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The Ole Miss Engineer committee considered several different themes for the 2014 edition. Based on the 30-year time warp in the “Back to the Future” Delorean time machine, we thought it would be interesting to consider what real life engineering projects and challenges existed within the school 30 years ago and where we just might be 30 years down the road.

Doc Brown, the nutty professor, and Marty McFly, the ambitious student, from the movie helped cast a humorous image, but we are pleased to share a few articles about real undergraduates working in real research labs in the School of Engineering.

Although not designing time machines, they’re doing some tremendous things. Hope you enjoy this year’s magazine.
DEAR ALUMNI AND FRIENDS OF OLE MISS ENGINEERING:

It is my pleasure to bring you good tidings from the University of Mississippi and the School of Engineering! Enrollment at the university surged this fall for the 20th consecutive year, making history with more than 23,000 students across all its campuses for the first time. The enrollment is also the largest in the state.

After seven consecutive years of growth, the UM School of Engineering ranks as one of the nation’s fastest growing engineering schools. Undergraduate enrollment, which broke the mark of 1,000 just two years ago, is now 1,419. The number of students majoring in mechanical engineering, geology and geological engineering, and chemical engineering has doubled or tripled in the past five years. We also see an increase in graduate students, with 162, up from 141 the year before.

The school has struggled with student retention in years past. Last year, however, with resources provided by the university’s central administration, we teamed up with the Center for Student Success and First-Year Experience to advise and retain freshmen. In a year, we accomplished 90 percent freshman retention, the second highest among all UM schools and the College of Liberal Arts.

Student quality also has been improving. The average ACT score for incoming freshmen increased from 24.0 in 2008 to 26.2 this year. During that time, the school renovated many classrooms and laboratories, and moved its administrative offices into the renovated Brevard Hall (formerly Old Chemistry). The university also added the Center for Manufacturing Excellence to complement and enhance existing engineering programs.

We believe that the UM School of Engineering has always been somewhat of a hidden treasure with small classes and personable faculty. But lately, more and more students from across the country and around the world are discovering just what we have to offer: a first rate engineering education with the added liberal arts element, preparing our students for leadership positions in their careers.

With enrollment growth, the school is hiring more teaching faculty. This fall, we welcomed seven new faculty members including two assistant professors and one instructor in mechanical engineering; one assistant professor each for electrical, chemical and geological engineering; and one instructor in civil engineering.

I am pleased to announce that the school has been approached by several high schools in the state to help start engineering programs. This fall, we are teaching ENGR 207: Graphics at Jackson Preparatory School. These ambitious students are dual-enrolled, earning both high school and college credits. Next semester, an ENGR 100: Introduction to Engineering course will be taught. By next year, we hope to start a few more programs to promote STEM (Science, Technology, Engineering and Mathematics) education in high schools around the state.

Other signs of our increasing reputation include the return of on-campus recruiting by ExxonMobil. The school had not been an official recruiting site because of our small size. Due to the success in hiring nine excellent engineering graduates from Ole Miss in the past 18 months and the hard work of our loyal alumni, ExxonMobil decided to establish Ole Miss as an official campus recruiting site.

Our students continue to excel in academics and service. Since the last issue of this magazine, our Engineers Without Borders student chapter conducted further engineering infrastructure work in Togo, West Africa. Chapter members traveled there twice in January to complete a classroom building for the Hedome Village and again in August to start a water supply project. We cannot be more proud of them.

To reflect the new spirit of the School of Engineering, we have created a new school logo, which is shown on this page and all over the magazine. As the university’s logo is based on the façade of the Lyceum, the engineering school’s logo is an artistic rendition of Brevard Hall, the school’s flagship building. The university’s logo is in red, and ours is in blue. The Lyceum has six columns. Brevard Hall defers with four columns. I hope you will like this new design.

Finally, allow me to explain the theme of the magazine for this issue — undergraduate

“Education is the mother of leadership.”
—Wendell Willkie
DEAR FRIENDS OF THE SCHOOL OF ENGINEERING:

English writer John Heywood’s words “many hands make light work” remind me of so many of our engineering alumni who have supported the University of Mississippi’s School of Engineering. Your financial generosity remains a significant sustainer of educational programming, student activities, vocational-prep competitions and undergraduate research. We are enjoying consistent, steady growth in Brevard Hall, which necessitates more professors who embody the unique teaching methods that make Ole Miss different. It is a joy to hear resounding stories about the professors who have made themselves available and promoted your educational and vocational preparation during your time as a student. This spirit remains and can be fortified with additional support to recruit and retain like-minded professors, who embody the same passion you experienced while on campus.

Our continuing growth brings great opportunities to prepare our engineering students with activities that help them learn as their engineering maturation occurs. The annual Woods Society does just that, promoting and providing leadership and learning avenues for our students to participate in and enjoy. Whether they participate locally in the Student Council or globally with Engineers Without Borders, our students are involved outside the classroom in leadership and service experiences that provide significant opportunities for growth. Organizations such as the National Society of Black Engineers, American Society of Mechanical Engineers, Institute of Electrical and Electronics Engineers, and Society of Women Engineers offer seminars and conventions that our students are able to attend. So, as you can see, student travel for educational experiences outside the classroom is an added benefit and is made possible through the Woods Society. Since the annual membership is $1,000 per year, monthly payments make it appealing and affordable for our recent graduates.

No matter your specificity of gift made now or a planned gift in the future, all types of gifts are needed and most appreciated. If I may assist in your goals or plans to support the UM School of Engineering, please contact me at kevin@olemiss.edu or call me at 662-915-7601.

Thank you for helping us to educate great engineers!

See you on the Circle.

KEVIN GARDNER
University Development Officer for the School of Engineering
While many undergraduates in engineering balance their academics with membership in an organization or two, students such as Courtney-Marie Laureys of Pineville, Louisiana, and Karanvir Singh of Clinton manage a full academic load in the School of Engineering while participating in the Naval Reserve Officers Training Corps and the Air Force Reserve Officers Training Corps, respectively.

A junior civil engineering major, Laureys applied for an NROTC scholarship as a high school student due to her family’s close ties to the military and the potential for career success upon graduation.

“My father was in the Navy for 20 years, and numerous family members have been in each of the branches of the military,” Laureys said. “In order to carry on the family tradition, ROTC seemed like the perfect choice.”

Laureys said she is not worried about finding work once she graduates.

“I have a guaranteed job as an officer in the Navy.”

Her college experience differs from students who directly enter the military or one of the service academies. She finds time management very important in balancing her role as a student with participating in NROTC. Laureys is appreciative of the support system that she has in place, especially when 6 a.m. physical training is involved three times a week.

“Since I have an NROTC scholarship, I treat it like it’s my job, and part of that job is to maintain my grades,” she said. “My advisers work with me to ensure that I complete my necessary course work. The other midshipmen are always ready to help in stressful situations.”

Laureys encourages any students interested in ROTC programs to pursue the opportunity because it instills responsibility, time management and leadership among other necessary skills.

Lt. Eric Reidelbach, assistant professor of naval science, has enjoyed working with Laureys during her tenure in NROTC.

“She has continuously demonstrated superior levels of performance physically, academically and professionally during her time in NROTC.

“She has continuously demonstrated superior levels of performance physically, academically and professionally during her time in NROTC.

“Her efforts help set the benchmark for excellence within the unit, and she is an invaluable member of our organization. I expect her to accomplish many great things during her naval career.”

Laureys has been a member of Chi Epsilon civil engineering honor society and the American Society of Civil Engineers. She is confident that the technical skills she has learned as a civil engineering student will aid her no matter what area she chooses to pursue.

Postgraduation, her plans are to commission as an ensign with an emphasis in Navy warfare communities: surface, submarine or aviation. Laureys said she may also pursue additional education in flight school or study nuclear power for submarines.

Singh, a sophomore majoring in electrical engineering, is a member of the Air Force ROTC program. In addition to being a part of the university’s program, he is part of the Air Force Reserve Unit in Jacksonville, Arkansas. Participation in the military has been an interest since his early years of high school, and the AFROTC program gave him the opportunity to merge two of his main goals in life.

“I knew I wanted to join the military, but I also wanted to go to college,” Singh said. “Air Force ROTC allowed me to pursue both, simultaneously.”

"The combination of outstanding academics and leadership training I received from both NROTC and the School of Engineering forever changed my life. Any success I have achieved is because of those four years at Ole Miss.”

— William Parsons, former executive director of NASA’s Kennedy Space Center
Although he is only in the second year of the program, Singh is already looking beyond graduation.

“The leadership and interpersonal skills that I will develop from AFROTC will come in handy when I am working to develop new technology,” he said. “I see having an engineering degree and military experience as an opportunity to broaden my career opportunities.”

Like Laureys, Singh encourages any student considering an ROTC program to pursue it because of the leadership and scholarship opportunities as well as the chance to maintain a high level of physical fitness. After graduation, Singh plans to commission as an Air Force Reserve Officer in addition to pursuing work as an engineer.

Singh’s performance thus far has been commended by his superiors.

“Singh is an outstanding cadet,” said Capt. Nathan McCartney, associate professor of aerospace studies. “He is a leader in our detachment and brings many valuable skills to the Air Force. It’s critical that we have members with a technical background join the force. Cadet Singh has chosen to do just that, and his skills are a valuable asset for us.”

Singh’s natural leadership make him someone other cadets respect and listen to, McCartney said.

“ROTC has improved his leadership skills and given him the confidence to step into larger roles.”

William “Bill” Parsons, former executive director of NASA’s Kennedy Space Center, agrees.

“My father was a career enlisted Air Force staff NCO, and my family did not have the financial means to send me to college,” he said. “I planned on enlisting in one of the services, but when I applied and was accepted for a full NROTC (USMC Option) Scholarship to the University of Mississippi, I decided on that path for my future.

“The combination of outstanding academics and leadership training I received from both NROTC and the School of Engineering forever changed my life. Any success I have achieved is because of those four years at Ole Miss.”

Graduates of the School of Engineering have also found the combination of ROTC participation and engineering education to be beneficial for their careers.

“The Ole Miss departments of Civil Engineering and Naval Science provided me a quality education based on principles of engineering and leadership,” said Bill Rigby, vice president of facilities services for Seneca SCMC LLC. “This combination led to my successful career in the Navy Civil Engineer Corps and continues to serve me well in my post-Navy endeavors.”
A group at the University of Mississippi received a grant from LG Electronics, Inc. to explore new possibilities for performance and power efficiency in mobile computing.

The Heterogeneous Systems Research (HEROES) lab at UM, consisting of a group of students ranging from Ph.D. candidates to Honors College undergraduates, was tasked with harnessing the power of LG’s development board to discover new secrets about various components of heterogeneous systems.

“We look at a full stack of heterogeneous systems from high-level code optimization to low-level software, compiler and hardware architecture,” said Byunghyun Jang, assistant professor of computer and information science and head of HEROES, which collaborates with leading companies to develop sponsored projects and help drive advances in the computing industry.

“Our expertise has been recognized by nonprofit HSA (Heterogeneous System Architecture) Foundation by being selected as an HSA Academic Center of Excellence,” Jang said.

The goal of HEROES is to maximize the power of the GPU and discover its full potential or find a better way to gain efficiency.

One of the students, Michael Ginn, a junior in computer science and a member of the Sally McDonnell Barksdale Honors College, has been instrumental in advancing the research. He has been working on the practicality of porting computationally intensive parts of augmented reality, a technology that allows for a digitally enhanced view of the real world, onto mobile GPUs.

Jang said Ginn’s work ethic became apparent while he worked with a vision application called PTAM (Parallel Tracking and Mapping) on mobile GPUs. Ginn has tackled a number of technically difficult challenges and successfully found solutions. His findings were presented at an online teleconference with LG.

“Since the summer of 2013, as an undergraduate research assistant, Michael has been leading efforts on porting, implementing and optimizing a promising augmented reality application,” Jang said. “Michael has a technical knowledge, skill and professional attitude, which can rarely be found among undergraduate students. He is making a great contribution to the research project.”

Ginn said a large part of getting the target applications running was working as a group to set up the test board LG sent to HEROES to start the project.

“The board had to use a certain type of operating system, which was a limited version of Linux. Then we had to figure out how it would work,” Ginn said. “As we looked more and more, we realized we would have challenges with getting the software onto the motherboard.”

Jang said that one of the target applications now runs twice as fast as before, taking advantage of the power in the mobile GPUs.

“Electricity and voltages can only move so fast,” Ginn said. “Most of the programs today are quite efficient, so finding ways to establish a noticeable increase in speed is challenging. You usually have to go several decimal places to see if it is making a difference.”
University of Mississippi senior mechanical engineering major Rhi Daniel has been working with a team from the university at sites in Washington state and also in the Mississippi Delta, using sophisticated equipment to calculate the movement of sediment in bodies of water.

Daniel, of Olive Branch, said the trips out in the field have been valuable learning experiences that have prepared her well for her career, which she hopes to embark on following her graduation in December. She’s interested in working with the U.S. Bureau of Reclamation, U.S. Geological Survey or a similar agency after she earns her degree.

“The labs really give you the hands-on knowledge to see what you’re learning in class,” Daniel said. “I’m a very visual learner. Going into labs and being hands-on and seeing how everything works really ties everything together and makes it all make sense.”

Part of her work involves using an acoustic device, which is U-shaped and has transducers on each end. It is placed in moving water to measure the sediment that passes through it by looking at the change in sound level between the transducers. It is useful following heavy rains and storms because it can calculate how much soil is being washed away from the banks of a river or other body of water. This helps with monitoring habitat quality, erosion-control efforts as well as helping to predict the useful lifetime of dams downstream.

“We like getting students like Rhi involved in our research,” said James Chambers, associate professor of mechanical engineering and senior scientist at UM’s National Center for Physical Acoustics.

“It’s good for them and good for us,” he said. “Rhi has gotten some great field experience, and since we’re developing new instrumentation for nonexperts in acoustics, we get feedback on how well we’re doing from a technology transfer perspective. Furthermore, she will already have had access to new technology that will be coming on line in the next few years.”

Daniel and other UM engineering students sampled the Elwha River, a 45-mile body of water on Washington’s Olympic peninsula. Recently, she and others took samples closer to home in Harris Bayou, which is near Alligator in Bolivar County.

The group has been working with the U.S. Department of Agriculture, U.S. Geological Survey and other federal agencies on their research.

KNEE DEEP!

Field research helps students understand sediment transport

By Michael Newsom

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Improving the infrastructure of a remote West African township is a painstakingly slow process, but students in the University of Mississippi chapter of Engineers Without Borders (EWB) are steadily making progress.

Since its founding in 2009, members of the group have dedicated themselves to the task, starting with the building of a much-needed school building in the Hedome Village of Togo. Rotating teams traveled thousands of miles on three trips for separate assessment/planning, implementation and construction. After weeks of working long, hot days with little or no modern equipment, Ole Miss students, faculty and staff successfully completed the structure in January.

In August, EWB-UM returned to the township to both inspect the school and launch a new project: the establishment of a new water supply system.

“We were able to assess the potential for the project, determine best sources of water and begin preliminary cost estimates,” said Cristiane Surbeck, associate professor of civil engineering and faculty adviser. “We’re looking at a commitment of two or three years from start to finish.”

Completing the project will require drilling a deep well and buying and installing pumps, plumbing and other equipment necessary for electrical operation. Bradley Sunrise Rotary of Cleveland, Tennessee, is among the many donors that have made generous contributions to the initial phase of the project, but additional funding and volunteers are always welcome.

“Considering the overwhelming needs of the people living in the villages, any project we undertake is like a drop in the bucket,” said Amanda Couch, a senior geology major who went with the most recent team. “Still, every drop brings us one step closer to filling the bucket.”

A native of Watertown, Wisconsin, Couch contributed to the water sampling and testing in Togo. Knowing she was playing a small but integral part of such a humanitarian effort is by far one of her greatest life experiences, she said.

“Living conditions in Togo are so sparse it’s stunning,” Couch said. “I’d really like to participate in the actual drilling of the well. This experience definitely determined my career will have a focus on improving water systems globally.”

Seniors James “Jim” Mosier of Manalapan, New Jersey, and Tara Shumate of Clinton surveyed the landscape of the well site during the assessment phase of the project. The August trip
Words are inadequate to describe my sentiments about this project, these students, the people we are privileged to serve and help, the support of the School of Engineering and the university, my co-faculty adviser Cris Surbeck, and our friend from the Meek School of Journalism, Nancy Dupont, who has traveled with us twice already. Life-changing comes close.”

— Marni Kendricks, Assistant Dean, School of Engineering
“I thought I was a broke college student, but now I’m feeling pretty wealthy,” Couch said. “I’m extremely honored to have been a part of this, if even for a moment.”

Much work must be done before the chapter can send another team to Togo for a follow-up visit. New members and support from nonmembers are welcome.

“Even if students aren’t interested in going to Togo themselves, we need help with fundraising, gathering background information and reporting,” Surbeck said. “Anyone who wishes to become involved should visit our Facebook page, talk to our members and come to one of our meetings.”

EWB completed Phase II of the school building project last winter intersession.

“I led a team of six engineering students to Togo starting Jan. 1 to begin the next phase of construction of the Hedome school,” said Marni Kendricks, assistant dean of engineering and co-faculty adviser to the chapter. “The second team of five more engineering students arrived Jan. 9.”

Both teams worked together a few days before the first team returned home Jan. 14. The second team completed the school project Jan. 18. Nancy Dupont, associate professor of journalism, supervised visiting student Sudhamsu (Sudu) Upadhyay of Oxford in filming the activities for a documentary, which will air later on Mississippi Public Broadcasting.

Upon the January teams’ return to campus, they met with Chancellor Dan Jones, who served as a medical missionary in South Korea for seven years. The students shared stories of their experiences and presented Jones with a framed photograph of the school building and a gift from the Togolese people.

“The EWB service project fits my vision of what the university should be doing in so many ways,” Jones said. “Whether the community is in Lafayette County or Togo, so much needs to and can be done for those less fortunate. I am hopeful their example inspires others on campus to make a difference.”

EWB-USA is a nonprofit, humanitarian organization established to partner with developing communities worldwide to improve quality of life. The partnerships involve implementing sustainable engineering projects while training internationally responsible engineers and engineering students.
Since an early age, Clay McLeod has delighted in coming up with new ideas and inventions. Before earning his bachelor’s degree in electrical engineering last May, the Sally McDonnell Barksdale Honors College graduate turned his passion into an honors thesis and more.

The Germantown, Tennessee, native developed TouchAnalytics™, a system that analyzes data collected from touch-screen devices to aid in authenticating a user.

“I’ve been formulating the idea for TouchAnalytics since I was about 14 years old,” McLeod said. “This idea actually came from when I used to play an online video game, and I wondered whether it was possible for the game to differentiate between two people based on how each person was moving the mouse in the game.”

Although the young inventor had been working on different versions of this idea ever since then, this particular implementation took him about three weeks from start to finish.

“Much of the time since then has just been refining the system to make it better,” he said.

Currently, the “app” is just a proof of concept for the patent McLeod is in the process of pursuing.

“I’ve definitely thought about making an app that is commercially available, but for now I don’t have any plans to implement a commercial app,” he said. “I’m hoping other companies with better infrastructure and funding will do that.”

Using TouchAnalytics™ requires a simple “training” step where the owner of the device must select a pattern and enter it several times.

“I was able to identify some characteristics (speed of movement, pressure, angles, size of touch area, etc.) that can be gathered and analyzed using machine learning to determine with very high accuracy whether the person who entered the pattern is the owner of the device (the one who trained it),” McLeod said.

The TouchAnalytics system can be implemented on any touch-screen device, so it would take multiple apps across multiple systems to realize its full potential.

The recent alumnus joins the UM Department of Computer and Information Science this fall as a master’s student and head teaching assistant. McLeod will coordinate all aspects of the lab component for the introductory programming sequence.

“During his honors thesis, Clay demonstrated a high level of independence and research ability,” said Dawn Wilkins, professor of computer science and McLeod’s faculty adviser. “I am looking forward to seeing what he can accomplish as a graduate student.”

McLeod is equally enthusiastic about continuing his association with Ole Miss engineering faculty.

“My short-term goal is to continue to work on this patent, as well as other research opportunities I’ve had through the university,” he said. “I have many other technological ideas that I would like to pursue commercially, and I’m hoping that the success of these current research opportunities will be a steppingstone to work on those ideas.”

“Long term, I hope to be doing some sort of entrepreneurial work in technology, specifically data science. I really think that data science is going to play a large role in how society handles the challenges we are presented in the next hundred years.”
Many University of Mississippi students earn their degrees solely in the classroom. However, geology and geological engineering students get the chance to travel outside the classroom and attend field camp in other states.

The Department of Geology and Geological Engineering worked in partnership with Study USA to allow students the opportunity to take two off-campus courses this past summer: Geological Engineering Design Field Camp 1 and 2. The courses took place in southern Oklahoma and Santa Fe, New Mexico, respectively. The first camp is designed for entering juniors, the second for entering seniors.

In previous years, students attended a five-week field camp in South Dakota, which was led by professors from the South Dakota School of Mines and Technology and other institutions.

“How that the geology and geological engineering department at Ole Miss is hosting its own field camp, I believe that the experience will be more rewarding for students,” said Amanda Couch, who attended the South Dakota camp as a geology student and was a teaching assistant for the Oklahoma camp.

While at field camp, students learned teamwork.

“The best part of this trip was interacting with my classmates and problem solving,” said Amber Wilson, a senior geology student. “In professional geoscience fields, we will often work with colleagues that have different strategies and even work ethic. I learned that projects will run smoothly and efficiently if everyone carries their weight and puts their minds together.”

During the first field camp in southern Oklahoma, students were tasked with measuring and describing stratigraphic sections in the field, constructing geologic maps and illustrations as well as exploring the stratigraphy of southern Oklahoma.

“We learned to make use of the Brunton compass, refreshed our mapping and navigational skills, explored the nature and, of course, had fun,” said Aditya Khare, a geology student.

During the second field camp in Santa Fe, New Mexico, students learned advanced applications of geological engineering field instruments and techniques. In addition, they learned to enhance geologic observations and prepare geologic and engineering reports, maps and figures.

Louis Zachos and Terry Panhorst, assistant professors in the Department of Geology and Geological Engineering, supervised the Oklahoma field camp.

“Teaching from the classroom will always give an individual knowledge of geologic theory, but it takes someone with vision and imagination to translate those concepts into valuable practices for field work,” said Aaron Jones, teaching assistant during the Oklahoma field camp. “Drs. Zachos and Panhorst are two professors who care about their students and guide their minds to an understanding of earth science, its processes and how to record findings every step of the way.”

“In professional geoscience fields, we will often work with colleagues that have different strategies and even work ethic.”

— Amber Wilson, senior, geology
The days will soon be gone when teachers call off the names of their students while the students raise their hands and say “here” or “present.” In some classes at Ole Miss, students are swiping their ID cards on scanners to verify their attendance. Yet even that technology is becoming old-fashioned.

Caleb Robinson, a senior computer science major, is part of a group that is researching facial-recognition software, and one of the ways it wants to test it is by installing webcams in classrooms to take attendance.

Robinson is under the tutelage of Jianxia (Jane) Xue, UM assistant professor of computer and information science. He joined her ongoing research into the subject because he was already planning to continue his studies as a graduate student and eager to begin research. They are working on a program called OSCARS, an acronym for Olemiss Student Classroom Attendance Recognition System.

As the program was designed, a camera would snap a photo of a student, then compare it with the student’s ID photo, which would be on file. Robinson is helping to solve problems that have been found with this program.

“One of the problems with a camera in the classroom is lighting, or people might just look different [from] their ID,” Robinson said. “Facial hair or makeup or all kinds of things could affect it. So we’re designing an algorithm, a program that can still get an accurate classification.”

Another problem inherent in the initial design was the use of just one sample size — the single student ID photo.

“Common facial-recognition techniques use a lot of pictures of a person to get a good recognition,” Robinson said. “One of the things we looked at last semester is called active learning, using data that you’re collecting on the fly to build up what you call a training set. So that could increase the accuracy of the program. We looked into that to see if it helps, and it does.”

Robinson is also working on new ways to advance the field of facial recognition.

“The technique is called local binary pattern histograms,” he said. “It treats your face as a texture, and it’s trying to match those textures to all the other textures it knows about. It does that by splitting your face up into regions and looking up information about each region. So it’s (a) texture-based descriptor of faces, and it’s just a process of matching them together.”

In March, Robinson and the rest of the OSCARS team presented the findings of their research at the Association for Computing Machinery Southeast computer science conference at Kennesaw State University in Georgia.
In the 1989 hit movie “Back to the Future Part II,” Biff Tannen makes a fortune using information gleaned from a 21st century sports almanac that his future self transports back to 1955 in the time-traveling DeLorean. Something similar is happening in southern Mississippi and Louisiana, where oilmen are eyeing a bonanza of oil ready to be recovered using dusty strips of data from decades-old wells.

No, we’re not tooling about in flying cars – or even on hoverboards – yet, and there’s no sign of holographic TVs or flux capacitors, either. But oil prospectors do have amazing tools such as horizontal drilling, hydraulic fracturing and 3-D digital mapping of subterranean formations, all of which were unheard of just 30 or 40 years ago, when University of Mississippi alumnus Julius Ridgway (BSGE 56) was working in his family’s oil and gas business.

Using these technologies, oilmen are on the cusp of transforming the economy and energy production across the southwestern corner of Mississippi. Amite, Pike and Wilkinson counties sit atop a portion of what could be the nation’s next big oil field, one rivaling Texas’ Eagle Ford Shale and North Dakota’s Bakken Shale.

And thanks to Ridgway’s vision and generosity, Ole Miss engineering researchers and students are helping to point the way.

“We have an opportunity to provide a tremendous benefit to businesses and people across the southern part of Mississippi,” said Greg Easson, a UM professor of geology and geological engineering and director of the Mississippi Mineral Resources Institute. “First, we’re making all this old data available online in a digital format, and then we have people, including several students,
who are looking at different parts of this data to figure out what the potential is for hydrocarbon production."

It’s a story of determination, the clever use of new data analysis methods and several friends’ stubborn insistence that old oil well logs were worth preserving and examining again.

Beginning decades ago, prospectors drilled hundreds of wells across the Gulf Coast region, trying to recover oil from the sands of the Tuscaloosa Formation. Although geological data indicated that the overlying marine shale should contain oil, most wells yielded only trickles, perhaps a barrel or two per day.

The current interest is in the oil locked in the Tuscaloosa Marine Shale, a boomerang-shaped geologic formation that sweeps across central and south Louisiana and into southwest Mississippi. The TMS is just above the oil-producing sands of the Tuscaloosa Formation, at a depth ranging from 11,000 to 15,000 feet beneath the surface.

Scientists at Louisiana State University estimate the TMS contains some 7 billion barrels of oil, much of which is light, sweet crude worth more than $100 a barrel. By comparison, the U.S. has about 40 billion barrels of oil in proven fields, according to federal government estimates. In North Dakota, which has experienced an oil boom over the past decade, similar formations are thought to hold about 7.5 billion barrels.

Getting the oil out of the TMS is tricky, and new drilling and well-completion techniques that did not exist in the 1950s and ’60s are required. The shale layer is only 200 to 400 feet thick, making it difficult to extract using traditional vertical wells.

“The companies that drilled all these wells across south Mississippi knew there is oil in there, but they couldn’t get it out,” Easson said. “Back then, they..."
were thinking, ‘If we could just drill horizontally, we could get that oil out.’ Well, now they can drill horizontally, so there’s a way to get the oil out if they can figure out exactly where to drill.”

Besides horizontal drilling, companies exploring the TMS are using hydraulic fracturing, or “fracking,” to extract oil from the formations. Fracking employs high-pressure injections of chemicals, water and sand to break apart rock formations and free the trapped hydrocarbon deposits.

“These technologies have been used successfully in the shale formations in southwest Louisiana, southern Texas, North Dakota and Oklahoma,” Easson said. “This technology has enabled a lot of places that were not considered to be economically feasible for oil production to be economically feasible.”

Today, some wells in the TMS of southern Louisiana are producing more than 1,000 barrels a day using these techniques. Several Ole Miss engineering students – working in a basement room in Brevard Hall that has been christened the Ridgway Data Center – are trying to ensure that same sort of thing happens in Mississippi.

That’s where the old well logs come into play.

After graduating from UM with a bachelor’s degree in geological engineering and serving a couple of years in the U.S. Army, Ridgway came back to Mississippi to work with his family’s oil exploration firm, Ridgway Management Inc. Working with his brother, Louis, he was involved in a variety of well projects across south Mississippi, where he worked with and made friends with many prospectors exploring the state’s oil and gas deposits. Among them was Roger Young, a young field representative for Tobin Map Co., who had been sent to Mississippi to update the firm’s maps showing mineral leases, drilling permits and completed wells.

After a few years with Tobin, Young went into business for himself as a consultant, and Ridgway left his family
business to work in banking, where he specialized in oil and gas accounts before striking out on his own. The friends worked together on many projects over the years.

As oilmen drill through the earth’s surface, they measure the electrical resistance and gamma ray emissions to identify changes in strata. The information is graphed on long strips of paper called well logs and look a bit like the EKG charts that physicians use.

“If you just look at one and don’t really know what it is, it doesn’t look like much,” said Nick Sullivan, a senior geological engineering major from Pensacola, Florida. “Basically, it’s just a reading of densities, but that can be very valuable information if you know how to read it.”

Some veteran petroleum geologists have tens of thousands of these logs, all packed with data about the rock layers deep underground.

Several years ago, Ridgway and Young became concerned about what would become of this treasure-trove of data. Many of their contemporaries had died, and their collections of well logs were in danger of being lost.

“The oil well logs are critical to the interpretation of the Earth’s surface and its oil and gas prospects,” Ridgway said. “If we didn’t preserve them, it would mean the duplication of an amazing amount of work, so we thought it was very important to preserve them.”

Ridgway decided to collect as many logs as possible and donate them to the School of Engineering for study in the Mississippi Mineral Resources Institute.

“I had done a lot of work with Donnie Lambert in south Mississippi, and he had been housing several collections of logs in his office,” Ridgway said. “I worked out a deal where I could buy certain collections from his estate prior to his death, and then I acquired additional collections from his widow. He was a very important mover and shaker and generator in the oil and gas world, so this is an important collection.”

And, just as Biff Tannen had to fish his sports almanac out of a garbage can, some of the well-log collections literally were saved from the trash.

“We went to a company that had about a million logs, or so it seemed, and they had closed down,” Young said. “When we got there, they were loading all their logs and a lot of old records onto a truck. We said, ‘Wait, what are you doing? We’ll take all this off your hands,’ and we saved them from hauling all that material to the dump.”

To date, Ridgway and Young have acquired and donated more than 100,000 well logs, hundreds of maps and books, and large quantities of other oil exploration data from south Mississippi. The material has quickly been put to use; MMRI has hired several student workers to scan the logs and convert them to a digital format.

“The idea was for the university to be more than an archive, for us to work with the logs and make data useful for researchers and people in the oil and gas business,” Easson said. “The first step is to get all the logs scanned and make them available online, and we’re making a lot of progress on that.”

Thousands of logs are available for free download on MMRI’s website, and many more will be added soon. Meanwhile, several geology and geological engineering students are busy combing over the data to help identify locations with the greatest potential for oil and gas production.

One of these students is Thomas H. Story, who is pursuing a master’s degree in engineering science. He is completing his thesis using well logs from the

The MMRI Ridgway Library got a kick-start in 2007 when Julius Ridgway persuaded Larry Johnson and Bradley Jeffries, owners of oil and gas exploration firm Landmark Energy, to donate 7,000 well logs they acquired from the estate of geologist Marvin Oxley.
Ridgway collections to map the extent and thickness of the TMS’s potential productive zone, which is commonly defined by an increase in resistivity. Story has been able to create a high-quality map of the zone’s depth and thickness.

Even some ambitious undergraduate students are getting valuable experience by tackling their own projects. Sullivan and another senior geological engineering major, Hunter Landry of Baton Rouge, Louisiana, have teamed up to study a formation previously ignored by prospectors.

“We’d be sitting here – I’d be numbering and he’d be scanning – and there would be other guys in here finishing up projects,” Landry said. “We got a look at what they were doing and talked to them about how they got started, so we decided to ask Dr. Easson if we could do a project.”

After discussing possibilities with Easson, Landry and Sullivan decided to begin mapping the Selma Chalk, a thin, softer layer atop the TMS that may prove useful for oil production. They are examining the logs to determine the layer’s depths and thicknesses, then using Petrel, a software suite developed by oil field services company Schlumberger Ltd., to develop a 3-D, color-coded map of the formations.

“I didn’t know stuff like this was even possible until I went to a Petrel class out in Houston,” Sullivan said. “The great thing is that when I graduate, I can tell employers what I’ve done and that I know Petrel, and that’s a huge plus.”

The goal, Landry said, is to “prove that it might be possible to use horizontal drilling and fracking to produce oil here like they do in Texas.”

The Selma Chalk is similar geologically to the Austin Chalk in Texas, and some geologists suspect that these two formations could be part of the same formation, Sullivan said.

“If the chalk in this area produces oil at anything like the level in Texas, it could be huge.”

If the chalk layer is found to contain enough oil, it could be easier to tap than the shale, Easson said. Wells in the TMS cost $12 million to $15 million each and take 35 to 60 days to drill. Since the chalk is shallower, drilling might be faster and cheaper, he said.

“The key to all this is taking that old data that the geologists ignored back in the ’40s and ’50s, when a lot of these wells were drilled, and examining it through the lens of new technology,” Easson said. “That new technology is opening up a whole new world of possibilities.”

Scientists estimate the TMS contains some 7 billion barrels of oil.
Lydia Makepeace, a senior general engineering major from Chattanooga, Tennessee, is researching the effects of psychological stress on physical fitness as part of a project with Krissy Rehm, M.D., an assistant professor of medicine and director of UMMC’s Cellular Immunology Core of the Laboratory of Behavioral Immunology Research. Rehm has studied physical stress in marathon runners and how it affects their immune systems.

Rehm and Makepeace were matched for the research by UM electrical engineering professor Dwight Waddell, who coordinates UM’s biomedical emphasis and is also a research associate professor of health, exercise science and recreation management.

“People have previously been interested in looking at the influence of exercise on stress as well as the immunological response to exercise,” Waddell said. “At its most simple, what Lydia and Dr. Rehm will be investigating is how the stress profile affects one’s ability to maintain an exercise regimen.

“Hypothetically, exposure to an acute physical stressor during times of high levels of psychological stress would result in the greatest alterations in immunity and susceptibility to infectious diseases,” Waddell said.

Makepeace plans to enter medical school after she receives her Bachelor of Engineering degree. The research project is an introduction to working with actual human subjects and gives her the ability to apply some of her now refined quantitative skills in a new domain. She’ll have to become conversant in basic exercise physiology, immunology and assaying methods all the while seeing things from the quantitative perspective of a young engineer, Waddell said.

Makepeace and Rehm will test more than 20 students. The subjects will answer questionnaires about both their physical fitness and their psychological stress. Their blood will be drawn both before and after they exercise and then drawn again the following day. The blood tests will examine participants’ levels of stress hormones and also immune system markers.

“People often examine the question of ‘If someone is fit, are they less likely to be stressed?’ I’m trying to see if someone is stressed, are they less likely to be fit?” Makepeace said. “We’re expecting to see a bimodal distribution — either you’re stressed and self-medicate with exercise, or you are so stressed and anxious that you cannot exercise. I think this is going to be an interesting way to merge my interests in hard science and psychology.”

Questions for the participants are targeted to obtain more information about the stress levels in their lives during the past year. They’ll be asked about whether they have had any deaths in their families, any debt or other situations that might have caused stress.

Makepeace said she’s interested to see how the data relate to the answers given to the questions, particularly whether the evidence matches up with what participants tell her and Rehm.

“There’s a big difference between how stressed someone says they are and how stressed their body says they are,” Makepeace said. “Some people are probably stressed who say they feel great, and some people who aren’t stressed at all say they are.”

The study could be a catalyst for other projects, Waddell said.

He said biomedical research and engineering is a breeding ground for interdisciplinary research. This study will involve exercise science and electrical/biomedical engineering at UM and behavioral immunology at UMMC.

The new emphasis in biomedical engineering at UM could serve as a hub, where various researchers from engineering, liberal arts, applied sciences and pharmacy can meet to do meaningful work in biomedicine, he said.

“We just want people to know what we are trying to accomplish, having undergraduates in our labs,” Waddell said. “When done properly, it is a win-win for all concerned. Students get a look into a world only referred to peripherally in textbooks, and faculty gets to work with engaged young students who often go on to make significant contributions in a field. Pretty exciting stuff.”

Lydia Makepeace helps collect data for research conducted by Dr. Kristina Rhem (top) at a University of Mississippi Medical Center immunology lab.
Grace McMahen Rushing had earned her first bachelor’s degree from the University of Mississippi before she discovered that nanomaterials research is both her passion and her niche.

“After receiving my English degree (with a minor in mathematics), I originally wanted to go to law school,” said the junior civil engineering major from Union. “But I changed my mind and decided to get a degree in engineering.”

Since then, Rushing has discovered that conducting experiments in UM’s Nano Infrastructure Research Group, or NIRG, is truly a dream come true.

“My primary skill set lies in using AFM, or atomic force microscopy, to image various materials that we are working with, such as cement with nano additives, oil shale and several different kinds of polymers,” Rushing said.

“This imaging allows us to understand the properties of the materials on a very small level, which will in turn aid us in predicting how the material will behave on a larger scale.”

Rushing is also in the process of learning how to use molecular dynamics to model these materials on a small scale to predict how they will react to various outside influences, such as temperature change or the presence of other materials. She assists Ahmed Al-Ostaz, Brevard Family Chair in Civil Engineering, professor of civil engineering and director of the research team. Collaborators include Alex Cheng, dean of the School of Engineering; A.M. Rajendran, chair and professor of mechanical engineering; and Hunain Alkhateb, assistant professor of civil engineering.

“In our laboratory, we design new materials and study the process of existing materials that can withstand extreme environments and improve the resilience of our nation’s infrastructure against man-made threats, such as bomb blasts, fire or projectiles, and natural disasters: tornadoes, earthquakes and hurricanes,” Al-Ostaz said. “We are also preparing future engineers and scientists to better understand and meet both today’s needs and tomorrow’s challenges.”

In the past six years, NIRG researchers have received more than $8 million in grants from NASA, the Office of Naval Research, Department of Homeland Security, Mississippi Space Grant Consortium and North Carolina Agricultural & Technical State University/U.S. Army.

The group has studied materials at extreme sizes, from nanoscale to full structures; extreme distances, from oil and gas shales deep in the ground to space applications, including the International Space Station; extreme loading rates, from static blast to ballistic to hypervelocity impact; extreme temperatures, from freezing to boiling; and extreme times, from a quadrillionth of a second – or one quadrillionth of a second – to years.

The multifunctional materials merge modeling, designing and manufacturing new materials with actual testing of these products in simulated environments. Examples include materials that can resist blast loading with improved fire performance, and new materials and structures to enhance the performance of New Orleans’ levees during extreme hurricane seasons.

“With the cement, for example, we are hoping that the nano additives will make it stronger and more durable, which will allow for less of it to be used”
As a sophomore mechanical engineering student, Cody Berrey couldn’t wait until his senior year to gain more hands-on research experience. Literally. He wanted to get started, so he devised a project that earned the approval of his professors and led to a part-time job. Now a senior, he credits his railgun research with opening numerous doors of opportunity for him.

A railgun is an electrically powered, electromagnetic projectile launcher. The weapon has a pair of parallel conducting rails (hence the name), along which a sliding armature is accelerated by the electromagnetic effects of a current that flows down one rail, into the armature and then back along the other rail. Railgun research was originally developed by the U.S. Army before being adopted by the U.S. Navy in 2010. Though many resources have been invested in the research and development of the railgun, the mass, size and cost of the technology have long prevented railguns from becoming practical military weapons.

Berrey is hoping his contribution will help change all of that.

“When I thought about what I wanted to build, I thought, ‘I’m a guy. I like guns. I like explosives. I like the Navy,’ so I chose the railgun,” Berrey said. “As I started building it, I realized there are a lot of problems with railguns that have yet to be solved, like the rails of the railguns get eroded very fast when you fire them, so that’s a problem for the Navy. They can’t put it on the ship if the rails go bad after a few shots.”
Berrey said the erosion occurs because of the extremely high energy that goes through the rails when the gun is fired. The size and shape of the projectile (bullet) are factors affecting erosion. Berrey is focused on learning as much as he can about the electrical circuit, the design of the projectile, the electromagnetic field created when the gun is fired and how to prevent rail erosion.

His initiative caught the eye of his professors as well as researchers in UM’s National Center for Physical Acoustics, where Berrey landed a part-time job to assist with research that includes biomedical acoustical research, aeroacoustics of Navy jets, and laser acoustics signatures of land mines and improvised explosive devices to detect those that are buried underground remotely.

“That Cody initiated a project that he was interested in and devoted a lot of efforts to reach the goal created a very good impression. He is a type of a student that I would like to have in the lab,” said Vyacheslav Aranchuk, senior research scientist at the NCFA. “Working on the railgun, he got an experience in mechanical and electrical design and hands-on experience in working with measurement equipment and tools. This knowledge is very beneficial to his current work in our lab, where he helps to build experimental setups and assists in experiments.”

The research has also opened the door to graduate school, which Berrey, a native of Meridian, plans to begin at UM in 2015. Because research on the railgun has provided Berrey with a lot of experience, he said he hopes the project will also provide opportunities for students who follow him.

“Because there are not currently a lot of projects available to underclassmen, I want to leave this project behind for students to work on and get their hands dirty with, so they can get some experience building things and designing things,” Berrey added. “That will help them have a better idea of what they want to do when they leave. That was part of the end goal as well, to get other people involved in the research.”

New classes of nanomaterials—such as carbon nanotubes, nanofibers, nanowires and quantum dots—are being assembled atom-by-atom, with various high-tech applications in mind, such as electronics, biomedicine, energy and environment.

NANO continued from page 23

when constructing a structure,” Rushing explained. “A smaller column made of cement that uses nano additives might support the same structure as a larger column that doesn’t use those additives.

“The less cement used to achieve the same result will mean that less CO2 is emitted into the atmosphere, and the structure will have a smaller environmental impact as a whole.”

Another example Rushing gave is polymers, some of which can be used as blast- and fire-resistant coatings on buildings.

“These coatings would allow the people inside to safely exit the building without being harmed by shrapnel if there was an explosion,” she said. “They can also be used to coat rail cars carrying toxic chemicals and could prevent, or at least slow, the leakage of the chemicals if the car were punctured or damaged.”

New classes of nanomaterials—such as carbon nanotubes, nanofibers, nanowires and quantum dots—are being assembled atom-by-atom, with various high-tech applications in mind, such as electronics, biomedicine, energy and environment.

“However, these materials are still very expensive and can only be produced at a relatively small quantity,” Al-Ostaz said.

To help protect the nation’s critical infrastructure, including buildings, bridges, tunnels, transportation systems, pipelines, power transmission and telecommunications systems, officials need nanomaterials that can be produced at low cost and in huge quantities.

Fortunately, not all nanomaterials are man-made and expensive,” Al-Ostaz said. “There are abundant, naturally occurring and low-cost materials that are at or near nanosize, such as nanoclay, volcanic and fly ash, cellulose nanowhiskers and many carbon- or silica-based minerals.”

Rushing originally decided to go to Ole Miss after high school because she fell in love with the campus after visiting and was offered generous scholarships, but she first decided as an English major. Now, as the secretary of the Ole Miss student chapter of the American Society of Civil Engineers, she has participated in the concrete canoe and steel bridge competitions as part of the Deep South Conference against schools such as LSU and Mississippi State.

“I also recently began volunteering at Habitat for Humanity with several other members of ASCE,” she said. “That has been a very educational and enjoyable adventure so far.”

While Rushing is excited and honored to be working with Al-Ostaz, she remains most proud of completing her thesis and graduating on time from the university the first time.

“I had been living in Oxford for a few years at that point, and, honestly, I just did not want to leave because it is a great town in which to live,” she said. “My experiences as both a student and a resident have been wonderful, and I especially enjoy the challenging course work in the civil engineering curriculum and the pleasant atmosphere of both Ole Miss and Oxford.”

Rushing is the daughter of Michael and Susan McMahen of Union. She is married to Joshua Rushing of the Lee County community of Edinburg, who works in asset protection. Upon completion of her bachelor’s degree, McMahen plans on getting her third degree from Ole Miss, a master’s in civil engineering.
Two University of Mississippi civil engineering students’ work in the School of Engineering’s Transportation Modeling & Visualization Laboratory could help shape the future of rail transit on the Mississippi Gulf Coast and intermodal freight corridors in the U.S.

Seth Cobb, a senior from New Albany, and Haley Sims, a junior from Ridgeland, work as research assistants for civil engineering professor Waheed Uddin, director of UM’s Center for Advanced Infrastructure Technology (CAIT). The students contribute to geospatial research and mapping for two projects for the National Center for Intermodal Transportation for Economic Competitiveness.

“We both took a class in geospatial analysis taught by Dr. Uddin, which is mapping software on the computer,” said Cobb, who has worked in the lab since fall 2012. “We create maps with the data that they [Uddin, undergraduate and graduate students] gather so that you can easily see and understand it for spatial analysis.”

Cobb and Sims are part of a project team that seeks to identify major transportation corridors involving shipping ports, Mississippi River waterways, highway networks and rail infrastructure. In addition, the team seeks to evaluate the economic viability, safety, disaster resiliency, and revenue and funding aspects of integrated, selected segments of the corridors. Because U.S. companies spend trillions of dollars a year on freight logistics, the project’s findings could prove valuable.

“Normally most of the freight transport is being moved by trucks on highways,” Uddin said. “They are not very good at going long distances between states because they take space on the road, especially near urban areas. There’s also a problem with safety, fuel consumption and emissions. We’re trying to find the optimum way for freight transport by intermodal integration.”

The students also work on a project that is evaluating the economic impact of restoring a passenger rail service on the Gulf Coast. The rail service, which used to serve the coast tri-weekly, was suspended after Hurricane Katrina hit the area in 2005. Since then, auto and freight traffic volume has continued to increase on I-10 and the U.S. 90 coastal highway, and is expected to grow. The project would integrate commuter rail travel with auto traffic to ease the auto travel demand on existing road corridors, offer economically competitive and safer travel, and reduce air pollution.

“We’re getting all of the data and showing all the different information to hopefully get [the rail] reopened,” Sims said. “We’re taking it from the angle of making commuter rail attractive and economically viable for the region so that people within this corridor and commuters from surrounding counties can use the rail to travel to work, and that will take more traffic off of the highways.”

Uddin said that in addition to offering a commuter rail service, another option would be to service the casinos on the coast, providing safe transport to and from the casinos and keeping more vehicles off the roads, which would reduce congestion and auto emissions.

Uddin said that the students are impressive both in the lab and in the classroom. In addition to working 20 hours weekly in the transportation lab, both

“We’re taking it from the angle of making commuter rail attractive and economically viable for the region so that people within this corridor and commuters from surrounding counties can use the rail to travel to work, and that will take more traffic off of the highways.” –Haley Sims
Sims and Cobb have worked on other hands-on projects.

Cobb’s term project for Civil Engineering 570 included spatial maps of the Oxford-University-Transit (OUT) routing and asset management using a new research analysis tool developed by a transit research project of the U.S. National Academies. At the end of the project, the transit software consultant used Cobb’s evaluation to enhance the product.

“I did a term project on the OUT buses, and Dr. Uddin was given an infrastructure software that allows you to insert your fleet information and evaluate when you will need maintenance on your fleet, your budget and all the economic factors and emission factors,” Cobb explained. “It was a new kind of software that hadn’t been used. I used it in my class project, and we wrote a review of things that were wrong so they could use it to make corrections.”

In April, Sims won first place from the Institute of Transportation Engineers for the best undergraduate paper in the Deep South section and ITE Southern District. For the paper, Sims analyzed carbon dioxide emissions from states bordering the Mississippi River.

“I did the paper based on a term project from the geospatial course of Dr. Uddin,” Sims said. “I wanted to use that research, but I obviously needed to direct it toward something transportation-based, so I did more research and it turned into the impacts of rapid urbanization on the transportation and energy demands of those 10 states.”

The students use GeoMedia Pro software for geospatial mapping that has been provided by Intergraph Corp. to CAIT since 2005 at no cost.

“It just takes tons and tons of amounts of information and makes it visual, so you can look at a map and know that [the] state of Louisiana had over 200 million tons CO₂ emissions,” Sims said. “It helps people be able to look at it and understand a little bit better what we do, as opposed to looking at a bunch of numbers.”

Sims and Cobb said that Uddin’s research focuses primarily on Mississippi, and they enjoy being involved in work that may actually help the state.

“He really likes to do anything that can help Mississippi,” Cobb said. “Mississippi is the primary focus on any of the projects that we do, and then we can expand from there.”

Upon graduation, Cobb will pursue a Master of Science degree at UM and will continue contributing to transportation research projects. Sims plans to continue her education, either through graduate school, law school or by entering the workforce and pursuing her professional engineer’s license.

“I’m so excited about these two students,” Uddin said. “With me, students have to work from day one on research. Hopefully the work they’ve done with me will help them land better jobs.”
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The 2014 Engineering Awards Banquet was a wonderful evening at The Inn at Ole Miss on April 3. The banquet drew a full house of alumni, faculty, staff, friends and students receiving honors and awards. Engineers Without Borders added color and fun to the evening, serving desserts, presenting a video of the Togo project and holding a silent auction fundraiser for market items they brought back from Africa.

**STUDENT AWARDS**
Outstanding Senior Leadership Awards: Maddie Costelli, Samuel L. Di, Zach Morgan, Trey Powell
Mississippi Engineering Society Award: Samuel L. Di
David Arnold Award: Maddie Costelli
Graduate Achievement Awards: Heather Rivera (M.S.), James Church (Ph.D.)
Class Marshals: Paul Furr, Trey Powell

**FACULTY/STAFF AWARDS**
Outstanding Faculty Member of the Year: Dawn Wilkins
Outstanding Faculty Service Award: Marni Kendrick
Outstanding Junior Faculty Research Award: Cris Surbeck
Outstanding Senior Faculty Research Award: Raju Mantena
Outstanding Staff Award: Lynne Trusty

Engineer of Service Award: Julius Ridgway
Engineer of Distinction Award: Larry Kelly
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