View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by SWOSU Digital Commons (Southwestern Oklahoma State University)

Southwestern Oklahoma State University
SWOSU Digital Commons

Oklahoma Research Day Abstracts

2015 Oklahoma Research Day

Jan 1st, 12:00 AM

08. Engineering

Northeastern State University

Follow this and additional works at: https://dc.swosu.edu/ordabstracts

Part of the Engineering Commons, Higher Education Commons, Life Sciences Commons, and the Physical Sciences and Mathematics Commons

Northeastern State University, "08. Engineering" (2015). *Oklahoma Research Day Abstracts*. 7.
https://dc.swosu.edu/ordabstracts/2015oklahomaresearchday/mathematicsandscience/7

This Event is brought to you for free and open access by the Oklahoma Research Day at SWOSU Digital Commons. It has been accepted for inclusion in Oklahoma Research Day Abstracts by an authorized administrator of SWOSU Digital Commons. An ADA compliant document is available upon request. For more information, please contact phillip.fitzsimmons@swosu.edu.

Abstracts from the 2015 Oklahoma Research Day

Held at Northeastern State University

05. Mathematics and Science

08. Engineering

05.08.01 The enhancement of laser immunotherapy by low-dose cyclophosphamide

Aamr,Hasanjee *University of Central Oklahoma*

Cody,Bahavar *University of Central Oklahoma*

Elivia,Layton *University of Central Oklahoma*

Connor,West *University of Central Oklahoma*

Elivia,Layton *University of Central Oklahoma*

Sheyla,Rabei *University of Central Oklahoma*

Wei,Chen *University of Central Oklahoma*

Metastatic cancer is the number one cause of cancer death. There has been minimal advancement in developing effective treatment options. Laser immunotherapy (LIT) is an innovative cancer treatment modality that uses laser irradiation and immunological stimulation to treat late-stage, metastatic cancers. LIT is currently being performed by interstitial laser irradiation. Although LIT is still in development, recent clinical trials have shown that it can be used to successfully treat patients with late-stage breast cancer and melanoma. The goal of this study was to observe the immunological effects of cyclophosphamide (CY) in combination with LIT on the survival rate of tumor-bearing rats and mice. CY is a chemotherapeutic agent that has shown limited success in treating patients with metastatic cancer. However, when used in low doses it can suppress regulatory T cells (Tregs) and enhance the immunological response created by LIT. Studies have shown that low-dose CY enhances apoptosis and decreases homeostatic proliferation of TRegs. In this preliminary study, tumor-bearing rats were treated with LIT using an 805-nm infrared laser at a power of 2.0 W and low-dose CY. The same parameters were used to perform a similar experiment using tumor-bearing mice. Spleen cells from the treated mice were then harvested and used to study the immunological response of LIT with low-dose CY. Glycated chitosan was used as an immunological stimulant. Our results confirm that low-dose CY can be u

05.08.02 Induction of Anti-tumor Immune Response by Noninvasive Laser Irradiation and Immunologically Modified Carbon Nanotubes using Mammary Tumor Model in Rats

Aamr,Hasanjee *University of Central Oklahoma*

Austin,Doughty *University of Central Oklahoma*

Cody,Bahavar *University of Central Oklahoma*

Connor,West *University of Central Oklahoma*

Erica,Halterman *University of Central Oklahoma*

Feifan,Zhou *University of Central Oklahoma*

Wei,Chen *University of Central Oklahoma*

Laser immunotherapy (LIT) is evolving as a new method for treating metastatic cancer. LIT is capable of reducing primary tumors and launching effective systemic anti-tumor responses. Using a targeted treatment approach along with a novel immunoadjuvant, glycated chitosan (GC), LIT is able to induce an anti-tumor immune response to highly aggressive metastatic cancers. In this study, Noninvasive Laser immunotherapy (NLIT) was selected to be the primary treatment method. Single-walled carbon nanotubes (SWNTs) were used in the treatment regimen to enhance the thermal effect of NLIT on tumors. SWNTs were conjugated to GC to create an immunologically modified carbon nanotube (SWNT-GC). To determine how different laser irradiation durations, 5 minutes or 10 minutes, would affect the treatment outcome, a series of experiments were performed. Rats were injected with DMBA-4 cells, an aggressive, metastatic cancer line. The group of rats that received 10 minutes of noninvasive laser treatment with SWNT-GC (laser+SWNT-GC) had a 50% survival rate, without primary or metastatic tumors. The group treated for 5 minutes with laser+SWNT-GC had no survivors. Thus, we concluded that NLIT treatment using SWNT-GC for 10 minutes is more effective at reducing tumor size and inducing long-term anti-tumor immunity than NLIT-SWNT-GC treatment for 5 minutes. This study provides a means of improvement of NLIT for future studies.

05.08.03 Improving the Hydraulic Efficiency of Centrifugal Pumps through Computational Fluid Dynamics Based Design optimization

ABDELLAH,MOUSSA *University of Central Oklahoma*

Tyler,Grubb *University of Central Oklahoma*

Yunhao,Lin *University of Central Oklahoma*

The design and optimization of turbo machine impellers such as those in pumps and turbines is a highly complicated task due to the complex three-dimensional shape of the impeller blades and surrounding devices. Small differences in geometry can lead to significant changes in the performance of these machines. We report here an efficient numerical technique that automatically optimizes the geometry of these blades for maximum performance. The technique combines, mathematical modeling of the impeller blades using non-uniform rational B-spline (NURBS), Computational fluid dynamics (CFD) with Geometry Parameterizations in turbulent flow simulation and a novel optimization techniques a probability density and multiple restarts.

05.08.04 Aerodynamic Drag Reduction for A Generic Sport Utility Vehicle Using Rear Suction

ABDELLAH,MOUSSA *University of Central Oklahoma*

Justin,Fischer *University of Central Oklahoma*

Rohan,Yadav *University of Central Oklahoma*

The high demand for new and improved aerodynamic drag reduction devices has led to the invention of flow control mechanisms and continuous suction is a promising strategy that does not have major impact on vehicle geometry. The implementation of this technique on sport utility vehicles (SUV) requires adequate choice of the size and location of the opening as well as the magnitude of the boundary suction velocity. We report here a new methodology to identifying these parameters for maximum reduction in aerodynamic drag. The technique combines automatic modeling of the suction slit, computational fluid dynamics (CFD) and a global search method using orthogonal arrays. It is shown that a properly designed suction mechanism can reduce drag by up to 9%.

05.08.05 Aerodynamic Drag Reduction for a Generic Truck using Bump-Shape Vortex Generators

ABDELLAH,MOUSSA *University of Central Oklahoma*

Justin,Fischer *University of Central Oklahoma*

Rohan,Yadav *University of Central Oklahoma*

Rhiannon,Hensley *University of Central Oklahoma*

The continuous surge in gas prices has raised major concerns about vehicle fuel efficiency, and drag reduction devices offer a promising strategy. In this project we investigate the extent to which bump-shape vortex generators placed in the rear of the cabin roof have on the overall reduction of aerodynamic drag for a generic model of a commercial truck. The incorporation of these devices requires proper choices of the size, location and overall geometry. In the following analysis we identify these factors using a novel methodology. The numerical technique combines automatic modeling of the add-ons, computational fluid dynamics and optimization using orthogonal arrays, a probability density and repetitive restarts. Numerical results showed reduction in aerodynamic drag between 6% and 10%.

05.08.06 Transmittal Pulse Oximetry

Carlos,Echavarri *University of Central Oklahoma*

Chelsea,Spencer *University of Central Oklahoma*

Jessica,Webb *University of Central Oklahoma*

Yuhao,Jiang *University of Central Oklahoma*

Pulse Oximeters are widely used in hospitals, clinics, and households all around the world by patients for many different reasons. However, based on our market research, most of these devices are either complicated and heavy or simple and portable with many functions missing. There is a need to offer an alternative design of pulse oximeter which is functional, portable, and marketable. Our senior design goal is to design, build, and test a portable pulse oximeter that captures a patient's blood oxygen saturation levels , and also the patient's pulse rate while remaining compact enough not to cause inconvenience to the patient's everyday activities. Our portable device will be easy to use though fast enough so that the patient will, within seconds, learn their oxygen saturation levels and pulse from the device display. Our group has successfully designed and built a functioning detection circuit, as well as designed and implemented a timing circuit. During this semester we are able to put timing and detection circuit together and build a portable component so that the patient is free to live their lives as comfortable as possible. As both circuits come together and are tested, we will be able to make our product more compact.

05.08.07 Design of a test station for measuring the performance of centrifugal pumps

ABDELLAH,MOUSSA *University of Central Oklahoma*

Hamzah,AlRashdan *University of Central Oklahoma*

Hedrine,Nchinda *University of Central Oklahoma*

Ira,Topp *University of Central Oklahoma*

Pumps are mechanical devices that add energy to a fluid as a result of the dynamic interactions between the device and the fluid. The first curved vane centrifugal pump was invented by the British engineer John George Appold in 1851 and since then numerous advances in design and application have been implemented. Today, centrifugal pumps are used in almost any and every sector of industry. Typical pump efficiency range between 60 and 80 %, and small differences in geometrical details can lead to significant changes in the performance of these machines. In this project, we design the experimental setup and instrumentation to automatically produce the pump characteristic and efficiency curves for several test models of centrifugal pumps. The experimental station is equipped with pressure and mass flow rate sensors, valve control regulator and a safety monitoring system that shuts down when critical pressures or flow rates are reached. The station also provides a visual representation of the pump characteristic and efficiency curves, and allows easy install of various impeller, volute, and casing geometries.

05.08.08 Determining the Entropy Generation and Flow Characteristics of Developing Flow in Rectangular Channels

Aric,Gillispie *University of Central Oklahoma*

Evan,Lemley *University of Central Oklahoma*

Entropy is a thermodynamic quantity that can be thought of as thermal energy that cannot be converted into mechanical work, because of what can be considered as a lack of order. The objective of the current research is to conduct a detailed investigation of the entropy generated in a rectangular channel before the flow has become fully developed. It will serve to better explain how energy is dissipated in laminar flows within rectangular cross sections while the flow is still developing. In order to calculate the entropy generated in the channels, we must perform several experiments and analyses. First, any adjustments to the particle imagery velocimetry, PIV, system will be made to accurately obtain the velocity of the specific fluid used in the experiments. Using the PIV system, a velocity profile will be obtained along various sections to first insure that the flow has not become developed, and second to calculate the velocity of the flow at each section. The volumetric flow rate will also be calculated. Finally, throughout the test region there will be numerous pressure sensors placed to accurately gain the pressure differences between the consecutive test sections. This information is critical in calculating the loss coefficients. Several of these tests will be performed with various fluid viscosities, and Reynolds Numbers so as to generalize the results for any rectangular channel of any size.

05.08.09 Near Space Ballooning: Equipment Research and Project Analysis

Dallas,Elleman *Tulsa Community College*

Thomas,Henderson *Tulsa Community College*

The scientific or engineering researcher that wishes to measure the effects of deep space on biological or mechanical experiments may not have the opportunity to do so with the limited resources available to learning institutions. If arrangements can be made for the experiment to fly on a rocket then pertinent questions would include: preparation time (time to launch), flight time duration, accommodations for data retrieval, and cost. Rather than use valuable resources to achieve deep space effects on experiments, critical outcomes could be measured at an altitude of 100,000 feet. This research investigates the equipment necessary to conduct experiments with sample payloads at high altitude also referred to as near space ballooning.

05.08.10 Micropipette Aspiration Technique: From Textbook to Testing

Gang,Xu *University of Central Oklahoma*

Nikolas,Wagner *University of Central Oklahoma*

The goal of this research is to design and construct a micropipette aspiration system around a research microscope that can be used in cellular biophysics research. Based on the fluid mechanics principles, this system can apply small suction pressures across the tip (a few micrometers in diameter) of a micropipette that will be used to manipulate individual cells or apply small pico-Newtown forces through a force transducer such as a microsphere inside the micropipette. The detailed principles and design of our custom-made micropipette aspiration system will be discussed, as well as the sample calculations and measurements. This system will be used in our ongoing study on the manipulation of single flagella and testing of their mechanical properties.

05.08.11 Forging the small in a hot box

Gang,Xu *University of Central Oklahoma*

Jordan,Johnson *University of Central Oklahoma*

This project was to design and assemble a microforge system to process micropipette tips. Micropipettes with 1-10 micron tip diameter are commonly used in cellular and molecular biophysics studies to manipulate single cells or other small objects. The desired micropipette tips require not only precise diameters but also flat smooth openings. Therefore, the rough tips of those micropipettes made by the commercial puller need to be further processed before being used in experiments. In this study, we designed and custom made a microforge system around a basic dissecting microscope. Our design implemented a specialized circuit to control the heating of a small glass bead through a piece of platinum wire. Flow of melted glass into the micropipette tip can be precisely controlled by heating to reach the desired diameter inside of the pipette. After heating was stopped to solidify the glass inside, the pipette would be moved away from the glass bead, during which the micropipette tip would break right at the stopped flow front due to stress concentration. Most of times a nicely flat and smooth tip with desired diameter was obtained. This system allows custom forging of individual pipettes for specific experimental needs.

05.08.12 DC Dielectrophoretic Particle-Particle Interactions and Dynamics

Matthew,Benton *University of Central Oklahoma*

Mohammad,Hossan *University of Central Oklahoma*

Dielectrophoresis (DEP) has become one of the most popular mechanisms for label free particle manipulations and transport in microfluidics. When particles suspended in a fluid are subjected to an external electric field, the particles polarize and create local non-uniformities in the electric field. Within a close proximity of each other, this induces a dielectrophoretic force upon all of the involved particles. In order to investigate this effect, we use numerical simulation to model the interactions between particles for various configurations. The numerical model utilizes Maxwell's stress tensor to obtain the dielectrophoretic particle-particle interaction forces while solving the transient Navier-Stokes equation to determine the hydrodynamic interaction between each of the particles and the fluid containing them. By varying the number of particles as well as the particles' size, electrical properties and initial orientation, a number of possibilities are considered. Results indicate that particles with similar electrical properties tend to align themselves parallel to the external electric field regardless of sizes. In contrast, particles with differing electrical properties tend to align perpendicular to the electric field irrespective of sizes and orientations. This study explains the effect of size and electrical properties on DEP interactive motions of particles and can be utilized to design microfluidic devices for DEP particle manipulations.

05.08.13 Watching Swimming Race of Green Alga Cells: Correlating Motility with Viscosity

Gang,Xu *University of Central Oklahoma*

Kara,Clark *University of Central Oklahoma*

Steven,Karpowicz *University of Central Oklahoma*

Thi,Nguyen *University of Central Oklahoma*

The goal of this project is to study the correlation between the translational motility of green alga Chlamydomonas reinhardtii and their external physical environment. Propelled by two long hair-like flagella that beat in coordinated waveforms, each Chlamydomonas cell can swim relatively fast in normal medium. In this work, cells were cultured in medium of higher viscosities and their movements were recorded with a high-speed camera on the microscope. A custom MATLAB tracking program was used to trace the movement of the cell center in space and time. The average swimming velocity of each cell in different viscous medium was calculated by dividing the total distance traveled by the total time. Our data show that cellular motility decreased with increasing external fluid resistance from higher medium viscosity. This motility change will be correlated to changes in gene expression in order to provide better understanding of the coupling between the mechanics and genetics of the flagella.

05.08.14 Protein concentration and detection in a microdevice for cardiovascular disease diagnosis

Jennie,Allen *University of Central Oklahoma*

Mohammad,Hossan *University of Central Oklahoma*

Regina,Smith *University of Central Oklahoma*

Steven,Karpowicz *University of Central Oklahoma*

Thiago,Omena *University of Central Oklahoma*

Tucker,Teigland *University of Central Oklahoma*

Cardiovascular disease is the leading cause of death in the world resulting in the loss of 17.1 million lives a year. One in four heart-damaging events goes unrecognized or misdiagnosed due to lack of symptoms. Cardiac troponin I (cTnI) is a protein specific to the heart muscle that is the preferred biomarker for detecting cardiac damage. However, because the concentration of cTnI isoforms (phosphorylated and unphosphorylated) in the blood is so small, there are currently no microdevices to monitor heart disease. Application of an electric field in a buffer solution with samples, known as electrophoresis, can separate and concentrate proteins. Our goal is to design a microdevice that is capable of separating and concentrating cTnI isoforms using electric fields, prior to an immunoassay that will then detect cTnI isoforms. The separation and concentration of proteins was enhanced with a combination of novel microdevice design and on-chip electrophoresis. The detection of phosphorylation-specific cTnI will be accomplished by using antibodies and immobilizing cTnI in the device. We achieved an increased sensitivity to a phosphorylation specific cTnI while also decreasing the limit of detection through antibodies with immobilized cTnI. These results allow us to differentiate and quantify different phosphorylation states of cTnI. In summary, our microdevice has great potential as a point-of-care tool in the accurate diagnosis of cardiovascular disease, possibly saving many lives.

05.08.15 Direction-Biased Acoustic Metamaterial Waveguide

Barrett,Lee *Oklahoma State University*

James,Manimala *Oklahoma State University*

Prateek,Kulkarni *Oklahoma State University*

Vishnu,Paidimarri *Oklahoma State University*

Acoustic Metamaterials (AM) are a class of artificial materials that derive their unique dynamic properties not just from material constituents but more so from engineered configurations. Tailoring their engineered configurations imparts unusual wave manipulation capabilities that bring about novel applications. We demonstrate the feasibility of a passive direction-biased structural waveguide using an AM having sequential arrays of linear and nonlinear hardening-type (NLH) resonators. Simulations show that by choosing the local resonance frequencies of the linear and NLH resonators appropriately, an amplitude-activated direction-bias in the propagation characteristics is achieved depending on whether the incident wave first passes through the linear or NLH resonator arrays. A prototype will be experimentally evaluated to verify the mechanism of shift in the spectrum of the propagated wave to lower frequencies when it passes through the NLH resonator array and the stop-band of the linear resonator array that enables this AM to act as waveguide in one direction and filter in the opposite direction for excitation within a tunable frequency range. An entirely passive direction-biased waveguide for mechanical waves would be a promising step towards a full-fledged mechanical analog of the electronic diode. It has attractive applications for acoustic shielding of sensitive equipment and steering and focusing of mechanical waves in both medical and military devices.

05.08.16 Developing an image processor to extract lipid size information from hepatic steatotic images

Mahesh,Banjara *University of Central Oklahoma*

Yuhao,Jiang *University of Central Oklahoma*

As the second most common transplantation, liver transplant depends on livers donated from cadaver and living donors. The more lipid content a donor liver has and the bigger the size of lipid vacuole in hepatocyte is, the higher risk of ischemic reperfusion injury the donor liver has after transplantation that risks the patient's life. We propose to use image processing methods to morphologically classify liver tissue of different levels of non-alcoholic steatosis, in terms of the volume concentration and size distribution of lipid vacuole. Specifically, we develop the advanced image processing methods including morphological process and image segmentation to extract the sizing parameters specific to macro-vesicular and micro-vesicular steatosis.

05.08.17 PROPOSAL FOR DESIGN AND IMPLEMENTATION OF CAPACITANCE TO DIGITAL CONVERTER

ANDRE,OMENA *University of Central Oklahoma*

JOHN,SEMANDS *University of Central Oklahoma*

MATTHEW,NEIGHBORS *University of Central Oklahoma*

Capacitive sensors are widely used in industrial, scientific, medical, automotive, and consumer applications including pressure measurement, touch sensing, position sensing, level sensing, humidity sensing, flow meters, and impurity detection. This project focuses on creating a wireless infrastructure for monitoring high resolution capacitive sensors. The objective is to design and configure a wireless sensor transducer (WiST) system to monitor capacitive sensors, convert the measurements to digital signals, and transmit the data to display at a receiving station (Gateway). High resolution capacitive to digital conversion allows more divisions over the sensing range which can support more decision making threshold conditions. Wireless capability decreases clutter of wires and allows for mobility of monitoring. Special consideration is given to hardware connectivity, programming, modification, and refinement into a finished product.

05.08.18 A Punch on Collagen Punch: Induced Wound Reveals Tension in Human Dermal Equivalent

Cory,Anderson *University of Central Oklahoma*

Gang,Xu *University of Central Oklahoma*

Lauren,Tinnin *University of Central Oklahoma*

Melville,Vaughan *University of Central Oklahoma*

The objective of this research project is to probe and quantify the mechanical tension generated in an in vitro dermal equivalent model created for studying wound healing. The dermal equivalent is made up of collagen lattices cultured with human fibroblasts. We probe the stress in these dermal equivalents by removing a small piece of tissue from the center of the lattice then observing the expansion of the hole. The faster the hole expands, the more tension is present. We study the effect of transforming growth factor on the tension. Also, we have studied the effects of different concentrations of media as well as different biopsy punch sizes. Understanding the biomechanics of the models will be an important step in understanding wound healing.

05.08.19 Evaluate Fiber Coated Hip Implant by Using Fatigue Setup

Morshed,Khandaker *University of Central Oklahoma*

Zack,Johnson *University of Central Oklahoma*

When it comes to implants, recovery time and failure can be a significant problem. It is important to know how much stress can be applied to a titanium-cement interface. The main application of this knowledge is for titanium implants, and how the cement will hold when a cyclic load is applied. A cyclic load simulates the action of a person walking or moving in an everyday setting. The goal is to evaluate the interface between a nano-fiber coated titanium implant and the bone cement, using a fatigue setup. The nano-fibers will be applied to the surface of the implant using an electrospinning process. The results are anticipated to show that the fiber coated titanium implant is able to withstand a cyclic load better than a non-coated implant. Static tensile tests were performed. The tensile load that the titanium-cement interface broke; was around 27 ± 2.69 N. This will be used for the pre load for fatigue testing Titanium implants with and without fibers will be tested to determine fatigue life. The results could possibly be applied to increase the strength of hip implants and to shorten the recovery time for implants.

05.08.20 An Investigation of Cellular Motility Using Rescued Algal Cells

Daniel,Fijalka *University of Central Oklahoma*

Gang,Xu *University of Central Oklahoma*

Steven,Karpowicz *University of Central Oklahoma*

Thi,Nguyen *University of Central Oklahoma*

The flagella of green alga Chlamydomonas reinhardtii are a popular model system utilized to study human cilia due to their remarkably similar genetics, structure, and functions. With an ultimate goal of understanding human cilia-related diseases, the correlation between structure and function in Chlamydomonas flagella must be investigated to provide better understanding in this area. The observation of how cells adapt to move in a variety of media can bring new insight. To achieve this, Chlamydomonas cells were cultured in various medium viscosities and then diluted with a control media to revert or “rescue” them from their thicker growth media. Videos of the cells were immediately taken after the dilution with a digital camera under a microscope and their velocities were tracked using a custom Matlab imaging processing program. Our data show that Chlamydomonas flagella appear to maintain their ability to propel the cell body. Combined with genetics data, this information may shed new light on how mechanics and genetics are regulated for flagellar and ciliary functions.

05.08.21 Solar Powered Water From Air Extraction System

Mahesh,Banjara *University of Central Oklahoma*

Manit,Kaliraj *University of Central Oklahoma*

Mustafa,Alhaddad *University of Central Oklahoma*

Sagar,Sharma *University of Central Oklahoma*

The purpose of this project is to design a size system that can extract water from humid air using the principles of mechanical and electrical engineering. Considering the main goal is to extract enough drinking water supply for a small family of 2 to 4 members as efficient as possible. This design is to provide a pure form of drinking water extracted from air using a system running completely on solar power. For this system, it consists of solar panel, charging battery, compression unit and water filtration technique. This system will absorb the humid air from atmosphere and extract water from it. We approached to produce safe standard drinking water specified by “Water Quality Board” of the United States, which is “Safe Drinking Water Act (SDWA)”. We are trying to make the design as portable as possible that means it can be fit in the trunk of SUV. We are still working on the project we have not find any conclusions yet but as of now the team is investigating on the application of solar energy to extract water from atmospheric air presented. The study also includes system design characteristics and the climatic conditions.

05.08.22 Development of a Novel Tracking Method for Tumor Metastases Using MRI and Molecularly-Targeted Contrast Agents

Aamr,Hasanjee *University of Central Oklahoma*

Austin,Doughty *University of Central Oklahoma*

Cody,Bahavar *University of Central Oklahoma*

Debra,Saunders *Oklahoma Medical Research Foundation*

Nataliya,Smith *Oklahoma Medical Research Foundation*

Rheal,Towner *Oklahoma Medical Research Foundation*

Wei,Chen *University of Central Oklahoma*

Laser immunotherapy (LIT) is a novel cancer treatment modality that focuses on using laser irradiation and an immunoadjuvant to instigate a systemic immune response to treat metastatic cancers. In order to accurately observe, improve, and plan the LIT process, a method to visualize and track tumor metastases is necessary. This study aims to develop this very methodology as a complement to LIT by identifying and analyzing metastases. We plan to accomplish this using contrast-agent assisted Magnetic Resonance Imaging (MRI). These contrast agents can be conjugated to antibodies specific to cancer markers, targeting the effect to cancerous tissues in an MRI scan. To begin development, a study was performed using Wistar Furth rats injected with DMBA-4 cancer model to analyze the influence of several types of molecularly-targeted contrast agents and ascertain the most efficacious contrast agent. From our results, we concluded that the Gd-alb-CD44v6 contrast agent was more effective than our other contrast agents. Hereafter, we plan to further this methodology by developing algorithms to computationally analyze the MRI data, enabling us to conduct studies to refine LIT into a more potent treatment.

05.08.23 Effect of electrospin material on the fracture strength of Ti/PMMA interfaces

Andrew,Rutter *University of Central Oklahoma*

shahram,Riahinezhad *University of Central Oklahoma*

The goal of this research is to increase mechanical interlock between titanium (Ti) and poly methyl methacrylate (PMMA) cement by improving the surface properties of implant using electrospin nanofiber. To achieve the goal, the study will determine the effect of electrospinning polymer fiber adhesion on titanium and the effect of electrospinning fiber material architecture (fiber diameter and distance between fibers) on Ti/PMMA interfaces. An uncoated cylindrical model was tested under static structural loading. During this study, the fiber material viscosity of PCL-Acetone, PMMA-Acetone-PCL, and PCL-Acetic acid was measured. This study compared the bounding strength of two electrospun fiber coated Ti/PMMA interfaces under static load (the strength load between titanium rods with cement, and titanium rods with fibers and cement). Qualitative adhesion tests showed that PCL-PMMA-Acetone solution had greater stickiness compared to PCL-Acetone. Experimental study found significant increase of pull out static strength for fiber coated implant compare to uncoated implant. In future, the effect of electrospun fiber material on the architecture on Ti and compare the bounding strength of two electrospun fiber coated Ti/PMMA interfaces under static load will be found. In addition, the stiffness on fracture strength (PCL-Acetone and PCL-Acetone-PMMA) will be found.

05.08.24 Data Acquisition System for Fluid Dynamics Research

Lillian,Seay *University of Central Oklahoma*

The proposed project will be designed to examine the flow in microjunctions using cutting-edge entropy generation techniques. Using these techniques, we will have an alternative view of how a fluid behaves during microfluidic flow. This will give other researchers a better understanding of the energy losses in any microfluidic system. My research project is to create the most efficient data acquisition system that will process all of the analog inputs from mechanical sensors and change those analog signals into accurate digital representations. The types of sensors disseminated throughout the microchannels are pressure sensors and flow meters, which measure the pressure and velocity of the fluid flowing through the system. I am currently working on a programming code to expand the amount of analog inputs by using an external analog to digital converter. This will allow more pressure sensors and flow meters to be used. Therefore, we can acquire more data and have a better picture of what is going on in the microchannel.

05.08.25 Finite Element Analysis of a Human Lumbar Vertebra

Kyle,Hodges *University of Central Oklahoma*

Morshed,Khandaker *University of Central Oklahoma*

Degenerative disc disease is a chronic condition affecting millions of people around the world. Due to genetics or traumatic injuries, the outer layer of the two-part intervertebral disc (IVD), known as the annulus fibrosus (AF), is damaged and becomes scarred, causing it to lose its structural integrity, leading to the degeneration of the inner layer of the IVD, or the nucleus pulposus (NP). As the degeneration continues, water content is lost from the gelatinous NP, thus diminishing the shock absorption properties of a healthy NP. While prior operative solutions were limited to disc fusion (replacing the defective IVD with bone to eliminate rubbing of two vertebrae), modern approaches are looking at replacing the defective disc with a prosthesis. This aims to maintain the natural and complex motion of the spine while maintaining natural stress distributions. Due to complex geometries and 6 degrees of freedom: compression (up/down), translation (left/right), and rotation in either direction. Implementing finite element analysis (FEA) software on modeled intact lumbar vertebrae opens the door into further understanding of the stresses occurring while offering a digital platform for design and virtual implementation of proposed artificial disc replacements. By using the FEA program ANSYS, the results under compression load were closer than that of prior attempts at UCO.

05.08.26 Effects of Varying Organic Loadings on Bio-Sand Filter Performance

Adrian,Saenz *Oklahoma State University*

Eli,Shepherd *Oklahoma State University*

Kevin,Vo *Oklahoma State University*

Tyler,Autry *Oklahoma State University*

With the introduction of bio-sand filters to developing communities, large populations of people have gained the ability to steadily supply clean water for their families. Bio-sand filters work by using physical straining and biological absorption to capture harmful bacteria from dirty water sources, allowing potable water to pass through the filter media. The challenges of bio-sand filters are that the original filter design cannot handle high concentration of organic material, thus the filter applications are limited. The purpose of this research is to calculate the theoretical maximum and minimum concentration of organic material that a typical bio-sand filter can process. During this experiment, six bench scale cylindrical bio-sand filters were created and loaded with three different organic concentrations. The results of the experiment showed that in every group, bio-sand filters steadily reduce the coliform counts over a time period of two to three weeks, until eventually converging to an absolute minima coliform count. These results clearly show that there is a lower limit to the amount of coliform that a filter can prevent from entering the human body and that at high Total Organic Carbon (TOC) loadings, removal of coliform bacteria is significantly more when compared to lower TOC loadings.

05.08.27 Martian Greenhouse Design for eXploration HABitat

Geoffrey,Kibble *Oklahoma State University*

Long duration, manned space missions to Mars create many challenges for the industry, and logistics of sustainability present some of the most significant questions. Mars' pattern of orbit brings it closest to Earth once every two years, and this is the optimal time to send payload on the two to three hundred day journey. Because of the lengthy gap between optimal launching times, designs for terrestrial missions to Mars must provide storage capable of holding two years' worth of supplies or include the ability to self-sustain. Fresh grown foods are essential for sustainability, and without sustainability, manned missions to Mars will continue to be science fiction. Regular frequent shipping is implausible for replenishing supplies on Mars; even the amount of fuel required to send this large payload during the optimal time poses a problem. This cost alone raises questions about the feasibility of such missions. In order to successfully place a station on the Martian surface, the mission design must include a means for producing food, thereby creating some degree of self-sustainability. Oklahoma State University is investigating various methods for producing food on the Martian surface as part of the 2015 eXploration Habitat (X-Hab) Academic Innovation Challenge sponsored by NASA and the National Space Grant Foundation. Our team is analyzing possible designs in search of the most feasible and useful concepts and will produce a full-scale model to prove their viabil

05.08.28 Evaluation of the Long Term Viscoelastic Properties of a Silicone Gel

Mikasa,Barnes *University of Central Oklahoma*

Morshed,Khandaker *University of Central Oklahoma*

The goal of this research is to determine whether the biomechanical performances of the intervertebral disc (IVD) after a nucleotomy can be mimicked with the use of a silicone gel replacement. We hypothesized that a silicone sample with a 1:1 base to cross-linker ratio may serve best as a replacement. To test this ratio, we evaluated the fatigue viscoelastic properties (creep, oscillation, recovery, and compression) of a silicone gel formation and determined the in vitro performance of the silicone using a cadaver IVD model under several loading conditions. The oscillation tests were evaluated on shear stress values varying from 0-50Pa with a fixed frequency of 1Hz to a controlled stress of 1.25MPa at a varying frequency from 1-100 radians per second. Bovine specimens were also prepared for use of comparison with various new materials in order to validate our results. Stiffness of intact and implanted IVD under the loading conditions of flexion, compression, bending, and rotation has been measured to evaluate the amount of restoration due to the silicone replacement. These results were then compared to the natural bovine specimens that were carefully prepared throughout the semester. The two materials' results correlate strongly, further suggesting that the 1:1 silicone may be an excellent choice.Our results are being used to develop a model to evaluate the usefulness of the implants used for the treatment of degenerated IVDs.

05.08.29 Design and Construction of a Micro Fatigue Tester for Small Animal Models

Charles,Collins *University of Central Oklahoma*

Hakan,Olasmis *University of Central Oklahoma*

Morshed,Khandaker *University of Central Oklahoma*

Ryan,Jordan *University of Central Oklahoma*

Zack,Johnson *University of Central Oklahoma*

There is currently no commercially available fatigue tester for testing on the micro or nano scale. This type of testing would allow for improvements in nano fiber applications in small models. The models would include an intervertebral disc (IVD) model and rabbit femur Implant model. The IVD model will include a silicone disc with aligned fibers along the edge of the disc and random fiber caps on the top and bottom. The rabbit femur model will use a titanium rod in the center with Poly Methyl Methacrylate (PMMA) bone cement covering a portion of the rod; this model tests the strength of the boundary with and without the application of aligned nano-fibers. The goal would be to perform a cyclic load on each of these models while simultaneously collecting data about deflection and load. The tester will also perform a static test on both models that will be compared to previous data for calibration.

05.08.30 EFFECT OF FIBER ARCHITECTURE ON THE FRACTURE STENGTH OF IMPLANT/BIO-MATERIAL INTERDFACES

Morshed,Khandaker *University of Oklahoma*

Yanling,Li *University of Central Oklahoma*

Ti and Ti-based alloys are widely used as implants for hard tissue repair. However, the optimal surface properties of an ideal metal implant have not yet been achieved. The goal of this study is to improve the bio-mechanical performances of Ti implant. It is hypothesized that deposition of fiber can increase mechanical interlock of Ti surface that can enhance in vitro mechanical integration of Ti/cement or Ti/bone interfaces. The research objectives were to (1) test the fracture strength of Ti-cement with one round, two rounds and five rounds of PCL fiber under static load to determine the stiffness effect of fiber on the Ti/PMMA cement interface; (2) test the fracture strength of Ti-cement with PCL fiber and PCL-PMMA fiber under static load to determine the topography effect of fiber on the Ti/PMMA cement interface; (3) test the fracture strength of Ti-fiber-cement with and without heating up Ti before fiber under static load to determine the thickness effect of fiber on the Ti/PMMA cement interface. PCL and PCL-PMMA fibers were produced by electrospinning. The result showed one round of PCL fiber has higher fracture strength than two rounds and five rounds. With PMMA added into the fiber solution, the fracture strength of Ti-fiber-cement increased. Heating up the Ti implant to 50℃ before coating PCL fiber can increase the fracture strength of Ti-cement interface. However, heating up Ti implant before PCL-PMMA fiber doesn’t help improve the quality of Ti-cement i

05.08.31 Metamaterial-Inspired Aerospace Structure for Improved Low-Frequency Acoustic Performance

ANUJ,REKHY *Oklahoma State University*

James,Manimala *Oklahoma State University*

Joseph,Aiken *Oklahoma State University*

Conventional acoustic absorbers used in aerospace structures such as foam, fiberglass or acoustic liners are impractical for low-frequency (LF) noise (~<400 Hz) which contributes to detrimental effects like environmental noise pollution, excitation of airframe vibration modes and reduction of cabin comfort. Research is currently underway at Oklahoma State University to develop a Metamaterial-Inspired Aerospace Structure (MIAS) delivering improved LF acoustic performance in addition to primary load-carrying capability. Metamaterials are manmade structural materials that derive their unique dynamic behavior not just from material constituents but more so from engineered configurations. Inspired by metamaterials, we utilize mass-loaded stretched membrane-type vibro-impact attachments on a baseline structure to create an effective LF acoustic barrier. Incident LF waves are up-converted via impact to higher modes in the backing structure for subsequent dissipation in conventional absorbers. Preliminary testing on 3D printed test articles in an impedance tube demonstrates filtering of LF spectrum to reduce peak transmitted pressure. MIAS prototype is being experimentally evaluated for proof-of-concept. Successful transition to applications will contribute to making commercial aviation more sustainable and enabling new mission capabilities for military vehicles. Moreover, this tunable, passive mechanism is amenable to multifunctional integration for energy harvesting and sensing.

05.08.32 Theoretical Analysis of Microwave Heating of Spherical Shaped Foodstuffs

Mohammad,Hossan *University of Central Oklahoma*

Timothy,Collins *University of Central Oklahoma*

The aim of this research is to find a closed-form solution to the 3-D temperature distribution in a dielectric, spherical shaped object when subjected to the heating of electro-magnetic waves of the microwave frequency range. Such a solution can be put to good use in the food industry, as the design of microwavable food is important. Primarily because microwave heating is non-uniform, and for food safety, a minimal cooking temperature must be met. Knowledge of the potential temperature distribution, in closed-form solution, of spherical shaped foodstuffs would allow better and easier design of microwavable food. To obtain such a solution, Maxwell's Equations, Vector Potentials, and the Poynting theorem are used to find an expression for the heat generated by the EM wave in the dielectric medium. This heat generation term is then plugged into the Heat Equation. Manipulation of the Heat Equation will follow using advanced integral transformations to obtain an analytical solution for the temperature distribution in the dielectric sample. As the project stands, a solution for the EM field distribution has been determined. This EM field will be used to evaluate heat generation distribution within the foodstuff. As the incident EM wave is planar, the power distribution within the spherical object will be non-uniform, and the localized heating will be heavily dependent on the angle, and frequency, of the incoming EM wave.

05.08.33 Design and Testing of a Biomimetic Flagella Propulsion Beam

Kenneth,Bush *University of Central Oklahoma*

Keren,Song *University of Central Oklahoma*

Cilia and flagella are organelles that protrude from the surfaces of many cells, and whose architecture is highly conserved from protists to humans. These complex organelles, composed of over 500 dynein proteins, can be either immotile or motile. Cilia and Flagella are hair like structure that propel cells or move materials in airways and other passages. They are composed of nine outer microtubules doublets that surround a central pair of microtubules. The movement is generally characterized by the bending waves along the length of the flagellum so that a propulsive thrust is developed more or less along the length of the flagellum. How these bending waves are created is not completely known. Our goal for this project is to design and test a physical model that mimics flagella/cilia structure and movement. The research and modeling are based off of what is already known about the structure of cilia and research that has been performed by Dr. Gang Xu in his Biomechanics Research Lab. The deliverables are used to accomplish this: (1) Finite element model based testing to better understand and design the structural mechanics of flagella, (2) Design and build a passive biomimetic beam that mimics that mechanics of flagella, (3) Use an electromechanical device to make the beam active.

05.08.34 Design and Construction of a Portable Tensile and Fatigue Testing Apparatus for Small Animal Models

Morshed,Khandaker *University of Central Oklahoma*

Ryan,Jordan *University of Central Oklahoma*

There is currently no commercially available fatigue tester for testing on the micro or nano scale or an apparatus that is portable. Current testing apparatuses are not easily moved due to their size and weight. Being portable would allow for the testing to be done in the same location where the model was made reducing the possibility of contamination of the sample. Nano scale testing would allow for improvements in nano fiber applications in small models. The models would include an intervertebral disc (IVD) model and rabbit femur Implant model. The IVD model will include a silicone disc with aligned fibers along the edge of the disc and random fiber caps on the top and bottom. The rabbit femur model will use a titanium rod in the center with Poly Methyl Methacrylate (PMMA) bone cement covering a portion of the rod; this model tests the strength of the boundary with and without the application of aligned nano-fibers. The goal would be to perform a cyclic load on each of these models while simultaneously collecting data about deflection and load. The tester will also perform a static test on both models that will be compared to previous data for calibration. Currently the tester can generate a sinusoidal waveform while receiving data from a load cell and DVRT.

05.08.35 Audio Recognition with Applications in Security Monitoring

Blair,Baldridge *Oklahoma State University*

Recognizing the environment around us is an important part of everyday life, and it allows us as human beings to make decisions necessary to perform tasks, or achieve specific goals. For us this is easy we are born with the ability to feel, taste, see, smell and hear, but for a computer or Surveillance system these are not easy tasks. This work is going to describe a technique that can be used in order to perform sound source localization, and audio recognition using a circular microphone array. For the audio recognition algorithm we will explore the extraction of Mel-Frequency Cepstral Coefficients (MFCC's), Zero Crossing Rates (ZCR's), Short-Time Energy (STE), and Spectral Flatness (SFM) as features. Some of these features might contain redundant information, so we will also explore the use of a feature selection algorithm, which will minimize the total number of features extracted, while maximizing the number of correctly classified events. A Gaussian Mixture Model (GMM) is used as a classifier, and created from the extracted features during a training process. After the GMM's have been created the extracted features from the incoming audio are compared to the models for audio classification. The sound source localization algorithm can be used to detect the direction of arrival (DOA) to a particular source. The sound source localization algorithm with audio recognition will allow the surveillance system to determine whether a threat is present.

05.08.36 Determining an Optimal Media System for Multiple Cell Types Within a Lung Model

Brooklin,Ryan *Oklahoma State University*

Heather,Falhenkamp *Oklahoma State University*

Trey,Simpson *Oklahoma State University*

We have developed a Tissue Equivalent Respiratory Model (TERM), which mimics the in vivo lung, and may be used to understand pulmonary disease mechanisms and the effects of therapeutics. The aim of the current study is to understand the effect of various media systems on the growth and differentiation of primary human lung cells. The media systems tested included defined media systems specially formulated for endothelial and epithelial cells, the defined epithelial cell medium with the addition of endothelial cell growth supplements, and a universal media system of RPMI-1640 with 10% fetal bovine serum and 1% penicillin, streptomycin, and L-glutamine solution. The methods included the culture of pulmonary epithelial, fibroblast, and endothelial cells, and the characterization of the seeding efficiency, growth rates, morphology, and viability in multiple culture systems. Our results showed that the epithelial and endothelial cells grew optimally only in their respective, defined culture media; and both failed to survive or showed a dramatically different morphology in any other media system. The fibroblast cells grew in all the tested media systems; however, the cells had the highest growth and viability rates in the endothelial cell media and grew poorly in the epithelial cell media. The results of this study demonstrate the complexities of a co-culture system and have resulted in a new protocol for culturing multiple cell types within the TERM.

05.08.37 To Drive or Be Driven

Amanda,Adney *Southwestern Oklahoma State University*

Cindi,Albrightson *Southwestern Oklahoma State University*

Ingrid,Law *Southwestern Oklahoma State University*

Madeline,Baugher *Southwestern Oklahoma State University*

Rachel,Hurt *Southwestern Oklahoma State University*

The NASA Human Exploration Rover Challenge was created by NASA to allow students to be involved with NASA's deep space challenges and to give students a valuable experience with the various tasks and technologies required to design, manufacture, and test a lunar rover that is durable and capable of performing on various types of environments. NASA requires that each team have at least one female and one male driver. This attempt to get more women involved in male dominated fields has been successful to an extent; yet, there is still not enough importance put on female involvement. By observing the other teams in 2014 it seemed that female roles involved promoting team spirit, decor, paperwork, organizational duties or simply fulfilling the driver requirement. Although these are all necessary applications to the project, females should not be solely utilized with these duties. Other jobs that females, like males, can contribute to include the designing, manufacturing, and testing of the rover vehicle. We will be comparing our research from the other competing teams to Southwestern Oklahoma State University, who avidly encourages females to be a part of all aspects of the team jobs. For our research, we will conduct face to face interviews and anonymous surveys with female and male members from all willing competing teams. These interviews and surveys will inquire how the females from the teams were utilized and how they feel about their involvement on their teams.

05.08.38 Control Mechanism Modeling of Human Cardiovascular-Respiratory System

Qi,Cheng *Oklahoma State University*

Sandeep,Gutta *Oklahoma State University*

According to the World Health Organization, non-communicable diseases like cardiovascular and respiratory diseases are a leading cause of deaths in the world. About 17.3 million people died from cardiovascular diseases in 2008 (about 30% of global deaths). It is possible to predict several cardiovascular and respiratory diseases in advance with right diagnostic information and tools. Mathematically modeling the underlying physiological systems will greatly help in providing accurate diagnostic information. It allows us to accurately quantify the complex interactions between several systems, and predict certain diseases in advance which alter the normal system function. The mechanisms of the cardiovascular and respiratory systems are highly interconnected with each other. In this research, we consider the local control mechanism of the cardiovascular-respiratory system during the transition from awake state to stage 4 non-REM sleep state. A discrete-time model of the cardiovascular-respiratory system with transport delays is considered. The system model is nonlinear and not first-order Markov. We convert the system into a first-order Markov process. We propose an iterative algorithm to find the optimal control inputs that drive the cardiovascular-respiratory system from awake state to sleep state. In each iteration, we linearize the system using the nominal state and input sequences. We perform simulations to show the effectiveness of the proposed method.

05.08.39 Indoor Multiple Sound Source Tracking Using Refined TDOA Measurements

Longji,Sun *Oklahoma State University*

Qi,Cheng *Oklahoma State University*

Sound source tracking has numerous applications, including speaker localization, video conferencing, and smart home design. Time differences of arrival (TDOAs) of sound signals are usually used as the measurements for tracking. In our work, the multiple sound source tracking problem is formulated into a state estimation problem, where the state of one source includes both its coordinates and velocities in a two-dimension space. Since the TDOAs are nonlinear functions of the states, the traditional Kalman filter is not suitable. Instead, the particle filter is used to approximate the posterior distribution of source states using the “particles”. The random finite theory is used to deal with the measurement association issue in multiple source tracking. Obtaining accurate TDOA measurements in indoor environments is challenging due to the presence of multiple sources and reverberations. To get more accurate TDOAs and thus reduce the gap between the measurement model and the measurements, a new approach is adopted. Preliminary TDOAs are estimated at selected time frequency data points, and a TDOA histogram is formed. The final TDOAs are obtained by determining the values corresponding to the peaks of the resulted TDOA histogram. Experiments are conducted to demonstrate the effectiveness of the proposed method.

05.08.40 Research Work on a Possible Setup for Microprocessors & Embedded Controls classes

JACK,LI *Southwestern Oklahoma State University*

There is a big change in microprocessor field. Recently, 8-bit CPUs are being replaced by the advanced 32-bit CPUs, such as ARM CPUs at the same price. 8-bit CPUs are normally used in microprocessor classes while markets ask to use new 32-bit CUPs. Because there are so many functions added to the new CPUs, program designing becomes so complex that it is hard to design software from low level to application level. Using operating systems, such as Linux or QNX, in a microprocessor system is a common way to solve these problems. Operating systems design is very complex, especially for 8-bit systems. Even an embedded operating system is used, there are still more hardware and software designs, such as driver or Board Support Packages (BSP) design. All these new design methods are normally not covered in microprocessor classes. It is so important introduce these new changes to students in order to help them to face to new market. In this project, we try to setup a class to help students to learn these general processes, which include how to setup development system in Linux, how to read and design basic interface circuits as well as embed Linux into systems. The students can get a whole idea how to use the advanced CPUs as well as 8-bit CPUs, which can help students to handle new design requirements from market.

05.08.41 Immobilization of Cardiac Troponin I (cTnI) in a Microfluidic Substrate

Jennie,Allen *University of Central Oklahoma*

Mohammad,Hossan *University of Central Oklahoma*

Regina,Smith *University of Central Oklahoma*

Steven,Karpowicz *University of Central Oklahoma*

Thiago,Omena *University of Central Oklahoma*

Tucker,Teigland *University of Central Oklahoma*

Immobilization of proteins on a microfluidic device is critical for on-chip detection and signal amplification for low abundant biomolecules. The concentration of cardiac biomarker protein troponin I (cTnI) is extremely low in serum which prevents its detection in microchip device. In this project, we present an O2 plasma assisted cTnI immobilization method to complement isotachophoretic concentration and detection of cTnI. Reactive ion etching (RIE) was used to treat the PMMA surface using oxygen plasma to increase surface area. This caused the surface to become hydrophilic, which aided in selective absorption of proteins. The anti-cTnI monoclonal anti-body (mAb) sample was applied manually in the detection site and allowed to incubate for approximately 1 h. After incubation, the surface was washed with PBST followed by nanopure water. After drying, the immobilization of antibodies was verified by respective fluorescent cTnI isoforms under a microscope. The image analysis was done using imageJ software to quantify the increase of cTnI concentration due to antibody amplification by measuring intensity. Currently the project is in progress and we are anticipating a hundred fold increase in cTnI concentration. This immobilization method will be integrated with the on-chip isotachophoresis for development of microfluidic immunoassay for diagnosis of myocardial infraction (MI).

05.08.42 Experiments of Air-flow in Damaged Human Trachea for Surgical Planning

Grant,Armstrong *University of Central Oklahoma*

Currently there are no standardized tools for visualizing stenosis repair before the surgery is attempted. The overall goal of this project is to create a standardized procedure that will allow surgeons to predict the results of a trachea surgery before the surgery is attempted. The goal of this research is to verify the simulation results that have been obtained by constructing a physical test system. A computational tool has been developed that takes MRI and CT scans of a damaged trachea and simulates airflow through the trachea that will allow for the prediction of surgeries on damaged tracheas. An experimental system has been designed and constructed that will experimentally verify these computer simulations. Experimental models have been designed in Solidworks® that will replicate a trachea. One model simulates a trachea with no stenosis and the other replicates a trachea with a stenosis. A system has been designed and constructed to deliver air at constant speed and pressure through the trachea models. The pressure drops and flow rates obtained from the system will be compared to the simulations that have already been run.

05.08.43 Water from Light: Solar Powered Water Filtration For Use in Disaster Afflicted Areas

Ahmed,Alsultan *University of Central Oklahoma*

Ali,Alsultan *University of Central Oklahoma*

Joseph,Aliwali *University of Central Oklahoma*

Kama,Miller *University of Central Oklahoma*

Every year disasters, both natural and man-made, around the globe affect the availability of drinkable water to tens of thousands of people. By designing a solar powered water filtration system we are providing a viable solution to this issue. With any natural disaster, energy availability is also limited. Instead of depending on traditional energy supplies, such as gas or propane powered generators, we are utilizing the more easily obtainable solar power.

05.08.44 Stationarity's Effect on Forecasting the Oil Price

Boshra,Karimi *Oklahoma State University*

It is obvious that unexpected and persistent fluctuations in the real price of oil are playing a main role to the welfare of both oil-importing and oil-producing countries. Additionally, some economy sectors rely on the oil price forecasting for their success. This paper uses oil prices from January 1979 to August 2014 obtained from datamarket website. This study tries to discover whether or not the price of oil is a stationary time series by evaluating the effect of stationarity without considering any seasonality. The results show that the non-stationary model is the better one to forecast the oil prices. The rest of the paper introduces the two different models and justifies the fitness of these models based on ACF, PACF, EACF, BIC, and Time Series plots. Then, a residual analysis and over parameterization were conducted to evaluate the validity of these models. Finally, 3 months of forecasting was completed ahead of oil price data in order to compare the projected results with actual results. It was concluded that the nature of the original data set is non-stationary, so the differenced of log data should be modeled to forecast the future of oil prices.