Symposium Program

USF 3rd Annual NSF REU-RET Research Day 2012

Interdisciplinary Research Building Galleria (IDRB)
Wednesday, August 1, 2012
USF Research Park

USF 3rd Annual NSF REU-RET Research Day 2012

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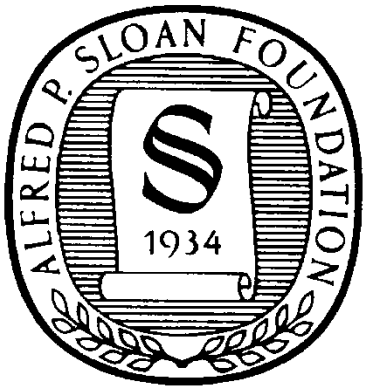

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2012 3rd Annual REU-RET Research Day Symposium Program

2012 3rd USF NSF REU-RET Day
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Interdisciplinary Research Building Galleria (IDRB)
Wednesday, August 1, 2012
USF Research Park

Agenda

10 a.m. to 11:00 a.m.	**Poster Set-Up**
11:00 a.m. to 11:15 a.m.	**Welcoming Remarks** Paul Sandberg, Ph.D., D.Sc. Vice President for Research & Innovation President, USF Research Foundation Distinguished University Professor
11:15 a.m. to 11:25 a.m.	Harold Keller, Ph.D. Professor and Interim Dean College of Education Larry Plank, Director K-12 Science, Technology, Engineering & Mathematics Education Hillsborough County Public Schools
11:30 a.m. to 1:30 p.m.	**Poster Viewing**
Noon to 1:00 p.m.	**Lunch**
1:30 p.m. to 2:00 p.m.	**Closing Remarks/Awards Presentation** Robert Potter, Ph.D. Professor & Associate Dean College of Arts and Sciences John Wiencek, Ph.D. Professor & Dean College of Engineering
2:00 p.m. to 2:30 p.m.	**Group Photos/Poster Breakdown**

Welcoming Remarks

Dr. Paul R. Sanberg is Vice President for Research & Innovation, Distinguished University Professor. Dr. Sanberg trained at York University, the University of British Columbia, the Australian National University and Johns Hopkins University School of Medicine, among others. Before coming to USF, Dr. Sanberg held academic positions at Ohio University, the University of Cincinnati, and Brown University. Prior to his current position, Dr. Sanberg served as Associate Dean in the Morsani College of Medicine, Associate Vice President in USF Health, Senior Associate Vice President for the Office of Research & Innovation and Special Assistant to the President all at USF.

Dr. Sanberg is a member of the Board of Scientific Counselors for the National Institute of Drug Abuse at the National Institutes of Health, and has served on numerous scientific advisory boards for health-related foundations and companies. He has significant industry experience with biotech companies involved in cell therapy for degenerative disorders and biopharmaceutical development. He is the Editor-in-chief of *Technology and Innovation*, and serves on editorial boards for more than 30 scientific journals. Dr. Sanberg is the President of the National Academy of Inventors and has also served as president of a number of professional societies including the American Society for Neural Transplantation and Repair, the Cell Transplant Society, and the International Behavioral Neuroscience Society. He is the author of more than 550 scientific articles, including thirteen books, with over 16,000 scientific citations (Google scholar).

As an inventor on approximately 100 health-related U.S. and foreign patents, his early work was pioneering in understanding why brain cells die in neurological disorders and in drug abuse research. His recent research has focused on discovering innovative ways to repair the damaged brain, and has helped lead the team that demonstrated that bone marrow and umbilical cord blood derived stem cells can be transformed to neural cells that may be useful in stroke, spinal cord injury and ALS. Dr. Sanberg's work has been instrumental in translating new pharmaceutical and cellular therapeutics to clinical trials for Tourette syndrome, depression, stroke, Huntington's disease and Parkinson's disease.

Welcoming Remarks

Harold R. Keller, Ph.D. is the Interim Dean, Associate Dean for Academic Affairs in the College of Education, and Professor in the Department of Psychological and Social Foundations in the College of Education at the University of South Florida. He earned his Ph.D. in Psychology (School Psychology) from Florida State University in 1968. Dr. Keller's research interests include home-school collaboration and caregiver involvement; multiple assessment/intervention approaches, ecological variables, and risk and protective factors for academic and social/emotional problems; continuous progress monitoring in relation to team functioning, teacher decision making, and intervention effectiveness; collaborative research partnerships and diffusion of research into practice.

Dr. Keller has been recognized for his teaching and research. He is a co-author of over 30 journal publications and reviews, and numerous books and book chapters.

Closing Remarks and Awards Presentations

Robert Potter, Ph.D., is the Associate Dean for Graduate and Undergraduate Studies in the College of Arts and Sciences, and a Professor in the Department of Chemistry at the University of South Florida. He has also served as the Associate Director of the Coalition for Science Literacy (CSL) at USF since 2000. He served as interim chair of the USF Chemistry Department 1998-99. Working with the CSL since 1995, Potter has led projects funded by NSF and USDOE to improve science and mathematics education, and has advocated for systemic, large-scale change at universities and in the K-12 sector.

Dr. Potter received his Ph.D. from the University of California at San Diego in biochemistry in 1979 and did postdoctoral work at the University of Wyoming where he served as non-tenure track assistant professor for two years before coming to USF in 1984. His funded research activities have ranged from basic science to highly applied biotechnology projects. All of the projects are linked by a general theme of structure and function in biological systems with the goal of gaining an enhanced understanding of these relationships and in defining new and better ways of analyzing them.

Closing Remarks and Awards Presentations

John M. Wiencek, Ph.D., is the Dean of the College of Engineering and a Professor in the Department of Chemical and Biomedical Engineering. Previously, Dr. Wiencek served as chair of the Department of Chemical and Biochemical Engineering at the University of Iowa, an AAU institution. After completing his Ph.D. from Case Western Reserve University in Chemical Engineering, Dr. Wiencek joined Rutgers University as Assistant Professor. He earned his tenure at Rutgers and moved to the University of Iowa and was subsequently appointed as chair of the Department of Chemical and Biochemical Engineering.

Dr. Wiencek is an accomplished teacher and scholar, having won several national and institutional awards in both areas. He has a long list of peer-reviewed publications and presentations and has attracted over $7.5 million in research support from external, competitive funding agencies including the NSF, NIH, NASA and DOE. His research interests focus on protein biophysics and novel membrane-based water purification.

NSF REU in Ubiquitous Sensing

Students and Faculty Research Mentors

Leon Augustine
Fred Bastian
Nestor Bonilla
Bolena Diaz-Hernandez
Chris Eggert
Ivory Hernandez
Andres Perez-Leon
Francisco Perez
Nelson Rivera
Yanira Rivera
Dan Rosa
Joshua Sheehy

Program Directors

Miguel Labrador, Ph.D., Associate Professor, Department of Computer Science and Engineering

Rafael A. Perez, Ph.D., Professor, Department of Computer Science and Engineering and Associate Dean for Academics

Faculty Research Mentors

Sean Barbeau, Ph.D., Research Associate, Center for Urban and Transportation Research

Dmitry Goldgof, Ph.D., Professor and Associate Chair, Department of Computer Science and Engineering

Miguel Labrador, Ph.D., Associate Professor and Graduate Coordinator, Department of Computer Science and Engineering

Yu Sun, Ph.D., Assistant Professor, Department of Computer Science and Engineering

Xianoing Qian, Ph.D., Assistant Professor, Department of Computer Science and Engineering

Students and Faculty Research Mentors

Saluta Banks	Andrew Hernandez
Shantonio Birch	Michelle Navar
Tyquan Burney	Angel Sanchez-Torres
Federico Diamante	Lauren Seaman
Roberto Donatto	John Stratton
Gabriela Dunk	Tony Thompson, Jr

Program Directors

Sylvia W. Thomas, Ph.D., Assistant Professor, Department of Electrical Engineering

Rudy Schlaf, Ph.D., Professor, Department of Electrical Engineering & Director of Undergraduate Research, College of Engineering

Faculty Research Mentors

Norma Alcantar, Ph.D., Associate Professor, Department of Chemical and Biomedical Engineering

John Kuhn, Ph.D., Assistant Professor, Department of Chemical and Biomedical Engineering

Rudy Schlaf, Ph.D., Associate Professor, Department of Electrical Engineering, Director of Undergraduate Research, College of Engineering

Arash Takshi, Ph.D., Assistant Professor, Department of Electrical Engineering

Sylvia W. Thomas, Ph.D., Assistant Professor, Department of Electrical Engineering

Thomas Weller, Ph.D., Professor and Chair, Department of Electrical Engineering

Mike Zaworotko, Ph.D., Professor, Department of Chemistry

Miao Zhixin, Ph.D., Assistant Professor, Department of Electrical Engineering

NSF RET in Engineering and Computer Science
Water Awareness Research and Education (WARE)

Students and Faculty Research Mentors

Emanuel J. Burch	James Poulin
Diana Chernofsky	Julie Sackles
Maria Delpilar	Deborah Seto
Kari Knisely	Beth Valentine

Program Directors

Maya A. Trotz, Ph.D., Associate Professor, Department of Civil and Environmental Engineering

Tina Hohlfeld, Ph.D., Assistant Professor, Department of Secondary Education
Instructional Technology

Faculty Research Mentors

Jeff Cunningham, Ph.D., Associate Professor, Department of Civil and Environmental Engineering

Sarina Ergas, Ph.D., Professor and Graduate Coordinator, Department of Civil and Environmental Engineering

Yogi Goswami, Ph.D., John and Naida Ramil and Distinguished University Professor, Department of Chemical and Biomedical Engineering and Co-Director of the Clean Energy Research Center (CERC)

Manoj K. Ram, Research Professor, Nanotechnology and Education Research Center (NERC) and Clean Energy Research Center (CERC)

Amy Stuart, Ph.D., Associate Professor, Department of Civil and Environmental Engineering, Department of Environmental and Occupational health, College of Public Health

Maya A. Trotz, Ph.D., Associate Professor, Department of Civil and Environmental Engineering

Daniel Yeh, Ph.D., Associate Professor, Department of Civil and Environmental Engineering

NSF REU in Applied Physics

Students and Faculty Research Mentors

Tylissa Bogle
Matthew J. Bovyn
Chance Brown
Trinidy Combs
Michael S. Crumrine
Alina Gitnik
Allison Hartman
Walter Hill
Oliver Lanes
Shelby Lee
Jedidiah McCoy
Constance Owens
Ben Stortenbecker
Michael Testa
David Turbay

Program Director

Ivan Oleynik Ph.D., Professor, Department of Physics

Faculty Research Mentors

Matthias Batzill, Ph.D., Associate Professor, Department of Physics

Wei Chen, Ph.D., Professor, Department of Physics

Donald Haynie, Ph.D., Associate Professor, Department of Physics

Myung Kim, Ph.D., Professor, Department of Physics

Garrett Mathews, Ph.D., Associate Professor, Department of Physics

Casey Miller, Ph.D., Associate Professor, Department of Physics

George Nolas, Professor, Department of Physics

Ivan Oleynik, Ph.D., Professor, Department of Physics

Hariharan Srikanth, Professor, Department of Physics

Sarath Witanachchi, Ph.D., Professor and Associate Chair, Department of Physics

Jianfeng Zhou, Ph.D., Assistant Professor, Department of Physics

College of Engineering Research Experiences for Undergraduates
Florida-Georgia Louis Stokes Alliance for Minority Participation

Students and Faculty Research Mentors

Christian Avila
Jorge Calabria
Herby Jean
Rodolfo Sayegh
Jose Vasquez

Faculty Research Mentors

Sanjukta Bhanja, Ph.D., Associate Professor, Department of Electrical Engineering

Nathan Crane, Ph.D., Associate Professor, Department of Mechanical Engineering

John Kuhn, Ph.D., Assistant Professor, Department of Chemical and Biomedical Engineering

Daniel Yeh, Ph.D., Associate Professor, Department of Civil and Environmental Engineering

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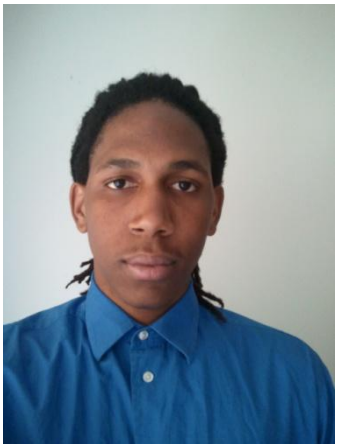
BIO SKETCHS & ABSTRACTS

REU in Ubiquitous Sensing

Leon Augustine



1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Computer Science*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sean Barbeau, Ph.D.*
1.5 Professional Goals:	*Upon my graduation, I plan to work in the computer science field for several years and based upon that experience decide whether to attend graduate school.*

2. Abstract

Real-Time Position Recalculation Management

Leon Augustine[1], Sean Barbeau[2], Miguel Labrador[1,2]

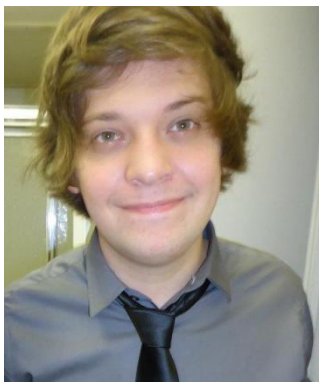
[1] *Department of Computer Science and Engineering, University of South Florida*
[2]*Center for Urban Transportation Research, University of South Florida*

laugusti@mail.usf.edu

Keywords: cell phones, location-based services, battery, GPS

GPS capability on cellphones has granted software developers huge functionality in the development of the programs that offer location-based services. This allows software to provide a unique experience to the end-users that curtail to certain regional preferences. However, this increase functionality comes at the price of increased battery consumption on the very limited batteries that power these devices. Therefore, a smart approach to location-based services becomes necessary. One particular issue is the disproportionate impacts of energy usage at certain locations. For example, retrieving a GPS fix outside in clear view of the sky (and GPS satellites) takes a relatively short amount of time. Thus, the GPS is on for less than say attempting to retrieving a GPS fix from an obstructed location where the GPS will stay on until it timeouts. This paper presents a system for position-recalculation which is shown to significantly reduce to this disproportionate impact on battery life.

Fred Bastian



1. Bio Sketch

1.1 Home Institution:	*Arcadia University*
1.2 Major:	*Computer Science and Mathematics*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Xiaoning Qian, Ph.D.*
1.5 Professional Goals:	*I hope to pursue a Ph.D. in Computer Science. My interests lie in Artificial Intelligence and Human-Computer Interaction so I hope to combine the two. After receiving my PhD, I want to obtain a R&D position within industry, but eventually I want to launch my own "start-up.*

2. Abstract

Keep It: An Android Based Application to Promote Preventative Health Care to Children

Fred Bastian[1], Dan Rosa[2], Xiaoning Qian[3]

[1]*Arcadia University, Philadelphia, PA*
[2]*University of Puerto Rico-Mayaguez, Campus*
[3]*Department of Computer Science and Engineering, University of South Florida*

fbastian@arcadia.edu

Keywords: Telepresence, Telemedicine, Robot, Robotics, Open-source

In the modern communication paradigm, physical presence is not necessary for communication. Ubiquitous communication devices and Internet connection allows for easy telepresence. However, most communication options have been static, not allowing full mobile interaction. There are now modern options for mobile telepresence offered from companies such as Anybots, Inc. that have both a webcam and a remotely controllable robot for full motion. We explore solutions that build on this pattern of mobile telepresence, but with the goal of a cost-effective, open-source based option for the medical community. We propose a full system, involving a robot-platform, on-board laptop, webcam, and the Microsoft Kinect for localization and mapping. Open-source programming solutions are also examined, such as the Robot Operating System (ROS), ffmpeg video-server, Apache http server, and an on-board application developed in Java-Swing.

Nestor Bonilla

1. Bio Sketch

1.1 Home Institution:	*Iberoamerican University of Science and Technology UNICIT*
1.2 Major:	*System Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Dmitry Goldgof, Ph.D.*
1.5 Professional Goals:	*I plan to work toward a Ph.D. in Computer Science within the area of Computer Vision.*

2. *Abstract*

Data Smoothing for 3D Optical Strain Calculations

Nestor Bonilla[1], Matt Shreve[2], Dmitry Goldgof[2]

[1]*Iberoamerican University of Science and Technology UNICIT*
[2]*Computer Vision and Pattern Recognition Group*
Department of Computer Science and Engineering
University of South Florida

nestor.bonilla.s@gmail.com

Keywords: Computer Vision, Range Values, Microsoft Kinect, Data Smoothing, Optical Strain

In this paper, we propose a novel solution to mitigate the noise values in 3D optical strain calculations. The proposed method aims to pre-process depth information with three filtering methods, mean, median and gaussian, in spatial and temporal domain to deal with the noise existing in those values and bring a better depth information to 3D optical strain calculations. Experimental results show that the noise in range values have been reduced, resulting in more stable 3D measurements for the duration of each facial expression. With further evaluation, this improvement could potentially lead to increased accuracy in facial analysis algorithms that depend on reliable 3D point tracking such as 3D optical strain.

Bolena Diaz-Hernandez

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Computer Engineering*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D., Diego Mendez, Chaves, Ph.D.*
1.5 Professional Goals:	*To work with new technologies, either helping to discover or improve them.*

2. Abstract

Determining the Sample Size for the Data Collection Stage on Participatory Sensing Applications

Bolena Diaz-Hernandez, Diego Mendez Chaves, Miguel Labrador

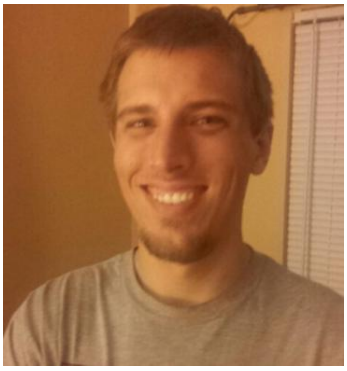
Department of Computer Science and Engineering
University of South Florida

bolena@mail.usf.edu

Keywords: Accuracy, precision, algorithm, global warning

Pollution control is a growing global concern that has enabled the use of Participatory Sensing for an effective way of measuring air quality. Measuring air quality with precision and accuracy is key for validating data. There are multiple variables that can question data's validity; one of these variables is sample size. In this paper, we will discuss various methods and algorithms that will help us determine what sample size will produce the most accurate measurements. With the correct algorithm implemented in the participatory sensing applications the measurements will be up to par with the Air Quality Index.

Christopher Eggert



1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Computer Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D.* *Oscar D. Lara, Ph.D.*
1.5 Professional Goals:	*I want to attend graduate school and study Machine Learning so that I can have a long career in advancing Artificial Intelligence.*

2. Abstract

Psychological Stress Recognition Using Vital Sign Data

Christopher Eggert, Óscar D. Lara, Miguel A. Labrador

Department of Computer Science and Engineering
University of South Florida

ceggert@mail.usf.edu

Keywords: Psychological stress, wearable sensors, ubiquitous sensing

The identification of psychological stress can provide important feedback in performance-critical activities. While a certain amount of stress may increase performance, an overly stressful reaction may hinder it. Because subjective bias can make it difficult to accurately recognize psychological stress, it would be advantageous for an external system to perform the task instead. We have developed a tool for psychological stress detection using physiological sensors during a chess match. The sensors are inside an unobtrusive chest strap that can be worn by the player during a match. By playing games on an Android phone, the system can apply machine learning techniques to the player's vital sign data to give important feedback such as which moves caused the player to become stressed during a match.

Ivory Hernandez

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Computer Science & Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D.,* *Diego Mendez Chaves, Ph.D.*
1.5 Professional Goals:	*My goal is to obtain a Ph.D. in Computer Science and Engineering. I want to gain expertise in the implementation and expansion of programming languages and compilers in novel ways that may include bio and nano processes.*

2. Abstract

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Data Collection on Participatory Sensing Applications: a Study on Accuracy, Sample Size Determination, and Feasibility

Ivory Hernandez, Bolena Diaz-Hernandez, Diego Mendez Chaves,
Miguel A. Labrador

Department of Computer Science and Engineering
University of South Florida

ihernan4@mail.usf.edu

Keywords: Accuracy, precision, algorithm, ubiquitous, sensing

Participatory Sensing (PS) offers the possibility of deployment of mobile sensing networks capable of gathering valuable data ubiquitously. Such data can be analyzed, processed, and transmitted to parties interested in it. Pollution-Sense (P-Sense) is an implementation of PS that while is very cost-effective allows the monitoring of the air quality at places not covered by official air quality monitoring systems. P-Sense has various aspects or components, being data validation one of them. This paper focuses in data acquisition, one of the subsections of data validation. Most appropriately, this paper focuses on the feasibility of accurate data acquisition by means of low-cost sensing devices. Factors like the quality and dissimilitude of sensing devices, in combination with the specific conditions of a given sensor reading affect accuracy by producing an unknown bias. Here we implement and test an algorithm based on a statistical theory, assumed to be correct, to determine the amount of samples needed to produce a given accuracy. We do this having in consideration the bias produced by the sensing instruments, point that is usually disregarded, and comparing our results against the results of a well-calibrated official monitoring station. We show how feasible is to implement this crucial aspect of P-Sense.

Andrés A. Pérez-León

1. Bio Sketch

1.1 Home Institution:	*Universidad del Norte*
1.2 Major:	*Computer Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D.* *Oscar D. Lara, Ph.D.*
1.5 Professional Goals:	*Obtain an M.S. and Ph.D. in Networking and Information Security related areas.*

2. Abstract

Human Activity Recognition using the Android Platform and Wearable Sensors for Health-Care purposes: a Continuation of the Vigilante Application

Andrés A. Pérez-León[1], Joshua C. Sheehy[2], Óscar D. Lara[3], Miguel A. Labrador[3]

[1]Universidad del Norte, Barranquilla, Colombia
[2]Belmont University, Nashville, TN
[3]Department of Computer Science and Engineering, University of South Florida

andres.a.perezleon@gmail.com

Keywords: human activity recognition, wearable sensors, vital signs, accelerometers, android

Advancements in mobile technology and wearable sensor technology offer the opportunity to gathering accurate, valuable information from an individual that would have otherwise been limited by equipment or environment in years past. The applications for human activity recognition (HAR) span numerous fields including medical, security, military, and entertainment. In particular, the Vigilante mobile application offers an accurate method for recognizing human activities by monitoring and processing vital signs and accelerometer data from a wearable sensor connected via Bluetooth to an Android-enabled phone.

In this paper, we focus on applications within the medical field. We present a means for a user to use Vigilante to track dietary and exercise habits, which could be extremely valuable to doctors monitoring the activity of patients with conditions such as diabetes, heart conditions, or dementia. In addition to the activities previously evaluated, we include activities related to sleeping and eating. We propose changes to the information path scheme previously implemented for Vigilante in order to address limitations in transmitting packets from phone to server over TCP. We also explore the use of a second sensor on the wrist to collect additional accelerometer data. Finally, we discuss the challenges of these modifications and offer our solutions.

Francisco J. Perez Laras

1. Bio Sketch

1.1 Home Institution:	*University of Puerto Rico-Bayamon*
1.2 Major:	*Computer Science*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sean Barbeau, Ph.D.* *Miguel Labrador, Ph.D.*
1.5 Professional Goals:	*To enter a graduate program for my M.S. in Computer Science, and expand my research experiences. I want to develop myself as a professional in my field of study.*

2. Abstract

2012-Evaluating the Impact in Variable Duty Cycling of Accelerometers on Battery Life

Francisco Perez Laras, Sean Barbeau, Miguel Labrador

[1] *University of Puerto Rico-Bayamon*
[2]*Center for Urban Transportation Research, University of South Florida*
[2,3]*Department of Computer Science and Engineering, University of South Florida*

francisco.perez7@upr.edu

Keywords: Android, Accelerometer, Sensor, Benchmark, Battery, Consumption

The use of smart mobile devices such as smartphones has increased through the years. These smart phones carry many sensors that are used for pin pointing locations, reading magnetic fields and determining orientation among others. Mobile developers utilize these sensors for commercial, personal and for research applications, therefore becoming very popular among the public and private sector. These sensors, when turned on, could be running in the foreground or background of the application, hindering battery charge on different levels. This research shows the battery impact of the accelerometer sensor being run in these conditions, it also demonstrates the benefits on battery consumption by duty cycling this sensor.

Nelson Rivera

1. Bio Sketch

1.1 Home Institution:	*Universidad del Turabo, Gurabo, PR*
1.2 Major:	*Computer Science*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D.* *Idalides Vergara-Laurens*
1.5 Professional Goals:	*I plan to finish my B.S., complete my M.S., and continue onward for my Ph.D. education in Computer Engineering.*

2. Abstract

Energy Consumption Characterization of Privacy Preserving Algorithms for Participatory Sensing Systems

Nelson Rivera[1], Yanira Rivera-Negron[2], Idalides Vergara-Laurens[3], Miguel Labrador[3]

[1]*Universidad del Turabo, Gurabo, Puerto Rico*
[2]*Universidad de Puerto Rico, Mayaguez Campus*
[3]*Department of Computer Science & Engineering, University of South Florida*

nelson.rivera.garcia@gmail.com

Keywords: Participatory Sensing, privacy-preserving mechanism, energy consumption

Participatory sensing is a new sensing paradigm where a group of users voluntarily gather, analyze, share and report data of interest utilizing their mobile devices. Given the large number of cellular users, these systems could be utilized to address or study issues or problems relevant to large populations. One of the most important problems in participatory sensing systems is that of the privacy, i.e., users will not be willing to participate, if the system does not include privacy-preserving mechanisms. However, privacy-preserving mechanisms may consume a considerate amount of resources, particularly energy due additional processing and data transmission, resulting in another issue that may prevent users from participating. . This project investigates the energy consumption associated with the most important privacy-preserving mechanisms available in the literature and the tradeoff between user privacy and energy consumption. These algorithms were classified in three categories, anonymization, obfuscation and encryption-based. Finally, the results present that the encryption-based algorithms consume significantly more energy, followed by anonymization-based algorithms and obfuscation-based algorithms.

Yanira Rivera-Negron

1. Bio Sketch

1.1 Home Institution:	*University of Puerto Rico, Mayaguez-Campus*
1.2 Major:	*Computer Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D.* *Idalides Vergara-Laurens*
1.5 Professional Goals:	*I plan to complete my B.S. in computer engineering in two areas, software and communications and signal processing. Thereafter, I plan to obtain my M.S. focused in database systems. My long-term goal is to achieve a Ph.D. in computing.*

2. Abstract

Energy Consumption Characterization of Privacy Preserving Algorithms for Participatory Sensing Systems

Yanira Rivera-Negron[1], Nelson Rivera[2], Idalides Vergara-Laurens[3], Miguel Labrador[3]

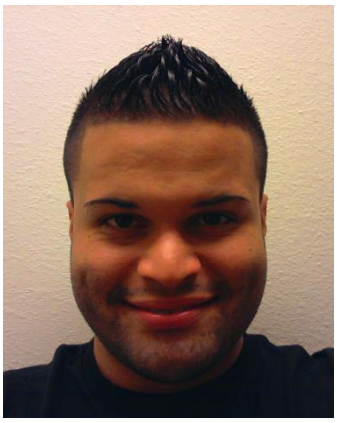
[1]*University of Puerto Rico, Mayaguez, Campus*
[2]*Universidad del Turabo, Gurabo, Puerto Rico*
[3]*Department of Computer Science and Engineering, University of South Florida*

yanira.rivera@upr.edu

Keywords: Anonymity, AES encryption, SSL, Points of interest, Private information, Asymmetric encryption, Symmetric encryption, Android application

Privacy preserving in Participatory Sensing (PS) applications is a challenge for today's mobile application designers. Mobile users are becoming more aware of the threats that might put in danger their private information. Since PS applications rely on the users, a PS application should be implemented with a privacy preserving mechanism and this mechanism should be energy efficient. The main objective is to motivate the participation and reliability of the data collected of the user, by guaranteeing his privacy and reducing the power consumption due to security mechanisms. This work presents the implementation of a hybrid mechanism involving anonymization, based on points of interest scheme, and a double-encryption technique. Additionally, a cost evaluation of the proposed mechanism is presented.

Dan Alberto Rosa de Jesús



1. Bio Sketch

1.1 Home Institution:	*Belmont University*
1.2 Major:	*Computer Science*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D.* *Oscar D. Lara, Ph.D.*
1.5 Professional Goals:	*Obtain a Ph.D. in Computer Engineering that will enable me to create new hardware and software that will benefit society.*

2. Abstract

Human Activity Recognition using the Android Platform and Wearable Sensors for Health-Care purposes: A Continuation of the Vigilante Application

Dan Alberto Rosa de Jesús[1], Fred Bastian[2], Xiaoning Qian[3]

[1]*University of Puerto Rico, Mayaguez, Campus*
[2]*Arcadia University, Philadelphia, PA*
[3]*Department of Computer Science and Engineering, University of South Florida*

dan.rosa@upr.edu

Keywords: human activity recognition, wearable sensors, vital signs, accelerometers, android

In this paper, we present “Keep It”, an Android based application that is being used to collect, analyze, and respond to health related activity data from young children. In the past, techniques similar to this application have focused mainly on data collection from adults. Keep It uses a combination of gamification, a system which uses game design techniques to enhance non-game applications, social networking, and a user interface tailored towards children as a way to draw younger users into playing and to keep them interested. After collecting the data through the use of smart phone sensors and games, the data is then analyzed and compared to other data in the user's direct social network. Then, based on this analysis, the user receives specially tailored responses from Keep It, which promote a healthier life style. In addition, from this analyzed data we can begin to tailor the application itself to promote healthier living in places where children seem to need it the most.

Joshua C. Sheehy

1. Bio Sketch

1.1 Home Institution:	*Belmont University*
1.2 Major:	*Computer Science*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Miguel Labrador, Ph.D.* *Oscar D. Lara, Ph.D.*
1.5 Professional Goals:	*Complete my B.S. in Computer Science and minor in Mathematics. After graduation, I plan to pursue a Ph.D. and hopefully remain in academia. My interests include Artificial Intelligence, and the theoretical aspects of Computer Science and its links to Mathematics.*

2. Abstract

Human Activity Recognition using the Android Platform and Wearable Sensors for Health-Care purposes: A Continuation of the Vigilante Application

Joshua C. Sheehy[1], Andrés A. Pérez-Leon[2], Óscar D. Lara[3], Miguel A. Labrador[3]

[1]Belmont University, Nashville, TN
[2]Universidad del Norte, Barranquilla, Colombia
[3]Department of Computer Science and Engineering, University of South Florida

cs.sts@gmail.com

Keywords: human activity recognition, wearable sensors, vital signs, accelerometers, android

Advancements in mobile technology and wearable sensor technology offer the opportunity to gathering accurate, valuable information from an individual that would have otherwise been limited by equipment or environment in years past. The applications for human activity recognition (HAR) span numerous fields including medical, security, military, and entertainment. In particular, the Vigilante mobile application offers an accurate method for recognizing human activities by monitoring and processing vital signs and accelerometer data from a wearable sensor connected via Bluetooth to an Android-enabled phone.

In this paper, we focus on applications within the medical field. We present a means for a user to use Vigilante to track dietary and exercise habits, which could be extremely valuable to doctors monitoring the activity of patients with conditions such as diabetes, heart conditions, or dementia. In addition to the activities previously evaluated, we include activities related to sleeping and eating. We propose changes to the information path scheme previously implemented for Vigilante in order to address limitations in transmitting packets from phone to server over TCP. We also explore the use of a second sensor on the wrist to collect additional accelerometer data. Finally, we discuss the challenges of these modifications and offer our solutions.

REU in Sustainable Energy Alternatives and the Advanced Materials

Saluta C. Banks

1. Bio Sketch

1.1 Home Institution:	*University of Arkansas at Pine Bluff*
1.2 Major:	*Chemistry*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*John Kuhn, Ph.D.*
1.5 Professional Goals:	*I want to receive my B.S. in Chemistry and enroll in a graduate program that will prepare for a career in the Chemical Sciences.*

2. Abstract

Synthesis and Characterization of Titania Supported Silver Phosphate

Saluta Banks[1], Erum Qayyum[2], John Kuhn[2]

[1]Department of Chemistry, University of Arkansas at Pine Bluff
[2]Heterogeneous Catalysis and Materials Chemistry Laboratory,
Department of Chemical and Biomedical Engineering, University of South Florida

saluta.banks@gmail.com

Keywords: Titanium dioxide, Silver phosphate, Photocatalyst

An in situ precipitation method used to place Ag3PO4 nanoparticles onto the surface area of TiO2 is developed to form a photocatalyst active under visible light spectra. The synthesis of Ag3PO4/TiO2 forms a heterostructured photocatalyst. X-ray diffraction patterns (XRD), Physisorption method on the Brunauer-Emmett-Teller (BET) surface area, UV-Vis diffusion reflectance spectra and Transmission electron microscopy (TEM) were characterizations used to investigate the structure and properties of Ag3PO4 of TiO2. To enhance the activity of Ag3PO4/TiO2 heterostructured photocatalyst degradation of methyl orange (MO) under visible light irradiation were executed to confirm decomposition. TiO2 is a photocatalyst that has ability to create an electron hole pair as a result to exposure to the ultraviolet radiation. Therefore, depositing Ag3PO4 onto the surface TiO2 will cause electron-hole separation leading to photocatalytic activity. Qualitatively, more Ag3PO4/TiO2 concentration in the reaction the better the decreasing of decomposing organics there will be.

Shantonio Birch

1. Bio Sketch

1.1 Home Institution:	*Georgia Perimeter College*
1.2 Major:	*Mechanical Engineering*
1.3 Classification:	*Sophomore*
1.4 USF Advisor/Mentor:	*Arash Takshi, Ph.D.*
1.5 Professional Goals:	*I plan to transfer to Georgia Tech University for my B.S., and then obtain my M.S. degree. I hope to advance the field of Sustainable Energy during my career.*

2. Abstract

Preparation of Poly(3,4-ethylenedioxythiophene) Poly(styrenesulfonate) (PEDOT-PSS) for Use as Electrodes in Supercapacitors

Shantonio Birch[1], Tete Tevi[2], Arash Takshi[2]

[1]*Georgia Perimeter College*
[2]*Department of Electrical Engineering, University of South Florida*
[2]*Department of Electrical Engineering, University of South Florida*

sbirch@asme.org

Keywords: Supercapacitors, Conductive Polymers, Four Point Probe, Current Voltammetry

The need for alternative energies has increased research interest in energy storage devices. Today, conventional batteries have a huge storage capacity. However, because of the electrochemical processes involved, the lifetime of these energy storage devices is very short. In contrast, capacitors do not store energy electrochemically. Instead, they store energy in an electric field, making them capable of delivering energy quickly, and charging in matters of minutes or even seconds. Furthermore, capacitors can be recharged hundreds of thousands of times before they wear out, thus making them more desirable than today's batteries, which must be discarded after a few hundred charges. In spite of the added advantage of longer lifetime that capacitors offer, their capacity for storing energy is very limited. Consequently, Supercapacitors have emerged as a backup for batteries in applications where high power density is needed.

Although today's commercial supercapacitor uses electrodes coated with activated carbon, which provides a large surface area for storing ions, it has been proposed that conductive polymers could be used as alternative electrode materials. Among conductive polymers, poly (3, 4-ethylene dioxythiophene): poly (styrene sulfonate) (PEDOT: PSS) is appreciated for supercapacitor electrodes because of its high stability and enhanced processability. However, according to researchers the films are plagued by a low conductivity; generally less than 1 S/cm. Research have shown that the conductivity of PEDOT-PSS films can be improved by treating pristine PEDOT-PSS with surfactants such as Ethylene Glycol, Dimethyl Sulfoxide, and Triton-X.

Tyquan Burney

1. Bio Sketch

1.1 Home Institution:	*Savannah State University*
1.2 Major:	*Electronic Engineering Technology*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Miao Zhixin, Ph.D.*
1.5 Professional Goals:	*To complete my degree and obtain professional employment as an Electrical Engineer.*

2. Abstract

Power Quality

Tyquan Burney, Lakshan Piyasinghe, Miao, Zhixin

[1]*Savanah State University*
[2]*Department of Electrical Engineering, University of South Florida*

tburney18@yahoo.com

Keywords: Power Quality, DC, AC, Frequency Wave, Frequency Inverter, Wikipedia

Power Quality is a major factor among many power companies and society. Hundreds of companies are concern with energy loss, due to this I having been doing research on ways to conserve energy this summer at the University of South Florida. I did research on inverters converting DC to AC. This output frequency can be changed by an external frequency command and frequency command from the panel and terminal. The motor speed is controlled by changing the frequency, thus saving energy for operation when a frequency inverter is adopted. Also I studied on how engineers can reduce harmonics in a frequency wave for better power quality or a better wave form.

I studied and obtain data from the University of South Florida Power System Lab and the Power System Wikipedia. Working in this lab I was able to use the equipment provided to perform test runs. I also use Wikipedia for better understanding of power quality. Throughout my further studies on Power System, I hope to find ways to conserve energy during peak load times so that energy can be stored and not wasted.

Federico Diamante

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Electrical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Thomas Weller, Ph.D.*
1.5 Professional Goals:	*My goal is to continue my education at the University of South Florida and complete my M.S. degree in Electrical Engineering.*

2. Abstract

Development and Design of Printed Electronics with Focus on RFID Systems for Transmission of Data and Impedance Variance Sensors

Federico Diamante[1,2], Robert Donatto'[1.2]
Vinicio Carias[3], Michael Grady[1,2], Thomas Weller[1,2]

[1]*Department of Electrical Engineering, University of South Florida*
[2]*The Center for Wireless and Microwave Information Systems (WAMI), University of South Florida*
[3]*Department of Chemical and Biomedical Engineering, University of South Florida*

fdiamante@mail.usf.edu

Keywords: RFID, printed electronics, quantum dots, transmission line

Electronic circuits are costly and time consuming to manufacture. However, the future of printable electronics looks promising with the ability to develop state of the art electronics at a reasonable price efficiently. The purpose of this research is to investigate alternative ways to produce reliable and inexpensive integrated circuits. Various developmental testing consists of using silver nano-particles (also called quantum dots) submerged on a water base solution ink to be printed via ink jet printers. The silver print will act as transmission lines between components as well as the conductive material for intricate antenna designs. Our current research consists of testing materials for accurate design on different CAD software, with a short term goal to simulate and construct different types of circuits. While our long term goals include the design and construction of a three-dimension printer that will incorporate the production of the substrate as well as the printing of an embedded circuit. The printed electronics technology is a new and untested territory and there is some research being done on the development of sensors and antennas and our goal is to expand the knowledge and to test its boundaries. Current design concepts will be focused on a RFID tag which can transmit data via printed antenna. The future of printed electronics will be an on demand instant delivery of any products that employ electrical components. In the future a printed electronics technology will allow the manufacture of electronic devices such as television or personal computer, all from a small work station from the home or office.

Roberto Donatto

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Electrical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Thomas Weller, Ph.D.*
1.5 Professional Goals:	*My goals are to complete both my B.S. and M.S. in Electrical Engineering and gain employment as a RF/Microwave Engineer either within industry or the federal workforce.*

2. Abstract

Robert Donatto[1,2], Federico Diamante[1,2]
Vinicio Carias[3], Michael Grady[1,2], Thomas Weller[1,2]

[1,2]Department of Electrical Engineering, University of South Florida
[2]The Center for Wireless and Microwave Information Systems (WAMI), University of South Florida
[3]Department of Chemical and Biomedical Engineering, University of South Florida

rdonatto@mail.usf.edu

Keywords: RFID, printed electronics, quantum dots, transmission line

Electronic circuits are costly and time consuming to manufacture. However, the future of printable electronics looks promising with the ability to develop state of the art electronics at a reasonable price efficiently. The purpose of this research is to investigate alternative ways to produce reliable and inexpensive integrated circuits. Various developmental testing consists of using silver nano-particles (also called quantum dots) submerged on a water base solution ink to be printed via ink jet printers. The silver print will act as transmission lines between components as well as the conductive material for intricate antenna designs. Our current research consists of testing materials for accurate design on different CAD software, with a short term goal to simulate and construct different types of circuits. While our long term goals include the design and construction of a three-dimension printer that will incorporate the production of the substrate as well as the printing of an embedded circuit. The printed electronics technology is a new and untested territory and there is some research being done on the development of sensors and antennas and our goal is to expand the knowledge and to test its boundaries. Current design concepts will be focused on a RFID tag which can transmit data via printed antenna. The future of printed electronics will be an on demand instant delivery of any products that employ electrical components. In the future a printed electronics technology will allow the manufacture of electronic devices such as television or personal computer, all from a small work station from the home or office.

Gabriela Dunk

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Chemical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sylvia Thomas, Ph.D.* *Norma Alcantar, Ph.D.*
1.5 Professional Goals:	*I plan to graduate from USF with a Bachelors of Science and Masters of Science in Chemical Engineering. After graduating, I hope to do my best to ensure that every individual on this earth has access to clean drinking water. I would like to work with a company that shares my passion.*

2. Abstract

Preliminary Life Cycle Analysis of Electrospun Cactus Mucilage Nanofibers

Gabriela Dunk[1], Samuel Perez[2], Daniela Lima-Stebbins[1],
Norma Alcantar[1], Sylvia W. Thomas[2]

[1]Department of Chemical and Biomedical Engineering, University of South Florida
[2]*Advanced Materials Bio & Integration Research (AMBIR) Group,*
Department of Electrical Engineering, University of South Florida

dunkg@mail.usf.edu

Keywords: *Ofi*, nanofiber, water filtration, life cycle analysis, electrospinning

Current nanofiber filtration systems are constructed from materials that are neither biodegradable nor biocompatible. By using biocompatible materials for water purification and filtration, the safety of both the environment and mankind will be ensured. It is clear that a filtration system that is user friendly, cost-effective and environmentally sound is needed. In this project, the composition and ability of the cactus, *Opuntia ficus indica*, has been investigated and it has been the primary source of mucilage that is being used. The mucilage found in this plant has been found to interact with heavy metals, cations and biological substances such as K(potassium), Mg (magnesium), Fe(iron) and Na(sodium).

The goal of this project is to synthesize an environmentally accepted and cost-effective nanofiber material, introduce this material as a competent resource for water filtration and make certain that it will be sustainable and affordable around the world. In order for this project to indeed be successful, there are several steps that need to be performed. After extracting the mucilage, the nanofiber material must be formed. Constructing cactus nanofibers through electrospinning is an inexpensive method that allows a nanofiber mesh to form quickly.

Andrew Hernandez

1. Bio Sketch

1.1 Home Institution:	*Florida Institute of Technology*
1.2 Major:	*Chemical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentors:	*Sylvia W. Thomas, Ph.D., Henry Cabra*
1.5 Professional Goals:	*I plan to pursue my Ph.D. education.*

.

2. Abstract

Design Modification and Preliminary Testing of an Implantable Bio-Generator

Andrew Hernandez[1], Henry Cabra[2], Sylvia Thomas[2]

[1]*Florida Institute of Technology, Melbourne, FL*
[2]*Advanced Materials Bio & Integration Research (AMBIR) Group, Department of Electrical Engineering, University of South Florida*

hernandeza2009@my.fit.edu

Keywords: generator, rotor, biogenerator, design, implant, SolidWorks, ANSYS

This research serves to provide design modifications and testing of these modifications to a millimeter biogenerator system design that can be implanted within the human body to produce electricity passively from the circulatory system. Simulations will supplement the designing of the modified model to be constructed to capture experimental data. This constructed physical model (PM) is approximately 4x larger than the design model (DM), and a small commercial motor assembled to the rotor and casing serves as the PM's generator.

In an effort to achieve the overall research objective of providing a continuous power source to biomedical devices, design modifications had to be made to the previous DM. These modifications, a funnel shaped inlet and change in the shape of the rotor blades, were applied using SolidWorks software. These modifications to the design were further validated with continued modification and simulation within the ANSYS software package. Measurements taken for the PM were completed using a pressurized water system attached to the model to loosely mimic circulatory conditions. Measurements were taken of the produced AC voltage at varying system pressures and volumetric flow rates. The physical testing provides this data, but more importantly reviews the functionality of the model.

Michelle Navar

1. Bio Sketch

1.1 Home Institution:	*University of Florida*
1.2 Major:	*Chemical Engineering*
1.3 Classification:	*Raising Junior*
1.4 USF Advisor/Mentors:	*John Kuhn, Ph.D., Selasi Blavo, Yolanda Daza*
1.5 Professional Goals:	*Undecided*

2. Abstract

Platinum & Silver Nanoparticles Loaded onto Perovskite-type Oxides as Catalysts for CO_2 Conversion

M. Navar[1], S.O. Blavo[2], Y. A. Daza[2], J.N. Kuhn[2]

[1]*University of Florida*
[2]*Department of Chemical and Biomedical Engineering, University of South Florida*

mnavar@ufl.edu

Keywords: carbon dioxide, perovskite-type oxide, silver, platinum nanoparticles

Carbon dioxide emissions are an undesirable product of fossil fuel combustion. One of the current methods for limiting CO_2 emissions is carbon capture and storage (CCS).The long-term goal of this project is to convert the captured CO_2 into CO, which can be used as a feedstock for synthesizing liquid fuels through the Fischer-Tropsch synthesis method. Because of their high oxygen mobility and easy-to-tailor properties, perovskites were chosen for this project. Perovskite refers to any crystalline material with the molecular formula ABO_3 (where the A and B position can be filled with a combination of up to three metals. The metal in the A position gives the perovskite its stability while the one in the B site gives it its reducibility.) The material selected for this project is a lanthanum-strontium-cobalt perovskite-structured oxide which was loaded with either Ag or Pt nanoparticles to evaluate the effects of metal loading in CO_2 conversion.

Previously, it had been found that the CO_2 conversion in the lanthanum-strontium-cobalt perovskite system ($La_{1-X}Sr_XCoO_3$) is enhanced when X=0.25 in the $La_{0.75}Sr_{0.25}CoO_3$ structure. The goal for this summer involved lowering the temperature of isothermal CO_2 conversion by doping the mentioned material with the metal nanoparticles. The perovskite was synthesized using the Pechini synthesis method while the solution containing either Ag or Pt nanoparticles was synthesized using a reflux set-up. The final product was a 5% metal loaded perovskite. The analysis methods used for this project include X-Ray Diffraction. Transmission Electron Microscopy, Temperature Programmed Reduction, modified Temperature Programmed Oxidation with CO_2, and an isothermal conversion study. Our group concluded that both Ag and Pt loaded perovskites lowered the temperature required for isothermal CO_2 conversion.

Angel Sanchez-Torres

1. Bio Sketch

1.1 Home Institution:	*University of Puerto Rico, Mayaguez, Campus*
1.2 Major:	*Mechanical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Rudiger Schlaf, Ph.D.*
1.5 Professional Goals:	*To achieve a Ph.D. degree in Mechanical Engineering focused in microelectromechanical systems (MEMS) for the development of novel applications for sustainability.*

2. Abstract

Design and construction of a LabVIEW based controller system for the front end of an ion funnel

Angel Sanchez-Torres[1], Eric Tridas[2], Rudiger Schlaf[3]

[1]University of Puerto Rico, Mayaguez Campus
[2]Department of Mechanical Engineering, University of South Florida
[3]Department of Electrical Engineering, University of South Florida

angel.sanchez6@upr.edu

Keywords: electrospray, ion funnel, LabVIEW, Arduino

The project focuses on the integrated design of an electrospray injection system, which will be used to inject macromolecules into an ion funnel based differential pumping stage. The objective of the project is the design of a LabVIEW based controller to operate a syringe pump, an electrospray high voltage supply (±3kV), a capillary heater, and a capillary bias supply (±250V). The project is based on the Arduino microcontroller platform. The individual parts of the system will first be tested on breadboard set-ups. Once a working design has been established, an integrated printed circuit board will be designed and fabricated based on the toner transfer technique. The circuit board will be populated, tested, and integrated into an existing syringe pump enclosure.

Lauren Seaman

1. Bio Sketch

1.1 Home Institution:	*Monmouth University*
1.2 Major:	*Chemistry*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*John Kuhn, Ph.D.*
1.5 Professional Goals:	*To attend graduate school for an advanced degree in Organic Chemistry, and eventually work in the flavor and fragrances industry to hopefully develop organic and sustainable food products.*

2. Abstract

Ligand Design for the Isoreticular Expansion of a Pillared Metal-Organic Material Platform

Lauren Seaman[1], Patrick Nugent[2], Michael Zaworotko[2]

[1]*Department of Chemistry, Medical Technology and Physics, Monmouth University*
[2]*Department of Chemistry, University of South Florida*
[2]*Department of Chemistry, University of South Florida*

s0731563@monmouth.edu

Keywords: Metal-organic materials, metal-organic frameworks, carbon capture, SiF_6 platforms

The use of carbon capture technology has seen a dramatic increase in the recent years as the plethora of carbon dioxide emissions continues to threaten the planet's environment. The existing carbon dioxide scrubbing methods have financial drawbacks, making them undesirable or inaccessible to many companies. A class of three dimensional crystalline compounds known as metal-organic materials (MOM's) has shown promising results in the storage and separation of carbon dioxide. This research focuses on manipulating the different variables that contribute to the topology of the framework, and therefore its physical properties. A new organic ligand, which is the linker in the MOM, an expanded from 4,4'-bipyridine (BPY), was synthesized to contain an amide group, which are known to have higher affinities for CO2. This ligand is known as N,N' di(4-pyridinyl) benzene-1,4-dicarboxamide or BPDA. Structure of the ligand was confirmed by nuclear magnetic resonance (NMR) spectroscopy and structure of the framework constructed with CuSiF6 was inconclusive by powder X-ray diffraction (PXRD). However, single crystal x-ray diffraction confirmed a pillared grid was formed. A surface area analysis showed results of 1 m2 per gram which indicated that the structure was no longer porous after solvent evacuation. Another organic ligand, also an expanded form of BPY, known as 3,6-di(4-pyridinyl)-1,2,4,5-tetrazine or BPTZ was also pillared with CuSiF6 to form a pillared square grid whose structure was confirmed by PXRD. Despite the surface area results, the structures obtained show that the frameworks have a good potential of being able to separate and store carbon dioxide more effectively than previously developed platforms

John Stratton

1.Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Electrical Engineering*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Rudiger Schlaf, Ph.D., Eric Tridas*
1.5 Professional Goals:	*I want to become a Research and Development Engineer after my graduation.*

2. Abstract

Design and Construction of a LabVIEW Based Controller for the Front End of an Ion Funnel

John Stratton[1], Eric Tridas[2], Michael Schaefer[3], Rudiger Schlaf[1]

[1]*Department of Electrical Engineering, University of South Florida*
[2]*Department of Mechanical Engineering, University of South Florida*
[3]*Department of Physics, University of South Florida*
[1]*Department of Electrical Engineering, University of South Florida*

jstratton1@mail.usf.edu

Keywords: Electrospray, LabVIEW, Arduino, Syringe, Pump

The project focuses on the integrated design of an electrospray injection system, which will be used to inject macro-molecules into an ion funnel based differential pumping stage. The objective of this project is the design of a LabVIEW based controller to operate a syringe pump. The project is based on the Arduino micro-controller platform. The system will first be tested on a breadboard set-up. Once a working design has been established, a printed circuit board will be designed and fabricated based on the toner transfer technique. The circuit board will be populated and tested, and integrated into an existing syringe pump enclosure. The project will later be extended to include an electrospray high voltage supply (±3kV), a capillary heater, and a capillary bias supply (±250V), so the design of the syringe pump system will be such that this expansion is possible.

Tony Thompson, Jr.

1. Bio Sketch

1.1 Home Institution:	*Savannah State University*
1.2 Major:	*Electrical Engineering Technology*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Sylvia W. Thomas, Ph.D., Samuel Perez*
1.5 Professional Goals:	*After receiving my masters degree in a field of engineering, I would like design electronics for the defense industry.*

2. Abstract

Thermal Energy Transfer with Phase Change Materials

Tony Thompson Jr[1], Sam Perez[2], Sylvia W. Thomas[2]

[1]*Savannah State University*
[2]*Department of Electrical Engineering, University of South Florida*

TThomp21@student.savannahstate.edu

Keywords: Phase change materials, paraffin wax, thermal energy

Solid-liquid phase change materials (PCM) are used in latent heat thermal energy storage systems to increase energy saving potentials and energy storage capacity by improving its thermal properties. The idea to use the paraffin wax as the PCM is for the purpose of accumulating thermal energy to make use of the latent heat of a phase change. Since a phase change involves a large amount of latent energy, PCMs are used for temperature stabilization and for storing heat with large energy densities in combination with rather small temperature changes. The successful usage of PCMs is on one hand a question of a high energy storage density, but on the other hand it is very important to be able to charge and discharge the energy storage with a thermal power, that is suitable for the desired application. One major drawback of latent thermal energy storage is the low thermal conductivity of the materials used as PCMs, which limits the power that can be extracted from the thermal energy storage. In the work presented in this paper, different percentages of carbon nanofibers mixed into the paraffin wax were investigated in the thermal energy storage. Different PCM materials, with and without the enhancement of the thermal conductivity, were used and tested experimentally.

REU: TIER Tampa Interdisciplinary Environmental Research

Tuliagenda Beckford

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Civil and Environmental Engineering*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Maya Trotz, Ph.D., Suzanne Boxman*
1.5 Professional Goals:	*To pursue a career in wastewater treatment and sustainable community development.*

2. Abstract

Tuliagenda Beckford, Suzanne Boxman, Maya Trotz

Department of Civil and Environmental Engineering
University of South Florida
Tampa, FL 33620

tuliagenda@mail.usf.edu

Keywords: Aquaculture, Total Phosphorous, plants

In an effort to promote the growth of land based marine aquaculture in the United States a sustainable, inland, zero discharge, marine recirculating aquaculture system (RAS) has been developed at the Mote Marine Laboratory in Sarasota, FL. This project evaluates the potential to expand saleable products associated with sustainable marine fish farming to include large-scale land-based production of saltwater plants, while reducing discharges of pollutants to the environment. Specific aims of this research includes evaluating the performance of the wastewater treatment systems associated with pilot-scale and commercial marine and demonstrating land-based production of native saltwater plants and macroalgae associated with sustainable aquaculture farming to restore coastal and marine habitats. Here we investigate the influence of height, foliage, species and age on phosphorus assimilation by plants. A spectrophotometric method was used to determine the phosphorus levels of three different plant species sampled from the system. It was determined that a positive linear relationship exists between foliage and phosphorus assimilation. This information will inform an engineering model to elucidate the movement of nutrients through the RAS system.

RET: Engineering and Computer Science
WARE: Water Awareness Research and Education

Phil Alderman

1. Bio Sketch

1.1 Middle/High School	*Hillsborough High School, Tampa, FL*
1.2 Position/Subjects Taught	*Geometry, Algebra*
1.3 USF Advisor/Mentors:	*Daniel Yeh, Ph.D., Robert Bair*
1.4 Professional Goals:	*To bring real-life mathematical applications to the classroom so that students can see why understanding and applying mathematical concepts are important in solving problems faced by our community and society as a whole.*

2. Abstract

Food Waste Sustainability Research

Phil Alderman[1], Robert Bair[2], Daniel Yeh[2]

[1] *Hillsborough High School, Tampa, FL*
[2]*Department of Civil and Environmental Engineering, University of South Florida*

phil_alderman@yahoo.com

Keywords: anaerobic, digester, reactor, sustainability, nutrients

There are millions of tons of food waste sent to landfills every year. This causes environmental, social, and economic problems. School cafeterias create an abundance of food waste every day that schools are in session. This provides an opportunity for innovative ways to sustain food waste and purposely use it in ways that will benefit our communities and society as a whole. A food waste reactor has been set up at Learning Gate School in Lutz, FL. This anaerobic digester reactor operates to recover the nutrients and energy from the food waste created at the school's cafeteria.

The food waste from the school's cafeteria is collected and fed into the reactor. As the waste works its way through the reactor, the anaerobic digesters will cause the waste to react resulting in liquid fertilizer, sludge, and methane production.

Calculations were done to determine the best flow rate for the food waste to be broken down. The amount of time it would take for the waste to travel the full length of the reactor was calculated, as well as how long the pump would need to stay on to attain optimal flow and production.

Emanuel J. Burch

1. Bio Sketch

1.1 Middle/High School	*Richard C. Spoto High School*
1.2 Position/Subjects Taught	*Chemistry, Physical Science, Earth & Space Science (Grades 10, 11, 12)*
1.3 USF Advisor/Mentors:	*Manjoj K. Ram, Ph.D.,* *D. Yogi Goswami, Ph.D.*
1.4 Professional Goals:	*I will continue my 14-year career as a science educator/researcher as I prepare myself to enter a leadership role either at the school or district level.*

2. Abstract

Characterization of Conducting Polyaniline Film

Emanuel J. Burch[1], Venkata P. Bolisetty[2,3], Manoj K. Ram[3,4], D. Yogi Goswami[4,5]

[1] *Spoto High School, Riverview, FL*
[2] *Department of Electrical Engineering*
[3] *Nanotechnology Research and Education Center (NREC), University of South Florida*
[4] *Clean Energy Research Center (CERC), University of South Florida*
[5] *Department of Chemical and Biomedical Engineering, University of South Florida*

emanuel.burch@sdhc.k12.fl.us

Keywords: Polymer, Electrochromic, Polyaniline

Conductive polymers research has been ongoing for more than three decades. Due to increased environmental regulation, they have recently gained more demand in the fields of corrosion control coatings, radars, batteries, sensors, and even electrochromic cells (Harun, M. H., et al., 2007). Specifically, Polyaniline has been identified as an effective conducting polymer in recent research. I have worked on the Polyaniline conducting polymer film which changes color with a metal contact in the presence of an electrolyte solution. The change of the film color allows a way to control light transmitted through the film. More specifically, I have synthesized and characterized the conducting polymer films on conducting surface. Later, I used the film to understand the mechanism of the polymer color using different electrolytes.

Diana Chernofsky

1. Bio Sketch

1.1 Middle/High School:	*Dowdell Middle Magnet School*
1.2 Position/Subjects Taught:	*Science Coach & Science Subject Leader (SAL)*
1.3USF Advisor/Mentor:	*Maya Trotz, Ph.D., Ryan Locicero*
1.4 Professional Goals:	*To continue working with science teachers both at the school and district levels, increasing their knowledge and expertise in the areas of science curriculum; and continue my own study in the area of educational research as a District trainer for science teachers.*

2. Abstract

Tampa Bay Watershed, WARE, Young Middle Magnet School, storm water, retention pond, runoff, SWFWMD, drainage map, McKay Bay, water quality

Diana Chernofsky[1], Ryan Locicero[2], Maya Trotz[2]

[1]*Dowdell Middle Magnet School, Tampa, FL*
[2]*Department of Civil and Environmental Engineering, University of South Florida*

mscdiana@gmail.com

Keywords: Algae, Wastewater, Dialysis membranes, Growth

McKay Bay is on the EPA's list of impaired water sources in Hillsborough County Florida. Continuous research has taken place at USF looking at environmentally friendly, cost-effective alternative methods of filtering out increased nutrient pollutants from runoff in community retention ponds, prior to percolating into the ground water supply and out to the Bay. Scientific research validates the increase of such pollutants and concludes much of it is from local activities such as lawn fertilizing and inappropriate dumping of waste into storm water runoff retention ponds, swales, and down storm drains. Community awareness through education, service projects and cooperation is aimed at prevention and overall reduction in pollutants.

Maria Delpilar

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Mathematics Education*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentors:	*Daniel Yeh, Ph.D., Ivy Cormier*
1.5 Professional Goals:	*To obtain my B.S. and obtain my master's from the University of South Florida.*

2. Abstract

What Can Algae Do For You?

Maria Delpilar[1], Julie Sackles[2], Ivy Cormier[3], Daniel Yeh[3]

[1]*Department of Secondary Education Mathematics Education, University of South Florida*
[2]*Tampa Bay Technical High School, Tampa, FL*
[3]*Department of Civil and Environmental Engineering, University of South Florida*

mdelpilar@mail.usf.edu

Keywords: wastewater, algae, biofuel, optical density, nitrate, phosphate

The consumption and degradation of earth's natural resources is going to require a different outlook on materials we have traditionally viewed as waste products. It will become critical to create processes to change these "waste" materials into useful products and to recycle them requiring lower expenditures of energy and money. The focus of this engineering project is to take wastewater and utilize its inherent nutrients to grow algae. This has many benefits: the nutrient load that has to be removed at the wastewater treatment plant is reduced, carbon is sequestered as the algae grow, and the amounts of virgin nutrient sources that must extracted elsewhere are decreased. The algae can then be harvested to extract their lipids for biofuels and the remaining biomass used for animal feed and fertilizer.

The students will be designing their own experimental protocol, focusing on how best to grow algae in a simulated wastewater. Each lab group will determine the variable they would like to test (material used to simulate waste water, amount of light, etc.) and then build their bioreactors using 2-liter soda bottles. Determination of growth will be done using optical density measurements taken each day. The optical density data will then be used to look at growth rate of the algae and the students will calculate (based on the data for a small sample) how much algae would be produced in a large tank such as would be used at a wastewater treatment plant.

Kari Knisely

1. Bio Sketch

1.1 Middle/High School:	*Sligh Middle School*
1.2 Position/Subjects Taught	*Grade Level Math, 7th Grade*
1.3 USF Advisor/Mentors:	*Jeff Cunningham, Ph.D.* *Austin Atkins*
1.4 Professional Goals:	*My future goals encompass staying in the education industry. I may choose to pursue a PhD at some point in the future as well based on what paths open up for me over the next few years.*

2. Abstract

Drinking Water & Lead Contamination

Kari Knisely[1], Austin Atkins[2], Jeff Cunningham[2]

[1]*Sligh Middle School, Tampa, FL*
[2]*Department of Civil and Environmental Engineering, University of South Florida*

kariknisely@gmail.com

Keywords: Madagascar, World Health Organization, Lead-contamination, lead poisoning, Anodic Stripping Voltammetry (ASV), Colorimetry, Graphite Furnace Atomic Absorption Spectroscopy (GFAA)

In Madagascar only 47% of the population has access to clean drinking water. In the Eastern part of the island, local artisans dig shallow drinking water wells and install locally manufactured pumps. Lead from old batteries is used for various parts of these pump systems as floats and as solder on the screen in contact with the water. Preliminary sampling of wells in 2010 and analysis for lead using ICP-MS at the University of South Florida (USF) indicated that there were some wells with lead levels above safe limits of 10 ug/L as set by the World Health Organization. Through the Master's International program in Civil and Environmental Engineering at USF, our team currently has a member on the ground in Madagascar who wishes to test these levels in the field. This research compared the effectiveness of different analytical methods to measure the level of lead contamination in drinking water. The mobile/portable analytical methods include Anodic Stripping Voltammetry (ASV) and Colorimetry with various reagents for color development. Analysis via lab based methods like the Graphite Furnace Atomic Absorption Spectroscopy (GFAA) were used to compare with the field based kits. The results from this work will be used to identify the most suitable method of analysis for field measurements of lead in drinking water in Madagascar.

James Poulin

1. Bio Sketch

1.1 Middle/High School:	*Young Middle Magnet School*
1.2 Position/Subjects Taught	*Technology Education, 7th and 8th Grade*
1.3 USF Advisor/Mentors:	*Sarina Ergas, Ph.D.* *Thomas Lynn*
1.4 Professional Goals:	*To obtain knowledge of STEM rresearch, and utilize this experience as an opportunity to bring real-world research activities into my classroom.*

2. Abstract

Guidelines for Internal Water Storage Zones in Bioretention Systems

James Pouln[1], Tom Lynn[2], Sarina Ergas[2]

[1]*Young Middle Magnet School, Tampa, FL*
[2]*Department of Civil and Environmental Engineering, University of South Florida*

poulintech@gmail.com

Keywords: biorention, stormwater runoff, nitrogen removal, internal water storage zone, low impact development

Storm water runoff contains nitrates, which leads to Eutrophication from excess bacteria growth. A type of low impact development that aims to reduce contaminates in storm water is the use of a bioretention system with an internal water storage zone. For these bioretention systems, different types of media, depths, and loading rates are examined for their denitrifying characteristics in order to provide guidance for design of Internal Water Storage Zone. This guidance will come in the form of an equation that will be able to be implemented into modeling software.

Julie Sackles

1. Bio Sketch

1.1 Middle/High School:	*Tampa Bay Technical High School*
1.2 Position/Subjects Taught:	*Science Department Chair, Advanced Placement (AP), Environmental Science, Grades 11 & 12*
1.3USF Advisor/Mentor:	*Daniel Yeh, Ph.D., Ivy Cormier*
1.4 Professional Goals:	*I have been involved in science curriculum writing efforts for the Hillsborough county School District. I have been the recipient of grants through the Southwest Florida Water Management District to teach freshwater-related concepts to my students. What I have learned in the RET program is perfectly aligned to my past efforts and the content I teach in my AP Environmental Science class.*

2. Abstract

What Can Algae Do For You?

Julie Sackles[1], Maria Delpilar[2], Ivy Cormier[3], Daniel Yeh[3]

[1]Tampa Bay Technical High School, Tampa, FL
[2]Department of Secondary Education Mathematics Education, College of Education
[3]Department of Environmental & Occupational Health, College of Public Health

Julie.Sackles@sdhc.k12.fl.us

Keywords: wastewater, algae, biofuel, optical density, nitrate, phosphate

The consumption and degradation of earth's natural resources is going to require a different outlook on materials we have traditionally viewed as waste products. It will become critical to create processes to change these "waste" materials into useful products and to recycle them requiring lower expenditures of energy and money. The focus of this engineering project is to take wastewater and utilize its inherent nutrients to grow algae. This has many benefits: the nutrient load that has to be removed at the wastewater treatment plant is reduced, carbon is sequestered as the algae grow, and the amounts of virgin nutrient sources that must extracted elsewhere are decreased. The algae can then be harvested to extract their lipids for biofuels and the remaining biomass used for animal feed and fertilizer. The students will be designing their own experimental protocol, focusing on how best to grow algae in a simulated wastewater. Each lab group will determine the variable they would like to test (material used to simulate waste water, amount of light, etc.) and then build their bioreactors using 2-liter soda bottles. Determination of growth will be done using optical density measurements taken each day. The optical density data will then be used to look at growth rate of the algae and the students will calculate (based on the data for a small sample) how much algae would be produced in a large tank such as would be used at a wastewater treatment plant. We will also calculate amount of biofuel that could be produced and how much remaining biomass would be available to use for other purposes, such as animal feed and fertilizer.

Deborah Seto

1. Bio Sketch

1.1 Middle/High School::	*Orange Grove Middle Magnet School*
1.2 Position/Subjects Taught	
1.3 USF Advisor/Mentors:	*Maya Trotz, Ph.D., Suzanne Boxman*
1.5 Professional Goals:	*My goals are to be able to bring back meaningful research projects for students that may include satellite work at East Tampa ponds. In addition I seek to form collaborations with the USF Department of Civil and Environmental Engineering and Orange Grove Middle Magnet School to provide guest lessons on conducting research in the middle school, Great American Teach-in presentations, judging of our annual STEM fair poster competition, and Science Olympiad engineering components.*

2. Abstract

Phosphorus Absorption in Soil from the Mote Land-Based System

Deborah Seto[1], Suzanne Boxman[2], Maya Trotz[2]

[1]*Orange Grove Middle Magnet School of the Arts*
[2]*Civil and Environmental Engineering Department, University of South Florida*

Deborah.Seto@sdhc.k12.fl.us

Keywords: phosphorus absorption, integrated aquaculture system, sustainability

This Water Awareness and Research Education- Research Experience for Teachers project (WARE-RET) investigates the phosphorus absorption in soil intended for use in an integrated aquaculture system (IAS). The project is designed to compare the ability of the soil to absorb phosphorus under a variety of conditions, which include varying pH, temperature, time, concentration of phosphorus, and quantity of soil. Currently in Dr. Trotz's lab from the USF College of Civil and Environmental Engineering in collaboration with the Mote Marine Laboratory Aquaculture Research and Development division seek to develop sustainable marine recirculating aquaculture technology with implications to expand the land-based marine aquaculture in the United States. The ultimate goal of the project is to create a computer model for the IAS that will show how phosphorus moves throughout the system. In order to create the model certain experimental data must first be collected. The project helps contribute to this experimental data and ultimately the creation of the computer model. Preliminary results suggest that phosphorus is desorbed by the soil. Studies are underway to explore this effect by varying the quantity of soil, and other parameters in this mechanism.

Elizabeth Valentine

1. Bio Sketch

1.1 Home Institution:	*Florida State University*
1.2 Major:	*Civil Engineering and Environmental Engineering*
1.4 USF Advisor/Mentor:	*Amy Stuart, Ph.D., Ryan Michael*
1.5 Professional Goals:	*I hope to use my experience this summer to create engaging lessons for my students at Bloomingdale. The new lessons will challenge students to become more aware of their local ecology and water cleanliness in the Tampa Bay area, and aligned with current course standards.*

2. Abstract

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Background Mercury Concentrations in the Environmental Laboratory

Beth Valentine[1], Ryan Michael[2], Dr. Amy L. Stuart[2,3]

[1]*Bloomingdale High School, Valrico, FL*
[2]*Department of Environmental and Occupational Health, University of South Florida*
[3]*Department of Civil and Environmental Engineering, University of South Florida*

elizabeth.valentine@sdhc.k12.fl.us

Keywords: mercury, emissions, Tampa Bay, pollution

Low-level contamination can lead to inaccurate results in the analysis process. Sources of Hg contamination in the lab include airborne particulate matter, for example airborne dust, dirt, particles, or vapors from unfiltered air supplies; nearby corroded or rusted pipes, wires, or other fixtures; or metal containing paint.

Additionally, SOP for mercury collection requires the use of 18-MΩ minimum, ultrapure deionized water from a prepurified source. Low-level contamination of the water source in the lab could significantly change results.

This research will evaluate low-level mercury concentrations in the three lab rooms of the environmental engineering laboratory. Additionally, mercury concentrations will be gathered from water sources used in the lab. Atmospheric Mercury concentrations should be present in the experimental lab and equipment lab just as they are in the surrounding outdoor environment. Mercury concentrations in the Clean Lab, however, should be significantly lower.

REU in Applied Physics

Tylissa Bogle

1. Bio Sketch

1.1 Home Institution:	*Norwalk Community College*
1.2 Major:	*Engineering Science*
1.3 Classification:	*Sophomore*
1.4 USF Advisor/Mentor:	*Robert H. Hyde, Ph.D.*
1.5 Professional Goals:	*To become a Biomedical Engineer after graduation.*

2. Abstract

Investigation of the crystal structure, surface morphology, and composition of ZnO

Tylissa Marie Bogle[1], Robert H. Hyde[2]

[1]*Norwalk Community College*
[2]*Department of Physics, University of South Florida*

tylissa.bogle@yahoo.com

Keywords: Zinc oxide, surface morphology, polycrystalline

Zinc Oxide (ZnO) is an organic compound that is used in a wide variety of materials and products. Also, it's a widely used, inexpensive semiconductor oxide with very favorable properties, including its wide band gap and high electron mobility. In this work we made an effort to not only show the many interesting characteristics of ZnO, but also show the capabilities of the many instruments used. Through studying the results and images of our ZnO samples acquired using the scanning electron microscope (SEM), energy dispersive spectrometry (EDS), and x-ray diffraction (XRD), we were able to carefully examine the crystal structure, surface morphology, and composition of ZnO in two different forms. A polycrystalline bulk pulsed laser deposition target (PLD) and a thin film grown by PLD on sapphire and silicone substrates were compare, showing both similar and different results on each of the instruments used. Using these instruments a preferred orientation of thin films was observed. Complications with the surface charge up accumulation were relieved by Au coating the thin film. This revealed the small crystal structures that made up the thin film, roughly ranging from 0.3 μm to 0.5 μm in size, and allowed us to show the difference between an uncoated sample and a sample coated with a good conductor, and also how a semiconducting material produces images lacking high quality in a SEM.

Matthew J. Bovyn

1. Bio Sketch

1.1 Home Institution:	*Northern Arizona University*
1.2 Major:	*Physics and Mechanical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Wei Chen, Ph.D.*
1.5 Professional Goals:	*My goal in professional life is nothing less than to change the world by being involved research that will in some way help benefit society.*

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2. Abstract

Driving Sodium-Potassium Pumps With An Oscillating Electric Field: Effects On Muscle Recovery

Matthew J. Bovyn[1], Olivia Lanes[2], Wei Chen[3]

[1]*Department of Physics and Astronomy, Northern Arizona University*
[2]*Department of Physics, Dickinson University*
[3]*Department of Physics, University of South Florida*

mjb285@nau.edu

Keywords: sodium-potassium pump, synchronization modulation, muscle fatigue, muscle recovery

A technique called synchronization modulation has been developed that uses an oscillating electric field to increase the rate at which the sodium-potassium pumps in the cell membrane work. Because the sodium-potassium pump is integral in the recovery of skeletal muscle fibers after an action potential, we investigated the effects of applying synchronization modulation to muscles which had already undergone fatigue due to repeated action potentials during exercise. Fatigue was induced in human subjects' biceps brachii through isometric contraction. Surface electromyography measurements of fatigue index were used to quantify how the muscle recovered over the minutes following fatigue, both when synchronization modulation was applied and when it was absent. The results show that applying synchronization modulation is effective in increasing the rate at which the muscle recovers to its initial state. This shows not only that synchronization modulation can be successfully applied to human muscle, but that it has many potential applications in sports medicine and novel disease treatments

Chance Brown

1. Bio Sketch

1.1 Home Institution:	*East Tennessee State University*
1.2 Major:	*Physics and Mathematics*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Ivan Oleynik, Ph.D.*
1.5 Professional Goals:	*After completing my B.S., the next step is to obtain a Ph.D. then move directly into industry, government, or academia. My goal is conduct research in the war on terrorism.*

2. Abstract

Development of Embedded Atom Potential for Aluminum for Simulation of Materials at extreme conditions

Chance C. Brown[1,2], Brian J. Demaske[2], Vasily V. Zhakhovsky[2], Ivan I. Oleynik[2]

[1]*Department of Physics and Astronomy, East Tennessee State University*
[2]*Department of Physics, University of South Florida*

browncc@goldmail.etsu.edu

Keywords: Density functional theory (DFT), embedded atom method (EAM) potential, molecular dynamics, melting point, shock Hugoniot

An embedded atom potential (EAM) potential for aluminum was developed by fitting a wide range of zero-temperature stress tensor components calculated using density functional theory (DFT). The theoretical stress tensor components were calculated for isotropic compressions as well as uniaxial deformations along three principal crystal axes. A number of experimental properties were included within the fitting database to ensure the accuracy of the potential near equilibrium conditions. Out of many candidate potentials, the one that most closely reproduced the experimental melting point and shock Hugoniot data was selected as the final potential. This potential gives a good description of aluminum under extreme pressures and temperatures, making it well-suited for atomistic simulations of laser-matter interactions and shock compression

Trinidy Combs

1. Bio Sketch

1.1 Home Institution:	*Oberlin College*
1.2 Major:	*Engineering*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Hariharan Srikanth, Ph.D.*
1.5 Professional Goals:	*Obtain my M.S. in Mechanical Engineering.*

2. Abstract

Synthesis of Iron Platinum nanoparticles in cubical shape

Trinidy Combs[1], Hafsa Khurshid[2], Hariharan Srikanth[2]

[1]*Physics Department, Oberlin College Ohio*
[2]*Physics Department, University of South Florida FL*

Tcombs@oberlin.edu

Keywords: Iron platinum, nanoparticles, magnetic nanoparticles

In this work we report the synthesis of monodispersed iron platinum nanoparticles by the thermal decomposition of iron pentacarbonyl and platinum acetylacetonate. Particle shape was controlled by varying the injection time and temperature of iron pentacarbonyl. At first, Pt seeds were formed in octadecene, oleylamine and oleic acid by decomposing it at 100oC. Afterwards, iron pentacarbonyl was added via injection method. An immediate injection after decomposition of platinum acetylacetonate made alloy nanoparticles of platinum nanoparticles, whereas its injection after a prolonged period of time formed mixed particles of iron oxide and platinum. When Fe(CO)5 was added at room temperature the shape was not uniform, instead we see a mixture of spheres, cubes, and triangular shapes. Particles size can be controlled by varying injection temperature of iron pentacarbonyl. Particles are average 6 nm at 100oC injection temperature, whereas varying injection temperature to 170C, particles size got smaller to ~3 nm. X-ray crystallographic technique was used to confirm the different phases present in sample. Particle was measured by taking bright field images using transmission electron microscope. Magnetic properties (measured using physical properties measurement system) indicated that particles are superparamagnetic nanoparticles with a blocking temperature of 64 Kelvin.

Michael Crumrine

1. Bio Sketch

1.1 Home Institution:	*Beloit College*
1.2 Major:	*Physic and Mathematics (Double major)*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Casey Miller, Ph.D.*
1.5 Professional Goals:	*Obtain my PhD and become a research physicist at a full-time research institution.*

2. Abstract

The Role of Bulk AFM Spin Structure on Exchange Bias in Magnetic Trilayers

Michael S. Crumrine[1], Hillary F. Kirby[2], Casey W. Miller[2]

[1]*Beloit College*
[2]*Department of Physics, University of South Florida*

crumrinem@beloit.edu

Keywords: Exchange Bias, Remnant Magnetization, Hysteresis Loop, Paramagnet

When an exchange bias is induced in materials with a ferromagnetic (FM) – antiferromagnetic (AFM) interface, the interfacial coupling between the AFM and FM manifests itself as a shift in the magnetic hysteresis loop. It has been an unresolved issue as to the role the bulk spin of the AFM plays in exchange bias and whether or not exchange bias is entirely an interfacial effect. We fabricated several FM/AFM/FM trilayer structures of Py(100Å)/FeMn(x)/$Ni_{69}Cu_{31}$(200Å) with varying AFM thicknesses and used a field cool procedure to induce an exchange bias. A Magneto-Optical Kerr Effect magnetometer was used to investigate the propagation of spin information through the AFM by examining the hysteresis loops at different angles of applied field with respect to the magnetization.

Alina Gitnik

1. Bio Sketch

1.1 Home Institution:	*University of Texas, Austin*
1.2 Major:	*General Physics and Hebrew Language and Literature*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Donald Haynie, Ph.D.*
1.5 Professional Goals:	*I'm basically a biologist hiding inside the body of physicist. I would find it really rewarding to spend some time teaching high school physics, and then ultimately continue on to acquire a higher degree (PhD, most likely) in biological physics.*

2. Abstract

Characterization of Crosslinked Electrospun Polypeptide Fibers at Extremes of pH and on Exposure to UV has Provided Insights on the Mechanism of Fiber Stability

Alina Gitnik[1], Michael Cross[2], Dhan Khadka[2], Donald Haynie[2,3]

[1]University of Texas at Austin
[2]Nanomedicine and Nanobiotechnology Lab, Dept. of Physics, University of South Florida
[3]Center for Integrated Functional Materials, Dept. of Physics, University of South Florida

agitnik@utexas.edu

Keywords: Biomaterials, electrospinning, fibers, materials characterization, polypeptides

Our experiments on crosslinked electrospun co-poly(L-glutamic acid4, L-tyrosine1) (PLEY) fibers have led to new insights on the mechanism of fiber stability in water at physiological pH. Electrospinning PLEY dissolved in water yields nano- to microscale fibers, if the feedstock concentration is high enough and the flow rate is unregulated. The resulting non-woven fiber mats are potentially useful as biomaterials, in vitro and ex vivo as cell culture coatings and in vivo as stand-alone biomaterials or as coatings for medical implants from which local drug delivery is possible. Fiber crosslinking is required to prevent fiber dissolution in water at any pH. Previously, we have crosslinked PLEY fibers with EDC, a diimide reagent that is dissolved in ethanol. PLEY has a net negative surface charge at neutral pH due to ionization of most if not all of its glutamic acid side chains. Sodium counterions are present in PLEY fibers prepared at neutral pH, according to analysis by energy-dispersive X-ray spectroscopy (EDX). Here, we tested the ability of UV exposure at 254 nm to crosslink the fibers as a potential means of eliminating EDC from materials processing.

The experiment was based on the unexpected observation that PLEY fibers autofluorescence when excited at 340 nm and the knowledge that formation of bi-tyrosine, which is fluorescent, occurs on UV exposure. In-situ exposure to UV lasted for 10 min, 3 h or overnight. An aliquot of water was then deposited on each fiber sample to assay for solubility. Both UV-exposed fibers and control fibers dissolved completely in all cases, according to analysis by light microscopy. The failure to crosslink is possibly attributable to the photon wavelength, flux or intensity.

Allison Hartman

1. Bio Sketch

1.1 Home Institution:	*College of the Holy Cross*
1.2 Major:	*Physics*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Myung Kim, Ph.D.*
1.5 Professional Goals:	*Complete my undergraduate degree with high honors and go on to an applied physics PhD program.*

2. Abstract

Images of Cone Photoreceptors Using Non-Coherent Light

Allison Hartman[1], Changgeng Liu[2], Myung Kim[2]

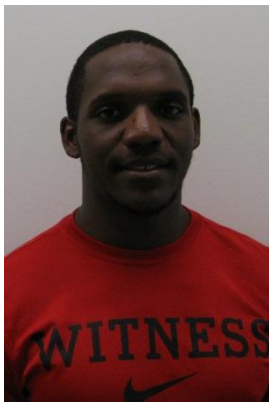
[1]*College of the Holy Cross, Worcester, MA*
[2]*Department of Physics, University of South Florida*

aehart12@g.holycross.edu

Keywords: Optics, Photoreceptors, Non-Coherent Light

In order to get clear images of the photoreceptors in a living human eye, we constructed collimated beam of light with non-coherent spatial phase information. In past imaging techniques using coherent light there have been interference speckles that are the same size and shape as photoreceptors, therefore clear images cannot be produced. Previous experiments have been unable to differentiate the speckles and the photoreceptors that are in the retina of the eye. In our experiment we used Matlab to create a simulation of the optical system and verified is using an experimental setup. We were able to get clear images of resolution targets and our future work will be to image retina samples using spatially non-coherent light.

Walter Hill



1. Bio Sketch

1.1 Home Institution:	*Jacksonville University (2009-2012); North Carolina A&T State University (2012-2014)*
1.2 Major:	*Engineering Physics (JU)* *Mechanical Engineering (NCAT)*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*George S. Nolas, Ph.D.*
1.5 Professional Goals:	*I want to graduate and obtain my graduate degree. Later on, I want to become employed in the automotive engineering industry.*

2. Abstract

Skutterudite $YbCo_4Ge_{6+x}Se_{6-x}$ (x= 0.2, 0.4, 0.6, 0.8, 1.0) for Thermoelectric Materials

Walter Hill[1,2], Yongkwan Dong[3], George S. Nolas[3]

[1]*Department of Engineering, Jacksonville University*
[2]*Department of Mechanical Engineering, North Carolina A&T State University*
[3]*Novel Materials Laboratory, Department of Physics, University of South Florida*

wbhill@ncat.edu

Keywords: Skutterudite, Thermoelectric properties; Phonon Glass Electron Crystal)

Polycrystalline skutterudite-related compounds with the nominal composition $YbCo_4Ge_{6+x}Se_{6-x}$ (x= 0.2, 0.4, 0.6, 0.8, 1.0) have been prepared by melting, annealing, and hot-pressing techniques and characterized by powder X-Ray diffraction (PXRD) and electron microscope spectroscopy. The crystal structure of skutterudites (MX_3; M= Co, Ir, Rh; X=P, As, Sb) possesses icosahedra voids which can be filled by guest atoms and X sites can be substituted for neighbor group elements pairs like Ge and Se to make isoelectronic compounds. It is well known that guest atoms filled in the voids and different elements in the X sites can scatter phonons by the PGEC (Phonon Glass Electron Crystal) concept and mass fluctuation which lead to reduced lattice thermal conductivity. The goal of this research was to synthesize skutterudite-related compounds examine their thermoelectric properties.

Olivia Lanes

1. Bio Sketch

1.1 Home Institution:	*Dickinson College*
1.2 Major:	*Physics*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Wei Chen, Ph.D.*
1.5 Professional Goals:	*To obtain a PhD in Medical or Astrophysics, and conduct research on my way to becoming a professor at a university.*

2. Abstract

Driving Sodium/Potassium Pumps with an Oscillating Electric field: Effects on Muscle Fatigue

Olivia Lanes[1], Matthew Bovyn[2], Wei Chen[2]

[1]*Dickinson College*
[2]*Physics Department, Northern Arizona University*
[2]*Cellular & Molecular Biophysics Laboratory, Department of Physics, University of South Florida*

laneso@dickinson.edu

Keywords: Synchronization Modulation

A technique called Synchronization Modulation has been developed, which has already been proven to be an effective tool in synchronizing and speeding up the sodium/potassium pumps in cell membranes. When synchronized, it is thought that these pumps are more efficient because they require less ATP. We hypothesized that if this was correct, this technique may be used to reduce muscle fatigue. To test our hypothesis, we had multiple test subjects hold a 15 lb weight for as long as they could while isolating the bicep muscle and applying an oscillating electric field. We compared the EMG data we took during these trials to the control, which was done the same way but without applying the electric field. To compare how fatigued subjects were, we did a Fast Fourier Transform on the first and last 10 seconds of each trial to measure the Fatigue Index. Our preliminary results suggest that the Fatigue Index decreased at a slower rate in the trials where the subject held the weight with Synchronization Modulation.

Shelby Lee

1. Bio Sketch

1.1 Home Institution:	*Marietta College*
1.2 Major:	*Senior*
1.3 Classification:	*Physics*
1.4 USF Advisor/Mentor:	*Jianfeng Zhou, Ph.D.*
1.5 Professional Goals:	*My professional goal is to attain a Ph.D in an experimental field of physics.*

2. Abstract

Tunable Nonlinear Metamaterial at Microwave Frequency

Shelby Lee[1], Sinhara Silva[2], Jianfeng Zhou[2]

[1]Marietta College, Marietta, OH
[2] Department of Physics, University of South Florida

sel001@marietta.edu

Keywords: Nonlinear Metamaterials, Varactor Diode, Split Ring Resonator (SRR)

Metamaterials are a new class of man-made materials that can be engineered to exhibit fascinating electromagnetic properties not existing in nature, such as negative index of refraction, capability of super-resolution in optical imaging, and electromagnetic invisibility (cloaking). Unfortunately, the desired properties of metamaterials have only been achieved within a narrow bandwidth around a fixed frequency. Currently, metamaterials with frequency tunability are particular of interest due to the flexibility of frequency control. With this research we analyze the properties of nonlinear metamaterials formed by integrating varactor diodes into metamaterial elements. By varying the applied bias voltage on the varactor diode, its capacitance can be controlled over a large range. Thus we can tune the working frequency of the metamaterial, which depends on the capacitance and inductance of the metamaterial elements, by tuning the varactor diode. Additionally we investigate the effects of different split ring resonator (SRR) designs on the electromagnetic properties of metamaterials. We begin with theoretical analysis of various SRR designs using numerical simulation software (CST: Microwave Studio). Then we measure the properties of these designs experimentally using a network analyzer. We hope to experimentally determine the tunable resonance frequency range for each design and conclude which design has the greatest tunable resonance frequency range.

Jedidiah McCoy

1. Bio Sketch

1.1 Home Institution:	*Morningside College*
1.2 Major:	*Physics and Mathematics*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sarath Witinachchi, Ph.D.*
1.5 Professional Goals:	*I plan to attend graduate school for engineering and obtain a Master's degree before entering the work force as an engineer.*

2. Abstract

Fabrication of Solid State Lighting Devices Based on Electroluminescence with Nanophosphors Synthesized by Microwave Plasma Growth Process

Jedidiah McCoy[1], Marek Merlak[2], Sarath Witinachchi [2]

[1]*Department of Physics, Morningside College*
[2]*Department of Physics, University of South Florida*

jjm015@morningside.edu

Keywords: Greenhouse Farming, Nanophosphor, Photoluminescent Specroscopy

Increasingly, greenhouse farming and urban agriculture are being looked at as a more efficient and more cost effective way to grow produce. As compared to conventional farming techniques, greenhouse farming uses less water, pesticides, and fertilizers while producing smaller amount greenhouse gases such as methane. In addition, greenhouse farming eliminates problems associated with uncertain weather conditions or droughts. Artificial lighting extends the greenhouse growing season all year round, and guarantees that the plants have a steady source of light. However, the energy cost of artificial lights limits the application of greenhouse farming on a larger scale. Currently the lights used in greenhouses rely on light sources that emit a broad spectrum of light. However, only light at wavelengths around 460 nm (blue) and 670 nm (red) are absorbed by most plants for photosynthesis. Solid state lighting devices can be engineered to produce light to match the needs of the plant while reducing the energy cost.

An investigation into the photoluminescence properties of the nanophosphor La2O3 doped with Bi was done in an effort to produce a phosphor emitting in blue wavelengths. The La2O3:Bi coatings were grown using a microwave plasma growth process. Microwave power and chamber pressure were varied to find the optimum synthesis conditions. Power was varied from 100Watts to 900Watts and chamber pressure was varied from 30Torr to 60Torr. The process utilized O2 and CO2 plasma. Nanoparticle size was varied by controlling the reagent concentration in the precursor solution. Studies were done on 50nm and 100nm particles. The nanophosphors were investigated by X-ray diffraction, electron microscopy, and photoluminescent spectroscopy. Photoluminescence was shown to be higher from samples synthesized in a CO2 plasma.

Constance Owens

1. Bio Sketch

1.1 Home Institution:	*Houston Baptist University*
1.2 Major:	*Physics*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sarath Witinachchi, Ph.D.*
1.5 Professional Goals:	*After graduation I plan to take off a year to study Spanish in Costa Rica and to go on a mission trip to several different counties. The following year, I then plan to attend a PhD program in Physics.*

2. Abstract

Growth and characterization of PEDOT: PSS and carbon nanotube composite structures for excitonic solar cells

Constance Owens[1], Lakmal Hettiarachchi[2], Domingo Feliciano[2]
Sarath Witinachchi[2]

[1]*Houston Baptist University, Houston, TX*
[2]*Department of Physics, University of South Florida*

owensca@hbu.edu

Keywords: Solar cells, Carbon Nanotubes, Dimethylformamide, Poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate), Bernoulli

Harnessing solar energy is one of the most promising ways to tackle today's energy issues. Though solar cells are comprised of many different layers, our focus is just on a single layer. The main goal of this study is to create thin film composite structures of poly(3,4-ethylenedioxythiophene) poly(styrenesulfonate) (PEDOT:PSS) and carbon nanotubes, more specifically with multiple wall carbon nanotubes (MWCT). In this study we employ a spray method that utilizes Bernoulli's principle. We believe that a spray method will give a better uniform layer than other methods that are utilized for creating thin films. Uniformity within a thin film is of the upmost importance because at perfect uniformity many properties are optimized. PEDOT:PSS was mixed separately with both dimethylformamide (DMF) and water. By the Dektak 3030ST, a profilometer device, it was discovered that the PEDOT:PSS containing DMF dispersed better than the PEDOT:PSS mixed with water, thus creating a more uniform film. Also it is well known that Carbon Nanotubes possess many excellent properties that can make them very useful in the field of solar technology, such as they are durable, and have a broad range of electronic, thermal and structural properties. In this study we also combine MWCNTs into our thin films to see how they affect transparency and conductivity by using the Lambda 950, a UV/VIS spectrometer, and a four point probe.

Ben Stortenbecker

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Physics and Mathematics*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Ivan Oleynik Ph.D., Vasily Zhakhovsky, Ph.D.*
1.5 Professional Goals:	*Obtain a Ph.D. in Physics and pursue a career in research..*

2. Abstract

Developing an Embedded Atom Method Potential for Copper

Ben Stortenbecker, Brian Demaske, Vasily Zhakhovsky, Ivan Oleynik

Functional Materials Laboratory, Department of Physics
University of South Florida, Tampa, FL

benjamin7@mail.usf.edu

Keywords: Interatomic potential molecular dynamics, embedded-atom method, density functional theory

A new embedded-atom method (EAM) interatomic potential for copper has been developed in order to improve upon the predictive power of atomistic simulations under extremes of pressures and temperatures induced by shock compression and ultrashort laser irradiation. Several candidate potentials were fit to a database consisting of ab initio cold pressure tensor components calculated for a wide range of hydrostatic and uniaxial deformations as well as experimental properties near equilibrium conditions. The close relationship between the stress tensor and interatomic forces under naturally-occurring material states ensures the accuracy of the potential without the need for a large number of fitting points. After fitting, the candidates were then screened against the experimental melting point in order to select a single best potential. This final potential will be verified against the experimental melting line, liquid-vapor coexistence curve, and the shock Hugoniot.

Michael Testa

1. Bio Sketch

1.1 Home Institution:	*Massachusetts College of Liberal Arts*
1.2 Major:	*Physics*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Garrett Matthews, Ph.D.*
1.5 Professional Goals:	*Find an area of research that I enjoy enough to dedicate my life to, eventually discovering new and exciting physics or applications of physics.*

2. Abstract

An Investigation of Rolling and Sliding Friction on the Nanoscale

Michael Testa[1], Himanshu Verma[2], Garrett Matthews[2]

[1]*Massachusetts College of Liberal Arts, North Adams, MA*
[2]*Nanoscale Biological Physics Laboratory*
Department of Physics, University of South Florida, Tampa, FL

mt4071@mcla.edu

Keywords: Tribology, atomic force microscope, polystyrene beads, silicon

Nanoscale rolling and sliding friction was investigated using an Atomic Force Microscope (AFM). The hypothesis that the translational mode of a nanoparticle is determined by the size, surface energy, and elastic modulus was tested by independently varying these parameters and using the AFM to observe the preferred translational mode. The deflection of the AFM cantilever is recorded as a function of position as polystyrene microspheres are pushed across a silicon substrate. Repeating this many times under controlled conditions gives insight into the relationship between these variables and the preferred translational modes. The size of the beads tested range from 10nm to 10μm and are measured using the AFM. The elastic modulus is varied by suspending the beads in organic solvents and is measured by poking the beads with the AFM tip and analyzing the force curve. The surface chemistry is varied by applying different chemical layers to the surface of the silicon substrates. Preliminary results show that these variables may independently dictate the preferred translational mode.

David Turbay

1. Bio Sketch

1.1 Home Institution:	*Brown University*
1.2 Major:	*Physics*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Matthias Batzill, Ph.D.*
1.5 Professional Goals:	*I would like to pursue some level of graduate school at some point in my life. I would also like to either do research in industry, work for a company in the technology sector, or work on a start-up.*

2. Abstract

Photocatalysis of Thin Films of TiO2 on Al2O3 Substrates

David Turbay[1], Timothy Luttrell[2], Matthias Batzill[2]

[1]Brown University
[2]Interface and Surface Science Laboratory
Department of Physics, University of South Florida

david_turbay@brown.edu

Keywords: Thin films, sapphire, Al2O3, titanium dioxide, TiO2, methyl orange, Pulse Laser Deposition, Molecular Beam Epitaxy

Titanium dioxide (TiO2) has grown to be one of the most promising photocatalysts in recent years because of its extensive applications in renewable and clean energy. We were interested in growing the rutile structure of TiO2 because it has a lower excitation energy of 3.0 eV compared to anatase (3.2 eV) and, therefore, has better activity in the visible portion of the spectrum. It has been shown that sapphire substrates are conducive to epitaxial rutile growth.

In this study, we measured the photocatalytic activity of thin films of TiO2 on sapphire (Al2O3) substrates. We used pulse laser deposition (PLD) and molecular beam epitaxy (MBE) to grow the films. Characterization of the films was done using XRD, XPS, RHEED, and AFM techniques. We measured the photoactivity via the decomposition of methyl orange on the film's surface using a UV/VIS spectrophotometer. The goals of the project were to grow epitaxial films of rutile TiO2 on sapphire and optimize growing conditions and techniques to maximize photoactivity.

College of Engineering Research Experiences for Undergraduates
Florida-Georgia Louis Stokes Alliance for Minority Participation

Carlos Alvarez

1. Bio Sketch

1.1 Home Institution:	*University of South Florida, Tampa, FL* Universidad *Del Norte Barranquilla, Colombia*
1.2 Major:	*Electrical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sanjukta Bhanja, Ph.D.*
1.5 Professional Goals:	*To graduate with my B.S. and find employment with an engineering company that will help me to grow as a professional. Later on, I want to obtain my masters in semiconductor masters while working full-time.*

2. Abstract

Study of MOSFET Devices and its Applications

Carlos Alvarez, Christian Avila, Rodolfo Sayegh
Munish Puri, D. K. Karnaratne, Sanjukta Bhanja

Nanocomputing Research Group (NCRG)
Department of Electrical Engineering, University of South Florida

alvarez5@mail.usf.edu

Keywords: MOSFET, CMOS

In this poster, we have studied the characteristics of n-type and p-type MOSFET devices. These devices have been widely used in the complementary format for logic computation. A complementary inverter was modeled and analyzed using PSpice simulator to understand its time delay characteristics. By changing the gate length, width, and gate oxide thickness, it was observed that the performance of time delay characteristic can be improved in a complementary inverter.

Christian Avila

1. Bio Sketch

1.1 Home Institution:	*University of South Florida, Tampa, FL* *Universidad Del Norte Barranquilla, Colombia*
1.2 Major:	*Electrical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sanjukta Bhanja, Ph.D.*
1.5 Professional Goals:	*Obtain Ph.D. in Electrical Engineering in Electronics at USF after completing both of my B.S. degrees.*

2. Abstract

Study of MOSFET Devices and its Applications

Christian Avila, Carlos Alvarez, Rodolfo Sayegh
Munish Puri, D. K. Karnaratne, Sanjukta Bhanja

Nanocomputing Research Group (NCRG)
Department of Electrical Engineering, University of South Florida

avila2@mail.usf.edu

Keywords: MOSFET, CMOS

In this poster, we have studied the characteristics of n-type and p-type MOSFET devices. These devices have been widely used in the complementary format for logic computation. A complementary inverter was modeled and analyzed using PSpice simulator to understand its time delay characteristics. By changing the gate length, width, and gate oxide thickness, it was observed that the performance of time delay characteristic can be improved in a complementary inverter.

Jorge Calabria

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Civil Engineering (Environmental track)*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Daniel Yeh, Ph.D.*
1.5 Professional Goals:	*Become a professional in the field of environmental engineering. Acquire a position that involves sustainable technologies that can be utilized in developing, emerging and established markets.*

2. Abstract

NEWgenerator for Recovery of Nutrients, Energy and Water from Human Wastes

Jorge Calabria, Robert Bair, Daniel Yeh

Department of Civil and Environmental Engineering, University of South Florida

jlcalabr@mail.usf.edu

Keywords: Anaerobic digestion, membrane bioreactor, nutrient recovery, biogas production

With powerful consuming markets emerging around the world, the task of consuming natural finite resources sustainably is becoming increasingly difficult. The need for renewable energy technology to sustain such vast consumption is becoming more and more crucial as fossil fuels dwindle whilst modern society's hunger for energy is ever expanding. Yet, in the midst of such growth, where the world's population has grown to 7 billion and counting, there are still 1.1 billion people that lack safe drinking water and 2.8 billion people that lack safe sanitation, thus, justifying the need for innovative solutions which can provide for these basic human needs. The NEWgenerator is a technology designed to treat human waste while recovering nutrients, energy, and water. The generator utilizes anaerobic bacteria to digest waste and membrane bioreactors to separate solids from the water.

In partnership with Learning Gate Community School, an environmentally-themed K-9 Charter School in Tampa, FL, a pilot version of the NEWgenerator will be built and field tested at the school. The field studies will be used to gauge nutrient removal and water recovery. Renewable energy sources such as wind and solar will be retrofitted as potential "off-grid" power sources. The NEWgenerator is designed for implementation in developing countries and in areas where access to public utilities and power is scarce. Such a technology could prove to mitigate the spread of infectious disease by providing a decentralized form of sanitation. Biogas produced from anaerobic digestion can be used as a heat and energy source. The NEWgenerator essentially turns a commonly discarded and problematic human by-product into an extremely useful and practical resource. Harnessing this "low hanging fruit" approach global solutions is the key to sustainable growth.

Michael Del Valle

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Chemical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Anna Pyayt, Ph.D.*
1.5 Professional Goals:	*To study and advance the relatively new field of Neuroprosthetics. I would like to continue my studies with the pursuit of an MD/PhD degree involving brain computer interfaces.*

2. *Abstract*

Reading Your Mind to Keep You Awake: Single vs. Multichannel EEG for Sleep Detection

Michael Del Valle, Anna Pyayt

Department of Chemical and Biomedical Engineering
University of South Florida

Mdelvall@mail.usf.edu

Keywords: EEG, single channel, multichannel, sleep onset, electroencephalogram, alpha waves, power spectra

The focus of this project was to determine the viability of sleep detection using a single-channel EEG as opposed to the multichannel EEGs frequently used in polysomnography. A single electrode EEG device is much more portable than a multi-channel system, and the development of such a system to monitor alertness and detect sleep onset could be used in a host of alertness-sensitive environments. To test such a device's viability, several volunteers had their waking and sleeping EEG waves recorded using a single-channel and a 32-channel EEG system. The waking and sleeping EEG data for each subject from each of the two systems was compared in order to demonstrate the occurrence of sleep via alpha wave variability. The data recorded from the single-channel device was then compared to that recorded from the 32-channel EEG. This provided an indication of the accuracy of the single-channel system in measuring data corresponding to sleep onset. The results of the data analysis showed that the same patterns which indicated a difference between wakefulness and sleep in the multi-channel EEG recording were also present in the single-channel EEG recording, consequently suggesting that a single-channel system may provide similarly accurate alertness and sleep detection capability while taking advantage of vastly increased portability. There are numerous potential applications for such a small device, including the detection of fatigue and drowsiness in environments were a lack of constant alertness may prove hazardous, e.g., piloting, security, and long distance automobile use.

Herby Jean

1. Bio Sketch

1.1 Home Institution:	*University of South Florida*
1.2 Major:	*Civil Engineering*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Daniel Yeh, Ph.D.*
1.5 Professional Goals:	*My goal is to obtain a Ph.D. in Environmental Engineering and return to Haiti to aid in the many environmental challenges confronting the country..*

2. Abstract

Pathways to Sustainable Food Waste

Herby Jean, Daniel Yeh

Membrane and Biotechnology Laboratory, Department of Civil and Environmental Engineering
University of South Florida, Tampa, FL

herbyj@mail.usf.edu

Keywords: anaerobic digester, environmental, food, pathways, recycling, sustainable, waste

According to the Environmental Protection Agency (EPA), 34 millions of tons of food waste were sent to landfills and incinerators in 2010, creating many environmental problems in the process (1). Reducing food waste production can mitigate environment issues and prevent unnecessary use of nutrients and energy required to produce food in the first place. Food waste recycling serves the purpose of recovering a portion of the energy and nutrients embodied within the food. Two pathways for food waste recycling are composting and anaerobic digestion (AD). This project investigates a sustainable approach to food waste recycling through AD and beneficial reuse of AD byproducts. Made out of re-purposed water heaters, this small scale constructed 260 Liter AD reactor will be continuously fed organic waste and kept at ambient temperatures. With the help of microorganisms, the food waste will be broken down into biogas, a liquid fertilizer, and a solid soil conditioner. The final design will result in a sustainable and decentralized method of recycling food waste.

Rodolfo Sayegh

1. Bio Sketch

1.1 Home Institution:	*University of South Florida, Tampa, FL*
1.2 Major:	*Electrical Engineering*
1.3 Classification:	*Senior*
1.4 USF Advisor/Mentor:	*Sanjukta Bhanja, Ph.D.*
1.5 Professional Goals:	*I plan to pursue a doctorate in Nanotechnology in order to improve and advance cutting-edge technologies that benefit society.*

2. Abstract

Study of MOSFET Devices and its Applications

Rodolfo Sayegh, Christian Avila, Carlos Alvarez,
Munish Puri, D. K. Karnaratne, Sanjukta Bhanja

Nanocomputing Research Group (NCRG)
Department of Electrical Engineering, University of South Florida

avila2@mail.usf.edu

Keywords: MOSFET, CMOS

In this poster, we have studied the characteristics of n-type and p-type MOSFET devices. These devices have been widely used in the complementary format for logic computation. A complementary inverter was modeled and analyzed using PSpice simulator to understand its time delay characteristics. By changing the gate length, width, and gate oxide thickness, it was observed that the performance of time delay characteristic can be improved in a complementary inverter.

Jose Vasquez

1. Bio Sketch

1.1 Home Institution:	*University of South Florida, Tampa, FL*
1.2 Major:	*Mechanical Engineering*
1.3 Classification:	*Junior*
1.4 USF Advisor/Mentor:	*Nathan Crane, Ph.D.*
1.5 Professional Goals:	*My goal is to graduate with my mechanical engineering degree and pursue my master's in Mechanical Engineering. I would love to work for a company like Boeing, Lockheed, Harris, or GE Aviation.*

2. Abstract

Micro-Scale Part Manipulation on a Liquid Interface through Interface Curvature Effects

Jose Vasquez, Jose Carballo, Nathan Crane

Department of Mechanical Engineering
University of South Florida

jvasquez1@mail.usf.edu

Keywords: Capillary Forces, Microscale, Hydrophobic

The focus of this project is to study the fundamentals of capillary interactions at a fluid interface. Previously, we introduced basic concepts of a microscale component integration system, that uses local changes in the fluid interface to manipulate floating components. We tested these capillary forces, by incorporating hydrophobic parts and experiment cylindrical rods and glass wafers, we measured the attraction between the capillary forces. Our group has proposed two approaches for achieving fluidic micro-integration, on a water-oil interface. First technique, being acquired, re-position and feed suspended parts. While the second being a long distance part conveying. Our current objective is to continue studying the fundamentals of capillary interaction at a fluild interface, while, evaluating a broader range of values for rod and part geometry, for the effect they produce on the resultant equilibrium distance.

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