these were designed for specific end users, then renovated and updated for the next user. Today, it’s more effective to build them in a way that allows them to be used for many different types of projects and purposes. One of these flex labs on the third floor is initially being designed with biomedical engineering research in mind.

SC: On warm afternoons, the courtyards and porticos of Shelby Phase I are buzzing with students. Can you tell us about the exterior spaces of the final project?

TC: When finished, the buildings will form a completed quad of the Shelby Center. The exterior spaces will form a central walkway and gathering area, the Carroll Commons, which is a green mall that will connect to the main north and south pedestrian walkways of campus. Once complete, the pedestrian corridor will provide students with walkways from Magnolia Avenue, past the Haley Center, Jordan-Hare Stadium, the Student Center and parking deck at Plainsman Park, all the way to the residence halls on the south side of campus. There will also be an east and west pedestrian connector between the Lowder Building and the engineering precinct.

SC: What aspects of the new MRI Research Center at the Auburn Research Park will you be working on for the college?

TC: I represent Dean Benefield and the college for planning, design and construction on the new Auburn University MRI Research Center. Many of us have been hoping a project like this would come to Auburn. We received board approval this spring for an expedited schedule. The design should be completed by the end of this year. With bids scheduled for early 2010, construction is scheduled to be complete fall 2010.

SC: I hear that your husband is an Auburn Engineering grad, too?

He is. Eric is an ‘89 civil engineering grad. We have two sons, Jacob, 10, and Jeremy, 7, who are probably two future Auburn Engineering graduates.

Check out the live Shelby Center construction webcam at http://ocm.auburn.edu/webcams
Sharp students. Engaging faculty. Modern facilities. International studies. Hands-on experiences. These are the elements of a leading engineering program. As Auburn Engineering continues its quest to become one of the nation’s top engineering programs, the college has once again set an ambitious goal – and gone about exceeding it. We are proud of this accomplishment and the message it sends.

David Timm, civil engineering Gottlieb Associate Professor
Auburn Alumni Engineering Council  
College-wide Professorship
Dr. and Mrs. Daniel F. Breeden, ’57  
Industrial Management  
Two College-wide Professorships
Mr. Henry M. Burt, ’58  
Mechanical Engineering  
Professorship in Mechanical Engineering
Dr. and Mrs. Tony J. Catanzaro, ’84  
Chemical Engineering  
Professorship in Chemical Engineering
Mr. Timothy D. Cook, ’82  
Industrial Engineering  
Professorship in Industrial and Systems Engineering
Mr. Joe W. Forehand Jr., ’71  
Industrial Engineering  
Professorship in Industrial and Systems Engineering
Mr. and Mrs. Charles E. Gavin III, ’59  
Textile Management  
Professorship in Chemical Engineering
Mr. M. Miller Gorrie, ’57  
Civil Engineering  
Professorship in Civil Engineering  
Professorship in Construction Engineering and Management
Mr. H. Vince Groome III  
Professorship in Civil Engineering
Mr. and Mrs. John A. MacFarlane, ’72, ’73  
Mechanical Engineering  
Professorship in Mechanical Engineering
Mr. and Mrs. Joe T. McMillan, ’58  
Chemical Engineering  
College-wide Professorship
Mr. and Mrs. C. Phillip McWane, ’80  
Industrial Management  
Two Professorships in Mechanical Engineering  
Professorship in Electrical and Computer Engineering
Mr. and Mrs. W. Allen Reed, ’70  
Aviation Management  
Two College-wide Professorships
Mr. and Mrs. William B. Reed, ’50  
Mechanical Engineering  
Professorship in Mechanical Engineering
Mr. and Mrs. Edgar L. Reynolds, ’70  
Electrical Engineering  
Professorship in Electrical and Computer Engineering
Julia and Albert Smith Foundation, ’47  
Mechanical Engineering  
Professorship in Mechanical Engineering
Mr. and Mrs. George E. Uthlaut, ’54  
Chemical Engineering  
Professorship in Chemical Engineering
Mr. and Mrs. John H. Watson, ’60  
Mechanical Engineering  
College-wide Professorship
Mr. Dwight L. Wiggins, ’62, ’67  
Mechanical Engineering  
Professorship in Mechanical Engineering
Mr. and Mrs. Walter S. Woltoz, ’69, ’77  
Aerospace Engineering  
Professorship in Aerospace Engineering  
Professorship in Chemical Engineering  
Professorship in War Eagle Motor Sports

Last year, Auburn University President Jay Gogue initiated a program to create 81 new endowed professorships across campus. The university offered $7,500 each year in perpetuity to the earnings of any endowed professorship established by Sept. 30, 2009. In so doing, the university enabled donors to create the equivalent of a $300,000 named endowment with a gift of $150,000 – half the amount normally required.

The College of Engineering was originally offered 13 of these endowments, but set its sights on acquiring 20. Demonstrating their steadfast commitment, our alumni and friends, people like you, answered the call, and by program’s end, the college had secured funding for 27 of these new endowments – more than two-and-a-half times that of the next closest constituency.

These professorships are critical to the college’s ability to compete with peer institutions for the finest faculty. Competition is stiff for top-notch educators and researchers who are proven experts in their field. These new resources for salary enhancements, research support, technology upgrades and faculty development are vital to Auburn Engineering’s ability to attract and maintain exceptional faculty members.

Throughout its history, Auburn Engineering has been at the forefront of discovery and innovation. We have taken advantage of opportunities because of the dedication and generosity of our supporters. As we build an outstanding faculty, we in turn produce the best graduates. We have maintained this tradition for a long time – just ask any Auburn engineer.
Maria Auad, assistant professor in polymer and fiber engineering, received a 3M non-tenured faculty grant, an award recognizing outstanding new faculty for the quality and pertinence of their research. The award is intended to help them achieve tenure, remain in their teaching position and conduct research. The unrestricted grant of up to $15,000 per year may be renewed until tenure is achieved for up to three years.

Mark Barnett, professor in civil engineering, was appointed by the Atomic Safety and Licensing Board Panel by the Nuclear Regulatory Commission (NRC) to serve as one of nine administrative judges in hearings on nuclear waste repositories in Yucca Mountain, Nev. A member of the NRC panel, he was chosen for the case based on his previous expertise with radioactive waste.

David Beale, professor in mechanical engineering, has been appointed by Auburn’s Office of the Vice President for Research to serve a three-year term as the campus coordinator for the Alabama Space Grant Consortium. Beale will be responsible for the NASA mission on campus and will report to the program’s director, John Gregory at the University of Alabama-Huntsville.

Roy Broughton, professor emeritus in polymer and fiber engineering, is part of a team of researchers who have developed a hormone-containing polymer implant that can induce the harvest of catfish eggs. The patent-pending process and extruded implant is expected to allow production of higher-quality, less-expensive timed release implants which promote ovulation in catfish. Other Auburn researchers involved in the project include Rex Dunham, Fatma Kilinc-Balci and Amina Zuberi.

Mark Byrne, Mary and John Sanders Associate Professor in chemical engineering, was chosen to participate in the 2009 U.S. Frontiers of Engineering Symposium of the National Academy of Engineering (NAE). Held in September, the symposium brought together a select group of 88 outstanding engineers from industry, academia and government to discuss pioneering technical work and leading research in various engineering fields and industry sectors.

Prabhakar Clement, Arthur H. Feagin professor in civil engineering, was invited by the National Research Council to investigate evidence of adverse health effects of contaminated drinking water at Camp Lejeune. Clement and 12 other scientists and engineers were part of the committee; Clement was one of three researchers chosen to present the committee’s findings at a press conference in June.

Harry Cullinan, professor in chemical engineering, has been awarded more than $2 million over the next three years by the National Science Foundation to provide the pulp and paper sector with a globally competitive, technologically advanced workforce through recruiting, retaining and placing students; developing and implementing standards, certificates, curriculum and professional development; and disseminating products to other colleges. Cullinan is a co-principal investigator on the project.

Jerry Davis, assistant professor in industrial and systems engineering, was appointed to the American Society of Safety Engineers (ASSE) editorial review board. As a member of the board, Davis will work to ensure that the society’s main journal, Professional Safety, continues to meet the needs of ASSE members and provide a high level of service. Davis’ term will expire in June 2012.

Kevin Gue, associate professor in industrial and systems engineering, received the Technical Innovation in Industrial Engineering Award during the Institute of Industrial Engineering (IIIE) annual conference in Miami. He was selected along with colleague Russell Meller from the University of Arkansas in recognition of their research related to innovative warehouse aisle designs.

Hulya Kirkici, associate professor in electrical and computer engineering, has been elected president of the Institute of Electrical and Electronics Engineers (IEEE) Dielectrics and Electrical Insulation Society. Her term began January 2009 and will expire in 2011.

Gopal Krishnagopalan, professor in chemical engineering, was awarded the Research and Development Technical Award and the William H. Aiken Prize by the Technical Association of the Pulp and Paper Industry (TAPPI). Krishnagopalan was chosen for the awards by the Research Management Committee of TAPPI and received them during the PaperCon conference in St. Louis, Mo.

Victor Nelson, professor in electrical and computer engineering, has been chosen by the Institute of Electrical and Electronic Engineers (IEEE) Educational Activities Board (EAB) and Accreditation Policy Council to become a member of the Committee on Engineering Accreditation Activities (CEAA) board. The CEAA sets the Accreditation Board for Engineering Technology (ABET) program criteria for electrical and computer engineering programs and provides guidance for the evaluation of those programs.

P.K. Raju, Thomas Walter Professor in mechanical engineering, was recently selected as a fellow of the American Society for Engineering Education (ASEE). Raju, the director of the Laboratory for Innovative Technology and Engineering Education (LITEE) and the Auburn Engineering Technical Assistance Program (AETAP), received the designation for his outstanding contributions to education.

Anton Schindler, Gottlieb Associate Professor in civil engineering, was recently named director of the Highway Research Center (HRC). The HRC focuses on research that helps to improve the safety, longevity, sustainability, user friendliness and return on tax dollars invested in the nation’s highway infrastructure. HRC researchers are civil engineering faculty with expertise in traffic analysis and control, traffic safety, foundation design, bridge engineering, hydraulics and hydrology, pavement design, construction materials, management systems and environmental issues.
Alice Smith, chair of industrial and systems engineering, has been elected to serve the Council of Industrial Engineering Academic Department Heads (CIEADH) as secretary and chair-elect for 2009-2010. The CIEADH is an organization whose members work with accredited industrial engineering-related programs. The council’s purpose is to discuss industrial engineering education, curriculum, accreditation, student activities, research and faculty development, as well as make recommendations to the Institute of Industrial Engineers (IIE).

Jeff Smith, professor in industrial and systems engineering, was recently selected for the editorial board of Simulation: Transactions of the Society for Modeling and Simulation International. As an associate editor, Smith is responsible for collecting reviews for submissions, and providing a recommendation to the EIC based on these reviews. His term will last for two years, but he may be invited to continue in this position for one or more additional terms.

Hareesh Tippur, professor in mechanical engineering, and Maria Auad, assistant professor in polymer and fiber engineering, have received a three-year grant for more than $450,000 from the Defense Threat Reduction Agency (DTRA). The funding will be used to conduct research on transparent armor materials that withstand extreme mechanical stress and toxic chemical environments found with weapons of mass destruction.

Levent Yilmaz, associate professor in computer science and software engineering, recently published a book, Agent-Directed Simulation and Systems Engineering, part of the Wiley Series in Systems Engineering and Management. In the spring, it will be used as textbook at Auburn, as well as Virginia Tech, Old Dominion University and the Virginia Modeling, Analysis and Simulation Center.

Ralph Zee, professor and associate dean for research, was recently elected to serve on American Society of Engineering Education’s (ASEE) Engineering Research Council Board of Directors. Zee is one of two Auburn University faculty members serving on the board; John Mason, Auburn’s associate provost and vice president for research, has served as chair of the council since 2008. Zee’s term on the board will expire in 2012.
ENGINEERING

Spirit Store

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hot dog? anyone?

From left, Cupola Engineering Ambassadors Judith Bailey, Brandon Norris, Daniel Evans and Ryan Hittle grill hot dogs for the organization’s fall Student Appreciation Day, which serves as a recruiting and recognition event. Cupola students served more than 800 hot dogs and almost as many bags of chips during the lunch hour that day. The group supports the dean in a variety of ways, including alumni relations.
We don’t often see snow on the Plains. This March, Auburn’s campus collected almost 4 inches after a storm that barreled through the unsuspecting Southeast. Some students took time to enjoy the rarely seen white stuff by building snowmen. As winter approaches, we look forward to what the new season has in store for Auburn Engineering.