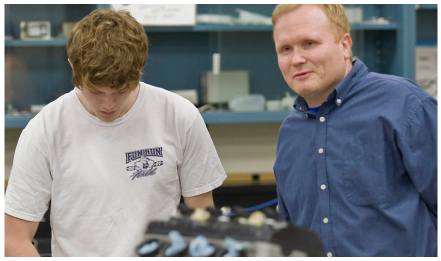
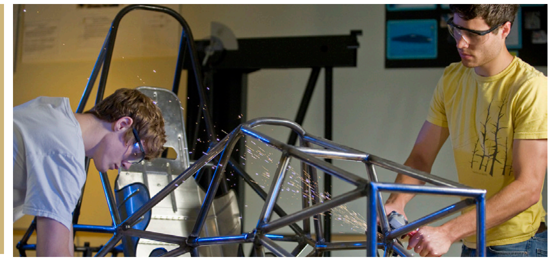




ORU ENGINEERING, COMPUTER SCIENCE, PHYSICS AND MATHEMATICS GRADUATES OF 2013

2013 ORU Engineering, Computer Science, Physics and Mathematics Graduates and Faculty

Seventeen senior engineers graduated this year with B.S.E. degrees and six students with B.S. degrees. Four computer science students, one mathematics student and one mathematics education student graduated, all with B.S. degrees. ORU Engineering and Mathematics double major Rebecca Giese won first and second place in the undergraduate old guard technical web design and poster competitions, respectively at the annual student professional development conference of the American Society of Mechanical Engineers that was hosted at ORU on April 4 - 6, 2013.

FACULTY NEWS:

Dr. Andrew Lang was nominated for the top 20 Science and Engineering Professors in Oklahoma. The goal of the top professors list is to highlight post-secondary educators who have been recognized recently for excellence in the classroom, on campus, and/or in the community. Dr. Lang is originator and co-founder of the Open Sledware program of data visualization tools. His specialty is in quantum field theories in curved space-time. Only five members of Oklahoma-wide faculties have been selected as Da Vinci Fellows.

2012 – 2013 SENIOR PROJECTS AT ORU ENGINEERING, COMPUTING, PHYSICS AND MATHEMATICS

Small-Scale Vertical Cylindrical Process Heater Luke Chinworth, Bethany Dickie and Andrew Walter

This project outlines the method, data, calculations and analyses performed by a group of senior Mechanical Engineering students of Oral Roberts University Engineering, Physics, Computer Science and Mathematics Department in partial fulfillment of the requirements for their Bachelor of Science. This project was sponsored by the John Zink InstituteSM of John Zink Hamworthy Combustion™.

John Zink Hamworthy Combustion leads its industry in emissions control and clean-air systems by dedicating its resources to environmentally conscious research and development. To ensure their customers operate their painstakingly designed systems safely and correctly, the John Zink Institute was established to train customers' process engineers and technicians. The Institute, though it thoroughly teaches operators proper safety procedures concerning John Zink's products, feels that its classes and lectures leave actual experimentation to be desired. Experimentation with full-scale burners in process heaters is much too expensive for teaching purposes, but a small scale heater can simulate similar performance in the classroom with a reduced cost of fuel and maintenance.

Designing a process heater simulator for demonstrational purposes involves some major changes from actual process heaters. Most notably, the scale is miniaturized to achieve portability and indoor use, and glass, rather than steel, is used for the process chamber and tubes for ease of flame observation. Though, to achieve any level of comparison between a simulator and its real world counterpart, the remaining features are held as consistent as possible with industrial heaters, e.g. digital data tracking and recording with LabView integration; properly insulated components that would rise to unsafe temperatures; flu gas composition analysis based on inlet and exhaust damper position; forced, induced and natural drafts; varying levels of ambient or premixed air.

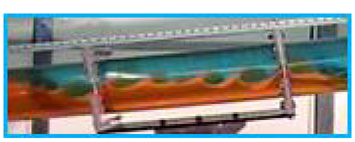
An Optimization of Hydrogen-Enhanced Combustion and the Design of a Hydrogen Feed System for a Portable Gasoline-Powered Generator

Stephen Doty, Marshall Harrup, Timothy Rink

An experiment to verify and qualify Hydrogen-Enhanced Combustion was performed, by allowing pure hydrogen to flow into the air intake of a gasoline-powered generator. A 400-Watt work-light was used as a constant load on the generator, and the fuel consumed, heat generated and air consumed to power the light was recorded. The system overcompensated for the safety concerns regarding hydrogen, and limited the amount of hydrogen delivered such that no change in fuel efficiency was observed.

Recreating the Kelvin Helmholtz Instability

Rebecca Giese and Michael Whitlatch



The goals of this project were to recreate the Kelvin Helmholtz Instability and to test it experimentally and theoretically. The Kelvin Helmholtz Instability is caused by velocity shears between two fluids which results in instabilities at their interface. Our project will utilize an apparatus to analyze the concept of reproducing the Kelvin-Helmholtz Instability in a cylindrical tube. The Instability was also analyzed using ANSYS FLUENT.

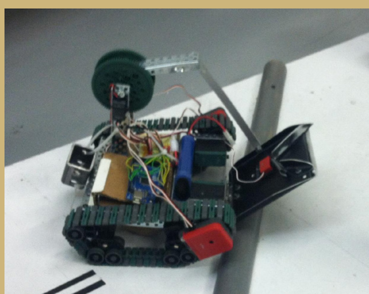
Radio Frequency Spectrum Analysis for Coexistence Testing in a Hospital Environment

Sean McDonough, Jessica Shearer, Ilha Won and Leo Wood

Healthcare has been among the last disciplines to adopt widespread use of computerized record keeping, despite the benefits to patients, and their efficiencies for business. However, President Barack Obama's 2009 healthcare stimulus package now mandates that all health care facilities adopt electrical record keeping. This means that there has been a surge in wireless traffic across the 2.4GHz frequency band in hospitals as nurses and doctors update patient records using wireless tablets and computers. Unfortunately, as the number of devices utilizing a Wi-Fi network increases, information sent from one device is less likely to be successfully received by another device. In order to ensure that a product can effectively transmit data across a busy wireless network, medical device manufacturers are required to validate their product's wireless functionality in the midst of wireless traffic. This kind of validation is called coexistence testing and the FDA requires wireless device manufacturers to validate their product's ability to coexist while tolerating high levels of channel utilization caused by the electronic record keeping of medical staff. Unfortunately, due to a lack of research in this field, it is not known what a hospital's wireless network looks like. In order that medical devices continue to operate correctly, attention is needed to effectively create an imitation of a hospital environment for coexistence testing. A literature search based on previous tests guided the project on effective ways to measure wireless activity in a hospital and how to analyze it in the most meaningful ways. Wi-Fi sampling tools were deployed at St. Francis Hospital in Tulsa, OK to collect daily samples of wireless activity. After analyzing the data, the results were handed to the University of Oklahoma to create an emulation of a wireless network with comparable characteristics to those found in a hospital such that Bluetooth development kits could be configured to mimic wireless medical devices and coexistence testing conducted in the new emulated environment.

Fully Autonomous Robot for Post Forest Fire Revegetation

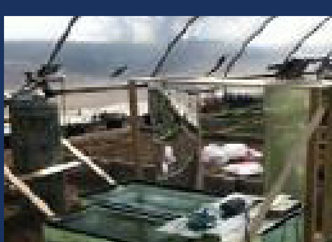
Meryl D'Souza, Stephanie Patruska and Ronald Pease



This project was done based on most of the IEEE competition rules and regulations. It utilized a fully autonomous robot to collect soil samples from a post forest fire environment. There were many design constraints that needed to be followed. Therefore, a lot of time was put into this project to ensure the programming and construction was detailed enough for the robot to function properly. This process required planning the design so the body of the robot works simultaneously with the programming. The design had to be changed several times due to various reasons. The project was completed when the robot met all the required specifications. The finished result is the robot being able to collect a soil sample and deliver it to a pre-determined location.

Utilizing Algae to Sequester CO_2 Emissions

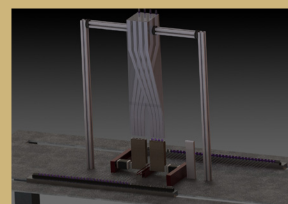
Jeramy Roberts and Julian Martin



The method of sequestering CO_2 emissions will first be performed and constructed on a small scale model, which will be inside a greenhouse. It consists of a cycle that will be set up and implemented using a CO_2 canister, algae, daphnia and tilapia. Each of the organisms will be in separate aquarium tanks, feeding one to the other; the algae will consume the CO_2, daphnia will eat algae, tilapia will eat daphnia, and finally tilapia waste will be fed to the algae. Basically, this is a closed loop cycle where every living matter will be used to support another organism. Also the platform for constructing the small scale model is 2 m2. This is a scaled down demonstration of the large scale model. This is a future implementation that will be put into action for sequestering the emitted particulates from power plants and refineries.

Design of a Needle Transportation Mechanism

Matthew Burton, Charles Shull and Tyler Traut

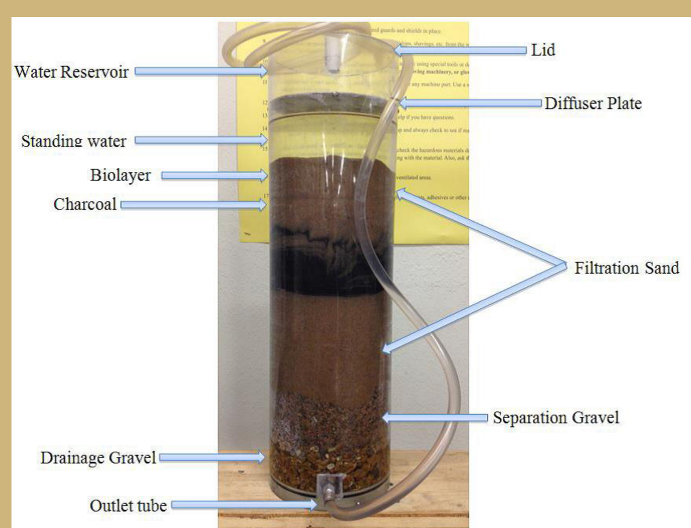


Three mechanical engineering seniors worked for the CareFusion manufacturing plant in Mannford, Okla. The senior project group was contracted to expedite a manufacturing section of the spinal tap needles. The following report outlines the design process of creating an autonomous needle transportation device to streamline CareFusion's spinal tap needle production. The design of the machine consists of four main elements: the funnel, the cradle, the bar conveyor and the table in which these preceding three elements rest upon. The funnel guides the needles, the cradle transports the needles and the bar conveyor helps orient the bar for each set of needles. In the end, the students completed the design for CareFusion, and the senior project report outlines the students' design procedure.

Water Purification and Fluid Flow System

Daniel Benjamin, Daniel Holman and Kerry Kammerlohr

Water filtration is a major need in today's world; those suffering from illness brought on by limited safe drinking water occupy more than half of the world's hospital beds.



Every year approximately 3.6 million people die from water-related diseases (The Water Crisis in Third World Countries). Most of these diseases are attributed to contaminated water sources. Biosand filters are built from materials that are easily gathered in most developing countries. The filters include sand and pebbles. By educating those who live in developing countries on the steps of water purification, millions of lives can be saved each year. The system designed in this project consists of three main parts; water storage, filtration, and a distribution system. The design was constructed out of PVC piping and Plexiglas with a sump pump to transport the water. The biosand filter discussed here successfully removes an average of 61.7 % of the Escherichia coli (E coli) that was introduced to the system.

Michael O'Brien, Major: Engineering (Electrical Concentration)

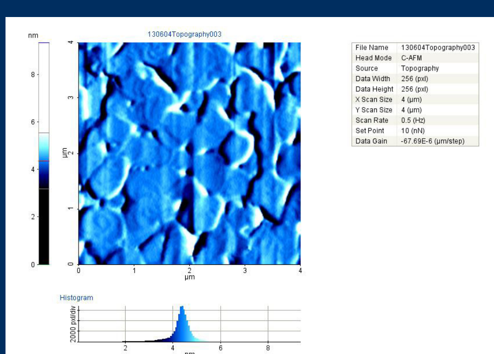
I'm working with TI's battery monitoring devices that gauge the amount of energy left in Li-Ion battery packs. My role in the team is to improve the tools we use to develop and test these devices. Although this position mainly involves software, the electrical background of my concentration at ORU has been invaluable in the process of learning the ins and outs of Li-Ion fuel gauging. So far, I've been able to significantly improve the main software tool the team uses for testing and verification and am currently working on another project that will reduce the validation and verification times of new device firmware releases.

2013 SUMMER INTERNSHIPS

Jessica Fitzgerald, Major: Engineering Physics

This summer, I am working at Rensselaer Polytechnic Institute (RPI) in Troy, NY. My project is officially entitled "condensed matter physics," and deals with measurements and images on a nanoscale. The first couple of weeks here have mainly been composed of finding a good tip-etching process for a Scanning Tunneling Microscope (STM) that uses the tips to measure conductivity of a sample. The tips are very tiny, and must be viewed under an optical microscope to see whether they are in good shape to make the measurement. My main project has been playing with the different parameters in the tip etching process that will produce the sharpest, most stable tips. They are made out of gold, and are etched electro-chemically using graphite as the cathode, and gold wire as the anode. The gold and graphite are submersed in a solution of Ethanol and HCl, and a cutoff current established-so that the etching process will stop when the computer senses this value. As the process goes on, a tip is produced at the miniscus of the solution in contact with the wire. Changing the parameters changes this tip shape and stability. I have included a couple pictures of the tips under the optical microscope.

The second part of my project will be using an Atomic Force Microscope (AFM) to image and sort adult stem cells. This requires a liquid-friendly probehand, which is new to RPI, and it will be my job to figure out how to use it with the AFM to get good images of the live stem cells. These cells can then be sorted based on their conductivity, and that will be the next step of the process if I am successful at imaging them before my REU is complete. I have really enjoyed my first few weeks here at RPI, and have learned a lot about research and nanotechnology. I was able to take some dry-sample pictures with the AFM, of gold on mica, and have included those as well.



ENGINEERING SUMMER CAMP AT ORU

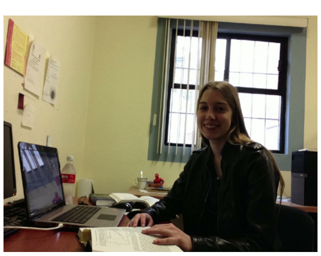
ORU Engineering hosted an Engineering Summer Academy day on June 17, 2013 as part of the Tulsa Engineering Alliance summer camp. 36 students from different schools in the Tulsa area visited ORU during the morning and Muncie during the afternoon.

2013 MISSION TRIPS

For the past month, five students and Jesse Schettler traveled through Ghana, Africa serving as engineering missionaries from ORU Missions. Four of us are engineering students and the other two are studying social work and international community development. Teaming up with the Change a Life Foundation and local ministries in Ghana, we developed site plans for Operation Orphan Rescue that will aid in the establishment of thriving communities capable of supporting and nurturing orphans in need. We helped local pastors take the first steps in their projects by digging trenches for water pipes and meeting with their committees to formulate plans of action. We also partnered with a local church and its ministries. Through this church we were able to lead morning staff devotionals, teach at a Christian School, participate in daily evangelism, visit the sick in hospitals, and preach in church services. The entire trip lasted approximately 28 days and was full of learning experiences in regards to both engineering and ministry. We as students really got a glimpse into what life would look like as long-term missionaries and as engineers working in a foreign country and culture.

Kathryn Crosby, Major: Mathematics

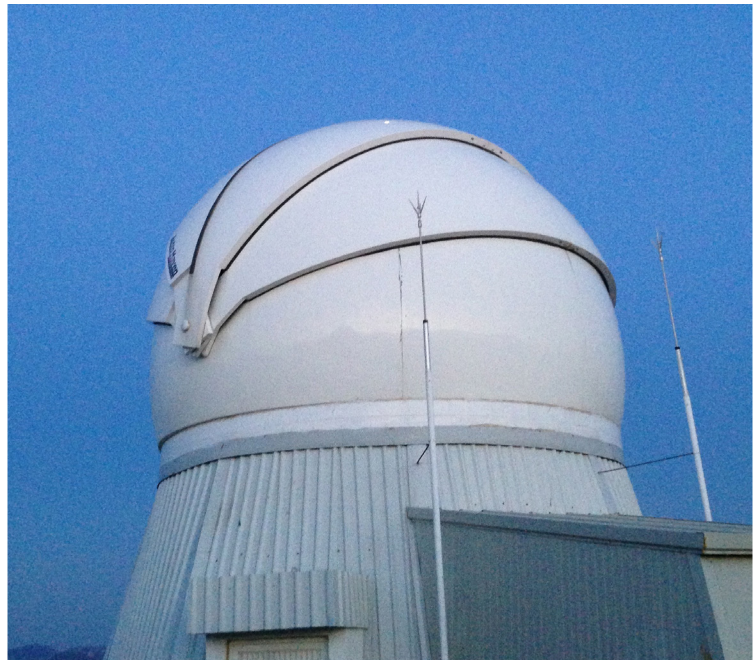
Overview of Mathematics REU at UTC



Over the course of eight weeks, Katie and eight other students participated in a mathematicsresearch experience for undergrads (REU) sponsored by the NSF. The nine students divided into4 groups. Katie joined two other students to work with a professor, Dr. Andrew Ledoan, in Number Theory. Specifically, they worked on partial sums of the Riemann Zeta-Function to show that there are upper and lower bounds on the Zeta squared function such that all nontrivial zeros exist within these bounds. They also showed that the nontrivial zeros exist on the sigma equals one-half line up to a height T and determined an estimate for the number of nontrivial zeros of the zeta squared function. At the conclusion of the eight weeks, the group had proved their theorems and submitted a paper containing their proofs to a mathematical journal for review and possible publication.

Summer Internship in Mexico on Stellar and Stellar Cluster Evolution

During the summer of 2013, Katie Crosby went to Mexico to work and learn from a professor of astrophysics, Doctor Klaus-Peter Schroder, at the University of Guanajuato from May 12-28. While there, she learned about star classification, the life-cycle of stars, the composition of a star and what it burns at different stages, the importance of star clusters in modeling stars, and how to model star clusters to discern patterns and learn clues about stellar life-cycles. In learning these things, she also learned how to conduct research and was able to write her senior paper on what she learned. Her research will continue in the following months as she finishes her senior paper and works with Dr. Schroder on another research paper involving an old stellar cluster which is composed of more metallic stars causing difficulty in discerning its age.



Sarah Pease, Major: Engineering (Mechanical Concentration)

This summer Sarah interned at Caseco manufacturing. She mainly modeled various sheet metal parts in Solidworks and then assembled those parts into various truck bodies. Sarah also modeled various chassis for modeling purposes.

Dear ORU Engineering, Computing, Physics, and Mathematics Alumnus,

You can make a difference in our recruitment efforts of our students at ORU!
Many prospective students express a desire to attend ORU but unfortunately they don't have a sufficient level of scholarships. We have for this purpose a restricted scholarship fund and we are requesting your donation to this fund.

You can make a donation at https://webapps.oru.edu/new_php/give/

Click on Academic Department, select Computer/Math Sciences Dept. or Engineering/Physics/Physical Science Dept.

Please make sure to comment that your donation is specifically for Computer/Math or Engineering scholarships.

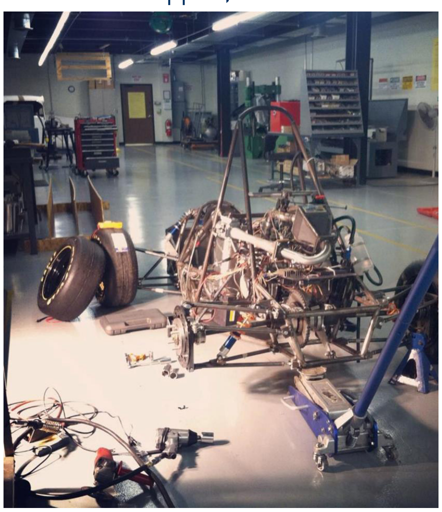
You are welcome to contact me at **jmatsson@oru.edu** or **918 495-6935** with any questions that you may have.

Sincerely,
John Matsson, Ph.D.
ORU Engineering Chairman

ORU Formula Racing

Progress has been slow, but steady. At the beginning of the 2012 fall semester, there was still a lot that needed to be done. A long list of brackets to be made, and mounted. Parts needing to be repaired, such as the rapid prototyped intake tube. And still a design flaw in the hubs to use the wheels that we purchased in order to save costs. This was crucial to having the chassis in a rolling state. Something we had planned on coming together a lot sooner.

It was in this time, the start of the 2012 semester that either the car would succeed or get pushed off to the side and sit in a dark back room, partially finished and glanced at periodically by students. We decided to not let this happen, to not let our sponsors down and to race this car. Meetings with the team were held early in the semester, pizza was consumed, and lots of early mornings and late evenings running milling programs, grinding, and welding.



A solution was found for our wheel and hub combination, and that got the ball rolling. By the end of the Fall 2012 semester we had a rolling chassis, and the suspension worked. The Suzuki GSX-R600 engine was partially wired, and before winter break we pushed to design and order all of the remaining foreseeable parts for the remaining systems of the car. At this point, it was finals week.

When Spring semester started, the work on the car was fast paced. Being that the start of school is always slow, this was a good time to start finishing the systems in the car, such as fuel, brakes, steering, etc. By mid semester the car ran and moved under its own power. This led to many more areas that needed attention. We had hiccups with the stock clutch pack, the wiring still wasn't finished, and the alignment a considerable amount off, and every fluid happened to have a leak somewhere on each system. We worked on fixing these issues before summer break.

This year, we actually have the opportunity to compete in the FSAE racing series. Registration opens Oct 7th for the competition in Lincoln, Nebraska on June 18th.

Unfortunately building a racecar is costly, even with the awesome donations from our sponsors. Registration fees are high, and necessary equipment would still need to be purchased. If you are still interested in helping us compete, or simply have questions and would like more details, please contact Dr. John Matsson

jmatsson@oru.edu or

918-495-6935