ALABAMA’S GRADUATE RESEARCH SCHOLARS PROGRAM
- GRSP -

Is unique among National EPSCoR programs. Few states have committed major resources toward the sponsorship and development of its next generation of researchers, scientists, and innovators.

The GRSP is a state investment in Alabama’s universities that will expand research output, attract quality graduate students and make our universities more competitive for quality faculty hires. The program will provide a highly trained workforce to fuel the growth of high technology companies in Alabama. A significant goal of the GRSP is to encourage interdisciplinary training and research, to train professionals for careers in the scrutinized fields, and to encourage individuals from underrepresented groups to consider careers in these fields.
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Birmingham, AL 35294-0107
www.alepscor.org
November 2017

Dear Colleagues,

In FY 2017 the Alabama Legislature invested in Alabama’s future research capacity and economic prosperity by continuing the appropriation to Alabama EPSCoR (formerly Experimental now Established Program to Stimulate Competitive Research) (ALEPSCoR). This program, managed through the Alabama Commission on Higher Education (ACHE), funds the Graduate Research Scholars Program (GRSP). The GRSP, now eleven years old, is a program that has offered research opportunities to over 260 graduate students with up to $25,000/year (sometimes multi-year) awards under the guidance of some of Alabama’s finest research scientists since 2006.

At the GRSP Campus Coordinators’ meeting in May 2017, thirty-two Round 12 recipients were chosen, seventeen of these are new to the program. These students will conduct EPSCoR supported research in Alabama through grants from the National Science Foundation (NSF), Department of Energy (DOE), National Aeronautics and Space Association (NASA), and the United States Department of Agriculture (USDA). As of December 2017, the GRSP has assisted in the accomplishment of 163 PhDs and fifty-three Master’s. Projections for 2018 include eight (8) more MS and nineteen (19) Ph.D. degrees.

I invite you to glance through the following pages to discover some of the exciting research being done by these students in areas such as: cancer research, safeguarding our food supply, solar energy harvesting, neuronal communication, pathogen resistant plants, energy efficient light bulbs, and commercial opportunities for new carbon fiber technologies just to name a few. In addition, we have included updates from students previously featured in this annual GRSP publication; some are continuing their education and research, some have graduated and are busy with jobs, post-doctoral positions, or starting companies.

Thank you for your interest in the Alabama EPSCoR Program and especially the Graduate Research Scholars Program.

Sincerely,

Ray Vaughn, PhD
Chair, Alabama EPSCoR Steering Committee
Vice President for Research
University of Alabama in Huntsville
November 2017

The Graduate Research Scholars Program (GRSP), now in Round Twelve, continues to be a great opportunity for outstanding Alabama students and mentoring faculty members. Each year as we gather updates from students on the impact of the GRSP I am always very impressed by the accomplishments and how the program affected their lives.

To highlight a few who have gone on to better things: Sherita Moses, GRSP Rounds 9 and 10 recipient and a 2016 AAMU PhD graduate, recently received official patent paperwork for a compound she invented that could help women diagnosed with triple-negative breast cancer. William Gaillard, a recent UAH PhD graduate in electrical engineering, is working as a UAH research consultant, has one patent and has applied for three more. Mercedes Berkovich used NASA Earth Observations to find oyster reintroduction areas along the Gulf Coast. Finally, Jeremy Peppers is now working as a laser scientist in Birmingham.

Karim Budhwani, a UAB GRSP awardee during Rounds 10 and 11, recently filed a second drug delivery device patent. His research efforts have been accompanied by outreach to an UAB undergraduate and three Birmingham high school students. These three high school students will be studying Chemical Engineering at Vanderbilt and MIT.

Other GRSP students have gone on to do post-doctoral work, these include: Bo Cheng at the University of Louisville, Justin Havird, Colorado State University, and Hunter Sims at Vanderbilt University/Oak Ridge National Laboratory.

Our GRSP presenter at the December 2017 meeting of the Alabama Commission on Higher Education is Dr. Alfred Tcherbi-Narteh, a GRSP recipient from Rounds 6 and 6 Supplement, who now serves as a Tuskegee University faculty member in the Materials Science and Engineering Department.

I know you join me is wishing all GRSP students much success in their chosen professions. I encourage you to take a few minutes to review the wonderful array of GRSP research and career paths. Alabama’s GRSP Program is an investment in Alabama’s future. With this document, we hope to show you how the GRSP has impacted our students, our institutions, and our state.

Sincerely,

Chris Lawson, Ph.D.
Alabama EPSCoR Executive Director
Chair, EPSCoR/IDeA Coalition Board
Department of Physics, University of Alabama at Birmingham
The Alabama Experimental Program to Stimulate Competitive Research (ALEPSCoR) Graduate Research Scholars Program (GRSP) was established in 2006 by the Alabama State Legislature through a $1 million increase in a line item appropriation to the Alabama Commission on Higher Education, fiscal agent for funds to the ALEPSCoR Program. The intent of the legislative funding is three-fold: 1) to strengthen and enhance the research capacity of ALEPSCoR institutions\(^1\) by positioning them to be more competitive in attracting eminent senior faculty, 2) to retain for Alabama the brightest and best of our graduate students for careers in disciplines related to science and engineering, and 3) to address the economic need for highly trained professionals to ensure the growth of emerging technology companies in this state.

Initially GRSP funding was targeted to support graduate students associated with the four (4) Centers of Excellence funded by the National Science Foundation (NSF) EPSCoR Infrastructure Improvement Award (RII-2). In FY 2007-08, the program was expanded to include qualified students at all ALEPSCoR universities whose proposed research or field of study and career interests are congruent with the funded science and technology EPSCoR programs of the National Science Foundation (NSF), Department of Energy (DOE), National Aeronautics Space Administration (NASA), U. S. Department of Agriculture (USDA), and the Environmental Protection Agency (EPA).

The success of Alabama’s long term commitment to promoting the education and careers of its most talented graduate students cannot be overstated. Since 2006, the Legislature has appropriated over $8.1 million in support of the GRSP. As of December 2017 more than 260 students have been recipients of 473 awards, with a number of students benefitting from multi-year full and partial awards. This support has led to the achievement of 163 Ph.D. and 53 Master’s degrees.

The highly competitive process includes the circulation of a Request for Proposal, rigorous internal institutional review and ranking of applications, and selection by members of a peer review team which makes recommendations for final awards. The twelfth round of competition was conducted April-May 2017. Of the 66 applications, 32 awards were granted which included 17 new GRSP recipients.

\(^{1}\)Alabama A&M University, Auburn University, Tuskegee University, The University of Alabama, University of Alabama at Birmingham, University of Alabama in Huntsville, and University of South Alabama.
MA/MS Degrees by Subject 2007-2017

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<td>Materials Engineering</td>
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PhD Degrees by Subject 2007-2017

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<td>Veterinary Medicine</td>
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<tr>
<td>Wildlife</td>
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</table>

Mika Houserova (page 13) is investigating why Salmonella bacteria survive in unfavorable conditions (e.g., high heat, nutrient deprivation, antibiotics, etc.). In the above simple test, Salmonella, when under stress, produces a viscous ‘sticky’ protective protein coating (darker color).
Dr. Alfred Tcherbi-Narteh, a native of Ghana, earned his Bachelor and Master of Science degrees in Mechanical Engineering from Belarus. He moved to the United States in the late 90s and in January of 2008 joined Tuskegee University for further graduate studies in Mechanical Engineering. As a graduate student, he was consistently involved in cutting-edge research in Advanced Materials Science and participated in numerous technical presentations and competitions, winning several awards. Upon completion of his second Master’s degree in Mechanical Engineering, he joined the department of Materials Science and Engineering, where he worked to earn his Ph.D. degree under the advisory of Dr. Mahesh Hosur. Upon completion of his Ph.D. graduate studies in Materials Science and Engineering, Dr. Alfred Tcherbi-Narteh accepted a teaching and research position at Tuskegee University. His research spans enhancing properties and usage of fiber reinforced polymer composites particularly in outdoor applications to research in development of green and bio-renewable materials with properties comparable to that of synthetic materials.

Dr. Tcherbi-Narteh believes in the power of education, as an instrument to a successful future. He is passionate about education and mentoring and believes technological advancements have created an enormous burden on this generation - increasingly distracting students both in the classroom and in daily life. He sees and accepts this challenge and is always working on innovative solutions to accomplish education objectives. He mentors undergraduate and graduate students across disciplines and constantly challenges students to be creative thinkers and develop problem-solving techniques/skills. He is passionate about the earth and its natural resources. His research focus has been on enhancing various polymeric material properties using different nanoparticles. In recent years, he has been working on studying the interactions between different nanoparticles as binary reinforcements in polymer composites and their use as matrix in hybrid fiber reinforced polymer composites. This will ensure increased applications across different industries, where durability has been an issue. This may also result in an efficient way of using fewer natural resources and provide increased protection of natural resources for the next generation. Dr. Tcherbi-Narteh is always challenging himself and his students to be the best they can be. He believes that once you put your mind to something, the only impediments are yourself and lack of preparation, both mentally and physically. At Tuskegee University, he is actively engaged in research and teaches graduate courses in the Department of Materials Science Engineering and undergraduate courses in the Department of Mechanical Engineering.
Alabama EPSCoR
Graduate Research Scholars Program

Featured Scholars
Round Twelve Awardees are comprised of new and renewing students. Information on new awardees follows, updates on renewing Round 12 awardees can be found on page 28 while updates on previously funded students can be found in the GRSP and Beyond Section starting on page 30.

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<th>Name</th>
<th>Inst.</th>
<th>Target degree</th>
<th>EPSCoR funding</th>
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<tr>
<td>Kristopher Liggins</td>
<td>AAMU</td>
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<td>Jonathan Mills</td>
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<td>Jafar Orangi</td>
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<td>Mohammad Bhaktiar Uddin</td>
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<td>Mohanad Idrees</td>
<td>TU</td>
<td>MS</td>
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<td>Christina Young</td>
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<td>Timothy Howton</td>
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<td>Dominique Everett</td>
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<td>Dominika Houserova</td>
<td>USA</td>
<td>PhD</td>
<td>NSF 1350064</td>
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Mohammad Bhaktiar Uddin  
Tuskegee University  
Round 12 Recipient  
NSF EPSCoR RII Track 1 Grant # 1158862  
Expected graduation in 2018, M.S. in Materials Science and Engineering  
muddin9658@tuskegee.edu

Objective  
To create a less expensive processing technique for bismaleimide (BMI)/Carbon Fiber (CF) composites and to study the effect of the incorporation of carbon nanotubes (CNTs) upon the thermal and mechanical properties of this composite.

Research Abstract  
- Bismaleimide (BMI) resin is a polymer which can withstand very high temperatures. Due to its high thermal properties it has applications in aerospace and aeronautical industries.
- Carbon fiber reinforced bismaleimide resin composites are usually produced using an ‘Autoclave mold process’, which is a very expensive processing technique.
- The aim of this research is to create an economical out-of-Autoclave (OOA) production process.
- To determine if it is possible to improve the properties of BMI by the incorporation of carbon nanotubes.

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?  
My inspiration to continue graduate education is to use my research and accumulated knowledge to improve the overall socio-economic scenario of the world. I was interested in this particular research topic because working with a high performance composites can cause a significant impact on the research field of advanced materials.

Future Plans  
To pursue doctoral degree in the field of materials science and engineering and conduct research to bring positive change in the society.

Faculty Advisor  
Dr. Shaik Zainuddin  
Materials Science and Engineering  
Tuskegee University  
Tuskegee, Alabama 36088  
334-724-4222  
szainuddin@tuskegee.edu
**Objective**
The proposed research involves the fabrication and characterization of a complex porous membrane for environmental remediation that utilizes various water decontamination mechanisms (photocatalysis, adsorption, and particulate size exclusion).

**Research Abstract**
- The rapid growth of water pollution attributed to widespread material processing procedures poses a multi-variable threat to worldwide public health. Depending on the source of pollution, contaminated water can potentially contain particulates with varied chemical compositions, dimensionalities, and toxicities.
- The fibrous membrane proposed contains nano/micro continuous photocatalytic composite fibers integrated with activated carbon charcoal to serve as an adsorbent constituent within the system which can ultimately serve as a cost effective solution for water contamination.

**List of Recent Publications/Presentations/Honors**
2016-2017 CDC National Institute of Occupational Safety and Health: Deep South Pilot Project Training Grant Electrospun Mn-doped Titanium dioxide and Bismuth ferrite nanofibrous composite network: Effective photo-degradation in visible light; October 13-14- Auburn University NanoBio Summit 2016; Dominique Everett, Andrew Wood, Vinoy Thomas

**What inspired you to continue graduate education and/or pursue research? Why this particular research topic?**
My inspiration to continue graduate education was continuing to grow as an engineer while engaging in scientific research. The research motivation was driven by the broader impact of contributing a low cost and minimum energy tool of water remediation to impoverished communities worldwide.

**Future Planes**
I have aspirations of fulfilling a role within an industrial research and/or advanced technology environment as an engineer to further apply my analytic perspective to solve scientific problems and extend limitations that have societal impacts.

**Faculty Advisor**
Dr. Selvum Pillay
Materials Science & Engineering
University of Alabama at Birmingham
1150 10th Avenue South
Birmingham, AL 35294
(205) 996 5797
Pillay@uab.edu
Objective
My research focuses on identification of novel, non-coding sRNA found in Salmonella in attempt to understand how these bacteria survive in unfavorable environments such as high heat, antibiotic treatment, and oxidation. This work will hopefully lead to the identification of not only numerous new genes in this pathogen, but also lead the way for identifying countless similar genes across an array of other medically relevant bacteria.

Research Abstract
• Salmonella are rod-shaped bacteria that, according to World Health Organization (WHO), cause approximately ten million cases of salmonellosis (Salmonella infection) each year, some of which result in death.
• Small, non-coding RNAs (sncRNAs) are biomolecules known to be a strikingly potent genetic regulator which can help bacteria, such as Salmonella, increase resistance or even alter virulence factor.
• By sequencing all the RNA found in Salmonella after exposure to various stresses and computationally comparing it to sequencing data from unhindered samples, our team has identified over 200 novel sRNA in nutrition-starved Salmonella suspected to regulate ‘survival’ genes.

List of Recent Publications/Presentations/ Honors
Publication and presentations:

Honors:
2016 Eastern Analytical Symposium Student Researcher Award EAS (2016); President’s List: multiple terms; Dean’s List: multiple terms

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
I was a bit of a late bloomer with regard to my interest in biomedical research. As a child of two IT software technicians, I was exposed to the natural sciences very sporadically and my only connection to actual research was through Scientific American and the occasional news article. All this changed when I enrolled at the University of South Alabama and took my first science course, Biology 101 for non-majors. There I finally saw all the chemistry and mathematics from the magazines come to life in a practical, real-life laboratory setting and it was thrilling. My life became irrevocably intertwined with science when I joined my first research laboratory, and even though I did not end up staying in that particular lab, it was there that I learned to love research with all of its excitement and tediousness.

I chose this project because I believe that there is still so much we do not know about genetics and many related metabolic processes. My hopes are that this work will broaden our knowledge of bacterial resistance and virulence genes, as well as sRNA regulation of genetic expression in general.

Future Plans
After finishing my Ph.D., I would like to continue in academia and become a college professor to help educate future generations about the importance of scientific research.

Faculty Advisor
Glen Borchert, Ph.D.
Department of Biology, Pharmacology Department
University of South Alabama
Mobile, AL 36688
251-460-7310
borchert@southalabama.edu

Identification of novel small non-coding RNAs in Salmonella

Dominka (Mika) Houserova
University of South Alabama
NSF Co-funded CAREER Award #1350064
Expected graduation in 2020, Ph.D., Basic Medical Sciences
dh1001@jagmail.southalabama.edu
Objective
The aim of this research is to elucidate a novel pathogenic strategy used by phytobacterial to manipulate a host plant’s metabolic pathways.

Research Abstract
Much of the recent work done on plant-pathogen interactions focuses on the plant immune system. Valuable insights about the plant immune system has led to a better understanding of how a pathogen can suppress the plants defenses. However, suppression of the host immune system is not the ultimate goal of a pathogen. All life forms, including invading bacteria, must acquire nutrients. Nutrients, in the form of macromolecules, are broken down to produce the chemical energy needed for survival and proliferation.

My work seeks to explain one way that pathogenic bacteria can manipulate the host’s innate metabolic pathways, such as the glyoxylate cycle, to acquire the needed nutrients for survival and proliferation. By identifying key genes involved in this aspect of the plant-pathogen interaction, more robust and resistant plants could be created through various genetic and agricultural strategies.

List of Recent Publications/Presentations/ Honors
• Harold Martin Award for excellence in Biology in 2017
• 2017 Ireland Research Travel Award


What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
My natural curiosity and love of biology left little doubt in my mind that I would seek a career in research. I enjoy being a part of a community of people focused on discovering new things and sharing that knowledge with others. I chose this research topic because I have always been fascinated by the evolutionary arms race between organisms and their respective pathogens.

Future Plans
Following the completion of the PhD, I plan to pursue a career in research and education.

Faculty Advisor
Dr. Shahid Mukhtar
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Objective
The objective of this research is to engineer properties of carbon derived from pyrolysis packaging waste, using different synthesis routes and investigate its performance in energy storage and polymer filler applications using 3D printing as a manufacturing technique.

Research Abstract
• Pyrolysis of packaging waste using different synthesis routes.
• Testing high surface area carbon for energy storage applications.
• Testing highly crystalline carbon for polymer filler applications.
• Investigating 3D printing as a manufacturing technique for polymer composites.
• Obtain carbon by burning packaging waste to make super-capacitors and improve polymers properties.
• Making products from packaging waste will help reduce waste disposed to landfills and change the economics of waste management.

List of Recent Publications/Presentations/ Honors:

What inspired you to continue graduate education and/or pursue research?
Through my entire life I've wanted to help people in poor communities. I realized this would not come true without gaining extra knowledge and research experience. My research on carbon materials and 3D printing of polymers could help poor communities make their own consumables from available raw materials. It could also help small industries begin plastic recycling and improve their supply chain since they will be able to create spare parts through 3D printing and eventually decrease downtimes to maximize profits.

Future Plans
After completing my MS, I will begin a PhD focusing on the same research theme ultimately pursuing a career in academia or research and development.

Faculty Advisor
Dr. Vijaya Ranagri
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Tuskegee University
1200 W. Montgomery Road
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vrangari@tuskegee.edu
Objective
Clean energy technologies, in this case electrochemical water splitting, will be investigated to promote hydrogen production using affordable and energy-saving processes.

Research Abstract
To address the global energy challenge due to the increase in consumption of fossil fuels, clean energy technologies have received substantial attention. Hydrogen is an ideal clean chemical fuel for storage and supply due to its small molecular mass and high energy density. Transition metal phosphides, especially nickel-based phosphides, have been reported as active electrocatalysts or co-catalysts to produce hydrogen. This study will provide an easy-to-follow synthesis procedure to improve the electrocatalytic activities of nickel phosphide (NixPy) nanoparticles and their promising application in clean energy technologies.

List of Recent Publications/Presentations/ Honors

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
I have always believed that education is the key that unlocks all opportunities; so with this in mind, continuing my education was a major move to further my intellectual richness towards my career path. With the ever increasing demand for energy and aggravated environment pollution, I am particularly interested in clean and renewable energy research as it represents a promising solution for energy sustainability.

Future Plans
After completing my PhD studies at the University of Alabama, I would like to contribute my knowledge and experience to the growing search of clean, sustainable and renewable energy.

Faculty Advisor
Shanlin Pan, PhD
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Objective
To understand how ambient glutamate influences excitatory synaptic transmission in the brain.

Research Abstract
Glutamate is a chemical in our brains that allows cells called neurons to communicate with one another. Although glutamate release from neurons is well regulated, our brains maintain a low concentration of “ambient glutamate” in the extracellular space between cells. While the change in ambient glutamate has been implicated in cocaine withdrawal and depression, we are yet to determine how this concentration is set and how it affects neuronal communication. Our work takes an important step towards understanding how the brain functions when healthy, which is important if we are to understand what goes wrong in disease.

List of Recent Publications/Presentations/ Honors


What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
I am interested in pursuing research because it provides me the tremendous privilege of learning something new every day. When I do an experiment and arrive at a result, for a few minutes I am the only person in the world with knowledge of that piece of information about the brain. I also enjoy helping young people who come into the lab to learn to think and ask questions.

Glutamate is a particularly interesting molecule to study because while it is crucial for communication to occur between neurons in the brain, any change in glutamate concentration can cause damage and lead to the death of neurons.

Future Plans
After obtaining my doctoral degree, I am interested in pursuing a post-doc before working as a scientist in the biotechnology industry.

Faculty Advisor
Dr. Jacques Wadiche
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Objective
The research objective is to stabilize nanocrystalline materials against grain growth to maintain properties.

Research Abstract
• Nanocrystalline grains yield exceptional strength, but they grow when thermal energy is provided.
• Stabilizing these grains against thermal growth would allow for use at high temperatures.
• Reducing the instability of the grains through alloying is one proposed method to inhibit growth.
• This work will examine two alloys which are modeled to show nanocrystalline stability.

Future Plans
My plans for the future are to work in industry as a material analyst for production and failure analysis.

Faculty Advisor
Dr. Gregory B. Thompson
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List of Recent Publications/Presentations/ Honors
Recipient of the Graduate Council Fellowship 2016-2017

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
I was inspired to pursue graduate research in a topic which ties cutting edge technology to a manufacturing technique which has become increasingly vital in the manufacturing industry.
Objective
The purpose of this research is to understand how the addition of nanoparticles can enhance the luminescence of rare-earth doped sodium borate glasses.

Research Abstract
• Sodium Borate glass is embedded with Dy3+, Sm3+, and Tb3+ which produces a white light when exposed to a laser diode.
• Under 405nm laser excitation the glass emits a strong orange color with a color temperature of 1599K.
• Under 375nm laser excitation the glass emits a greenish-white color with a color temperature of 3756K.
• It was found that under the right conditions Dy3+, Sm3+, and Tb3+ can be a viable option to produce white light.
• This research is important because it examines new techniques for producing multilayer phosphors coatings with nanoparticles embedded for white light production. This is beneficial to society because it can introduce new energy efficient light bulb options that can be used for everyday use.

List of Recent Publications/Presentations/ Honors
2. Liggins, Cristopher, Dr. Alexandru Atim. A Catalan Type Identity for k-Fibonacci Numbers, Carolina Math Seminar, October 2011, Charleston, SC.
4. Liggins, Kristopher, Dr. Naima Naheed. Suppressing the Large Oscillations of a Spring-Mass System, South Carolina Academy of Science, April 2012, Aiken, SC.

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
The inspiration to continue my graduate studies and pursue further research comes from the time that I spent doing community service as an Americorps member. During this term of service, I saw firsthand the dire need for affordable luminescent devices. This realization motivates my research every day to produce something that will enhance the livelihood of everyone.

Future Plans
After graduation, I plan to start the ground work for starting my own non-profit organization aimed at advancing STEM opportunities extended to the African American youth in poor demographic areas.

Faculty Advisor
Vernessa M. Edwards, Ph.D.
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Objective
This research explores sensing techniques with portable Raman spectroscopy to rapidly detect adulterants in pure honey. Enhanced algorithms and sample preparation methods will be tested for reducing spectral noise and fluorescence, to permit rapid detection of hidden adulterants.

Research Abstract
- Adulterants blended with honey, such as high fructose corn syrup, beet syrup, and brown rice syrup, are difficult to quickly detect and have been fraudulently marketed as pure honey.
- Raman analysis can take seconds, but suffers from noise and fluorescence in honey’s spectra.
- Complex sugars in pure honey will be diluted to enhance the Raman spectra for analysis.
- Novel algorithms to reduce fluorescence in the Raman baseline will be coded to improve detection.
- My research will assist in safeguarding the food supply and protecting against fraud, while developing techniques applicable to additional studies.

List of Recent Publications/Presentations/ Honors

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
Research and working towards a PhD has always been a personal aspiration. I have a passion for adapting technology to solve problems, especially when sensors, digital systems, and lasers are involved. I endeavor to uncover knowledge and create solutions to help others.

Future Plans
I plan to continue my education and research at Alabama A&M University into the PhD program next fall.

Faculty Advisor
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Department of Physics, Chemistry and Mathematics
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Anup.Sharma@aamu.edu
Combining MEG and fMRI to examine dynamic brain activity during verbal memory and learning task

Sangeeta Nair
University of Alabama at Birmingham

Round 12 Recipient
NSF EPSCoR RII Track 2, # 1632891
Expected graduation in 2020, PhD, Behavioral Neuroscience
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Objective
My project aims to examine dynamic aspects of memory and learning processes in healthy subjects by integrating complementary brain imaging techniques: functional magnetic resonance imaging (fMRI) and magnetoencephalography (MEG).

Research Abstract
FMRI and MEG are both noninvasive imaging tools used to safely observe brain function during various tasks, but these methods have different physiological bases. FMRI is a hemodynamic method, indirectly measuring brain activity via blood flow, while MEG is an electrophysiological method, indirectly measuring brain activity via generated magnetic fields. These different methods have complementary strengths: fMRI has millimeter spatial resolution for brain activity, while MEG is sensitive to brain activity down to the millisecond. FMRI can tell you where activity is taking place, and MEG can tell you when.

By optimally merging these two techniques while participants perform verbal and non-verbal memory processes we can maximize the strengths of each method and examine spatial and temporal correlates of memory and learning. The framework developed to spatially and temporally characterize healthy verbal memory and learning circuits may be applied to clinical populations to provide better assessment of memory in disease states.

Recent Publications and Presentations

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
Since my first exposure to functional and structural MRI techniques, my research interests have evolved considerably. I am fascinated by the strengths and limitations that accompany various neuroimaging modalities and understanding ways of efficiently combining different techniques to optimally investigate the dynamic, distributed nature of higher-level cognition and executive functioning.

Future Plans
I plan to continue on a traditional academic trajectory after completing my Ph.D., pursuing post-doctoral studies before working to secure a tenure-track position at a research-focused academic institution. Additionally, I have an interest in simultaneously getting involved with science policy advocacy.

Faculty Advisor
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Objective
Carbon Nanotubes (CNTs) have remarkable thermal, mechanical and electrical properties that make them ideal candidates for diverse engineering and space applications. The objective of this research is to develop innovative computational procedures for understanding field emission characteristics of single and array of CNT structures at higher temperature and pressure.

Research Abstract
The increasing demand for system miniaturization and high power density energy produces excessive thermal loads on the electronic circuits or thermal devices in missiles, aircrafts or spacecraft. Nanotube based 3D microstructures have shown strong potential as efficient thermal materials with enhanced functionality. The widespread applications of these complex 3D nanostructures, are still limited due to lack of understanding of electronic, thermal flux and dissipation characteristics. These properties can be studied using computational modeling and simulation approaches. Topologically accurate 3D nanotube structures will be generated using a novel Computer Aided Design (CAD) based modeling technique followed by the study of thermal transport properties and field emission characteristics of these structures using atomistic simulations. If these technologies are successful, it will enable significant changes to the bulky space power electronics, paving the way for leaner and efficient space avionic subsystems for extreme environments.

List of Recent Publications/Presentations/ Honors

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
Since young age, I was highly interested in science and technology based television documentaries on Discovery and National Geographic Channels. In one show featuring supercars, I was introduced to super strength materials made of carbon fibers that make high speed cars safer, lighter and more fuel efficient. I later learned about the exceptional properties of carbon nanotubes (CNTs) and how they have fascinated the research community since their discovery in 1991. The wide-spread application of CNT is still limited due to a lack of understanding of some of their characteristics. This motivated me to pursue my doctoral research in computational nanomechanics, with specific emphasis on understanding the thermal and field emission characteristics of nanotube and nanotube based composites. I believe such a novel computational study will be a game changer in thermal and shock management in space electronics.

Future Plans
I plan to pursue a career in academic or aerospace engineering Research and Development (R&D) with particular focus on nanomaterial based composites for engineering applications.

Faculty Advisor
Dr. Vinu Unnikrishnan
Department of Aerospace Engineering and Mechanics
The University of Alabama
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Objective
To understand the underlying mechanisms of breast cancer metastasis and associated drug resistance using in vitro biomimetic materials platform.

Research Abstract
We engineer the environment experienced by metastatic breast cancer cells in body using polymeric hydrogels (Jell-O like substances) which mimic key features of the tissue. By studying the interactions of metastatic breast cancer cells and hydrogels, we can deduce the role of environmental factors in metastatic progression of the disease and come up with novel therapeutic targets. In addition, we study the impact of these factors on efficacy of various chemotherapeutic drugs against metastatic breast cancer cells. The polymeric hydrogels provide a physiologically relevant platform with precise engineering control to further the understanding of tumor-microenvironment interactions. They can be employed as a tool for anticancer drug screening prior to animal/clinical studies.

List of Recent Publications/Presentations:

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
I feel that the application of knowledge is highly important for scientific progress and graduate research allows me to apply my academic skills to answer scientific questions. My current research topic intrigues me because it lies at the interface of biology and engineering, which will revolutionize the way we understand modern medicine.

Future Plans
My long-term career goals are to involve myself in biomedical research in academia or in industrial R&D.

Faculty Advisor
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Synthesis of Two-Dimensional (2D) Vanadium Carbide as fillers for polymer nanocomposites

Jafar Orangi  
Auburn University  
Round 11 Recipient  
NASA EPSCoR, # NNX15AK29A  
Expected graduation in 2020; PhD, Materials Science and Engineering  
Jzo0018@auburn.edu

Objective  
The main objective of the research is to understand the role of transition metal elements in the MXene structures on the properties of polymer nanocomposites made using these two-dimensional (2D) materials as fillers. The properties of the copolymer nanocomposites made using V2C MXene as the filler will be compared to those made from other 2D materials. Also, the effect of various synthesis routes on the surface chemistry of V2C sheets and the possibility of the synthesizing porous V2C sheets will be studied. The synthesized materials will be tested as conductive fillers develop advanced dielectric polymer nanocomposites.

Research Abstract  
- New materials with engineered structures are necessary to advance electronic and energy storage devices. Advanced 2D materials can provide the required properties.
- Synthesis of 2D V2C sheets through different methods.
- Modifying V2C surface chemistry.
- Evaluate the effect of using V2C as a filler on the dielectric response of polymer based nanocomposite.

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?  
I like performing research that requires overcoming various challenges on a daily basis. It forces me to come up with innovative ideas and is an effective way to improve my skills. I chose this topic because it involves studying the properties of an interesting family of 2D materials. This is a fast-growing field and results addressing some of the energy problems of the future.

Future Plans  
After graduation, I intend to work in R&D industries focused on energy storage technologies or biomaterials.

Faculty Advisor  
Majid Beidaghi, PhD  
Materials Engineering Program  
Department of Mechanical Engineering  
Auburn University  
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Establishing in vivo-like glioblastoma stem cell niche by mediating nitric oxide, hydrogel stiffness, and oxygen concentration

Suengio (Joe) Park
The University of Alabama
Round 12 Recipient
Alabama NSF EPSCoR Co-funding, #1604677
Expected graduation in 2019, PhD, Chemical and Biological Engineering
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Objective
The goal of this study is to engineer a niche of glioblastoma stem-like cells (GSLC) to understand and provide a platform for GSLC targeted therapy.

Research Abstract
Brain tumors are one of the most aggressive and almost incurable cancers for now. Even with rigorous treatments involving chemotherapy, radiation therapy, and surgical techniques, complete eradication of brain tumors remain difficult and patient survival has not improved over the last several decades. This is due to the poor targeting of the origin of cancer. By developing a brain tumor model similar to an actual tumor will provide a great platform for studying brain tumor therapy.

List of Recent Publications/Presentations/ Honors


What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
Seeking undiscovered knowledge inspires me. In this perspective, studying glioblastoma is a big challenge because its survival rate has not changed over the past 30 years.

Future Plans
I plan to graduate with a PhD degree and pursue a professional job as an independent researcher.

Faculty Advisor
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Objective
My project aims to study and explore the customizability of polyphosphonite polymers. Ideally, the structures of these polymers can be finely tuned to make them useful in a variety of applications.

Research Abstract
• These polymers will be tuned to be optical limiting films that block high-powered laser light, but allow normal light to pass. For example, this can benefit pilots who can be disrupted by citizens using laser pointers while at the terminal.
• Another design of these polymers could aid in hydroformylation catalysis, which is a method for producing millions of tons of aldehydes a year.
• The final design to be studied should be able to bind, and therefore remove, heavy metal contaminants from sources such as wastewater.

List of Recent Publications/Presentations/Honors

Totsch, T. R.; Freeman, J. L.; Zhao, Q.; Wang, J.; Zhang, Y.; Prado, J. R.; Stanford, V.; Lawson, C. M.*; Gray, G. M.* Synthesis, thermal characterization, and applications of various polyphosphonates. Presented at the Southeast/west Regional Meeting of the American Chemical Society 2016, Columbia, SC.

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
My natural curiosity and affinity for science courses led me to continue graduate education in chemistry. This particular research group and topic I was very interested in due largely to the importance of polymers and their contribution to the growth of our society.

Future Plans
I plan to finish my graduate work within the next year and pursue a career in the chemical industry.

Faculty Advisor
Dr. Gary M. Gray
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Objective
To improve current continuous glucose monitors by using biomimetic solutions to selectively modify bacterial cellulose for longer signal stability of the biosensor.

Research Abstract
• In the US alone, 29 million diabetics are subjected to 4-8 pricks to monitor their glucose with each test strip averaging $1.80 USD.
• In the interest of assisting diabetics with cost effective and painless monitoring of glucose, continuous glucose monitors should be improved for longer membrane stability.
• By genetically modifying bacterial cellulose with wax ester synthesis genes, the bacterial cellulose membrane will exhibit hydrophobicity.
• The modified bio-nano material will not only improve water seepage of the biosensor membrane, but help introduce another alternative to the “paper or plastic” option.

List of Recent Publications/Presentations/ Honors

What inspired you to continue graduate education and/or pursue research? Why this particular research topic?
Research is the pinnacle of knowledge and as sustainability becomes a bedrock of most disciplines, we turn to nature for blueprints. Biomimicry is the future for sustainable technological advances.

Future Plans
I plan to continue exploring the intersection of electronics and biological interfaces by pursuing a doctorate degree at Tuskegee University then serving the Department of Defense laboratories based in Huntsville, Alabama.

Faculty Advisor
Mahesh Hosur, PhD
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Tuskegee University
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<td>Alan Hanley</td>
<td>AU</td>
<td>PhD</td>
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<td>Rajdeep Shakya</td>
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<td>Valeria King</td>
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<td>Fariborz Bayat</td>
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<td>Jackson Cunningham</td>
<td>USA</td>
<td>PhD</td>
<td>NASA NNX16AT47A</td>
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Alabama EPSCoR
Graduate Research Scholars Program

**GRSP and Beyond**
*A follow-up on previously featured scholars and alumni*
Fariborz Bayat  
University of South Alabama  
Recipient, Rounds 11 and 12  
NSF EPSCoR RII Track 1, Award # 1158862  
Expected graduation in 2018, MS, Mechanical Engineering  
fb1001@jagmail.southalabama.edu

The microstructure of the Z-aligned nanofiber-stitched carbon fiber reinforced polymer (CFRP) composite was modeled as a periodic unit cell which was the representation of the material at the smallest scale. The unit cell was initially constructed using two carbon fibers (CF) and a polymer matrix that were designed and put together in SOLIDWORKS. Then appropriate boundary conditions were defined to assure that the cell was fixed in place and a displacement load was applied to analyze the reactions of the cell using Ansys. Stress, strain and deformation data were gathered through which some of the material properties of the cell were evaluated. Next, the carbon nanofibers (CNF) were created to be placed inside the unit cell in the direction of the thickness (Z-direction). The CNFs were designed as additional reinforcing components and were only to occupy a certain percentage of the matrix's volume. This requirement resulted in creation of 32 CNFs which were placed inside the unit cell. The analysis was then performed on the new unit cell containing the Z-aligned CNFs.

Finally, to make the results as accurate as possible, the conditions expected to be experienced by the real microstructure of the composite were created and included in the analysis. For this reason, eight additional unit cells were created, four for the original cell (without CNFs) and four for the new cell (with CNFs). Each type of unit cell was surrounded by four new cells of its kind which were attached to it in the XY plane from each side. The analysis was then performed on both unit cells and the calculated properties indicated more than a 14 % improvement resulted in the modulus of elasticity of the composite when Z-aligned nanofibers were present. Other properties of the material such as the Poisson’s ratio also indicated a noticeable improvement due solely to the addition of nanofibers. Therefore, at this stage of the research the unique design of the Z-aligned CFRP is already concluded to have significant positive impacts on the material properties of CFRP composites. The study will continue by investigating more mechanical properties and conducting a parametrical study to better understand the behavior of this type of material. The goal of the research is ultimately to provide an insightful modeling approach for academia to understand the behavior of the emerging multiscale CFRP.

List of Recent Publications/Presentations/ Honors
- Presented research project to Airbus Americas
- Presented research project to the Hexcel Corporation

Jinnan Chen  
University of Alabama in Huntsville  
Recipient, Rounds 11 and 12  
NSF EPSCoR RII Track 1, # 1158862  
Expected graduation in 2019, PhD, Electrical Engineering  
jc0082@uah.edu; jchen0082@gmail.com

Last year, I demonstrated a super wide-band light perfect absorbers using cascade cavities for solar energy harvesting. A super-wideband solar light absorber of 97.97% total absorptance has been experimentally demonstrated. The demonstrated super-wideband solar light absorbers are significant for solar-to-thermal energy harvesting and future thermophotovoltaic solar energy systems. This work is published in Optical Materials Express. Also, we are continuing our work on investigating high aspect ratio super wide-band solar light absorbers using metal/dielectric cascade cavities nanostructures.
Journal Publication

Jackson Cunningham
University of South Alabama
Recipient, Rounds 11 and 12
NASA EPSCoR Awards NNX13AB09A; NASA NNX16AT47A
Expected graduation in 2022, PhD, Chemical Engineering
jdc1007@jagmail.southalabama.edu

I began as an undergraduate on this undergraduate research program project supported by the NASA eXploration Habitat Program studying life support. There are many engineering challenges related to life support, and I am currently studying CO2 removal from air using porous adsorbent materials. After completing my B.S. in Chemical Engineering, I began the Master’s program in Chemical Engineering and will graduate December 2017. I will then continue my research at the University of South Alabama pursuing a D.Sc. in Systems Engineering.

My particular research area has focused on understanding how CO2 adsorbs on porous solids when water vapor is also present. In particular, I am studying the adsorption of CO2 and water vapor on a class of adsorbent materials known as metal organic frameworks (MOFs). MOF materials are currently the focus of a significant amount of research because these materials can be tailored for specific applications. Since being funded by GRSP, I have built, and validated an adsorption apparatus, and have measured multicomponent adsorption data on MOFs. I have completed nearly all the experiments need for my master’s degree, and I am working on my thesis that will detail these results. Additionally, the data will be presented at the 2017 Annual American Institute of Chemical Engineers (AIChE) meeting.

Alan Hanley
Auburn University
Recipient, Rounds 10, 11 and 12
NSF EPSCoR RII Track 1, Award # 1158862
Expected graduation December 2017, PhD, Chemical Engineering
amh0072@auburn.edu

Over the last year, I have investigated new characterization methods for examining Janus nanoparticles as well as modified our synthesis methods to improve the purity of these nanoparticles. I have started synthesizing Janus nanoparticles with different surface compounds to examine the difference in self-assembled nanoparticle structures. I have also begun preliminary work for the synthesis of antimicrobial Janus nanoparticles as well as begun developing the methods to test their antimicrobial activity. Experiments that involve exposing these nanoparticles to bacteria cells should begin soon and we are very excited to see the results.

Presentations
• Hanley, A.M.; David, A.E. Novel Method for Synthesizing Janus Nanoparticles to Develop “Smarter” Nanostructures; Science and Technology Open House, Poster Presentation, Montgomery, AL, February 2016
Vincent Hembrick-Holloman  
Tuskegee University  
Recipient, Rounds 11 and 12  
NSF EPSCoR RII Track 1, Award # 1158862  
Expected graduation in 2018, MS, Materials Science and Engineering  
vhembrick-holloman4506@mytu.tuskegee.edu; vhembrick@gmail.com

After completion of my first year as a GRSP recipient, I have successfully synthesized a host of nanoparticles from naturally occurring waste such as eggshells, seashells, and fish scales. I am in the active stages of using these nanoparticles to produce 3-D printed scaffolds aimed to help promote cell growth, attachment, and proliferation for dental tissue engineering applications. After earning my M.S. degree, I plan to pursue a PhD in Materials Science and Engineering before going on to work an industry career in biotechnology.

Poster Presentations

- Hembrick-Holloman V, Rangari V, Jeelani S. Nanobiomaterial Synthesis for Dental Tissue Engineering. Poster presented at: Tuskegee University Open House; 2016; Montgomery, AL
- Hembrick-Holloman V, Rangari V, Jeelani S. Nanobiomaterial Synthesis for Dental Tissue Engineering. Poster presented at: 4th Annual Nanobio Summit; October 13-14, 2016; Auburn, AL

Oral Presentations

- Hembrick-Holloman V, Rangari V, Jeelani S. Conversion of Egg and Seashell Waste into a Valuable Nanomaterial for Tissue Engineering. Oral Presentation presented at: Joint Annual Research Symposium; March 17, 2017; Tuskegee, AL

Valeria King  
University of South Alabama  
Recipient, Rounds 11 and 12  
NSF Co-funding, Award # 1350064  
Expected graduation in 2018, MS, Biology  
vmk902@jagmail.southalabama.edu

This past year I have been conducting research focused on the relevance of a novel class of small non-coding RNAs in cancer development and maintenance. Following evidence that snoRNAs are actively processed from their previously known form to structures that resemble and behave like microRNAs, we have demonstrated that one of these sno-derived RNAs (sdRNAs), sdRNA-93, is functionally relevant in breast tumor invasiveness. After these exciting preliminary results, I began examining the expression profiles of a wide variety of sdRNAs in several different types of cancers. Using various bioinformatic data refining and mining techniques, I analyzed over 200 publicly available Next-Generation Sequencing files obtained from 10 different malignancies and their corresponding normal tissues. I plan to submit my findings for publication in the following months.

List of Recent Publications

- Dillon Patterson, Justin Roberts, Valeria King, Dominika Houserova, Emmaline Barnhill, Aline Crucello, Caroline Polska, Lucas Brantley, Garrett Kaufman, Michael Nguyen, Megann Santana, Ian


Sebastian Kirmse
University of South Alabama
Recipient, Rounds 11 and 12
NSF EPSCoR RII Track 1, Award 1158862
Expected Graduation in 2018, MS, Mechanical Engineering
sk1111@jagmail.southalabama.edu

During my first year of research, called “Characterization of Fracture Mechanisms in Carbon Fiber Composites Reinforced by Carbon Nanofiber Z-Threads during Mechanical Loading using Acoustic Emission,” I have established a deeper understanding of this novel z-threaded composite (ZT Composite) in terms of e.g. internal wave propagation, and I have made significant progress in developing an acoustic emission (AE) testing setup, At the same time, I was finishing up an additional research project, which lead to the publication mentioned below.

In addition, I have broadened my research into audible and ultrasound frequency range testing of the ZT Composite, and I have recently been accepted into the D.Sc. program in Systems Engineering here at the University of South Alabama, where I will further my research in the acoustic study of the ZT Composite. Recently, I have been accepted as a Co-Entrepreneurial Lead (EL) for the national NSF I-Corps Program, together with Alexander Scruggs, a current candidate of the D.Sc. program in Systems Engineering, and under the guidance of Dr. Kuang-Ting Hsiao as a Principal Investigator (PI) and Dr. Michael Chambers as a I-Corps mentor (IM), in order to investigate the commercialization capabilities of this new technology.

Recent Publications/ Awards/ Honors
- Induction into Tau Beta Pi (Alabama Epsilon Chapter): The Engineering Honor Society
- Induction into Phi Beta Delta (Delta Eta Chapter): Honor Society for International Scholars
Zachary Lindsey  
University of Alabama at Birmingham

Recipient, Rounds 10, 11 and 12  
NSF EPSCoR RII Track 1, Award 1158862  
Expected graduation in 2018, PhD, Physics  
zack@uab.edu; zrlindsey@gmail.com

A primary goal that was achieved over the past year in efforts to make progress towards a compact, electrically-pumped, multilayered mid-IR lasing device, was successful deposition and optimization of the waveguiding material, ZnSxSe1-x. Multiple growth parameters were utilized and varied to produce several thin films of this ternary alloy of interest, and the films were subsequently analyzed for crystalline quality and elemental composition via x-ray diffraction (XRD) and energy dispersive x-rays (EDX), respectively. Analysis of XRD rocking curves of pulsed-laser-deposited ZnSxSe1-x indicates relaxed films with shifts in the film peak relative to the (400) GaAs substrate peak as sulfur content and deposition temperature were varied. The smallest shift resulting in a lattice mismatch between film and substrate of $\epsilon=0.059 \pm 0.32\%$ was obtained for ZnS0.02Se0.98 ($x=0.02$) deposited at a substrate temperature of 450oC. Analysis of the FWHM of the (400) XRD peaks reveals a minimum dislocation density of $D=2.2x10^{10}$ cm$^{-2}$ for ZnS0.06Se0.94 ($x=0.06$) and substrate temperature of 450oC. These rocking curve widths are much broader than most epitaxially-grown thin films reported in the literature, and this could be due to many factors including high laser fluence, surface roughness of the GaAs substrate after etching, a lack of rotation of the substrate during deposition, surface defects due to sulfur at the film/substrate interface, and/or the absence of an ambient inert gas in the deposition chamber during film growth.

While there is need for improvement of the quality of the ZnSSe epilayer in terms of defect density for feasible integration into an optical device, this is the first instance of this material being grown by means of PLD which is an important milestone for this research considering the final goal is to produce a multilayered structure of high optical quality, which requires in situ deposition of all layers. Now that the waveguiding layer alloy has been successfully deposited onto the GaAs substrate with high crystallinity, some next steps include (1) incorporating dopant atoms into the ZnSSe lattice to produce both n-type and p-type conductivity, (2) adding Mg to deposit high quality thin films of ZnxMg1-xSySe1-y on GaAs, and (3) depositing multiple layers of reliably-doped ZnS-based ternary and quaternary alloys in combination with ZnSe:Cr2+ quantum wells and subsequent electrical and optical characterization of these structures. This work was presented at both the 2016 OSA ASSL Lasers Congress and the 2016 Fall Meeting of the Materials Research Society, and resulted in the two publications listed below:

Recent Publications

- Z. R. Lindsey, M. Rhoades, V. V. Fedorov, S. B. Mirov, and R. P. Camata, "Pulsed Laser Deposition of Relaxed ZnSxSe1-x Thin Films for Waveguiding Applications in Mid-IR Active Cr2+:ZnSe Multilayered Structures." Lasers Congress 2016 (ASSL, LSC, LAC), OSA Technical Digest (online) (Optical Society of America, 2016), paper AM5A.19. DOI: https://doi.org/10.1364/ASSL.2016.AM5A.19
Sayed Mirshafieyan  
**University of Alabama in Huntsville**  
Recipient, Rounds 10, 11 and 12  
NASA EPSCoR FY15 Research Infrastructure Development  
Expected graduation in 2018, PhD, Mechanical and Aerospace Engineering  
sm0058@uah.edu  

In my research, I have experimentally demonstrated perfect light absorption in ultrathin nanocavities made of metal and semiconductor materials. The absorption wavelength can be tuned by varying the thickness of the cavity, altering the metallic substrate, thermal annealing, or simply by applying an electric voltage to the cavity. In the visible range, these absorbers exhibit different colors corresponding to their absorption wavelengths. The device structure requires a simple thin-film fabrication process, and therefore has tremendous advantages over patterned nanostructures in terms of cost and large-area manufacturing. This new technology paves the way for many potential applications such as real-time high resolution displays, sensitive photodetectors, color filters, and biosensors.

**List of Recent Publications/Presentations/ Honors**

**Patent**

**Journal Papers**

**Conference Papers and Presentations**

Vijaya Rani  
**University of Alabama in Huntsville**  
Recipient, Rounds 11 and 12  
NASA EPSCoR NNX15AK29A  
Expected graduation in 2018, PhD, Mechanical Engineering  
vr0004@uah.edu; srivkrani@gmail.com  

The research area that I work on is called combustion instabilities which are characterized by high-amplitude, self-excited acoustic oscillations that arise due to interactions between unsteady heat-release rate and acoustic flow perturbations. These instabilities are an impediment to the smooth operation of a combustor and can cause severe damage to the engine structure. Accurate prediction and mitigation of combustion instabilities is still an active area research.
This past year has been really productive with one peer-reviewed journal publication and one conference presentation. The published journal paper is on developing a novel and comprehensive Flame Transfer Function (FTF) used to relate heat-release fluctuations to acoustic fluctuations. This FTF is essential in computing the unstable frequencies in combustors. The conference presentation in the prestigious Joint Propulsion Conference is on developing a novel analytical solution to acoustic waves traveling in inhomogeneous media. This work could be used to capture accurate combustor dynamics and has the added advantage of not needing massive computational resources like the conventional computational models. In addition to that, two papers are undergoing peer review in prestigious journals. Overall, the year has been good and we are embarking on some exciting research going forward.

Recent Publications/Presentations/Honors

- Vijaya Krishna Rani and Sarma L. Rani, "Development of a Novel Approximate Solution to the Acoustic Wave Equation with Mean Gradients and its Application to Predicting Combustion Instabilities in a Dump Combustor", 53rd AIAA/SAE/ASEE Joint Propulsion Conference, July 10-12, 2017, Atlanta, GA.

Farooq Syed
Tuskegee University
Recipient, Rounds 11 and 12
NSF Co-funding CREST Award # 1137681
Expected graduation 2019, PhD, Materials Science and Engineering
Fsyed2309@mytu.tuskegee.edu

The objective of this proposed work is to fabricate and characterize novel nano force spunned fibers using nanoparticles derived from natural resources. Turmeric, which contains curcumin, and black pepper are well known for their healing properties and have been used for many years in treating various diseases. Bionanoparticles will be synthesized from these substances as multi-functional bionanoparticles.
- Nanofibers will be processed using the synthesized nanoparticles through newly developed forcespinning method.
- Forcespun Bio-Nanofibers will replace current synthetic/toxic materials, and significantly help in treatment of wound healing and skin related disorders.

Research progress from Round 11
- Crosslinking and interfacial properties of epoxy nanocomposites were investigated.
- Investigation of mechanical properties of epoxy nanocomposites through Nanoindentation simulation and experiment is going on, where the experimental phase has been completed and Nanoindentation simulations are being carried out.

List of Recent Publications/Presentations/Honors
- University research Symposium Finalist and CAMX Travel Award 2017
- Poster Presentation Award (Science and technology open house, 2016) (Won Second Prize)
- Poster Presentation Award (JARS Symposium 2016) (Second Prize)
- Poster Presentation Award (SAMPE Conference, Long Beach CA 2016) (Third Prize)
Rajdeep Shakya
Auburn University
Recipient, Rounds 11 and 12
USDA EPSCoR 2015-67021-22842
Expected graduation in August 2018, PhD, Agricultural Engineering
rzs0035@auburn.edu

I continue to investigate biofuels from algal biomass to make biorefinery economically and technologically sustainable. I’ve completed the following objectives of understanding 1) the influence of the biochemical composition during hydrothermal liquefaction of algae on product yields and fuel properties; 2) the influence of different heterogeneous catalysts on the upgrading of algae bio-crude; and 3) the effect of residence time on the catalytic upgrading of bio-crude produced from hydrothermal liquefaction of algae. I am on the verge of completing my last objective: Influence of binary mixture of CO₂ and H₂ on catalytic upgrading of bio-crude produced from hydrothermal liquefaction of algae.

Publications:

Abubaker Tareki
University of Alabama in Huntsville
Recipient, Rounds 10, 11, and 12
NSF EPSCoR RII Track 1, Award # 1158862
Expected graduation in May 2018, PhD, Electrical and Computer Engineering
amt0014@uah.edu

I am continuing my PhD degree at The University of Alabama in Huntsville. My research interest focuses on the basic concept for proposed tunable platform at terahertz (THz) frequencies which consists of an engineered stratified structure using liquid crystal (LC) layers and dielectric material layers coated with patterned metal layers. The metal layers will be used as electrodes for tuning the structure properties.
- Material selection (choosing and testing) will be used as spacer and substrate for the proposed platform structure. We managed to fabricate on quartz and Teflon.
- Design and fabricate thin LC layers as a tuning material. We made multiple cells structures which are now under testing.
- Design and fabricate metallic pattern (gold) as transparent and polarization independent electrode at THz. We managed to get around 93% independent polarization transmission for selected frequencies of THz spectrum.

List of Recent Publications/Presentations/and Honors
- 2014, 2015, 2016, and 2017- Graduate Dean’s List recipient for excellent achievement, The University of Alabama in Huntsville, Huntsville, Alabama USA
Over the past year and in the course of the proposed research, we successfully synthesized two-dimensional (2D) titanium carbide (Ti3C2) MXene material with chemically removing the aluminum atoms from Ti3AlC2 bulk material. After successful synthesis of 2D Ti3C2, we applied different approaches to transfer the 2D titanium carbide sheets from water to organic solvents such as dimethylformamide (DMF) and could achieve stable dispersions of MXene sheets. This step was crucial for nanocomposite fabrication to be able to achieve a homogenous mixture of the MXene and polymer matrix.

After obtaining a uniform dispersion of MXene in the polymer solution, the dielectric nanocomposites with different loadings of MXene fillers were fabricated through a simple solution casting process. The uniformity of the nanocomposites produced at this stage surpassed our preliminary results and dielectric nanocomposites with just 10 wt.% of Ti3C2 MXene exhibited high dielectric constant of more than 1500 and dielectric loss of 0.8 at frequency of 100 HZ. The dielectric loss obtained in our research is much smaller than other high-dielectric constant 2D filler based composites, which results in their better performance.

In the next steps, we are moving forward to further improve the 2D Ti3C2 dispersion in the polymer matrix, tailoring desired properties by surface modification of Ti3C2 sheets, and studying the effects of alignment and lateral size of the 2D sheets on the performance of the produced dielectric nanocomposites.

Recent Publications, Presentations, and Awards

- Armin VahidMohammadi and Majid Beidaghi, “Hybrid Electrodes of Conducting Polymers and Two-Dimensional Ti3C2 (MXene) for Li and Na Ion Storage”, Accepted for Oral presentation, 2017 ECS Fall Meeting, October 1 – 5, 2017, National Harbor, MD.
- First place winner of 2016 MRS Fall Meeting “Science as Art” international competition, Title: Nano Lord Voldemort SEM image, Armin VahidMohammadi and Majid Beidaghi. (https://www.mrs.org/science-as-art)
Yi Zeng
Auburn University
Recipient, Rounds 10, 11 and 12
DOE EPSCoR #DE-SC0002470
Expected graduation in 2018, PhD, Mechanical Engineering
yzz0070@auburn.edu; YiZengs88@gmail.com

Objective
The focus of my research is to study nanoscale heat conduction of the Nanostructure Enhanced Phase Change Materials (NePCM) and enhance their thermal properties.

Research Abstract
- Studying the mechanism behind heat transfer enhancement of NePCM at nanoscale can improve the effectiveness of existing thermal energy storage systems.
- The non-continuum heat transfer model is studied by molecular dynamics simulation method (Schematic diagram of a typical simulation box of n-eicosane system under NEMD simulation).
- The effect of the interaction between molecular blocks at the interfaces on nanoscale heat conduction of long-chain n-alkanes are being studied.

List of Recent Publications/Presentations/ Honors
- Research Poster Contest Winners from Annual Elements of Mechanical Engineering Conference (Auburn University)
The following are short updates from previously funded GRSP students.

**Malek Abunaemeh**  
Alabama A&M University  
Recipient, Rounds 4, 5 and 6  
PhD, 2011; Materials Science, Physics  
abunaemeh@gmail.com  

After graduating from AAMU, I was appointed to the Physics faculty at Talladega College where I served until January 2013. After that, I was appointed to the Physics and Science Education department at Lehman College (CUNY) in New York City where I remained until the end of the year. In 2014, I joined the Physics faculty at University of West Florida in Pensacola, Florida where I remained until 2015. In 2017, I joined the Mechatronics faculty at Motlow State College where I am currently serving. We are preparing the next generation of robotics for use in industry.

**Mercedes Bartkovich**  
Alabama A&M University  
Recipient, Rounds 9 and 10  
MS, 2016; Wildlife  
bartkovichm@gmail.com  

Since graduating with my M.S. from Alabama A&M University, I’ve been working in Huntsville with NASA DEVELOP as a GIS Research Lead. Through NASA DEVELOP, I’ve had the opportunity to lead multiple research projects that use NASA Earth Observations to answer various environmental questions. My most recent project used the NASA Aqua MODIS satellite to monitor changes in salinity levels in the Mobile Bay and Mississippi Sound system, and then used that data to determine optimal areas for oyster reintroduction and to monitor West Indian Manatee movements. I was recently promoted to a project coordination position where I will be a part of more research projects and will work more hand-in-hand with project partners and the NASA DEVELOP National Program Office. I am thankful for the opportunities that I’ve been given so far, and I hope to continue down the path that focuses on conservation using interdisciplinary research.

**Karim Budhwani**  
University of Alabama at Birmingham  
Recipient, Rounds 10 and 11  
PhD, 2018, Materials Science and Engineering  
IronMan@uab.edu  

Last year I had recruited and mentored a NSF Research Experiences for UGs (REU) student who, I am happy to report, has been accepted to one of the top 10 graduate programs in Materials Science and Engineering, in part, because of his experience working with me on my EPSCoR powered research project fabricating and characterizing materials at micro and nano scales. I look forward to following his successes in advancing knowledge and in using that knowledge to bring tangible value to people in our country and around the world. I have recently submitted a manuscript, with him as one of the co-authors, to the journal Current Nanoscience. This summer, I did similarly with a student from Hoover High School (Hoover, AL) who is ranked 1st in her class. I will continue to mentor her and will
also endeavor to publish a manuscript with her as one of the co-authors to boost her competitive advantage over her peers. During this time, I also mentored two other high school students, albeit on much shorter timescales, who are on their way to Vanderbilt (Chemical Engineering) and MIT (Chemical Engineering). These are long-term investments in our future, and in Alabama, so that we are better positioned to lead and shape the landscape of the knowledge society and knowledge economy of tomorrow. I’d like to reiterate that this was made possible by the EPSCoR investment in me which, as originally intended, I’m paying forward with considerable dividends! Speaking of the knowledge economy, I led a team through the successful completion of the regional NSF I-Corps (Innovation Corps) program designed to facilitate and accelerate the commercialization of scientific discovery – a goal that is very closely aligned with the EPSCoR program. And in working toward that goal, last month I filed my second patent. This patent is for a new interfacial tension measurement method specifically for hydrodynamics manufacturing processes. I expanded the scope of the filing to include two of my graduate student colleagues at UAB. It is our hope that this invention will help increase the range for stable Taylor cones in electrohydrodynamic atomization (EHDA) manufacturing of micro and nano scale drug delivery devices to combat cancer, CVD, and other diseases. Real impact on real people, here in Alabama and beyond, powered by the EPSCoR GRSP. Moreover, we hope to publish these findings by Q1 of 2018. And finally, Good-Vibes Theranostics, my EPSCoR powered targeted drug delivery (therapy) and imaging (diagnostics) solution using drug-loaded, core-shell microbubbles, has entered into its third phase. As detailed in my last report, my research, including the role of the EPSCoR GRSP in supporting this work, was featured in the UAB School of Medicine News and the Coe College Courier. I also took the opportunity to share aspects of this research during my recent IPN TV Leadership Series interview and at various other programs where I was invited to speak on innovation and the knowledge economy including the UAB Discoveries in the Making, Dr. Hugh Floyd’s Health and Technology Seminar at Samford University, Coe College Scientific Research and Innovation Panel (Cedar Rapids, IA), and the IPN LaunchPad in Silicon Valley.

Ethan Cagle  
University of Alabama at Birmingham  
Recipient, Rounds 9, 10 and 11  
Expected graduation May 2018; PhD, Chemistry  
eccagle@uab.edu

I have just finished my fourth year in the PhD program at UAB. I successfully defended my original research proposal in December 2016 and enter candidacy the following month. I am scheduled to complete the PhD program in May 2018.

Yi Chen  
University of Alabama in Huntsville  
Recipient, Round 6  
PhD, 2011; Computer Science  
cyaicf@gmail.com

I am currently working at Ellie Mae, the software company that processes mortgage applications. I have been in the technology industry for 5 years. I started as software engineer and became a data engineer in March 2017. The NSF research project that I worked on gave me a tremendous help with my career development.
Bo Cheng
The University of Alabama
Recipient, Round 9
2016, PhD, Mechanical Engineering
bo.cheng@louisville.edu
I am currently a Postdoctoral Associate in Industrial Engineering Department in the University of Louisville. My research is mainly regarding: (1) thermal and thermomechanical simulation of selective laser melting (SLM) and electron beam melting (EBM) process, (2) process temperature measurement and (3) structural optimization.

List of recent Publications

Daniel Clayton
The University of Alabama
Recipient, Round 7
PhD, 2015, Metallurgical and Materials Engineering
bdanclayton@gmail.com
I graduated from the University of Alabama with my PhD in chemistry, Summer 2015. I was hired and worked at Minot State University in Minot, North Dakota as an Assistant Professor of Analytical Chemistry from the Fall of 2015 until the Spring of 2017. While there I taught multiple chemistry courses in general chemistry, analytical chemistry and environmental chemistry and served on multiple committees including a stint as the chair of the general education committee. In the spring of 2017 I moved to Rome, Georgia to a new job at Shorter University where I currently serve as an Assistant Professor of Chemistry and Chemical Safety Officer.

Liwu Fan
Auburn University
Recipient, Rounds 5 and 6
PhD, 2011, Mechanical Engineering
liwufan@zju.edu.cn
I am currently a Research Professor in the School of Energy Engineering at Zhejiang University, Hangzhou, China. Upon receiving my Ph.D. degree from Auburn University, I spent two years working as a Postdoctoral Fellow at Zhejiang University. I was then promoted to Associate Professor at Zhejiang University in Dec. 2013. From Sept. 2014 to Sept. 2015, I was a Visiting Scholar in the Department of Nuclear Science and Engineering at Massachusetts Institute of Technology. My research interests are mainly focused on heat transfer involving multiphase and phase change with a wide range of applications to thermal energy conversion, management, and storage. Current projects are supported by the National Natural Science Foundation of China (NSFC), Zhejiang Provincial Natural Science Foundation for Distinguished Young Scholars and “100 Talents Program” of Zhejiang University.
List of Recent Publications

- Li-Wu Fan, Hong-Qing Jin, Local thermal nonequilibrium during melting of a paraffin filled in a copper foam: A visualized study at the pore-scale, Journal of Heat Transfer, Transactions of the ASME, 139, 034505 (2017).
- Li-Wu Fan, Yu-Yue Wu, Yu-Qi Xiao, Yi Zeng, Yi-Ling Zhang, Zi-Tao Yu, Transient performance of a thermal energy storage-based heat sink using a liquid metal as the phase change material, Applied Thermal Engineering, 109, 746-750 (2016).

Basil Farah
University of South Alabama
Recipient, Rounds 5, 6 and 6S
MS, 2012, Mechanical Engineering
basil.farah@gmail.com

I joined Vacuum Solutions of Texas (VacSol Robotics) in Houston, TX in May 2016. VacSol is a leading supplier of equipment and support to the environmental services industry. VacSol brings innovation to industrial services with custom robots that can meet a variety of needs in many environments. I am personally involved in the integration of the mechanical components of the remotely operated vehicle with the electrical operating system. Since I joined VacSol, I have commissioned a new rental ROV unit, a couple of tank cleaning units and a man-way cannon unit. In addition to my responsibilities as an engineer, I have also trained customer personnel, and provided technical support to equipment owners worldwide. My experience as a graduate research assistant at the University of South Alabama funded by GRSP equipped me with the technical and interpersonal skills to perform my duties at work and in life to be best of my ability.”
William Gaillard  
University of Alabama in Huntsville  
Recipient, Rounds 7, 8 and 9  
PhD, 2016; Electrical Engineering  
wrg0001@uah.edu  
I am currently advancing my dissertation research as a research consultant at UAH. My dissertation work resulted in a reusable glass micro reactor capable of producing custom oligonucleotides. These oligonucleotides are used commercially in genetic testing, antisense therapy, artificial gene synthesis, DNA amplification, DNA sequencing, and as molecular probes. The reactor consists of a microfluidic chip with integrated optics and custom electronics to control fluid flow. My goal is to expand the capabilities of the system as I move towards commercialization. I currently have one patent related to the reusable glass micro reactor and have applied for three additional patents.

Patents  
Microfluidic reactors for oligonucleotide synthesis, Publication number: US 20150087820 A1, Application number: US 14/334,497 (awarded)

Hong Guo  
University of Alabama in Huntsville  
Recipient, Rounds 7, 8, and 9  
PhD, 2017, Electrical and Computer Engineering  
hg0006@uah.edu  
Guo is a PhD candidate in the Electrical Computer Engineering Department at the University of Alabama in Huntsville (USA). I work in Prof. Junpeng Guo’s laboratory researching optical surface plasmon resonance biochemical sensors. My research is focusing on developing novel and ultra-sensitive nanostructures plasmonic sensors and low-cost optical measurement platform for biochemical material sensing. I have published five journal publications on plasmonic sensing. In May 2017, I was awarded the 2017 Optics and Photonics Education Scholarship by the international society for optics and photonics.

Luai Hasoun  
University of South Alabama  
Recipient, Rounds 4, 5, and 6  
PhD, 2012, Basic Medical Sciences  
loalhasoun1@yahoo.com  
I am currently a faculty member in the College of Pharmacy, Applied Science University in Jordan. My position is Assistant Professor in Pharmacology.
Justin Havird  
Auburn University  
Recipient, Rounds 6, 6S and 7  
PhD in 2014, Biological Sciences  
jchavird@gmail.com

My research elucidates fundamental biological processes by examining coevolution and conflict between mitochondrial and nuclear genomes. As a NIH postdoctoral fellow at Colorado State University, I have been working with Dan Sloan examining this intergenomic relationship by using plants in the genus Silene, which have some of the most bizarre mitochondrial genomes described to date. Recent projects have also involved looking at the mitonuclear dimension of Neanderthal ancestry in modern human genomes, examining the role of mitochondrial genomes at species boundaries, and asking how mitochondrial function affects thermal acclimation ability in aquatic insects. I will be starting my own lab investigating questions involving genomics, evolution, physiology, and ecology at the University of Texas in the Department of Integrative Biology as an Assistant Professor in Fall 2018.

William (Jeff) Horne  
The University of Alabama  
Recipient, Round 8  
PhD, 2015, Chemical and Biological Engineering  
wjeffreyhorne@yahoo.com

This is my second year as a lecturer in the Chemical Engineering department at Auburn University.

Lei Hu  
The University of Alabama  
Recipient, Round 11  
Expected graduation in 2018; PhD, Electrical Engineering  
lhu7@crimson.ua.edu

I have finished the GRSP project and am currently supported by different grants now. I set up an advanced wireless communication platform with important data transferred between devices. I also made sure that the communication QoS was supported.
Hunter Hyche  
The University of Alabama  
Recipient, Round 1  
MS, 2007, Environmental Engineering  
hunterhyche@hotmail.com  

I’ve taken a job working for a firm called OnQ Global, who provides construction/project management support for various clients including Google, Tesla, Intel, Howard Hughes Research Lab, and many others. Last fall, I was assigned as a project/construction manager representing a bonding company on the new Red Wings Hockey Stadium in Detroit. This spring and summer I was in Reno, NV working on Tesla’s Gigafactory where they will be producing lithium ion batteries for their cars and battery walls. I was recently transferred to Tesla's Fremont, CA facility to assist in constructing additions to the car factory to facilitate the rollout of the Model 3.

Tyler Kaub  
The University of Alabama  
Recipient, Rounds 9, 10 and 11  
PhD, 2017; Metallurgical and Materials Engineering  
tmkaub@crimson.ua.edu  

I am on track to finish my doctoral degree by December 2017. My research is focused on intrinsic stresses in metallic thin films with my current work focused on the influence deposition rate and pressure has on the microstructure and intrinsic stress in copper thin films.

Recent Publications:


Shikai Liu  
Auburn University  
Recipient, Round 8  
PhD, 2014, Fish Genomics  
lushk@ouc.edu.cn  

In May 2017, I accepted a position as full professor in Ocean University of China. This is a big transfer to me and my research career. As an independent researcher, I will focus on shellfish genetics and breeding in the future. It has been a great achievement to study and work at Auburn, I hope I will continue to do great job in my new research career.
Sherita Moses
Alabama A&M University
Recipient, Rounds 9 and 10
PhD, 2016, Physics
miss.moses.2012@gmail.com

Since graduation in 2016, I have been teaching in the Physics Department at Loyola University Chicago. I absolutely love academia. I enjoy the flexibility in an academic schedule, the academic freedom in the classroom, and most of all the camaraderie amongst my colleagues in my department. I was truly blessed to land this full-time opportunity right out of school.

In addition to lecturing, I teach labs and am currently creating an avenue of collaboration for further research in order to continue to publish.

In October 2017, I received official patent paperwork for a compound I invented that could help women diagnosed with triple-negative breast cancer.

Easir Papon
The University of Alabama
Recipient, Round 11
Expected PhD in May 2019, Aerospace Engineering and Mechanics
mpapon@crimson.ua.edu

Fused deposition melting (FDM) is a low-cost additive manufacturing (AM) processes which uses thermoplastic materials to fabricate prototype parts from a computer aided design (CAD) model. To improve the parts quality, different property modifiers (micro and nano sized) like carbon fiber, glass fiber, carbon nano tube etc. are used to make stronger fiber reinforced composites. However, the part quality processed through FDM is found to be inferior compared to the conventional manufacturing techniques due to higher inter-bead voids in finished part. The use of circular cross section nozzle is one of the probable causes of such voids. When two circular cross section beads are placed side by side and layer by layer; in between the beads, a void area is developed which is mostly triangular and diamond in shape depending on the layer orientations. It is hypothesized that instead of using the circular nozzle, if the nozzle cross section is modified in such a way that the extruded beads are rectangular in cross section. In such case, less interbead voids are expected to develop in bead spreading architecture. Thus, by creating a comparatively extended contact surface and larger bond length between the successive deposited layers, the inter-bead voids may be reduced and the structural properties of the nanocomposites can be improved. With a view to prove the hypothesis, numerical modeling of thermo-fluidic behavior of the nanocomposites are conducted using ANSYS Fluent and Polyflow code. Along with the numerical simulations, experimental testing of the nanocomposites is also conducted with different nozzle geometries using a commercial 3D printer.

Recent Publications

- Papon EA, Haque A, Sharif MAR, Effect of nozzle geometry on melt flow simulation and structural property of thermoplastic nanocomposites in fused deposition melting. (Accepted in 32nd American Society of Composites Technical Conference, October 23-25, 2017, Purdue University, Indiana)
Jeremy Peppers
University of Alabama at Birmingham
Recipient, Rounds 7, 8 and 9
PhD, 2016, Physics
peppersjm@gmail.com

I am now working as a Laser Scientist for IPG Photonics at their Southeast Technology Center in Birmingham Alabama.

Rezwahur Rahman
The University of Alabama
Recipient, Rounds 6 and 6S
PhD, 2012, Mechanical Engineering
rezwanrehman@gmail.com

I am an Aerothermal Engineer at Fiat-Chrysler Automobiles (FCA).

Kathleen Ann Roberts
Alabama A&M University
Recipient, Rounds 4, 5 and 6
PhD, 2013, Agriculture and Environmental Sciences
kokopelliclay@gmail.com

I am currently teaching in Mobile, Alabama at Murphy High School in support of our IB curriculum. I still teach as an adjunct at a local community college (Bishop State Community College) and at a local college (Spring Hill University). I really do have the best of all worlds, I teach a wide range of students in terms of age and from all walks of life, yet am still active in scientific research.

Hunter Sims
The University of Alabama
Recipient, Round 4
PhD, 2013, Physics
hunter.r.sims@gmail.com

For the past year, I have been living in Oak Ridge, Tennessee and working as a postdoctoral researcher at Vanderbilt University/Oak Ridge National Lab in the group of Sokrates Pantelides. I work in close collaboration with the scanning transmission electron microscopy (STEM) group at ORNL (and have even had a few sessions on the microscope of my own). Mostly, I aid in understanding their experimental results and in guiding new experiments by calculating the crystal and electronic structure of the materials they study and by performing imaging and spectroscopy simulations. My research thus far has focused on understanding the local structure surrounding Group V dopants in Si -- with applications in quantum computing -- and on superconducting FeSe monolayers.
Wesley Sims  
Alaska A&M University  
Recipient, Rounds 10 and 11  
PhD, 2016, Applied Physics  
wesley.sims@morehouse.edu  

I completed my degree in December of 2016 (PhD, Applied Physics). Currently I am an Assistant Professor of Physics at Morehouse College. I also manage the Micro/Nano Optics and Engineering (M.O.R.E.) Laboratory in the Dual Degree Engineering and Physics Department, where I collaborate with the Electro-Optics Engineering Department at the University of Dayton in Dayton, Ohio and also the NSF Engineering Research Center for Extreme Ultraviolet (EUV) Science and Technology at Colorado State University in Fort Collins, Colorado.

Brandie Stringer  
Alaska A&M University  
Rounds 7 and 8  
MS, 2014, Plant and Soil Science  
brandie.stringer@gmail.com  

I have been managing various remediation projects for the Florida Department of Environmental Protection in Tallahassee since November 2015.

Merlin Theodore  
Tuskegee University  
Recipient, Round 1  
PhD, 2008, Materials Science and Engineering  
theodorem@ornl.gov  

In January 2017, I became Director of the Carbon Fiber Technology Facility at Oakridge National Laboratory. This research facility helps remove overall technical barriers of producing low cost carbon fibers using lower energy. It serves to help clean energy industries with the technical barriers of adopting carbon fiber and carbon fiber components in their application and to promote domestic commercial sources of low cost carbon fibers. I seek collaborations between DOE, DOD, academia and industry.
Alabama EPSCoR
Graduate Research Scholars Program

Campus Coordinators / Staff
Each of the seven Alabama EPSCoR member institutions has an appointed campus coordinator. Campus Coordinators, in collaboration with the Alabama EPSCoR State Office and each GRSP faculty advisor, manage the GRSP awards. Campus Coordinators serve as the main point of contact for their respective institution.

**Dr. David Berkowitz**  
*University of Alabama in Huntsville (UAH)*

Dr. David Berkowitz is the Dean of the Graduate School and International Services at UAH. Prior to his appointment, he was the Associate Dean of the College of Business Administration, the Director of the Innovation, Commercialization and Entrepreneurship Lab (ICE Lab), and the Director of the Integrated Enterprise Lab. David is also a Professor of Marketing and continues to educate students in conjunction with his administrative roles. He has experience as a product developer, small business owner and academic. His current research focuses on the intersection between Product Development and Supply Chain for Complex Long Lifecycle products. His research has appeared in leading academic journals such as the Journal of Retailing, Journal of Advertising Research, Journal of Advertising, European Journal of Marketing, European Journal of Innovation Management, Defense Acquisition Review Journal and the Journal of Product Innovation Management. At UAH, Dr. Berkowitz teaches Marketing High Technology Products, Managing Technology, Development, and Marketing Management. He is the past Director of the Center for the Management of Technology at UAH. Dr. Berkowitz was a founding board member of Alabama Launchpad.

Dr. Berkowitz earned his Ph.D. in Marketing and Applied Statistics from the University of Alabama, a MBA from the University Texas at Austin and a B.A. in Accounting from Rutgers University at Camden. Dr. Berkowitz worked for 12 years with Hallmark Cards. Dr. Berkowitz developed and implemented several analytical models and managed new product introductions while working with Hallmark Cards. He was involved with site selection, retail acquisition, international licensing and franchising. Dr. Berkowitz also co-owned and operated a small retail business with his wife for 6 years. Dr. Berkowitz has consulted with numerous organizations on performance based logistics, customer satisfaction, strategic planning, brand loyalty and product development issues. For more information contact Dr. Berkowitz at berkowd@uah.edu or 256-824-6952.

**Dr. Frank “Skip” Bartol**  
*Auburn University*

Dr. Frank F. (Skip) Bartol is Alumni Professor of Reproductive Biology in the Department of Anatomy, Physiology and Pharmacology, Associate Dean for Research and Graduate Studies, and Interim Director of the Scott-Ritchey Research Center in the College of Veterinary Medicine at Auburn University (AU). Additionally, since its establishment in September, 2014, Dr. Bartol serves with Dr. Greg Barsh of the HudsonAlpha Institute for Biotechnology, as co-Director of the HudsonAlpha/Auburn University Center for Comparative Genomics and Translational Research. A member of the AU faculty since 1983, Bartol obtained the BS degree from Virginia Tech and both MS and Ph.D. degrees through the Interdisciplinary Reproductive Biology Program from the University of Florida. Additionally, he obtained advanced training in molecular biology as a Visiting Scientist and Scholar in the Center for Animal Biotechnology at Texas A&M University. In 2005, Bartol was honored by his doctoral alma mater when he was named a Donald Henry Barron Lecturer at the University of Florida in recognition of “outstanding research and scholarly activities in the field of reproductive biology.” In 2017 he was named a “Distinguished Alumnus” by the College of Agriculture and Life Sciences at Virginia Tech. His research, which focuses on identification of mechanisms
regulating development and function of female reproductive tract tissues in domestic ungulates, has been supported by competitive grants from the USDA National Research Initiative, the National Institute of Food and Agriculture (NIFA), the National Science Foundation, and private organizations in the U.S. and abroad, as well as by the Alabama Agricultural Experiment Station. Dr. Bartol served as Panel Manager for the U.S. NIFA Animal Reproduction program in 2014 & 2015. He is an active member of the Society for the Study of Reproduction (SSR), the American Society of Reproductive Immunology (ASRI), and the Society for Theriogenology (SFT), and was elected as an Honorary Member of the Society of Phi Zeta, the honor society of veterinary medicine, for “distinguished service in the advancement of science relating to the animal industry.” An advocate of the responsible use of animals in research and education, Dr. Bartol has served as chair of the Auburn University Institutional Animal Care and Use Committee, and both Animal Care and Experimentation and Animal Ethics sub-committees for the SSR. In addition to teaching the graduate course in reproductive biology at AU, Bartol lectures in bioethics and animal law in the AU veterinary curriculum and has spoken nationally and internationally on these topics. For more information, contact Dr. Bartol at 334.844.3700 or bartoff@auburn.edu

Dr. Mahesh Hosur
Tuskegee University

Dr. Hosur is the Director of NSF-CREST center (Center for Nanobiomaterials Derived from Natural and Waste Resources) at Tuskegee University. Partners in this center include Auburn University, Cornell University and The University of Alabama at Birmingham. Research is focused on utilizing agriculture waste like egg shells, sea shells, rice husk, cellulosic biomass to synthesize nanoparticles; use plant based oils to synthesize polymers and fabricate natural composites, filters, precursors for materials for biomedical and pharmaceutical applications. He was also the Director of NSF-EPSCoR RII award (2011-2017) headquartered at Tuskegee University. In this award, he led the effort on the Nano and Biomaterials thrust. The thrust consisted of researchers at Auburn University, the University of Alabama at Birmingham, the University of Alabama, and the University of South Alabama. Together, they studied a broad spectrum of areas connected to materials research and engineering including nanotechnology, advanced biomaterials, carbon/epoxy composites, epoxy syntactic foams, and nanomaterials for drug delivery applications. The research has the potential to create a new generation of automobile, aircraft, spacecraft, locomotives and sporting goods materials. Further, the nanotechnology work could lead to new types of biosensors, drug delivery systems, and heat exchangers.

Dr. Hosur earned his B.E. in Civil Engineering, M. Tech in Aeronautical Engineering and Ph.D. in Aerospace Engineering from India. He currently serves as Professor and Head of Materials Science Engineering Department at Tuskegee University. For more information, contact Dr. Hosur at 334.724.4220 or mhosur@tuskegee.edu.

Dr. John M. Wiest
The University of Alabama

Dr. John M. Wiest is a Professor of Chemical and Biological Engineering and Associate Dean for the College of Engineering, and has been at the University of Alabama since 1995. He received his Ph.D. in 1986 from the University of Wisconsin and has held positions at Sydney University, the University of Wisconsin, and Purdue University. His research interests are in the areas of rheology and non-Newtonian fluid mechanics and include structural and molecular theories for rheologically complex materials, and thermostiviscoelasticity. For more information, contact Dr. Wiest at 205.348.1727 or jwiest@eng.ua.edu.
Dr. Chris Lawson
University of Alabama at Birmingham

Dr. Christopher Lawson is a Professor of Physics at the University of Alabama at Birmingham. His research specialty is optical sensing and nonlinear optics and he has published over 70 journal articles and 10 books or book chapters in these areas. At UAB, Dr. Lawson has been Principal Investigator (PI) for numerous research grants awarded from the National Science Foundation, the Army Research Office, Army Research Labs, the Air Force Office of Scientific Research, and NASA. He received his Ph.D. in Physics at Oklahoma State University and his M.S. Degree in Physics at the University of Colorado.

Dr. Lawson has served as Executive Director of Alabama EPSCoR since 2010. The Executive Director is the chief administrative officer of ALEPSCoR, and is elected by the ALEPSCoR Steering Committee. The ALEPSCoR Executive Director has overall responsibility and authority for the day-to-day operation, management and coordination of the Alabama EPSCoR program, as well as, supervising and administering the state funded Graduate Research Scholars Program (GRSP) which is funded by the Alabama Commission for Higher Education. In October 2016, Dr. Lawson was elected Chair of the EPSCoR/IDEA Coalition which provides a leadership role in coordinating national EPSCoR activities.

For more information, contact Dr. Lawson at 205.975.5059 or lawson@uab.edu.

Dr. Chance Glenn
Alabama A&M University

Chance Glenn received his Bachelor’s of Science degree in Electrical Engineering from the University of Maryland at College Park. He then received his Master’s of Science degree and Doctor of Philosophy degree, both in Electrical Engineering, from The Johns Hopkins University Whiting School of Engineering. He also holds a certificate from the Management Development Program in the Graduate School of Education at Harvard University.

In August of 2012, Dr. Glenn became the Dean of the College of Engineering, Technology, and Physical Sciences at Alabama A&M University in Huntsville, Alabama. Dr. Glenn returned to Huntsville after starting school at Alabama A&M years ago. He is now leading the college through its expansion to prepare students and researchers to meet the global needs of the 21st century. Dr. Glenn is also the President and Executive Director of the Alabama A&M Research, Innovation, Science and Engineering (AAMU-RISE) Foundation. The Foundation’s mission is to create new opportunities for the region in research and development utilizing contract-based research and development. Prior to coming to A&M he was the Associate Dean of Graduate Studies at the Rochester Institute of Technology in Rochester, New York. He holds several patents and is internationally recognized for research in radio frequency communications and digital signal processing. Dr. Glenn is married with four children. For more information, contact Dr. Glenn at 256.372.5560 or chance.glenn@aamu.edu.
John W. Steadman, P.E., serves as the Alabama Department of Energy (DOE) EPSCoR State Agency Director, the Dean of Engineering at the University of South Alabama, and is a licensed professional engineer. Dr. Steadman previously served as Associate Dean and Head of the Department of Electrical Engineering at the University of Wyoming. He earned his B.S. and M.S. degrees in electrical engineering from the University of Wyoming and the Ph.D. degree from Colorado State University. Dr. Steadman was a research engineer for General Dynamics, Convair Division in San Diego, California before joining the faculty at the University of Wyoming and served as a Distinguished Visiting Professor at the United States Air Force Academy.

Dr. Steadman has received several awards, including the IEEE United States Activities Board Citation of Honor, the NCEES Distinguished Service Award with Special Commendation, the Wyoming Engineering Society Outstanding Engineer Award, and the AT&T Foundation Award for Excellence in Teaching. Professor Steadman was appointed to the Board of Registration for Professional Engineers and Professional Land Surveyors in Wyoming by three different governors serving on that board for more than sixteen years. He has also been active in the National Council of Examiners for Engineering and Surveying (NCEES), serving on several of the national committees, as treasurer, and as the national president in 1993-94.

In addition to his engineering education responsibilities, Dr. Steadman was 2004 President of IEEE-USA, Past Chair of the Board of Governors of the Order of the Engineer, and participates in accreditation of engineering programs for ABET. Dr. Steadman is the author of more than 60 journal publications, book chapters and patents. He has been honored with election to Fellow grade in the National Society of Professional Engineers and the American Society for Engineering Education. For more information, contact Dr. Steadman at 251.460.6140 or jsteadman@southalabama.edu.

Charlotte Nix (left), serves as the Alabama EPSCoR Program Administrator at The University of Alabama while Jami Anderson (right), serves as the Alabama EPSCoR Graduate Student Intern at the University of Alabama at Birmingham.
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### GRSP Campus Coordinators Page

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### Steering Committee

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**Front cover:**

Timothy Howton (page 14) is isolating protoplast cells from Arabidopsis thaliana for a protein-protein interaction assay.

**Back cover:**

Mika Houserova (pages 7 and 13) conducting experiments on Salmonella under stress.

---

**Figure:** Upgraded Bio-oils obtained at different residence time A) 4 hr, B) 6 hr and C) 10 hr using Ru/Cas catalysts and temperature of 350 °C.

Rajdeep Shakya’s (page 37) biofuels experiments
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