RiSE at Rutgers

Research in Science and Engineering

Summer Research Symposium

July 30, 2014

Sponsored by:

Rutgers Office of Institutional Diversity and Inclusion
Rutgers Graduate School - New Brunswick
and the
Graduate School of Biomedical Sciences at

Robert Wood Johnson Medical School

2014 Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

Wednesday, July 30, 2014

Busch Campus Center
604 Bartholomew Road
Busch Campus, Rutgers University, Piscataway, NJ

9:00 – 9:30 AM	**Welcome**	**Fireside Lounge**
9:30 – 10:30 AM	**Plenary Session**	**Center Hall**

Nadya Mason, Ph.D.
Associate Professor
Department of Physics, University of Illinois at Urbana-Champaign

"Life in the Academy: Trying to Make a Difference while Balancing Research, Teaching, Outreach and Family"

10:45 – 11:35 AM	**Student Research Posters-A**	**Multipurpose Room**
11:35 – 11:45 AM	**Break**	
11:45 – 12:35 PM	**Student Research Posters-B**	**Multipurpose Room**
12:40 PM	**Buffet Luncheon**	**Multipurpose Room**

Sponsored by

RiSE (Research in Science and Engineering) at Rutgers

and affiliated NSF-sponsored summer programs at Rutgers:
REU in Cellular Bioengineering: From Biomaterials to Stem Cells
REU in Structured Organic Particulate Systems (SOPS)
REU: Green Energy Technology Undergraduate Program (GET UP)
REU in Physics and Astronomy

With selected participation from**:**
REU in International Environmental Sciences
Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program

PLENARY SPEAKER

NADYA MASON, PH.D.

"Life in the Academy: Trying to Make a Difference while Balancing Research, Teaching, Outreach and Family"

Nadya Mason received her bachelor's degree in physics from Harvard University in 1995 and her doctorate in physics from Stanford University in 2001. She engaged in postdoctoral research at Harvard University, where she was a Junior Fellow in the Harvard Society of Fellows. Dr. Mason joined the Department of Physics at the University of Illinois at Urbana-Champaign as an assistant professor in 2005, and was promoted to associate professor in 2011. A condensed matter experimentalist, Dr. Mason focuses on electron behavior in low-dimensional materials such as carbon nanotubes, graphene, and nano-structured superconductors. Her research is relevant to the fundamental physics of small systems, as well as to applications involving nano-scale electronic elements. In addition to maintaining a rigorous research program and teaching, Dr. Mason works to increase diversity in the physical sciences, embracing opportunities to encourage and mentor aspiring scientists from underrepresented groups and to promote a welcoming climate within the field. Dr. Mason was a recipient of a National Science Foundation CAREER award in 2007, was named a 2008 Emerging Scholar by *Diverse Issues in Higher Education* magazine, the 2009 Denise Denton Emerging Leader Award, and the 2012 Maria Goeppert Mayer Award of the American Physical Society (APS). She is a General Councillor of the APS as well as an active member of the APS Committee on Minorities.

SUMMER PROGRAMS

RiSE (Research **i**n **S**cience and **E**ngineering) **at Rutgers**

RiSE, http://rise.rutgers.edu, seeks to extend the pathway to graduate study and the workforce in the sciences, math and engineering. We particularly encourage participation by underrepresented minority, disadvantaged, and first generation college students as well as for students from Predominantly Undergraduate Institutions with limited academic-year research opportunities. Jointly sponsored by Rutgers Graduate School–New Brunswick and the Graduate School of Biomedical Sciences at RWJMS, RISE is hosting 48 scholars this summer. These students, selected from over 600 applicants, represent 36 sending schools throughout the United States and its territories, and reflect a broad spectrum of STEM and social/behavioral science disciplines. Students spend the summer actively engaged in cutting-edge research under the guidance of carefully matched faculty mentors. An outstanding suite of professional development activities, including training in scientific writing and speaking, career guidance, guest speakers, and GRE preparation, complements the research. Some of our scholars also participate in affiliated research programs at Rutgers sponsored by the National Science Foundation (NSF) or National Institutes of Health (NIH), as detailed below. With Rutgers now a member of the Big Ten, RiSE has had the opportunity this summer to collaborate with the CIC (the academic arm of the Big Ten) Summer Opportunity Research Program (SROP).

REU – Cellular Bioengineering: From Biomaterials to Stem Cells

The Research Experiences for Undergraduates (REU) in Cellular Bioengineering (http://celleng.rutgers.edu, NSF EEC-1262924) is in its fifth year as an REU site. REU-CB evolved from the legacy of ISURF (IGERT Summer Undergraduate Research Frontiers), which operated as an undergraduate partner program to the Rutgers-NSF IGERT graduate fellowship program on the Science and Engineering of Stem Cells. REU-CB has a thematic focus on the science and engineering associated with the development of technologies centered on living mammalian cells, with emphases on biomaterials and stem cells. Through partnership with RiSE and the other REU program, the REU-CB participants have been exposed to a wide range of professional development activities and been integrated into an active living-learning community. In addition, in collaboration with the Center for Innovative Ventures of Emerging Technologies, the REU-CB scholars have engaged in a summer-long exercise aimed at appreciating translational research and the importance of innovation and entrepreneurship.

REU – Structured Organic Particulate Systems

The Engineering Research Center on Structured Organic Particulate Systems (ERC-SOPS), sponsored by the NSF, is comprised of four institutions: Rutgers University, the New Jersey Institute of Technology, Purdue University, and the University of Puerto Rico, Mayaguez. The ERC is producing globally competitive engineers with the depth and breadth of education needed for success in technological innovation, especially in the area of pharmaceutical manufacturing, and for effective leadership of interdisciplinary teams throughout their careers. It also seeks to increase the future pool of qualified high-tech workers, including women and minorities. One facet of the educational environment that helps achieve this goal is REU-SOPS, a summer research experience for undergraduates (REU) site at Rutgers. Students participate in highly successful academic seminars through the RiSE (Research in

Science and Engineering) program.

REU – Green Energy Technology Undergraduate Program (GET UP)

The objectives of the REU Site: Rutgers University Green Energy Technology for Undergraduates Program are to provide an enriching research experience, engineering training and professional development to three cohorts of ten sophomore or junior students for ten week in the summer. The intellectual focus of GET-UP centers around three thrusts: *nanotechnology and materials*, *renewable and sustainable fuels*, and *devices and energy management systems for energy generation, conversion and storage*. These are areas where Rutgers has a critical mass of faculty interest, existing academic and physical infrastructure, and funding; as evidenced by our IGERTs, K-12 programming, RET program, and research centers. During this program students have opportunities for student-faculty interaction and student-student communication aimed to develop young undergraduate students' research, technical writing and presentation skills. Post program, support will be provided to students during the academic year through continual education, e-mentoring and funding for publication of papers and travel to conferences focused on energy related topics.

REU in Physics and Astronomy

Thanks to funding from the National Science Foundation via grant PHY-1263280, the Department of Physics and Astronomy welcomes a cohort of nine REU students to Rutgers this summer. The students' research projects span a broad range of areas in astrophysics, high energy and nuclear physics, and condensed matter physics. The REU program combines discipline-specific professional development activities-- including trips to the Hayden Planetarium of the American Museum of Natural History, the IBM Thomas J. Watson Research Center, and Brookhaven National Laboratory-- with a residential experience shared and enriched by the dynamic and multidisciplinary RiSE scholars. A description of the program is available at http://reu.physics.rutgers.edu/.

REU in International Environmental Sciences

Our program is formally titled "Biogeography of Biotransformations for Halogenated Organic Compounds: A Comparison of the Tropics, Temperate and Sub-Arctic Environments". The goal is to compare biotransformation processes carried out by naturally occurring microbes in the environment across distant geographic regions. The compounds we are investigating are brominated and chlorinated organic compounds used in flame retardants, pesticides and other industrial processes. Students went to Helsinki, Finland, to examine the sub-arctic microorganisms and went to Guangzhou, China, to study microbial communities in the tropics, while others stayed in NJ to study temperate communities. All students met at the beginning of the program and at the end to compare their results and to share their experience on doing science around the globe. Science is international and will become more so in the future. To experience the international scope of scientific discovery prepares our young researchers for a more globally engaged future.

Ernest Mario School of Pharmacy
Summer Undergraduate Research Fellowship Program

The Summer Undergraduate Research Fellowship (SURF) is comprised of biomedical research investigations from the Ernest Mario School of Pharmacy (EMSOP), the Environmental and Occupational Health Institute, and the Robert Wood Johnson School of Medicine. Students participate in cutting edge research in a variety of laboratory and clinical settings. The goal of this program is to train undergraduate students for research careers in the pharmaceutical, biomedical, and environmental health fields. SURF fellows are engaged in exciting research projects, career development workshops, scientific presentations and a tour of a pharmaceutical company. The SURF program is funded by grants from the National Institutes of Health (R25ES020721) and the American Society for Pharmacology and Experimental Therapeutics. Administrative support is also received from the NIEHS Center for Environmental Exposures and Disease (P30ES005022). SURF has partnered with RiSE to promote diversity in the fields of pharmaceutical and environmental health research. More information is available at https://pharm.rutgers.edu/content/summer_research_fellowship_program.

ACKNOWLEDGMENTS

~Institutional Sponsorship~

Office of Institutional Diversity and Inclusion

Graduate School – New Brunswick

Graduate School of Biomedical Sciences at Robert Wood Johnson Medical School

Ernest Mario School of Pharmacy

Professional Science Master's Program (Master of Business & Science)

~External Support~

NASA New Jersey Space Grant Consortium

NIH MARC Program

NSF Research Experiences for Undergraduates (REU) Program

NIH Summer Undergraduate Research Fellowship Program

U.S. Department of Education McNair Scholars Program at Bloomfield College

Louis Stokes Alliances for Minority Participation (LSAMP)

~Special Thanks~

Our research programs would not be possible without the support of the dedicated faculty members who have donated their time, materials and laboratory space. We are also extremely grateful for the financial support that some of our mentors provided through research grants or supplements.

In addition, we thank the graduate students and post-docs who provided invaluable guidance as "near-peer" mentors.

Finally, we thank Dr. David Shreiber and Ms. Linda Johnson for collecting and organizing the abstracts for the Summer Research Symposium booklet.

GUEST SPEAKERS

The Devil in the Details: Record Keeping and Laboratory Data
Kimberly Cook-Chennault, Ph.D.
Assistant Professor, Department of Mechanical & Aerospace Engineering,
Director, REU: Green Energy Technology Undergraduate Program (GET UP)

Graduate School: How to Get In, Get Funding and Meet Success
Nicholas Fox
PhD Candidate, Psychology, Rutgers

Ivelisse Irizarry
PhD candidate, Plant Biology, Rutgers

Christopher Lowe
PhD candidate, Biomedical Engineering, Rutgers

James Millonig, Ph.D.
Assistant Dean of Medical Scientist Training, Robert Wood Johnson Medical School
Rutgers Graduate School of Biomedical Sciences

Eva Nelly Rubio
PhD Candidate, Graduate Program in Biomedical Sciences,
Rutgers Graduate School of Biomedical Sciences

Elizabeth Stucky
PhD candidate, Chemical & Biochemical Engineering, Rutgers

Jeffrey Zahn, Ph.D.
Associate Professor, Biomedical Engineering, Rutgers

Opportunities in Big Pharma, Biotech, and Contract Research Organizations
Lyndon Mitnaul, Ph.D.
Associate Director, Research Program Management, Regeneron Pharmaceuticals

Science Communications and Management
Deborah Silver, Ph.D.,
Executive Director, Professional Science Master's Program (Master of Business & Science)
Professor, Electrical and Computer Engineering

Sangya S. Varma, PhD
Director, Professional Science Master's Program (Master of Business & Science)

How to Prepare Winning Applications for Fellowships and Funding
Teresa DelCorso
Director of GradFund and Assistant Dean, Graduate School-New Brunswick

What Can You Do With a Ph.D.? – Our Alumni Tell their Stories

Delia Pitts, Ph.D.
Associate Vice President, Office of Institutional Diversity and Inclusion

Roselin Rosario, Ph.D.
Associate, Biomaterials, Ingredion, Inc.

Rebecca Baerga, Ph.D.
Senior Research Project Manager, Educational Testing Service (ETS)

Douglas Hausner, Ph.D.

Aditya Vanarase , Ph.D
Research Investigator, Bristol Myers Squibb

Cherise Bernard, Ph.D.
Assistant Technology Manager, Office of Technology Transfer, The Rockefeller University

Innovation and Entrepeneurship
Tim Maguire, Ph.D.
Associate Research Professor, Rutgers; CEO, Vasculogic

SUMMER PROGRAM STAFF

Research in Science & Engineering (RISE)

Evelyn S. Erenrich, Ph.D., Director
Director, Center for Graduate Recruitment, Retention and Diversity (GR^2aD), OIDI
Assistant Dean, Rutgers Graduate School-New Brunswick
Visiting Associate Professor, Department of Chemistry & Chemical Biology

Beatrice Haimovich, Ph.D., Associate Director
Associate Professor of Surgery, Robert Wood Johnson Medical School

REU in Cellular Bioengineering: From Biomaterials to Stem Cells (REU-CB)

David I. Shreiber, Ph.D., Director
Professor, Department of Biomedical Engineering
Director, Graduate Program in Biomedical Engineering

Susan Engelhardt
Director, Center for Innovative Ventures of Emerging Technology

REU in Structured Organic Particulate Systems (REU-SOPS)

Henrik Pedersen, Ph.D., Director
Education Director, NSF Engineering Research Center
Professor, Dept. of Chemical and Biochemical Engineering
Associate Dean for Lifelong Learning and Education, School of Engineering

Hector Lopez, M.S., Associate Director
Education Specialist, NSF Engineering Research Center in Structured Organic Particulate Systems

REU: Green Energy Technology Undergraduate Program (GET UP)

Kimberly Cook-Chennault, Ph.D., Director
Assistant Professor, Dept of Mechanical & Aerospace Engineering

REU in Physics and Astronomy

Andrew Baker, Ph.D., Director
Associate Professor, Dept. of Physics and Astronomy

Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship (SURF)

Lauren Aleksunes, PhD., Director
Associate Professor, Pharmacology and Toxicology

REU in International Environmental Sciences (Biogeography and Biotransformations)

Lily Young, Ph.D., Director
Professor, Environmental Sciences

Administrative Staff

Ms. Dawn Lopez, RiSE Program Coordinator
Rutgers Graduate School-New Brunswick

Ms. Linda Johnson
Rutgers Department of Biomedical Engineering

Teaching Fellows

Ms. Ana Rodriguez, PhD Candidate in Biomedical Engineering

Ms. Melvili Cintron, PhD Candidate in Molecular Biosciences

Resident Advisors

Ms. Brittany Taylor, PhD Candidate in Biomedical Engineering

Ms. Antoinette Nelson, PhD Candidate in Biomedical Engineering

Mr. Benjamin Druffel, PhD Candidate in Music

Website and Admissions Portal

Mr. Richard Knowles, Rutgers MS 2012 and RiSE Alumnus, currently at Priceline.com

Mr. Richard Rodriguez, OIDI

Mr. David Pickens, GSNB

Mr. Shamir Khan, GSNB

Photography and Social Media

Ms. Patricia Munoz, OIDI

Ms. Sonia Espinet, OIDI

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Name and Affiliation(s)	Title	Poster
Frances M. Acevedo *Ernest Mario School of Pharmacy, RiSE*	**A straightforward method of cisplatin speciation in human blood**	1A
Juan A. Aguilar *Green Energy Technology*	**Bulk thermoelectric characterization setup**	2A
Khaled J. Alhaddad *Cellular Bioengineering*	**Tracking mesenchymal stem cell differentiation using SC35 organization**	3A
Humma Awan *Physics & Astronomy*	**Optimizing the LSST observational strategy for survey uniformity**	4A
Joseph A. Azzolini *RiSE Associate*	**Distributed spectrum sensing in software-defined radio**	5A
Faith L. Borradaile *RiSE*	**Regulation of the BCRP/ABCG2 placental transporter in response to HIF-1α activation**	6A
Evan C. Callihan *RiSE*	**Principal Component Analysis reveals mtDNA phylogeny of macro-haplogroup L**	7A
Laura A. Carlucci *RiSE*	**Crystallization of β-Cardiac Myosin in the Presence of Nucleotide and Omecamtiv Mecarbil**	8A
Angeline Chen *Cellular Bioengineering*	**Quantification of optical scatter changes induced by Drp-1 mediated mitochondrial fission**	9A
Alice Chen-Liaw *Cellular Bioengineering , RiSE*	**The effect of interleukin 1β on VLDL secretion by steatotic hepatocytes during defatting**	10A
Katelyn M. Ciccozzi *Physics & Astronomy*	**Comparison of Dark Halos' Merging Histories**	11A
Toni L. Coleman *RiSE*	**Deletion of Activating Transcription Factor 4 (ATF4) in the liver of mice: generation and characterization of heterozygous mice**	12A

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Ethan J. Courtney *RiSE*	**Redox-neutral synthesis of protoberberine precursors**	13A
Melisa S. DeGroot *RiSE*	**Proper regulation of Rac1 activity is required during Drosophila dorsal vessel formation**	14A
Claire M. Digirolamo *RiSE*	**The effect of collaborative behavior on information seeking tasks**	15A
Tyler J. DiStefano *Cellular Bioengineering , RiSE*	**Characterization of the stiffness and cytotoxicity of poly(ethylene glycol) diacrylate hydrogels for retinal tissue engineering**	16A
Elena N. Dominguez *RiSE*	**Arc expression, the hippocampus, and associative learning**	17A
Alexis M. Fenton Jr. *Structured Organic Particulate Systems*	**Monte Carlo study of adsorption of water onto carbon nanosheets with surface defects**	18A
Katherine M. Fullerton *International Environmental Science, RiSE*	**Degradation of 2,4,6-tribromophenol under denitrifying and sulfate-reducing conditions in sediment microcosms**	19A
Fernando Garcia *Physics & Astronomy*	**Local conduction in multiferroic lutetium ferrite superlattice films**	20A
Amarilys E. González *International Environmental Science, RiSE*	**Comparison of the dechlorination rates of chlorinated phenols under anaerobic conditions**	21A
Matthew C. Grota *Cellular Bioengineering , RiSE*	**Characterization of highly aligned collagen sponge-like scaffolds for nerve tissue engineering**	22A
Jordan D. Hoyt *Green Energy Technology , RiSE*	**Fabrication of dome-shaped three phased, PZT - epoxy - multi walled carbon nanotube piezoelectric devices**	23A
James Z. Jackson *Cellular Bioengineering , RiSE*	**Carbon nanohorns facilitate healing in tendons and ligaments**	24A
Ronneshia Jackson *RiSE*	**Bacterial Communities Associated with Hydrothermal Vents as Novel Drug Sources**	25A

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Nerla Jean-Louis *Cellular Bioengineering , RiSE*	**Effects of Mesenchymal Stromal Cells on Macrophage Phenotype in a Chronic Wound Environment**	26A
Melissa S. Jennings *RiSE*	**Regulation of IGF2R expression by CREG1**	27A
Steven Jones *RiSE*	**Who doesn't love money as a gift? Signal theory and cash as gifts.**	28A
Christopher J. Kirby *Structured Organic Particulate Systems*	**Evaluation of the effects of tableting speed, compaction force and excipients on behaviors of mono and bilayer tablets with different shapes**	29A
Gabriel Schimit Ribeiro *Independent Study in Structured Organic Particulate Systems*		30A

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

Name and Affiliation(s)	Title	Poster
Cindy E. Kumah *Green Energy Technology*	**Organic optoelectronics: characterization of insulator-semiconductor-metal-insulator waveguides and fabrication of nanoporous metal electrodes**	1B
Devin Maiello *Green Energy Technology*	**Glass sealants for liquid metal batteries**	2B
Adrian E. Meyers *Physics & Astronomy*	**Pixel-based source reconstruction of the gravitationally lensed 8 o'clock arc**	3B
August J. Miller *Physics & Astronomy*	**A search for counterparts to unconfirmed Planck cluster candidates in ROSAT, Chandra, and XMM-Newton data**	4B
Orlando A. Mulero Flores *Structured Organic Particulate Systems*	**Mechanical Properties of Lipid Bilayer Membranes: Bending and Compressibility Modulus.**	5B
Keisha Mullings *Green Energy Technology , RiSE*	**Investigation of novel coatings for nano-BT particles for composite dielectric materials**	6B
Monica Navarreto *Green Energy Technology*	**Assessing the electrocatalytic activity of a series of Ni and Fe based Perovskites for the electrolysis of water**	7B
Tara C. Nealon *Green Energy Technology , RiSE*	**Windbelt with Pneumatic Actuators for Tunable Energy Harvesting**	8B
Sean R. Noble *Green Energy Technology*	**Development of visiblel light titanium dioxide photocatalysts**	9B
Faria Nusrat *Green Energy Technology*	**Characterization of ammonia stress and the dnaK stress gene in Thailand and New Jersey landfill leachate digester communities**	10B
Natalia N. Olmeda *Structured Organic Particulate Systems*	**Comparing and correlating mixing energy of LabRAM to V-blender**	11B
Jackson C. Olsen *Physics & Astronomy*	**A stop decay search using jet substructure**	12B

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

Stephanie Ortiz *Structured Organic Particulate Systems*	**The Behavior of Water Swelling with Compression in Drug Release Tablets**	13B
Valerie M. Paschalis *Ernest Mario School of Pharmacy, RiSE*	**Circadian disruption promotes breast cancer lung metastasis in C3(1)/Tag transgenic mice**	14B
Jordanna Payne *Cellular Bioengineering , RiSE*	**Measuring the mechanical properties of tissue using optical coherence tomography**	15B
Talia M. Planas-Fontánez *RiSE*	**Synthesis of iridium complexes supported by new POC ligands for catalysis by bond activation**	16B
Madeline R. Porter *Cellular Bioengineering , RiSE Associate*	**A novel role for cypin as a proteasome inhibitor**	17B
Maricely Ramirez-Hernandez *Structured Organic Particulate Systems*	**Role of excipient API interactions in hot melt granulation**	18B
Dhaval Rana *Green Energy Technology*	**Design and testing of an acoustic impedance tube**	19B
Benjamin J. Romano *Cellular Bioengineering*	**The effects of nanofiber scaffold features on astrocyte adherence and reactivity**	20B
Caresse O. Simmonds *Cellular Bioengineering , RiSE*	**Electrical stimulation of contractile electrospun scaffolds for skeletal muscle tissue engineering**	21B
Kevin J. Smith *Cellular Bioengineering*	**Investigating the effects of stromal cell - neuronal cell co-culture on neuronal maturity and neuronal viability under oxidative stress**	22B
Cayla A. Stifler *Physics & Astronomy*	**Jet finding efficiencies for single and multiple matched partons**	23B
Taylor E. Sweet *RiSE*	**Obtaining constant, controlled, and extended release using salicylate-based poly(anhydride-esters)**	24B
Mariel Tader *Physics & Astronomy*	**Lower limit for the Minimal Type III Seesaw Mechanism fermionic triplet mass with CMS multi-lepton analysis**	25B

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

Eleni G. Temeche *Green Energy Technology*	**Effect of Fruit-based Dyes on the Output of Dye-sensitized Solar Cells**	26B
Ayzha D. Ward *RiSE*	**Climatology and cluster analysis: self-organizing maps (SOMs)**	27B
Bianca M. West *RiSE*	**Social observation in neighborhoods: a comparison of methods**	28B
Rojae O. Wright *Physics & Astronomy*	**Growth of Crystals with Exotic Physical Properties**	29B

<u>Cellular Bioengineering Business Pitches</u>

In addition to the professional development component of the RiSE program, scholars in the REU in Cellular Bioengineering participate in weekly workshops on Innovation and Entrepreneurship. Led by Susan Engelhardt, Director of the Center for Innovative Ventures of Emerging Technology, these workshops introduce students to the fundamentals of taking an idea from benchtop-to-bedside. In teams of four, the students concurrently develop a business pitch around technology derived from their own REU research projects, which are presented at the Symposium.

The three products are:

OptiScan - Technology for rapid, non-invasive imaging of tissue properties
OCT Diagnostics: *Angeline Chen, Alice Chen-Liaw, Jordanna Payne, Madeline Porter*

AccuraSEE - Technology for the treatment of macular degeneration
Vision Enterprises*: Khaled Alhaddad, Tyler DiStefano, Matthew Grota, Kevin Smith*

Carbon Heelers - Technology for the treatment of tendon and ligament strains and sprains
CNH Inc: *James Jackson, Nerla Jean-Louis, Benjamin Romano, Caresse Simmonds*

Abstract and Student Biography

Frances M. Acevedo **Poster # 1A**
University of Puerto Rico-Rio Piedras Campus

Mentors:
Andreia Valente, PhD
Department of Medicinal Chemistry, University of Lisbon

Elizabeth McCandlish, PhD and Brian Buckley, PhD
Environmental and Occupational Health Sciences Institute, Rutgers, The State University of New Jersey

A straightforward method of cisplatin speciation in human blood

The development of cancer treatments has vastly improved people's lives over the past decades. In particular, chemotherapy has been a key option to treat most of cancer types. Cisplatin is a powerful, widely used (50-70% of all cancer cases) and commercially available chemotherapeutic drug. However, the current treatments cause severe toxic side effects. Many studies in the past have led to a better understanding of the mechanism, binding properties and toxicity of this and other chemotherapeutic agents. When this drug is administered intravenously, 65-98% is bound to blood plasma molecules. Platinum leads to apoptosis of cancer cells by the formation of adducts with DNA through covalent cross-links between nucleotides, called DNA-Pt adducts, thus disturbing the DNA double helix. The main goal of this project is to study the toxicity mechanisms of cisplatin when in contact with different molecules in the blood, cells, and other tissues. We will study the binding of platinum to plasma small molecules, such as L-Cysteine, L-Glutathione, and Cysteine-Glycine dipeptide, since their Pt adducts are known to cause nephrotoxicity. Previous binding studies used HPLC coupled with mass spectrometry, but the results were not satisfactory enough since specific platinum binding to any molecule was not characterized. With our novel approach, which employs ion chromatography with UV detection combined with inductively coupled plasma mass spectrometer, we will optimize the separation and quantification conditions of the platinum and several molecules present in blood. After incubation of the metallodrug with the above mentioned plasma small molecules at 37ºC, we expect to obtain different retention times for the {M-blood small molecules} adducts and calculate their binding kinetics and efficiency. Finally, we will apply this new method to true blood samples and to quantify adducts formed with any other metallodrug.

Biography: Frances M. Acevedo Mariani was born and raised in the city of San Juan, Puerto Rico. She currently attends the University of Puerto Rico, Rio Piedras Campus (UPRRP) in San Juan where she is pursuing a bachelor's degree in Chemistry. During her time in UPRRP, she has developed as a scientific researcher, collaborating and working with several faculty mentors during the academic year. This experience has been a great opportunity for her since she has been able to be part of different research fellowships such as MARC (Minority Access for Research Careers), IFN (Institute for Functional Nanomaterials), and PRLSAMP (Puerto Rico Louis Strokes Alliance for Minority Participation). Also, as part of her development as a future graduate student, she has done three summer internship including Rutgers, The State University of New Jersey, University of Pennsylvania, and University of Michigan. Once she graduates in the spring 2015, she plans on pursuing a PhD in Pharmaceutical Sciences and hopes to specialize in drug delivery systems and development. This summer she worked in Dr. Brian Buckley's laboratory in the department of Toxicology. She spent most of her time under the guidance of Andreia Valente, PhD in the development of an analytical method for cisplatin speciation in human blood. She is very grateful to the RiSE and SURF program, also to Dr. Aleksunes, Dr. Buckley, and Dr. Erenrich for giving her an once in a lifetime opportunity which she will apply in the near future as a graduate student and colleague.

Abstract and Student Biography

Juan A. Aguilar **Poster # 2A**
Stevens Institute of Technology

Mentors:
Mona Zebarjadi, PhD
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Bulk thermoelectric characterization setup

Thermoelectric materials are solid state devices that generate a voltage when a temperature gradient is introduced to them. Due to the reason that these materials convert thermal energy into electrical energy without the need of moving parts, they can be used in a great array of applications such as waste heat recovery, solar- thermal energy conversion and long lifetime applications. Despite the fact that advancements in nanostructures and semiconductors have allowed for the improvement of thermoelectric materials, there has been little attention on the best ways to integrate these new materials into economically stable systems. Previous studies have demonstrated that the thermoelectric efficiency of materials is an increasing function of a materials property called figure of merit (ZT). There are no theoretical limits on ZT and in principle it can reach infinity, which is the Carnot limit. Nevertheless, none of the research performed on thermoelectric materials has displayed a figure of merit above 3. The long term goal of this experiment is to find or create a material with a figure of merit above 3 which would aid in more practical applications and will permit the acceptance of thermoelectrics by the industry. Furthermore, the figure of merit is composed of three coefficients: electrical conductivity, thermal conductivity and Seebeck coefficient. The focus of this research project is to design and build proper stages for the simultaneous measurement of these parameters in different materials. Moreover, the experiments in the laboratory will be performed at room temperature and inside a vacuum chamber with temperatures reaching up to 1000 Kelvin. Lastly, the continued research of thermoelectric materials will allow the discovery of new ways to recover the thermal energy wasted into the environment by sources such as heating, ventilation, air conditioning, mechanical energy and electric power and it will help preserve natural resources.

Biography: Juan Andres Aguilar was born in Colombia, but relocated to the United States at the age of 17. He graduated from Hudson Community College with an associate degree in engineering science. Currently, he is a rising senior at Stevens Institute of Technology working towards a degree in mechanical engineering with a minor in mechatronics. Additionally, Juan was awarded with the Edwin A. Stevens scholarship which is giving to students who have demonstrated record of excellence in high school as evidenced by grade point average, class rank, SAT scores and high recommendations. Juan has also reinforced his leadership outside of the classroom through professional organizations such as the American Society of Mechanical Engineers (ASME) and Society of Hispanic Professional Engineers (SHPE). In Addition, He is also a 2013 fellow in the New Jersey Needs You (NJNY) program where he is offered the ability to establish and expand his professional career development through the mentoring by young, successful professionals in the industry. Finally, Juan hopes to pursue graduate studies in mechanical engineering with a focus in nanotechnology or robotics.

Abstract and Student Biography

Khaled J. Alhaddad **Poster # 3A**
The College of New Jersey

Mentors:
Dr. Prabhas Moghe, Dr. Anandika Dhaliwal, and Matthew Brenner
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Tracking mesenchymal stem cell differentiation using SC35 organization

Engineered microenvironments have been shown to dictate cellular phenomena such as cell morphology and lineage commitment. Currently, methods for assessing the effect of micro-environmental cues on mesenchymal stem cell (hMSC) phenotype are mostly end point in nature and fail to provide a sufficient explanation of the role of micro-environmental cues at the single cell level. Here we have developed computational approaches to profile early phenotypic responses and forecast future cell behavior in response to soluble micro-environmental cues. Using high content image analysis of high resolution images, we attempted to develop a methodology to profile cell state using sub-nuclear signatures. Our profiling algorithm captured changes in nuclear protein organization specifically splicing factor SC35, in response to soluble cues at early time points and linked it to lineage commitment at later time points. Results show that SC35 organization varies at 3 days in hMSC committed to a distinct lineage fate. Furthermore, early SC35 organization is a sensitive marker for predicting soluble cues-induced hMSC long term differentiation.

Biography: Khaled Alhadad is currently pursuing his Bachelors of Science/Engineering at The College of New Jersey in Biomedical Engineering with a concentration in Mechanical Engineering. Although Khaled is the first of seven siblings to attend college, he wishes to pursue higher education by attaining a Ph.D in Biomedical Engineering and being a role model for his siblings. Currently, Khaled is conducting research as a REU student in Dr. Prabhas Moghe’s lab under the mentorship of Dr. Anandika Dhaliwal with a focus on developing a methodology for profiling human Mesenchymal Stem Cell differentiation on engineered microenvironments. Khaled is thankful for the opportunity to gain his first hands-on laboratory experience and practical training under a great mentor that has constantly challenged him to break the boundaries of his comfort zones. He hopes to use this research opportunity to become a more well-rounded student, researcher, engineer, and scientist.

Abstract and Student Biography

Humma Awan **Poster # 4A**
Cornell University

Mentors:
Eric Gawiser and Peter Kurczynski
Department of Physics & Astronomy
Rutgers, The State University of New Jersey

Optimizing the LSST observational strategy for survey uniformity

Starting in 2022, the Large Synoptic Survey Telescope (LSST) will gather unprecedentedly detailed data of the southern sky, with goals ranging from investigating the nature of dark energy to searching for earth-killer asteroids. Since Baryonic Acoustic Oscillations are a particularly important probe of dark energy and they require a highly uniform survey, this project aims to find an observation strategy for optimal survey uniformity. We have shown that the default, undithered survey strategy (with minimal telescope-pointing offsets) leads to data with significantly varying depth. Hence, we implemented strategies with variants of large telescope-pointing offsets (dithers), such as random and repulsive random offsets, offsets arranged in a spiral with one spiral completing in a few months and another during the entire ten-year run. Comparison of survey uniformity from the different strategies emphasizes that large dithers are crucial to guarantee survey uniformity, and suggests paths towards the optimal observation strategy. Such an optimization will be implemented in LSST and the telescope will be better equipped to collect data for use in addressing the science goals. This project has been supported by funding from the National Science Foundation (grant PHY-1263280) and the Department of Energy (grant DE-SC0011636).

Biography: Humna Awan is a rising senior at Cornell University. She is majoring in Engineering Physics and intends to pursue a PhD in Physics after her undergraduate studies. As a participant in the Physics & Astronomy REU program, she is working with Prof. Eric Gawiser and Dr. Peter Kurczynski on optimizing the LSST observation strategy for dark energy studies. At Cornell, she is working with Prof. Darrell Schlom on modeling thin film crystals in order to produce X-ray diffraction patterns from a theoretical standpoint. She is also working with Prof. Micheal Niemack on improving measurements of galaxy cluster velocities via the kinematic Sunyaev-Zel'dovich effect; the project involves characterizing luminous red galaxies from the Sloan Digital Sky Survey and combining these data with cosmic microwave background measurements from the Atacama Cosmology Telescope.

Abstract and Student Biography

Joseph A. Azzolini **Poster # 5A**
The College of New Jersey

Mentors:
Ivan Seskar
Associate Director for Information Technology, WINLAB
Rutgers, The State University of New Jersey

Distributed spectrum sensing in software-defined radio

The inefficient use of the electromagnetic spectrum, resulting from static allocation and expensive licensing, is a widely recognized problem in the field of wireless communications. Since the wireless spectrum is a scarce and limited resource, as the demand for faster and more reliable networks increases so will the need for a more efficient way to use the spectrum. One way to achieve this goal would be to allow secondary users to take advantage of partially or completely unused frequency bands. In this case, secondary users would require a means of identifying these communication gaps. This work focuses on finding the fastest and most reliable method of distributed spectrum sensing that could accurately detect when certain bands are in use. The team will develop, test, and analyze several different sweeping algorithms that will be implemented on the ORBIT testbed. In the experiments, we will use a set of centrally controlled receivers to fractionally scan the wireless spectrum and perform energy detection processes to indicate the presence of a transmitter.

Biography: Joseph Azzolini is a rising senior at The College of New Jersey majoring in Electrical Engineering. This summer Joseph has worked with a research team at the Wireless Information Network Laboratory (WINLAB) and also worked with ECE Professor Anand Sarwate. Upon graduation, Joseph plans to pursue his Ph.D. in Electrical Engineering.

Abstract and Student Biography

Faith L. Borradaile **Poster # 6A**
The Richard Stockton College of New Jersey

Mentors:
Lauren Aleksunes, Pharm.D., Ph.D., Kristin Bircsak, Ph.D. Candidate
Department of Pharmacology and Toxicology
Rutgers, The State University of New Jersey

Lissa Francois, M.D.
Department of Obstetrics, Gynecology, and Reproductive Sciences
Division of Maternal-Fetal Medicine
Rutgers-Robert Wood Johnson Medical School

Regulation of the BCRP/ABCG2 placental transporter in response to HIF-1α activation

Over the last 30 years, the use of prescription medications during pregnancy has increased by more than 60%. Fortunately, the placenta is endowed with endogenous mechanisms that protect developing fetuses from many of these xenobiotics. One such mechanism is the placental efflux transporter, Breast Cancer Resistance Protein (BCRP/ABCG2). The objective of this study was to investigate whether or not activation of the hypoxia inducible factor (HIF-1α) transcription factor, a key signaling molecule during hypoxia, alters the protein expression of the BCRP transporter in a human BeWo choriocarcinoma cell line, a model of first trimester placental cells. Cells were treated with the hypoxia mimetics, Deferoxamine Mesylate (DFO) and Cobalt Chloride ($CoCl_2$), for 24-48 hours and then lysed. HIF-1α protein levels, as determined by ELISA, increased 3.1- and 3.4-fold respectively, after treatment with the hypoxia mimetics. In the $CoCl_2$ treated cells, this corresponded with a 13% decrease in BCRP protein levels at 48 h. In contrast, treatment with the HIF-1α inhibitor, KC7F2, increased BCRP protein levels. Ongoing experiments will culture BeWo cells in a hypoxic chamber (5% versus 20% oxygen tension) and measure the expression of BCRP and HIF-1α proteins. Preliminary data shows that the hypoxia mimetics down-regulate the protein expression of placental BCRP in response to HIF-1α activation. The implications of these findings are that during times of low oxygen tension, such as those that exist early in healthy pregnancies and in response to pathological conditions, such as fetal growth restriction, the defensive mechanisms of the BCRP transporter may be decreased. This could increase fetal exposure to xenobiotics, including prescription medications and environmental chemicals.

Biography: Faith Borradaile was born and raised in southern New Jersey. She currently attends The Richard Stockton College of New Jersey where she is pursuing a bachelor's degree in public health with an environmental health concentration and a holistic health minor. During her time at Stockton, Faith has actively participated in Golden Key International Honour Society and has conducted research on the reproductive and developmental effects of Roundup on two aquatic species, *Daphnia magna* and *Daphnia pulex*. Faith has always been interested in how environmental and pharmaceutical toxicants impact health. When she graduates in the fall of 2014, she plans on pursuing a Ph.D. in Toxicology and hopes to specialize in its reproductive and developmental division. This summer she worked in Dr. Lauren Aleksunes' laboratory in the Department of Pharmacology and Toxicology. Faith spent the bulk of her time under the guidance of Lissa Francois, M.D., researching how hypoxic conditions affect the function of BCRP efflux transporters in the placenta. She is grateful to RiSE and Dr. Aleksunes for providing her with a glimpse into the life of a Ph.D. student. This experience has increased her passion for the toxicological field.

Abstract and Student Biography

Evan C. Callihan **Poster # 7A**
American University

Mentors:
Gyan Bhanot
Department of Molecular Biology and Biochemistry

Omar Shams
Department of Physics and Astronomy

Principal Component Analysis reveals mtDNA phylogeny of macro-haplogroup L

Mitochondrial disorders are maternally inherited and seen at higher frequency among certain populations. Phylogenetic trees based on mitochondrial DNA (mtDNA) polymorphisms are useful tools for analyzing human migration patterns and diagnosis of mitochondrial disorders. For example, Leber's Hereditary Optic Neuropathy (LHON), which leads to loss of acute central vision, is caused by three point mutations in mtDNA that are present in higher frequency in certain haplogroups. Haplogroups are groups of related mtDNA sequences that are based on shared single nucleotide polymorphisms (SNPs) and have letter names A-Z. We developed a new method, based on principal component analysis (PCA), for identifying commonalities among 25,000 mtDNA sequences. The PCA analysis of 25,000 mtDNA samples yielded 5 clusters: 4 L haplogroup clusters and one, large L3/M/N cluster. This analysis was repeated on the 1769 samples from the 4 L clusters, excluding L3. This yielded 7 sub-clusters that represent haplogroups L0, L1, L2 and L5. Consensus sequences were generated for each L sub-cluster and compared pair-wise to determine the distinguishing SNPs. The ability to identify the SNPs that are associated with higher predispositions within certain haplogroups for mitochondrial disorders such as LHON could facilitate the diagnosis and treatment of these diseases.

Biography: Evan Callihan was born in Lancaster, Pennsylvania and is a senior at American University in Washington, D.C., studying Biology with minors in Spanish and German. After graduating in May 2015, Evan plans to pursue a Ph.D. in Molecular Biology or Biochemistry. This summer he is working with Dr. Gyan Bhanot in the BioMaPS Institute for Quantitative Biology to develop a computer program that reconstructs the human mitochondrial DNA phylogeny, generates consensus sequences for each haplogroup, and identifies the characteristic mutations for each. Evan hopes to continue this research after he returns to American University in the fall.

Abstract and Student Biography

Laura A. Carlucci **Poster # 8A**
University of Massachusetts Amherst

Mentors:
Donald A. Winkelman Ph.D.
Department of Pathology
Robert Wood Johnson Medical School

Crystallization of β-Cardiac Myosin in the Presence of Nucleotide and Omecamtiv Mecarbil

Hypertrophic cardiomyopathy (HCM) is a type of heart muscle disease, characterized by an unusual thickening of the ventricular wall and a decrease in ventricular chamber size. It is common among humans, affecting about 1 in 500 individuals, and claims the lives of many young athletes. In some instances, HCM is caused by a single point mutation in the gene for myosin, an ATP-dependent motor protein involved in muscle contraction. Upon screening for potential therapeutic drugs, a novel drug, Omecamtiv Mecarbil (OM) was found to increase cardiac force production in models of heart failure by facilitating phosphate release from myosin. As the mechanism of drug action is uncertain, we determined the structure of cardiac myosin bound to OM in the absence of nucleotide (rigor conformation). We noted potential key interactions between the drug and myosin. We sought to further these insights by solving how the drug binds to myosin in the pre-power stroke conformation, with a bound nucleotide analogue. We crystallized the protein with OM and ADP-aluminum fluoride, an analog of hydrolyzed ATP. Small single crystals were obtained and a low resolution X-ray diffraction dataset (3.6 Å) was used to solve the structure. The myosin appeared in a conformation between the pre-power stroke and the rigor state; however, we failed to capture the pre-power stroke conformation. This will be confirmed with larger crystals needed to solve a higher resolution structure and establish the presence of bound nucleotide. We also will continue screening nucleotide analogues with OM to catch the pre-power stroke conformation. This structure-based analysis of drug action will contribute to the development of new drug designs and therapies to treat cardiovascular disease.

Biography: Laura Carlucci is from Wayne, NJ. In the Spring 2016, she will graduate from UMass Amherst with a degree in biochemistry and molecular biology, and she is considering to subsequently pursue a Ph.D in a similar field. She has enjoyed spending the summer researching in Donald Winkelmann's lab, in which she worked with tissue culture and protein crystals, and socializing with fellow RiSE participants. Although she has greatly enjoyed her experience at Rutgers, she is excited to return to UMass where she works in a lab studying the structure of a plant cell wall under the guidance of Tobias Baskin, and is an officer for the university club fencing team.

Abstract and Student Biography

Angeline Chen **Poster # 9A**
Simmons College

Mentors:
Kamau Pierre, Nada N. Boustany
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Quantification of optical scatter changes induced by Drp-1 mediated mitochondrial fission

Mitochondrial fission has recently been found to play a key role in the execution of apoptosis. Therefore, much interest has been generated in the study of mitochondrial dynamics and how it directly relates to apoptosis. Better understanding of the orchestration between mitochondrial morphological change and apoptosis could provide insight on the interactions between the pro- and anti- apoptotic members of the Bcl-2 family of proteins and mitochondrial fission proteins such as Drp-1. In this context, the objective of the project is to devise and validate a method of quantifying mitochondrial fission through light scattering. Currently available microscopy techniques may interfere with natural biological activities, have limited ability to record changes over time, and are subject to interpretation. With the optical scatter imaging (OSI) system, morphological activity including mitochondrial fission can be detected without the use of labels and in real-time; allowing novel insight into and quantifiable data regarding the mechanics of protein-mediated processes. Structural changes in mitochondria have been induced and recorded by the OSI in a positive (staurosporine) and negative control (dimethyl sulfoxide), providing a basis for comparison to experimental results in which activity of Drp-1 is inhibited with mdivi-1. We expect that the inhibited Drp-1 will result in mitochondrial fission termination; subsequently stopping change in light scattering, which occurs with morphological change. Long term objectives for understanding mitochondrial fission include investigating the direct effects of mitochondrial involvement in apoptosis and incorporating mitochondrial fission as an additional criterion for cell death induction in apoptosis assays.

Biography: Angeline Chen grew up in southern California and is currently attending Simmons College in Boston, MA. She is expecting to graduate spring of 2016 with a B.S. degree, double majoring in biology and chemistry. After she finishes her undergraduate education, she plans to attend graduate school to study cellular dynamics in a PhD program. In the Cellular Bioengineering REU, Angeline worked in Dr. Boustany's optics lab, where she had the opportunity to learn wet and dry lab techniques and experience the intricate workings of data processing. Angeline would like to thank Dr. Boustany, her graduate mentor Kamau Pierre, and other members of the lab group Mohammad Naser and Oluwatoyosi Ipaye for the warm welcome into the lab and support throughout the project.

Abstract and Student Biography

Alice Chen-Liaw **Poster # 10A**
University of Scranton

Mentors:
Francois Berthiaume, Ph.D., and Mr. Gabriel Yarmush
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

The effect of interleukin 1β on VLDL secretion by steatotic hepatocytes during defatting

Steatotic livers (fatty liver) complicate liver transplantation due to their increased susceptibility to primary non-function when exposed to ischemia reperfusion injuries which are inherent in all transplants. To combat this, one option is to perfuse, ex vivo, the steatotic livers with a defatting cocktail that reduces lipid droplets accumulated within hepatocytes. The current defatting cocktail functions by increasing lipid droplet breakdown and by upregulating fatty acid oxidation. Another synergistic approach involves the secretion of TG via very low density lipoproteins (VLDL) from liver cells. We hypothesize that the pro-inflammatory cytokine, interleukin 1β (IL-1β), may increase VLDL secretion in hepatocytes. To investigate the role of IL-1β in VLDL secretion, we cultured a hepatocyte cell line (HepG2/C3A) in media supplemented with linoleum acid and oleic acid for two days, thus inducing steatosis. Cells were then switched to media supplemented with IL-1β, the current defatting cocktail, or the combination of both. Intracellular triglyceride (TG) content as well as that released in the medium were measured with Nile Red staining and with biochemical TG assays. We expect TG reduction to be higher in cells treated with the defatting cocktail + IL-1β than in cells treated with the defatting cocktail alone. Furthermore, we expect IL-1β to increase TG secretion into the media, which would like indicate an increase in VLDL secretion. IL-1β may be a novel way to stimulate VLDL secretion that would open up new avenues for increasing the efficiency of liver defatting perfusion.

Biography: Alice Chen Liaw is currently pursuing a degree in Biochemistry, Cellular and Molecular Biology and expects to graduate from the University of Scranton with a Bachelor of Science in Spring 2016. This summer, she is working with Dr. Francois Berthiaume and Gabriel Yarmush on the effect of interleukin 1β on VLDL secretion in hepatocytes during defatting. In conjunction with her research, Alice will participate in the MD/PhD shadowing program. She is extremely grateful for this opportunity to increase her clinical experiences and her understanding of the career of a physician scientist. After graduation, Alice plans to pursue an MD/PhD program. She hopes to conduct research and treat patients at an academic research center and teaching hospital.

Abstract and Student Biography

Katelyn M. Ciccozzi **Poster # 11A**
Kutztown University of Pennsylvania

Mentors:
Alyson Brooks
Department of Physics and Astronomy
Rutgers, The state University of New Jersey

Sarah Loebman
Department of Astronomy
University of Michigan

Comparison of Dark Halos' Merging Histories

The histories of colliding galaxies are using cosmological simulations. We compare results from different halo finders, programs that trace dark matter halos through time using different algorithms. We construct merger trees using different halo finders. Tools such as merger trees are important in creating a foundation for galaxy formations and in better understanding the evolution of the cosmic structure of the universe. This project focused on analyzing the history of one current-day halo in detail. By using one simulation of a Milky Way-mass galaxy, two halo finders output data sets for the single current-day halo. The use of a database assists in analyzing merger trees to compare the reliability of different halo finders. Discrepancies were found between two different halo finders in the structure of their respective merger trees. We are investigating the origin of these discrepancies in detail. This project has been supported by funding from National Science Foundation grant PHY-1263280.

Biography: Katelyn Ciccozzi is a fifth year senior at Kutztown University of Pennsylvania where she is pursuing a duel B.S. in Physics and Mathematics. She is expected to graduate in the spring of 2015 and hopes to continue her education in graduate school. She has been active in research since her sophomore year at Kutztown and received the Neag Undergraduate Research Grant in order to present her findings at a national conference hosted by the American Astronomical Society. Over this summer, Katelyn has worked with Professor Alyson Brooks, Dr. Maureen Teyssier, and Sheehan Ahmed in studying the history of merging dark matter halos.

Abstract and Student Biography

Toni L. Coleman **Poster # 12A**
Bloomfield College

Mentors:
Tracy Anthony, Ph.D., Ms. Emily Mirek
Nutritional Science Department
Rutgers, The State University of New Jersey

Deletion of Activating Transcription Factor 4 (ATF4) in the liver of mice: generation and characterization of heterozygous mice

Activating Transcription Factor 4 (ATF4) is a basic leucine zipper (bZIP) transcription factor that functions to remodel the transcriptome to favor adaptation during environmental stress. During nutrient stress, the ATF4 protein, alone and in concert with other bZIP transcription factors, stimulates the expression of select genes involved in protein synthesis, cell cycle control and oxidative defenses. Whole body *Atf4* knock-out mice are growth-retarded, blind and sickly, complicating study of ATF4 in any single organ system. Our lab is interested in studying the role of ATF4 in regulating liver metabolism and function in response to amino acid starvation. To accomplish this goal, we endeavored to generate a liver-specific ATF4 knockout mouse using Cre-LoxP recombination technology. Through genetic breeding of $Atf4^{flox/flox}$ mice to mice expressing Cre recombinase under the control of the albumin promoter (AlbCre), heterozygous AlbCre • $Atf4^{flox/+}$ progeny were evaluated alongside whole body $Atf4^{+/+}$ and $Atf4^{+/-}$ mice. In these mice, the hepatic response to pharmaceutical depletion of amino acids by the anti-leukemic agent, L-asparaginase was determined by measuring the expression of ATF4 target genes *Atf5*, CAAT enhancer binding protein homologous protein (*Chop*), asparagine synthetase (*Asns*) and eukaryotic initiation factor 4e binding protein 1 (*4ebp1*). The long-term goal of this project is to identifying molecular differences in the response to asparaginase in order to improve treatment of leukemia

Biography: Toni Coleman was born and raised in West Palm Beach, Florida. She attended various community colleges in Florida, supporting herself with softball and cross-country athletic scholarships (NCAA Division II), as well as part time work. She has been living in New Jersey since the fall of 2012, when she started at Bloomfield College. She is a double major in chemistry (biochemistry concentration) and biology and is expected to graduate in May 2015. Toni is involved in many extracurricular activities at Bloomfield College, including McNair Scholars, Alpha Chi Honor Society and the National Society of Leadership and Success (Alpha Sigma Pi). She is a very outgoing and spontaneous person who likes to explore everything. In her free time, she enjoys visiting the beach, shopping, playing all sports and taking road trips. One of her most favorite things to do is taking photos! The RiSE experience has been wonderful for her, exposing her to full-time research, albeit for a short period of time. She considers it life-altering and is most grateful for the opportunity. She looks forward to applying everything that she has learned and will continue to learn to a productive graduate school experience.

Abstract and Student Biography

Ethan J. Courtney **Poster # 13A**
Trevecca Nazarene University

Mentors:
Daniel Seidel, Ph.D., Mr. Longle Ma
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Redox-neutral synthesis of protoberberine precursors

Natural products within the protoberberine family have shown various biological properties, such as having antimalarial qualities or the ability to reduce blood glucose levels. However, these compounds, which consist of fused ring skeletons with at least four rings, are difficult to synthesize with good yield from simple starting materials in an efficient manner. This research focuses on an innovative redox-neutral method, discovered by the Seidel group, which is able to produce protoberberines from simple starting materials. The specific aim of this project is to examine the efficacy of reactions between benzaldehydes with a diethyl malonate group on the ortho position and variously substituted tetrahydroisoquinolines, by functionalizing the α position of the tetrahydroisoquinoline moiety with concomitant ring closure to construct the desired protoberberine skeleton. NMR spectroscopy is then used to confirm the structure. This method is able to produce many of these molecules with yields of approximately 80-95%.

Biography: Ethan is originally from Richfield, Pennsylvania, and now is a rising senior chemistry major with one semester left at Trevecca Nazarene University in Nashville, Tennessee. He currently is working under Dr. Daniel Seidel and Longle Ma through RiSE, and he is extremely grateful for the opportunity.

Abstract and Student Biography

Melisa S. DeGroot **Poster # 14A**
Daemen College

Mentors:
Sunita Kramer and David Swope
The Department of Pathology and Laboratory Medicine
Rutgers-Robert Wood Johnson Medical School

Proper regulation of Rac1 activity is required during *Drosophila* dorsal vessel formation

Cardiogenesis is a complex process that requires a series of specifically synchronized cellular events leading to the formation of a fully functional heart tube. Cardioblasts (CBs) must migrate towards the midline of the developing embryo and undergo cell shape changes to facilitate lumen formation. This event is conserved between insects and vertebrates, making *Drosophila melanogaster* an ideal model system to study heart development. The Rho GTPase family, particularly Rac, Rho, and Cdc42, have previously been shown to mediate cell movement, shape, and adhesion through the actin cytoskeleton. Moreover, Cdc42 has been shown to be specifically required in tinman-expressing CBs for proper cell migration during heart tube formation. However, the role of Rac1 in dorsal vessel (DV) formation remains unclear. To address this, we expressed Rac1 gain-of-function (GOF) and loss-of-function (LOF) mutants specifically in the *Drosophila* DV and examined embryos for cardiac abnormalities. When constitutively active (CA) Rac1 was expressed in the entire DV, we observed misalignment of CBs, gaps between CB pairs, and overall abnormal morphology of the CBs, while pericardial cells were not affected. In contrast, overexpression of wild-type and dominant negative Rac1 did not cause any significant morphological defects. These findings suggest that proper regulation of Rac1 signaling activity is required for DV formation. Future genetic enhancer/suppression screens will help identify additional components involved in the Rac1 signaling pathway that modify heart development.

Biography: Melisa DeGroot is a biology major at Daemen College in Amherst, NY, where she is the president of Beta Beta Beta National Biological Honor Society and is studying the effects of electromagnetic fields on the development of *Danio rerio* eggs. This summer Melisa is thankful to be working in Dr. Sunita Kramer's lab under the tutelage of Dr. David Swope, where she is exploring the role of Rac1 activity during *Drosophila* cardiogenesis. Understanding the early conserved genes and molecular pathways involved in *Drosophila* heart development will shed light on cardiac development in humans. The RiSE program has given Melisa the opportunity to experience cutting edge research among an elite group of faculty and students. In the future, she plans to continue exploring life's many opportunities.

Abstract and Student Biography

Claire M. Digirolamo **Poster # 15A**
George Washington University

Mentors:
Chirag Shah
School of Communication and Information
Rutgers, The State University of New Jersey

The effect of collaborative behavior on information seeking tasks

The research was carried out to analyze if collaborative behavior positively or negatively affects performance when conducting information seeking tasks. The data analysis was performed on log data collected from a user study conducted during Summer 2013 by InfoSeeking group members. The study consisted of individuals, dyads, and triads tasked with finding answers to questions derived from ‘Google-A-Day’ questions. Users were instructed to search online and answer as many questions possible during a finite period of time. Data was logged using a customized version of Coagmento toolbar in real time while users performed their online search tasks. The purpose of the study and subsequent data analysis is to determine whether the size of the group affected search behavior and search performance. Study measures included effectiveness, the ratio between the number of pages groups lingered on over a threshold time (determined by relevant research literature) to the number of distinct web pages visited. Efficiency measures the ratio of effectiveness to the number of distinct search queries issued. The analysis also looked at the number of pages groups collected snippets of text from, as well as their accuracy with respect to questions correctly answered out of questions attempted. The data analysis was conducted using Microsoft Excel and R. Statistical tests performed include the Shapiro-Wilk test for normality, the Kruskal-Wallis analysis of variance, and the Wilcoxon rank sum test. Analysis is ongoing and preliminary results indicate statistical significance for measures of effectiveness and efficiency across different group sizes.

Biography: Claire Digirolamo is a rising senior at George Washington University in Washington, DC. She is currently pursuing a B.S. in Applied Mathematics and is expected to graduate in May, 2014. Claire plans to attend graduate school to pursue a Master’s degree in Applied Mathematics. She is a member of the University Honors Program. This summer Claire has been working on analyzing data from a user study conducted the previous summer by the Info Seeking group at Rutgers.

Abstract and Student Biography

Tyler J. DiStefano **Poster # 16A**
Cooper Union

Mentors:
Corina White, Ronke Olabisi, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Characterization of the stiffness and cytotoxicity of poly(ethylene glycol) diacrylate hydrogels for retinal tissue engineering

Bruch's membrane is a five-layered extra-cellular matrix found within the eye that, along with the retinal pigment epithelium, forms the blood retinal barrier. This barrier is commonly affected by dry Age-related Macular Degeneration (AMD). This condition compromises unique mechanical and transport properties that are found within the blood-retinal barrier microenvironment and is the leading cause of blindness in developed countries. Specifically, the build-up of carrier lipoproteins across Bruch's membrane reduces its Young's modulus and limits the transport of necessary vitamins and glycosaminoglycans (GAGs) for photoreceptor function. Poly(ethylene glycol) diacrylate (PEG-DA) hydrogels are attractive biocompatible scaffolds whose mechanical properties can be fine-tuned to simulate those found within Bruch's membrane for promising tissue engineering therapies to treat AMD. In this study, we characterize Young's modulus of PEG-DA hydrogels across compositional concentrations and combinations of molecular weights. Particularly, 1X and 2X concentration hydrogel scaffolds were made from various molecular weight PEG-DA chains ranging from 3.4kDa to 20kDa. Hydrogels in this study were made of one composing molecular weight (single-network), as well as combinations of two varying molecular weights (double-network). We further conducted cell viability tests on the aforementioned PEG-DA scaffolds to analyze the effects of hydrogel stiffness on a Retinal Pigment Epithelium (ARPE-19) cell line viability. We expect to observe scaffolds that have a Young's modulus similar to that of a healthy Bruch's membrane will support ARPE-19 cell viability more so than hydrogel scaffolds with a dissimilar stiffness.

Biography: Tyler DiStefano is a native New Yorker and lives in Manhattan during the academic year. He is currently pursuing a degree in Mechanical Engineering from The Cooper Union, and will be graduating with a bachelor's degree in May of 2015. After his undergraduate degree, Tyler would like to pursue a long-term biomedical research experience in preparation for MD/PhD programs. Tyler's REU experience in Cellular Bioengineering has taught him invaluable skills needed for graduate school, especially since this is his first research experience in bioengineering. In Dr. Olabisi's laboratory, Tyler is developing a novel hydrogel to simulate mechanical and transport phenomena in hopes to replace particular layers found within Bruch's membrane. In his spare time, Tyler enjoys swimming, biking through nature trails in state parks, and trying out new restaurants in NYC.

Abstract and Student Biography

Elena N. Dominguez **Poster # 17A**
Brooklyn College

Mentors:
Dr. Timothy Otto, Ph.D. and Mr. Caleb Hudgins, M.S.
Department of Psychology
Rutgers, The State University of New Jersey

Arc expression, the hippocampus, and associative learning

The goal of the present study was to examine the biological basis of learning and memory. More specifically, this project explored changes in the biology of the hippocampus induced by Pavlovian fear conditioning. Rats were exposed to an unconditioned stimulus (US), the environment's context, which was paired with an aversive stimulus, a tone. Two groups of rats were trained in this contextual fear conditioning paradigm. One group was labeled as “familiar” because these rats in particular were previously exposed to the conditioning environment; therefore they were familiar with the context prior to learning. The other group was known as “novel” because the context of the conditioning chamber was completely new to them. Behavior was observed in this project through monitoring freezing behavior. In associative fear conditioning, rats pair the environments context along with the foot shock. Therefore, when they are only exposed to the environment in the absence of foot shock, they display this freezing behavior as a response because it elicited fear. Changes in the brain were also examined through expression of activity-regulated cytoskeletal (Arc) protein in the hippocampus. Expression of Arc is implicated as a biomarker for synaptic plasticity and changes in synaptic strength commonly thought to underlie memory formation. Our laboratory has previously demonstrated that the expression of Arc protein is enhanced following hippocampal dependent learning. With this in mind, we expected the “novel” group to have more freezing/immobile behavior and Arc expression because they are new to the environment. This is because the novel group learned about the environment in addition to the environment US relationship, versus the rats in the familiar group who only had to learn to associate a familiar context with foot shock. Results are pending.

Biography: Elena Dominguez is a student coming from Brooklyn, New York. She is a MARC scholar at Brooklyn College where she is currently studying psychology and neuroscience. Elena also works in a cognitive lab under Dr. Matthew Crump where she studies skilled performance in human subjects. She will be graduating this upcoming spring with a Bachelors of Science in psychology and hopes to attend graduate school the following year.

Abstract and Student Biography

Alexis M. Fenton Jr. **Poster # 18A**
Rice University

Mentors:
Alexander V. Neimark, Ph.D.; Richard Cimino, M.S.
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Monte Carlo study of adsorption of water onto carbon nanosheets with surface defects

Activated carbons are widely used in industrial, medical and everyday applications such as water filtration, desalination and as catalytic supports due to their porosity and high internal surface area (> 1000 square meters/g). The hydrophobic nature of carbon repels macroscopic water droplets. As such, one would expect that water would not adsorb to its surface. However, we find that as relative humidity approaches 100%, water does indeed adsorb to carbon surfaces, and will fill carbon pores completely. It is generally accepted that this adsorption occurs because of the chemical surface defects present in most carbon nanosheets (1). The subject of this project is to study the effect of surface chemical defect density on water adsorption in activated carbons via molecular simulations. We approach this experiment using a dynamic Monte Carlo algorithm, which enables us to study these surface defects in slit pores that approximate the true porosity of activated carbon.

1. Gubbins, K. E., Brennan, J. K., Bandosz, T. J., & Thomson, K. T. Water in porous carbons. Colloids and Surfaces A: Physicochemical and Engineering Aspects, 539-568.

Biography: Alexis Fenton, Jr. was born October 28, 1993 in Rochester, Minnesota. He was raised in San Antonio, Texas, and is currently an undergraduate studying Chemical and Biomolecular Engineering at Rice University in Houston, Texas. He is currently an ACS Scholar and a member of AIChE. In the summer of 2011, he helped conduct research at Texas State University under Dr. Gary Beall, where he studied the synthesis of graphene from humic acid and the infusion of cyclobutane-1,3-diol into organoclay pellets. This summer, he is helping conduct research at Rutgers, The State University of New Jersey under Dr. Alexander Neimark, where he is studying adsorption patterns of water onto carbon nanosheets. In the future, he intends on pursuing a career in materials sciences.

Abstract and Student Biography

Katherine M. Fullerton **Poster # 19A**
Rutgers, The State University of New Jersey

Mentors:
Lily Young, PhD. & Ms. Alexandra Walczak
Department of Environmental Science
Rutgers, The State University of New Jersey

Degradation of 2,4,6-tribromophenol under denitrifying and sulfate-reducing conditions in sediment microcosms

Contamination of aquatic sediments with aryl halides, such as those found in pesticides, flame retardants, and other industrial chemicals, has become very widespread and a matter of environmental concern. Some microbes have the natural ability to reductively dehalogenate these aryl halides. In this processes, halide substituents are substituted with hydrogen, thereby transforming these pollutants into less toxic forms that are more easily degraded, with the presence of a favorable electron acceptor. The goal of this study was to investigate the effect of various electron acceptors on the rate of dehalogenation of 2,4,6-tribromophenol (TBP), a common pollutant. We prepared sediment microcosms from the Raritan and Mullica Rivers, a polluted and clean site respectively, under denitrifying and sulfate-reducing conditions. Anaerobic sediment slurries were ammended with TBP and either 5mM nitrate, 5mM or 100μM sulfate, and then incubated for several weeks. Weekly samples were collected and then analyzed using high performance liquid chromatography and ion chromatography to track the loss of TBP, nitrate, and sulfate and the increase in free bromine. Molecular analysis will be conducted in order to study the changes in microbial communities as a result of enrichment. This study will allow us to determine the electron acceptors needed to optimize the degradation of TBP in the environment by the natural microbial community, in addition to identifying the microorganisms most likely to be involved in the process.

Biography: Katherine is a native of New Jersey born on November 29, 1993. She is a rising junior in the School of Environmental and Biological Science at Rutgers, The State University of New Jersey studying microbial biotechnology with a minor in biochemistry. Katherine is not new to research and has been conducting research since high school. Prior to this summer, she worked in a lipid biochemistry lab in the Department of Food Science at Rutgers, studying a novel fungal gene with implications in endocytosis and lipid metabolism. Currently, she is studying the degradation of halogenated aromatics in river sediments in the presence of different electron acceptors with Dr. Lily Young in the Department of Environmental Science. Outside of research, Katherine is a proud member of the Douglass Residential College and the SEBS Honors Program and is involved in Douglass Orientation Committee and is currently Co-President of Designer Genes (the biotechnology student organization). She plans to pursue a PhD once she graduates in two years and wants to continue studies in environmental microbiology and remediation.

Abstract and Student Biography

Fernando Garcia **Poster # 20A**
The University of Texas at Austin

Mentors:
Weida Wu, Wenbo Wang
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Local conduction in multiferroic lutetium ferrite superlattice films

A magnetoelectric multiferroic is a material in which a magnetic polarization is induced when subjected to an external electric polarization or vice versa. It was once thought that $LuFe_2O_4$ exhibited both ferrimagnetism and ferroelectricity at temperatures as high as 250 K, but analyses of the material from several groups show that $LuFe_2O_4$ is not ferroelectric, and is only ferrimagnetic at temperatures below 240 K. A structurally similar compound, hexagonal $LuFeO_3$ exhibits improper ferroelectricity above room temperature and develops an antiferromagnetic ordering ($T_N \approx 147$ K) that allows for a tiny net moment due to slight canting of the spins. A $(LuFeO_3)_M/(LuFe_2O_4)_N$ superlattice was grown by molecule beam epitaxy, with the goal of producing a high-temperature magnetoelectric multiferroic that combines the ferrimagnetism in $LuFe_2O_4$ and the ferroelectricity in $LuFeO_3$. In this project, piezoelectric force microscopy (PFM) was used to visualize any possible ferroelectric domain in the samples. Unexpectedly, the samples were found to be too conductive for PFM measurements. Conductive atomic force microscopy (cAFM) at room temperature was used to study the local electronic transport properties of these films for better understanding the origin of conduction. Preliminary cAFM images show that local conduction is uniform within scan area (100 μm^2). It is speculated that the macroscopic conduction is due to filamentary conduction paths. This project has been supported by funding from National Science Foundation grant PHY-1263280.

Biography: Fernando Garcia is a rising senior at the University of Texas, at Austin. He grew up in Mexico, and came to the US after finish High School. During the latter years of his education in Mexico, he became interested in physics, participating in extracurricular activities to learn more about the subject; his interest on the subject still persists, and Garcia's aspiration is to become a Ph.D. in Physics. During the fall of 2013, and the spring of 2014, Garcia's worked as a research assistant for Dr. Alejandro De Lozanne, at the University of Texas, at Austin. As an extracurricular activity, and as part of a program of student-led classes, last spring Garcia became a technical instructor of the Machine and Shop area. During the summer of 2014, Garcia was accepted to participate in Dr. Weida Wu's lab, which is building low noise electronics and performing Conductive Atomic Force Microscopy on multiferroic thin films. Garcia's hobbies are reading, gardening, racquetball, soccer and hiking.

Abstract and Student Biography

Amarilys E. González **Poster # 21A**
University of Puerto Rico, Aguadilla Campus

Mentors:
Dr. Lily Young, Ph.D., Alexandra Walczak
Department of Environmental Sciences
Rutgers, The State University of New Jersey

Comparison of the dechlorination rates of chlorinated phenols under anaerobic conditions

A class of Persistent Organic Pollutant (POP), known as chlorinated phenols, has been widely used as wood preservers, pesticides, and biocides in industry and agriculture. Their high solubility in water allows them to easily migrate into bodies of water and persist as hazardous contaminants in the ecosystem. It has been shown that some microorganisms are able to use these CP compounds as electron acceptors during anaerobic respiration. This process known as reductive dechlorination, involves the removal of the halogen substituents from the molecule and their replacement with hydrogen atoms. This makes the compounds to be more easily degraded; however, the rate of degradation depends on the number and location of the halogen substituents on the aromatic ring. We expect that in a polluted site such as the Raritan River, the present microbial communities will be more successful at degrading CPs than in a pristine site such as the Mullica River. We also expect that the dechlorination rate of 2,3,4,6-Tetrachlorophenol is higher than that of 2-Chlorophenol and 2,4,6-Trichlorophenol due to its high number of chlorine substituents. To test this, we created anaerobic replicate microcosms of each site using sediment and site water. Enrichment with our CPs of interest: 2-Chlorophenol, 2,4,6- Trichlorophenol, and 2,3,4,6- Tetrachlorophenol was then performed and weekly samples were taken and analyzed using High Pressure Liquid Chromatography (HPLC) and Ion Chromatography (IC) to measure the degradation of each compound. Molecular analysis was later performed to determine and compare the microbial communities present at each site.

Biography: Amarilys E. González Vázquez was born in Moca, Puerto Rico on September 24, 1993. She is a rising senior in the University of Puerto Rico, Aguadilla (UPRAG) studying to obtain a Bachelor of Science Degree in Environmental Technology. After she graduates in 2016, Amarilys plans to continue her studies towards a Ph.D. in Environmental Science. As a high school freshman, she conducted her first research study focused on the preservation of sand dunes at UPRAG with Dr. Robert Mayer through the Minority Science and Engineering Improvement Program. During her undergraduate studies, Amarilys has also participated in ecological data compilation through the "Fideicomiso de Conservación" Institution in Puerto Rico and is currently a member of the university's Environmental Society. This summer, she examined the degradation rates of chlorinated organic compounds under anaerobic conditions in two river sites under the mentorship of Dr. Lily Young in the Rutgers, The State University of New Jersey Department of Environmental Sciences.

Abstract and Student Biography

Matthew C. Grota **Poster # 22A**
University of Massachusetts Dartmouth

Mentors:
Christopher Lowe and Dr. David I. Shreiber
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Characterization of highly aligned collagen sponge-like scaffolds for nerve tissue engineering

Peripheral nerve injury (PNI) is a common result of trauma and leads to loss of motor and sensory functions. Autografts, the current "gold standard" treatment for PNI, is ineffective in repairing large gaps and leads to donor site morbidity. A commercial tissue engineering solution uses nerve guidance conduits, which support axon regrowth across gaps and promote nerve repair. However, current nerve guidance conduits are unable to regrow axons across gaps larger than 3 cm because most are hollow and act only to confine axon growth. One approach to orient and accelerate regeneration is to provide aligned fiber-like topography. The Rutgers biomedical engineering lab has developed a simple but novel method of fabricating aligned collagen scaffolds through freezing sublimation. Other methods of creating aligned collagen scaffolds, like electrospinning, require complex setups or denature the collagen. The goal of this research was to characterize the effects of different fabrication parameters on features that can maximize directed axonal outgrowth. These fabrication parameters included the diameter of conduits used for fabrication and the collagen concentration of initial hydrogels. Results showed that increasing conduit diameter or collagen concentration increased scaffold diameter. Further, increasing conduit size increased the diameter of the scaffolds' fiber-like structures. Scaffold uniformity along the length of the scaffolds was evaluated by scanning electron microscopy. Results demonstrated that approximately 3-cm sections of the scaffold, a 1/2 cm in from both sides, had the most well-defined and greatest number of fiber-like structures. After characterizing the scaffold parameters, dorsal root ganglion (DRGs) extracted from E8 chick embryos were cultured with the scaffolds in microfabricated devices to determine which scaffolds enhanced axon outgrowth and orientation.

Biography: Matthew was born in New Bedford, Massachusetts and is the son of Thomas and Mary Jo. Matthew is currently pursuing a bachelor's degree in Bioengineering at the University of Massachusetts Dartmouth. This summer, he is performing research pertaining to nerve axon regrowth using unique collagen scaffolds under Dr. David Shreiber. His RISE experience has given him exciting and invaluable research experience that was not available to him at his home institution. Matthew is very appreciative for the opportunity to participate in this program.

Abstract and Student Biography

Jordan D. Hoyt **Poster # 23A**
The University of Tulsa

Mentors:
Jordan Dunn Hoyt
Department of Mechanical Engineering
The University of Tulsa, Tulsa OK

Wanlin Du, Sankha Banerjee Ph. D., Kimberly Cook-Chennault Ph. D.
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Fabrication of dome-shaped three phased, PZT - epoxy - multi walled carbon nanotube piezoelectric devices

Piezoelectric materials have long been a research topic as a means of converting raw mechanical energy into electrical energy without the use of fossil fuels and for their potential as actuators and sensors. In this study, dome-shaped, thick film, three-phase, 0–3-0 composite PZT-epoxy-Multi Walled Carbon Nanotube (MWCNT) piezoelectric structures are being fabricated for the first time in order to quantify their piezoelectric (d33 and d31) and dielectric properties. However, the effect of MWCNTs in these dome structures is not yet known. While dome-shaped thick film two-phase composites have been studied and flat three-phase thick films have been tested, the properties for three phase domes are yet to be studied. We are fabricating dome structures using sol-gel and spin coating techniques with varying volume fractions of PZT from 0% to 70% and varying MWCNTs from 0% to 17%. To study the influence of MWCNTs we use a control variables method where we investigate all possible combinations of volume fractions. This will also allow us to compare our three phase samples to PZT-epoxy and MWCNT-epoxy two-phase samples. The results of this research will set the precedent for the optimal volume fraction for these three-phase composite structures and their piezoelectric and dielectric capabilities.

Biography: Jordan Dunn Hoyt was born in Shreveport, Louisiana and attended Union High School in Tulsa, Oklahoma. Jordan is rising into his junior year at The University of Tulsa, majoring in Mechanical Engineering with minors in physics and economics. He is a NanoJapan REU alumnus, Tulsa Engineering Scholarship recipient, Oklahoma Academic Scholar, and a University of Tulsa Dean's Scholar. He has completed 2 years of research consisting of lab work at Tulsa University, Osaka University in Japan, and now at Rutgers, already having 2 published research articles in print with more in progress. Jordan intends to pursue a Ph.D. in a renewable energy related field in order to reduce dependence on fossil fuels and provide the next generations with a cleaner world in which to live. Jordan's research at Rutgers falls under the third GETUP thrust for "devices and energy management systems for energy generation, conversion, and storage."

Abstract and Student Biography

James Z. Jackson **Poster # 24A**
Rensselaer Polytechnic Institute

Mentors:
Joseph Freeman, Ph.D., and Mr. Emmanuel Ekwueme
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Carbon nanohorns facilitate healing in tendons and ligaments

Subfailure injuries such as sprains and strains are common injuries in collagenous tissues such as tendons and ligaments. The tissue consists of fibroblasts embedded within an extracellular matrix (ECM) of mainly type I and type III collagen. After injury, a wound healing response is initiated, which is heavily influenced by TGF-β signaling, leading to the deposition of more ECM. Due to insufficient vascularization, this process is inefficient, resulting in incomplete healing and increased susceptibility to future injury. Preliminary data in our lab has shown that specialized carbon nanoparticles called carbon nanohorns (CNH) can modulate healthy and damaged tendon biomechanics but their effect on resident cells is unknown. CNH have a tendency to aggregate when not suspended in a surfactant due to their star-like shape and attraction of charges. Different microscopy modalities are being utilized to see how aggregate size changes with changing concentration of CNH in cell media. Preliminary data has clearly shown that CNH concentration is directly proportional to aggregate size. Aggregate size could affect how fibroblasts uptake the nanoparticles, also affecting signaling pathways which will lead to the overall cell response. Immunocytochemical staining for SMAD2/3 is also being conducted. SMAD2/3 is required for TGF-β induced gene expression; thus an upregulation of SMAD2/3 correlates with more TGF-β signaling, resulting in higher collagen deposition. Lastly, qRT-PCR will be used to monitor mRNA levels of different genes involved in tendon and ligament healing. Fibroblasts treated with CNH are expected to show elevated expression of markers related to ECM maintenance and turnover due to increased TGF-β signaling. When combined with the improvement in tendon stiffness after CNH treatment, these results suggest that CNH therapy is a promising treatment likely to decrease healing time in subfailure injuries, and prevent future injuries.

Biography: James Jackson was raised in Belfast, Maine and is the son of Isabel and Jerry Jackson. Outside academics, his passion lies on the golf course. James is currently pursuing a B.S. in Biomedical Engineering at Rensselaer Polytechnic Institute. He is very grateful for the opportunity the RiSE program has given him as it has put a new light on graduate school. This REU has made pursuing a Ph. D a very attractive idea. James is working on a project to improve the treatment of subfailure injury to ligaments and tendons under the outstanding tutelage of the Freeman lab. A special thanks is in order for Emmanuel Ekwueme, he's been an awesome graduate mentor and has taught James so much.

Abstract and Student Biography

Ronneshia Jackson **Poster # 25A**
University of Alabama

Mentors:
Eric Andrianasolo, PhD
Center for Marine Biotechnology, IMCS
Rutgers, The State University of New Jersey

Costantino Vetriani, PhD
Dept. of Biochemistry and Microbiology
Institute of Marine & Coastal Sciences

Bacterial Communities Associated with Hydrothermal Vents as Novel Drug Sources

Secondary metabolites produced by microbes of hydrothermal vents are novel sources for natural products. Specifically, chemolithoautotrophic bacteria such as Phorcysia thermohydrogenphilia possibly produce bioactive compounds with therapeutic applications. P. thermohydrogenphilia was anaerobically cultivated to examine the associated secondary metabolites for bioactivity. The crude organic extract was tested for necrosis activity using a necrosis assay that resembles a MTT assay. One of four isolated fractions expressed necrosis activity. The bioactive fraction was fractionated via RP-HPLC revealing at least seven compounds. Elucidated bioactive compounds will represent novel chemical structures with potential therapeutic applications. Byproducts produced by hydrothermal vent microbial communities are promising medicinal agents.

Biography: Ronneshia L. Jackson conducted her 2014 RiSE summer research experience with Dr. Eric Andrianasolo and Dr. Costantino Vetriani. She is currently a senior majoring in Chemistry with a minor in Biology at the University of Alabama, and will complete her B.S. in Chemistry in May 2015. In fall 2015, Ronneshia will begin a Ph.D. program studying the ecological roles of secondary metabolites at an accredited university.

Abstract and Student Biography

Nerla Jean-Louis **Poster # 26A**
Cornell University

Mentors:
Francois Berthiaume, Ph.D,. Ms. Renea Faulknor
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Effects of Mesenchymal Stromal Cells on Macrophage Phenotype in a Chronic Wound Environment

Chronic wounds do not heal in a normal progression and remain open for extended periods of time. These wounds are often painful and reduce the quality of life of the patients, and if left untreated these wounds can cause tissue damage and can become infected. Chronic wounds are characterized by having a prolonged inflammatory response driven by dysfunctional macrophages in the wound and a resulting hypoxic environment due to lack of blood flow. During wound healing, macrophages transition from a M1 pro-inflammatory phenotype to an M2 anti-inflammatory phenotype. However, in chronic wounds, this transition is impaired and macrophages remain in the M1 phenotype. Mesenchymal stem cells (MSCs) are known to help transition macrophages from the M1 to the M2 phenotype by using paracrine signaling. Currently, we are investigating the effects of MSCs on macrophage phenotype in a low oxygen environment. Samples of human macrophages will be co-cultured with MSCs in both normoxic (21% O2) and hypoxic (1% O2) environments. The pro-inflammatory protein, TNF-alpha, and the anti-inflammatory proteins, IL-10, and the M2 surface protein marker, CD206, will be analyzed. We hope to observe that even in hypoxia, MSCs can transition macrophages to the anti-inflammatory phenotype.

Biography: Nerla Jean-Louis was born in Port-au-Prince, Haiti in 1994. She moved to the United States at the age of four. She is currently a rising junior at Cornell University studying Biological Engineering. She is interested in research that relates to tissue engineering and regenerative medicine. She hopes to get a pHd in Biomedical Engineering and pursue research and teaching.

Abstract and Student Biography

Melissa S. Jennings **Poster # 27A**
University of Georgia

Mentors:
Shaohua Li, MD and Jie Liu, MD
Department of Surgery
Robert Wood Johnson Medical School

Regulation of IGF2R expression by CREG1

Both the cellular repressor of E1A-stimulated genes 1 (CREG1) and the cation-independent mannose 6-phosphate (M6P) / insulin-like growth factor II (IGF2) receptor (IGF2R) are highly expressed in the embryonic heart. The relationship between these two proteins in cardiomyocyte differentiation remains unclear. CREG1 is a small glycoprotein that inhibits cell proliferation and induces differentiation. CREG1 binds to IGF2R, which acts as a potential tumor suppressor by removing excess IGF2. The CREG1-IGF2R interaction depends on the presence of CREG1 N-linked glycosylation sites. Our preliminary data showed that expression of CREG1 in mouse embryonic stem (ES) cells inversely correlates with that of IGF2R. The purpose of this study was to determine if CREG1 regulates IGF2R expression and if the N-linked glycosylation sites are important for IGF2R regulation. For this reason, we have generated stable CREG1-overexpression and CREG1- knockout ES cell lines and performed immunoblot analysis on ES cell-differentiated embryoid bodies to evaluate the effect of loss-and gain-of-function of CREG1 on IGF2R protein levels. To determine the role of CREG1 N-linked glycosylation sites, we reconstituted CREG1-null ES cells with wild-type and N- linked glycosylation mutant CREG1. Results show that CREG1 negatively affects IGF2R expression and that this is independent of the presence of N- linked glycosylation sites. Future work will examine if IGF2R regulation occurs at the transcriptional level via quantitative RT-PCR. If regulation is not at the transcriptional level, we will perform a protein degradation assay to determine whether the CREG1-IGF2R interaction affects the stability and degradation of IGF2R. These experiments are expected to elucidate the mechanism of CREG1's regulation of IGF2R expression.

Biography: Melissa Jennings was born in Montego Bay, Jamaica but was raised in Buford, Georgia. This Fall she is entering her third year at the University of Georgia (UGA) as a Biochemistry and Molecular Biology major with a minor in Global Health. She will also continue her two year Biochemistry research on an infectious protozoa called Leishmania major. This summer, she is doing embryonic stem cell research under the direction of Dr. Shaohua Li at the Department of Surgery. After she graduates she wants to attend a MD/ PhD program so that she can do translational research in the future. Her experience with RiSE at Rutgers has been a blessing. Not only was she able to learn a lot about research, but she was also able to learn about the life of a MD/PhD student and graduate through Rutgers' new mini summer MD/PhD program. In addition to her academic and professional growth, Melissa had a great time hanging out with new friends and exploring the New Jersey area.

Abstract and Student Biography

Steven Jones **Poster # 28A**
The University of the District of Columbia

Mentors:
Jeff DeWitt, Gretchen Chapman PhD.
Department of Psychology
Rutgers, The State University of New Jersey

Who doesn't love money as a gift? Signal theory and cash as gifts.

We explore the stigma associated with giving cash as a gift. Cash gifts, compared to tangible items, may be used to buy something the gift recipient wants, but in many settings money is viewed as an inappropriate gift. Giving a tangible gift entails a risk that the gift may not be what the recipient wants. But such gifts also signal a greater level of care due to the time and effort spent choosing the gift or the risk in choosing something tangible. We examine whether the stigma of cash gifts is reduced by attached notes, which could serve to signal the level of the relationship between friends or loved ones. Study participants were dyads – either friend pairs or romantic couples. Each member of the dyad was randomly assigned to be either the gift giver or the gift recipient. Gift givers chose between chocolate and cash as gifts for the recipient. Givers in the experimental condition also selected a signaling note to attach to the gift they choose. We hypothesize that givers will be more likely to choose the monetary gift when they are allowed to attach a signaling note than in the no-note control condition. Likewise, we hypothesize that givers in the no note control condition will be more likely to choose the chocolate gift than those in the note experimental condition. This results pattern would support the idea that the gift giver's ability to give cash as a gift with a note attached reduces the stigma and repugnance for cash as gifts. The reduction in the repugnance of cash as a mode of exchange is important because it could be used to increase donation in different areas such as blood and organs.

Biography: Steven Jones is a Psychology Major at the University of the District of Columbia. His research interests include minority adolescent male empowerment and minority health disparities. In the summer of 2013 he helped conduct qualitative research with Dr. Jennifer Woolard at Georgetown University on parents of students who were affected by DCPS' decision to close over thirty schools. This summer in addition to working with Dr. Gretchen Chapman, he has worked with Dr. Shalonda Kelly on education level, in group stereotypes, and relationship satisfaction. He future goals include obtaining admission to a graduate program, gaining his doctorate, and becoming a college professor in order to conduct research and mentor the next generation of scientists.

Abstract and Student Biography

Christopher J. Kirby **Poster # 29A**
The College of New Jersey

Mentors:
Yifan Wang and Bereket Yohannes
Center for Structured Organic Particulate Systems
Rutgers, The State University of New Jersey

Evaluation of the effects of tableting speed, compaction force and excipients on behaviors of mono and bilayer tablets with different shapes

Tablets are one of the most common forms of administering medicine in the world today. As a result studying them and their various mechanical properties tells us about how they will interact with the body when they are consumed. Studies will be done to report on the effect of compaction force, tableting speed, shape and the composition of tablets to determine their effects on the tabletability, compactability, and compressibility on tablets. In order to do this study 2 speeds will be used, 2 shapes will be made, 3 formulations will be made, and 7 compaction forces will be used. Bilayer tablets will also be created in order to see if trends will follow for tablets with multiple layers. Compaction forces can be changed for the first and second compaction, and will be varied.

Biography: Christopher Kirby is a senior chemistry major at The College of New Jersey (TCNJ) located in Ewing, New Jersey. As a junior he studied in an organic chemistry laboratory at The College of New Jersey. In his senior year, Chris will be working in an inorganic chemistry lab. At TCNJ Chris is the president of his school's honors chemistry society, Gamma Sigma Epsilon. As a member of the CSOPS program Chris is seeing different aspects of the pharmaceutical industry that he hopes to be a part of. He is grateful for everything that this program has afforded him.

Abstract and Student Biography

Cindy E. Kumah **Poster # 1B**
University of Maryland, Baltimore County

Mentors:
Catrice Carter, Zeqing Shen, Deirdre O'Carroll
Department of Material Science and Engineering
Rutgers, the State University of New Jersey

Organic optoelectronics: characterization of insulator-semiconductor-metal-insulator waveguides and fabrication of nanoporous metal electrodes

Organic polymer semiconductor optoelectronics have high potential for large-area display and lighting applications due to their flexibility, transparency, easy solution processing, and low cost. However, the coupling of light emitted by the polymer to photonic and plasmonic modes significantly limits light extraction efficiency to 20-30%. In an effort to improve light extraction efficiency, SiO_2-PFO-Ag-SiO_2 waveguides (PFO: poly(9,9-dioctylfluorene)) with varying Ag film thicknesses were previously theoretically modelled to quantify the extent of surface plasmon polariton (SPP) mode leakage. To experimentally validate the theoretical models, analogous waveguides were fabricated and the SPP modes supported in the waveguides were investigated using polarized photoluminescence spectroscopy. It was found that for certain Ag film thicknesses a larger fraction of the emitted light was polarized perpendicular to the plane of the film, suggesting that a larger fraction the PFO emission coupled to SPP modes. In addition, a method to fabricate nanoporous Ag electrodes was developed as an alternative structure for light extraction. Ag-Cu alloys were fabricated by co-thermal evaporation and dealloyed by etching in a 0.12:0.125 M $FeCl_3$¬:HCl solution. The resulting materials were viewed using scanning electron microscopy. Nanoporous silver films with potential to improve light extraction via light scattering were produced.

Biography: Cindy Kumah is from Ghana. She currently lives in Maryland, where she attends the University of Maryland, Baltimore County. She is a rising fifth year Meyerhoff scholar and chemical engineering major. She is also a member of the national engineering honor society, Tau Beta Pi. Upon earning her Bachelor's of Science degree in May 2015, she will pursue a PhD in material science and engineering. Her research interests include materials for energy generation, conversion, and storage. Her research in nanotechnology and materials for energy storage and conversion this summer has improved her research skills and grown her interests in the field.

Abstract and Student Biography

Devin Maiello **Poster # 2B**
The College of New Jersey

Mentors:
Dr. Ashutosh Goel and Yaqoot Shaharyar
Department of Materials Science and Engineering
Rutgers, The State University of New Jersey

Glass sealants for liquid metal batteries

With the emergence of many green energy technologies and techniques to harnessing renewable energies, the ability to store energy has become more valuable than ever. The more common lithium-ion batteries have proven to be too expensive for electric vehicles and other applications. Therefore liquid metal batteries, such as Na-S and Na-NiCl2, have been determined to be promising alternatives. These batteries have both high energy densities as well as low cost material, which make them a more efficient option for energy storage. To ensure the lifetime of a battery a seal must be placed between the electrolyte and insulation in the battery. This seal must be hermetic and resistant to the chemical reactions taking place. Many types of glasses have been researched and implemented as a seal, but none perfectly fit the required criteria for a liquid metal battery. Calcium alumino-borate ("Cabal") glasses have been successful in lithium-ion batteries. Our research explores the use of Cabal glasses in liquid metal batteries by substituting components with bismuth-oxide, lanthanum-oxide, and yttrium-oxide to obtain the desired thermal and corrosion durability properties.

Biography: Devin Maiello is a rising senior at The College of New Jersey majoring in electrical engineering. He was born in Martin County, Florida and currently lives in Teaneck, NJ where he grew up for the majority of his life. Devin is a recipient of the Capital Steel Scholarship award in his junior year and was elected to his student chapter's executive board for IEEE. He recently completed an internship with Metro-North Railroad in the power engineering department. He plans to pursue graduate school, probably to study electrical engineering further, but is still keeping an open mind to other engineering disciplines. Devin's research falls under the GET UP thrust of devices and energy management systems for energy generation, conversion and storage.

Abstract and Student Biography

Adrian E. Meyers **Poster # 3B**
Columbia University

Mentors:
Andrew J. Baker and Amitpal S. Tagore
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Pixel-based source reconstruction of the gravitationally lensed 8 o'clock arc

Gravitational lensing serves as an important tool for observing galaxies at high redshift due to the brightening and enlarging of their images by lens galaxies and clusters. This magnification provides an up-close look at objects that would otherwise be too faint to observe and can aid in putting constraints on the morphologies and structures of high-redshift galaxies. In this project we use the pixel-based source reconstruction software *pixsrc* to create a de-lensed image of the 8 o'clock arc, a Lyman break galaxy at redshift 2.73 that is being gravitationally lensed by a luminous red galaxy at redshift 0.38. Its exceptionally high magnification allows for its CO emission-line morphology to be reconstructed as well, providing a direct measurement of its molecular gas mass. In order to gain insight on the feasibility of producing a de-lensed image of the 8 o'clock arc, we begin by creating a point-source model using the software *lensmodel*. By adopting the resulting optimal parameters for the lens and approximating the parameters of the source galaxy, we construct a model that matches the real data to a strong degree. Finally we produce a more accurate de-lensed model of the 8 o'clock arc in optical and CO emission using the more sophisticated functionality of *pixsrc*. This project has been supported by funding from National Science Foundation grant AST-0955810.

Biography: Adrian Meyers is from Hampton, GA and is a rising senior at Columbia University. He expects to graduate in the spring of 2015 with a Bachelor's degree in astrophysics. He is an article writer and event organizer for the student-run magazine Columbia Science Review and enjoys playing basketball, writing and editing codes, and catching up on his favorite television series such as "The Walking Dead." At his home institution he is investigating a method to assess the contributions to the stellar disk of the Milky Way from accreted dwarf galaxies; he hopes to attend graduate school for a Ph.D. in astrophysics.

Abstract and Student Biography

August J. Miller **Poster # 4B**
Bowdoin College

Mentors:
John P. Hughes and Amruta J. Deshpande
Department of Astronomy
Rutgers, The State University of New Jersey

A search for counterparts to unconfirmed *Planck* cluster candidates in ROSAT, *Chandra*, and *XMM-Newton* data

In this project we aimed to identify counterparts to unconfirmed galaxy cluster candidates detected by the recent *Planck* SZ survey. One of the objectives of the *Planck* mission was to generate a catalogue of galaxy clusters by observing spectral distortions in the cosmic microwave background that arise due to interactions with hot intracluster gas, a phenomenon known as the Sunyaev-Zel'dovich (SZ) effect. *Planck* detected a total of 1227 candidates, 861 of which have already been confirmed as clusters. We investigated 5 catalogues of X-ray sources in an effort to identify counterparts to the remaining 366 candidates. We searched 3 catalogues within the Röntgen Satellite (ROSAT) data archive: the ROSAT Catalogue of PSPC WGA Sources (WGACAT), the ROSAT Complete Results Archive of Sources for the PSPC (ROSPSPCTOTAL), and the ROSAT Complete Results Archive of Sources for the HRI (ROSHRITOTAL). We also searched the *Chandra* XAssist Source List (CXOXASSIST) and the *XMM-Newton* Serendipitous Source Catalogue (XMMSSC). All searches were conducted within 5' of the *Planck* detections. Seventeen *Planck* candidates returned results in one or more of the above catalogues. Of these, 3 were determined to be high-likelihood candidates. The likelihood of each candidate was assessed by considering (1) the offset of the source from the *Planck* detection, (2) the significance and spatial extent of the X-ray signal, and (3) the abundance of potential cluster members in optical and infrared images. We also generated a list of 38 candidates that were observed but not associated with any X-ray sources by searching in 3 different observation catalogues: ROSMASTER (ROSAT), CHANMASTER (*Chandra*), and XMMMASTER (*XMM-Newton*). Under specific assumptions about the mass and distance of each cluster candidate, we will be able to obtain upper limits on their X-ray luminosities. Many (311 out of 366) *Planck* candidates were not observed by any of the above surveys, so other methods, e.g., optical or infrared imaging, will be necessary to confirm them as clusters.
This project has been supported by funding from National Science Foundation grant PHY-1263280.

Biography: August Miller is from Amherst, MA, and is currently attending Bowdoin College in Brunswick, ME, where he is a rising junior. He is pursuing a B.S. in Physics with a minor in Italian, and is expected to graduate in May 2016. He hopes to eventually earn a Ph.D. in either physics or astronomy and work as a researcher at a respected university. At Bowdoin he is a member of the Society of Physics Students, and has worked as a grader for the Department of Physics and Astronomy. As a participant in the 2014 Physics and Astronomy REU at Rutgers, The State University of New Jersey, he has worked with Prof. Jack Hughes, searching for counterparts to potential galaxy clusters identified by the recent *Planck* SZ survey.

Abstract and Student Biography

Orlando A. Mulero Flores **Poster # 5B**
University of Puerto Rico, Mayaguez Campus

Mentors:
Meenakshi Dutt, Fikret Aydin,Geetartha Uppaladadium and Micheal Sebastiano
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Mechanical Properties of Lipid Bilayer Membranes: Bending and Compressibility Modulus.

Lipid bilayers are the fundamental building blocks for the cells membrane. These membranes are formed by various molecules (lipids, proteins, cholesterol, etc.) and are of complex shapes and forms. It has been found out that these systems have a peristaltic behavior in very fast time periods, so the systems morphology will be constantly changing and it's the morphology that will dictate the properties of the membrane. This complex behavior makes it difficult to determine certain properties that characterize cell membranes. Because of this, the mesoscopic technique known as Dissipative Particle Dynamics (DPD) is being used to simulate the dynamics of the "particles" of cell membranes in a given space and time. The mechanical properties of cell membranes can be calculated using particle trajectory data from simulations. The bending modulus that describes quantitatively the amount of energy needed for the membrane to bend and the area of compressibility tells how resistant the membrane is to compression. Because the bending modulus depends on the height fluctuations of the lipid layers, mathematical fittings were done for both the upper and the lower layers. We take a Fast Fourier Transform of the average function to determine the mid-plane in the fluctuation spectrum domain. This new function is dependent upon the domain of the wavenumber, specified by the membranes parameters. The slope of the function will give us the bending modulus which can be used to compute the area compressibility modulus. We find our measurements of the bending modulus to be given by 63±20 k_B T which is in agreement with other experimental results.

Biography: Orlando Andres Mulero Flores was born March 1992 in San Juan, Puerto Rico. He currently lives in the island in the municipality of Guaynabo and studies in the University of Puerto Rico, Mayagüez Campus. His mayor is in Chemical Engineering and his minor is in Pure Mathematics and graduates in May of 2016. His past research experience include NIR-Chemical Imaging under Prof. Rodolfo Romanach at UPR Mayaguez Campus. In the future he hopes to enter graduate school to continue studying fields in chemical engineering that involve mathematical concepts or to work for an industry.

Abstract and Student Biography

Keisha Mullings **Poster # 6B**
Rutgers, The State University of New Jersey

Mentors:
Kimberly Cook-Chennault and Udhay Sundar
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Investigation of novel coatings for nano-BT particles for composite dielectric materials

Polymer-ceramic composites have gained attention for electrical energy storage applications because they exhibit high dielectric constants and high dielectric breakdown strengths. Though diphasic nano-composites of this type show some promise, the fabrication techniques often led to agglomerations of the conductive nanoparticles. These agglomerations cause the composite to exhibit poor dielectric properties. Thus, surface treatment of the conductive filler has been a proposed strategy to reduce the number of agglomerations, and increase particle dispersion within the matrix. It is well known that use of dopants, surfactants and coupling agents can enhance the dispersion of nano-particles in the matrix. Most of these, use of a dopant that acts as both a surfactant and interfacial polarization agent has shown great promise. Less is known about the role surface modification of the nano-particle plays on particle to matrix interface, and subsequent dielectric properties of the composite. Hence, in this work, we present an analysis surface treated $BaTiO_3$ (BTO) in bulk and thick films. BTO is treated with the surfactant, Glycidoxylpropyl trimethoxysilane (KH-560). Bulk and thin film composites are fabricated using a sol gel technique. The piezoelectric strain coefficients, d33, d31, dielectric properties, capacitance, *C* and dielectric constant, *K*, were measured. Particle dispersion, surface morphology and the interaction between the polymer and ceramic phases were examined with the aid of SEM images. Both surface modified and non-surface modified $BaTiO_3$ samples of varying volume fractions (10-70%) were fabricated and compared. We anticipate processing techniques such as these will lead to enhanced dielectric performance.

Biography: Keisha Mullings, a New Jersey native, is a rising senior at Rutgers, The State University of New Jersey- New Brunswick majoring in Mechanical Engineering with an Energy Systems concentration. In her spare time she serves as the External Vice President of the Minority Engineering Educational Task (MEET) which is the Rutgers chapter of the National Society of Black Engineers (NSBE). With a passion for alternative energy systems, she intends to pursue graduate study in the field of energy upon graduating in May 2015. This summer, Keisha participated with RiSE for her first summer research experience under the Green Energy Technology Undergraduate Program REU (GET-UP). Under the advisement of Dr. Kimberly Cook-Chennault she has enjoyed investigating surface modification techniques to improve the dielectric and piezoelectric properties of composites through the GET-UP thrust nanotechnology and materials for energy storage and conversion. She believes that the program has prepared her technically and professionally for graduate level work and any of her future endeavors.

Abstract and Student Biography

Monica Navarreto **Poster # 7B**
University of Puerto Rico, Rio Piedras

Mentors:
Mr. Graeme Garnden and Charles Dismukes, Ph.D.
Chemistry and Chemical biology
Rutgers, The State University of New Jersey

Assessing the electrocatalytic activity of a series of Ni and Fe based Perovskites for the electrolysis of water

The development of new, cost-effective renewable energy technologies has brought attention to the use of Perovskites for the electrocatalysis of water, a reaction relevant to the creation of solar water splitting devices. Previous studies have shown that the presence of Fe could increase the catalytic activity in nickel-based catalysts toward the oxygen evolution reaction (OER), but a consistent explanation for this behavior has not been found. Based on this, we aim to measure the electrocatalytic performance of a series of Perovskites of the form $LaNi_{1-x}Fe_xO_3$ (where $0 \leq x \leq 0.5$) under alkaline conditions using Cyclic Voltammetry. We studied the differences in activity and redox behavior and correlate those with the Perovskites' composition and structure. These experiments were performed in parallel with X-ray absorption spectroscopy measurements (XAS), and powder X-ray diffraction (PXRD) to develop a better understanding of the link between the atomic structure and the OER catalytic behavior of Ni-Fe Perovskites.

Biography: Monica Navarreto Lugo was born in Fajardo, Puerto Rico. Currently, she is a rising senior at the University of Puerto Rico pursuing a double bachelors degree in Chemistry and Marketing Management with an expected graduation date of May 2015. Her research experience started at the end of her freshman year, and until now, she has been involved in several research projects, ranging from the study of chemical compounds for drug delivery purposes to the development of electrochemical biosensors entitled Synthesis and Characterization of a Ferrocene-NAAD for the Detection of an Opportunistic Pathogen. The second project won an award in the Chemistry category for the Poster presentation of the ABRCMS conference in November 2013 in Nashville, Tennessee; which also became her first publication. During 2012, she was selected in the Research Initiative for Scientific Enhancement program (RISE) and in June 2013 the Minority Access to Research Careers (MARC) selected her to join their program. This summer Monica participated in the Green Energy Technology Undergraduate Program studing the catalytic behavior of different Ni-Fe based Perovskites for the catalysis of the oxygen evolution reaction in Dr. Charles Dismukes research laboratory. Project that gave her the opportunity of explore a new chemistry area. She aspires to pursue a dual degree: a PhD in Biomedical Engineering and a MBA, and in the future, she hopes to become a professional in the area of the development and marketing of biomedical products.

Abstract and Student Biography

Tara C. Nealon **Poster # 8B**
The College of New Jersey

Mentors:
Jingjin Xie and Aaron Mazzeo
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Windbelt with Pneumatic Actuators for Tunable Energy Harvesting

Green energy technology is a rapidly expanding field as the desire to gather energy from sources other than fossil fuels continues to grow. Recent work demonstrates that flexible, flapping airfoils that function in a manner similar to the wings of birds have the potential to harvest energy from flowing fluids. One device that operates based on such principles is the windbelt. The windbelt is a small-scale, compact, and potentially low-cost alternative energy generation device that uses a flexible tension membrane in order to transform the kinetic energy of the wind into usable electrical energy. The purpose of this research was to attempt to increase the overall power output of the windbelt. In order to accomplish this goal, inflatable bladders were implemented into belts in order to alter the air as it flowed over the belt to generate a more effective flutter. Belts with widths of 2-, 1-, and 0.5-inches, as well as two bladder patterns, a wavy pattern and a straight pattern, were tested in the wind tunnel. The wind speed, belt tension, and internal bladder pressure were held constant for each trial as the frequency of oscillation, peak-to-peak voltage, RMS voltage, and power output were measured. The highest power output recorded for any belt was 1.7 mW. This was observed for the straight-patterned belt at a wind speed of 6 m/s and an initial tension of 0.9 N, with the bladder uninflated. Overall, inflating the bladders decreased the power output of the windbelt since it reduced the amplitude of the oscillation, as observed from the high speed images taken during experimentation.

Biography: Tara Nealon, born in East Brunswick, NJ, is a rising senior at The College of New Jersey, majoring in mechanical engineering. She is a member of Tau Beta Pi, the engineering honors society, and has been awarded through TCNJ the Armstrong Scholarship Award, the Engineering Fund Scholarship for Sophomores, and the Joseph F. Shelly Scholarship Award. This summer, Tara is a participant in RiSE under the Green Energy Technology Undergraduate Program (GET-UP). Her research falls under the GET-UP research thrust of devices and energy management systems for energy generation, conversion, and storage. In the past, she was a Residential Teaching Assistant (RTA) for the New Jersey Governor's School of Engineering and Technology in 2012, also hosted by Rutgers, The State University of New Jersey, and returned in 2013 as the Head RTA. Tara hopes to continue her education upon graduating next spring by pursuing her Ph.D. with a focus in thermodynamics and fluid mechanics in relation to energy systems.

Abstract and Student Biography

Sean R. Noble **Poster # 9B**
University of Missouri Columbia

Mentors:
Dr. Fuat Celik, Mr. Deniz Dindi, Ms. Ashley Pennington
Rutgers, The State University of New Jersey
Chemical Engineering Department

Development of visiblel light titanium dioxide photocatalysts

Advances in the studies of TiO_2 can provide new methods to produce solar energy as an abundant and safe energy source. It will also significantly address environmental pollutions and hazards related to fuel production/consumption on a global scale. Our TiO_2 studies will provide a process for the photocatalytic conversion of biomass into hydrocarbon intermediates for biofuel production. Our objective is the photocatalytic conversion of Methanol into Hydrogen gas and Carbon dioxide. We are in the process of constructing the apparatus for our experimental analysis. We therefore have yet to produce any findings. We will begin experimentation by synthesizing TiO_2 doped with carbon and/or platinum. Next we will characterize the first TiO_2 sample. Then we will Conduct experimental analysis on the synthesized photocatalyst via methanol reformation: converting methanol into hydrogen and carbon dioxide. We will use those results as a basis to conduct theoretical density functional theory (DFT) studies on surface-modified crystalline rutile and anatase phases of TiO_2 for our first sample. We will use the DFT results to develop models for reforming methanol on the surfaces of other doped TiO_2 samples. Our variables are the metals ions that are doped into the TiO_2 lattice structure. We aim to get results that confirm that TiO_2 can efficiently convert Methanol into Hydrogen and Carbon dioxide using metal-ion-doped TiO_2 as a photocatalyst under visible light irradiation. We will be able to see which dopants work most efficiently under visible light irradiation.

Biography: Sean Noble was born and raised in St. Louis Missouri. He is currently in his 5th year at the University of Missouri Columbia. He is majoring in chemical engineering with a focus in materials and is minoring in International studies with a focus on Japan. He is an American Chemical Society Scholar and has been on Engineering Honor Roll at the University Of Missouri Columbia from fall 2010 until spring 2014. During the 2013-2014 school year he participated in the Undergraduate Engineering Research Program at the University of Missouri. He is a member of the National Society of Black Engineers and the American Chemical Society. He intends to pursue a PhD in chemical Engineering. After finishing school he intends to become a senior research leader for a company that focuses on Green Energy and Technology. His research in the Get-Up program is the Development of Visible Light Titanium Oxide Photocatalyst which is in the research thrust of nanotechnology and materials for energy storage and conversion.

Abstract and Student Biography

Faria Nusrat **Poster # 10B**
Bloomfield College

Mentors:
Donna E. Fennell, Sunirat Rattana and Amanda Luther
Department of Environmental Sciences
Bioenvironmental Engineering
Rutgers, The State University of New Jersey

Characterization of ammonia stress and the dnaK stress gene in Thailand and New Jersey landfill leachate digester communities

Fossil fuels, a finite energy source, highlight the need for efficient renewable energy sources. Anaerobic digestion is such a resource that produces bioenergy (i.e. methane) from organic matter. Capturing methane prevents its release to the atmosphere as a greenhouse gas, alleviating the effects of global warming. Ongoing research aims to increase the efficiency of anaerobic digestion through maximizing the methane and hydrogen yield and reducing stresses in the digester environment. A prevalent stressor in digesters is ammonia, which accumulates from the breakdown of organic nitrogenous matter (primarily proteins and urea). Our research aims to identify ammonia-tolerant microbes and to detect and characterize stress genes of the dnaK locus present in the digester microbial community. Landfill leachate from New Jersey and Thailand provided the anaerobic microbes. Enrichments were fed glutamate on a semi-continuous basis as the carbon substrate. Control digesters were operated at background ammonia concentrations and are ideally free of stress. Methane, volatile fatty acids and ammonium concentrations were measured using chromatographic instruments to assess digester performance. The dominant microbes were identified using polymerase chain reaction and denaturing gradient gel electrophoresis. A polymerase chain reaction assay was developed to detect dnaK, a general stress gene that encodes for the 70 kilodalton heat shock proteins, and which may be involved in ammonia tolerance. In the NJ enrichments, the control reactors had a higher methane production than the ammonia stressed reactors, indicating an ammonia-intolerant community. In contrast the ammonia stressed Thailand enrichments generally produced approximately the same amount of methane as the controls, indicating a robust ammonia tolerant community. The assay to characterize dnaK genes is being used to compare the presence and diversity of these stress genes in the NJ and Thailand enrichments. This work will enable a better understanding and control of digester response to ammonia stress.

Biography: Faria Nusrat was born in Bangladesh. She is a junior studying Chemistry at Bloomfield College, Bloomfield, NJ, and maintained a place on the Dean's List in each semester she attended. Her first research experience in the GET UP program at Rutgers allowed her to work on sustainable fuels derived from organic matter to serve as a renewable energy source. She is currently working on building her research career, entering a research position in the field of Chemistry at Bloomfield College starting the Fall of 2014. Upon completion of her Bachelor of Science in Chemistry, she plans to continue her study of Chemistry at the graduate level.

Abstract and Student Biography

Natalia N. Olmeda **Poster # 11B**
University of Puerto Rico-Humacao

Mentors:
Fernando Muzzio, Yifan Wang
Rutgers, The State University of New Jersey

Comparing and correlating mixing energy of LabRAM to V-blender

In the pharmaceutical industry the mixing process is very important. Previous investigations have demonstrated that changes in the mixing process can alter the behavior of blends (I.C. Sinka, et. al. 2008) and later on the behavior of the tablets. For the mixing process, the tumbling blenders are the most used in the pharmaceutical industries. However when a tumbler blender is used the energy applied into the mixing process is not known. LabRAM is an innovative mixing technique, based on acoustic vibration, which allows for measurement of mixing energy. Using LabRAM it is possible to calculate the energy applied in the tumbling blenders and thus correlate the product performance. Blends were prepared in the LabRAM and in the V-Blend/Shear Cell applying different power, time, revolutions and shear rates to accomplish different energies. They were tested in the FreeMan Technology equipment for their flow properties, such as compressibility, flow function and cohesion. Later on, tablets were made at the Presster with a fixed compaction force of 24kN. Tablet properties such as tensile strength and dissolution were tested to compare the two equipments. After comparing the data, both techniques seemed to have the same trend for each property tested and in the same range, letting us to compare them and correlate the energy for the V-Blend/Shear Cell technique. Results demonstrated that there is a dependant relation in changing the shear rate/ power in both techniques.

Biography: Natalia N. Olmeda-Viera, born on 1995 in Puerto Rico Caribbean Island. Currently a rising junior in the University of Puerto Rico, Humacao cursing an Industrial Chemistry major. She is part of the CETARS program (Center for Education and Training in Agriculture and Related Sciences) working in related research projects since she was in high school; having the opportunity of representing Puerto Rico in the INTEL-ISEF Science Fair in the 2012. As part of her research experience, she works with high school students mentoring and helping them work on their researches projects. This has helped her to develop her passion for research and teaching. During this summer she worked in the Pharmaceutical Engineering department at Rutgers, The State University of New Jersey, New Jersey at the NSF ERC SOPS program (Structured Organic Particulate System). Professor Fernando Muzzio was her mentor. As a passionate student who loves research, she looks forward to completing a doctoral degree in Pharmaceutical Related Sciences.

Abstract and Student Biography

Jackson C. Olsen **Poster # 12B**
The College of William & Mary

Mentors:
Yuri Gershtein, Rishi Patel
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

A stop decay search using jet substructure

A possible extension of the Standard Model of particle physics is Supersymmetry, in which every Standard Model particle has a Supersymmetric partner particle. Should such Supersymmetric particles exist, experiment and theory both indicate that the Large Hadron Collider at CERN will have the capability to produce them when it begins its second major data collection run at a 13 TeV center-of-mass energy. A possible method of detection is through the production and subsequent decay of the Supersymmetric partner to the top quark, the stop squark. Simulations of a heavy Supersymmetric top quark decay to a lighter Supersymmetric top and a Higgs boson are performed. A likely decay of the Higgs boson is to a pair of W bosons. The main feature of this process is a high number of cascades of particles known as jets. Due to an anticipated heavy Supersymmetric top mass of upwards of 1 TeV, the much lighter decay products become highly relativistically boosted, leading to closely clustered bursts of particles that may become merged into a single jet within the CMS detector by typical reconstruction techniques. Simulated data is analyzed to determine the effectiveness of variables that discriminate between jets with substructure and background jets produced by normal quark-gluon interactions. Further, the jets originating from the Supersymmetric decay should possess masses very nearly the mass of the particles from which they have decayed. Background particles from other interactions, known as pileup, blur these distinctive masses, and so techniques are explored to remove these extraneous particles from the final analysis. This analysis should well-equip those searching for such a Supersymmetric event when the Large Hadron Collider begins its second run of data collection. This project has been supported by funding from National Science Foundation grant PHY-1263280.

Biography: Jackson Olsen grew up in a suburb outside of Washington, D.C., and now attends the College of William & Mary, where he is pursuing a B.S. in Physics. At William & Mary, he has worked on a ROOT-based fitting routine in preparation for the Heavy Photon Search experiment at Jefferson Lab. He also spent two semesters working on a project investigating the origin of mysterious annotations that appear in a first edition copy of Newton's Principia housed in the Special Collections of William & Mary's library. While at Rutgers for the summer of 2014, he has been working with the high energy experimental group on preparations for a search for Supersymmetry at the Large Hadron Collider.

Abstract and Student Biography

Stephanie Ortiz **Poster # 13B**
University of Puerto Rico, Mayagüez Campus

Mentors:
German Drazer
Department of Mechanical & Aerospace Engineering

Gerardo Callegari
Department of Chemical & Biochemical Engineering
Rutgers, The State University of New Jersey

The Behavior of Water Swelling with Compression in Drug Release Tablets

Tablets using Micro Crystalline Cellulose (MCC), Lactose and Acetaminophen (APAP), with Magnesium Stearate as a lubricant, were made in a direct compaction presster with different compaction force and two different formulations. Dissolution profiles were monitored to study drug release from a series of tablets with different compression forces. The drug is released through water penetrating into the pores of the tablet, followed by the disintegration of the matrix. This established methodology is used in pharmaceutical industry to provide in vitro drug release information for both quality control purposes and drug development, taking in consideration the dynamics of water and the excipient's properties. Swelling dynamics is known to be correlated with dissolution profiles. Dissolution profile do not provide physical insight in the mechanisms of the disintegration, in order to understand this mechanism an experiment was designed to study the swelling dynamics. This consists on measuring volume and mass of the swelling tablets as a function of time. The position of cracks found in tablets as the swelling occurs was monitored as a function of time to provide more information about the swelling rate. The results of dissolution and swelling can be correlated since both show a similar monotonic behavior, both dissolution profile and swelling rate decrease as the compaction force increases.

Biography: Stephanie Ortiz Valle, born and raised in Mayaguez. I'm a raising senior majoring in Chemical Engineering in the University of Puerto Rico, Mayaguez Campus. I'm in the Executive Board of the Golden Key Honor Society in my university. I'm also a member of the SHPE, AiChe, and ACS. My area of interest is Pharmacy and Material Science. Currently, I'm doing research in the area of Pharmaceutical Engineering at Rutgers RiSE Program. I'm interested in pursuing graduate study in the field of Pharmacy.

Abstract and Student Biography

Valerie M. Paschalis **Poster # 14B**
Montclair State University

Mentors:
Mingzhu Fang, PhD
Department of Environmental and Occupational Medicine,
Robert Wood Johnson Medical School
Environmental and Occupational Health Sciences Institute
Rutgers, The State University of New Jersey

Circadian disruption promotes breast cancer lung metastasis in C3(1)/Tag transgenic mice

Studies showed that frequent cross-time zone travelers and shift workers are at higher risk of developing breast cancer due to disruptions in their circadian rhythm. Circadian rhythm is the biological process that displays an endogenous oscillation of about 24 hours in various physiological, biochemical, and behavioral functions in the body. It can be entrained by external cues, the most important of which is daylight. In previous studies conducted in C3(1)/SV40 T-antigen transgenic mice, an established model for studying breast cancer and its progression, disruptions in circadian rhythm through jet lag increased the size and multiplicity of mammary tumor lung metastatic foci. However, it is currently not known how disruptions in circadian rhythm promote distant metastasis of primary mammary tumors. To further understand the molecular mechanisms behind this phenomenon, primary and lung metastatic tumor tissues from the mice maintained on regular vs jet-lagged light and dark cycles were analyzed using immunohistochemistry and Western blots. Changes in protein expression levels of prometastatic genes (e.g., β-catenin, TGF-β, and MMP2) and circadian genes (i.e., Per-2) were determined. Decreased levels of β-catenin protein was observed in primary mammary tumors in jet-lag vs control groups, indicating that β-catenin might be involved in promoting mammary tumor metastasis by jet-lag. More ongoing analyses will help us to identify and characterize potential molecular targets that play important roles in promoted mammary tumor metastasis.

Biography: Valerie Paschalis is a rising senior at Montclair Sate University majoring in Molecular Biology with minors in Chemistry and Theatre. Being homeschooled through high school by parents who have backgrounds in science first served to fuel her interest in research, and learning about the intricate complexity and design of science never ceases to amaze her. Valerie is part of the Science Honors Innovation Program at Montclair State, and has recently presented the research she has done with her mentor, Dr. Quinn Vega, at this year's Experimental Biology Conference in San Diego. Valerie aspires to earn a graduate degree in order to pursue a career in research, and her current project at her home university is investigating the inhibition of herpes simplex virus (HSV-1) by EGCG stearate, a green tea polyphenol, and its effects on cell signaling. As a SURF/RiSE fellow this summer, she has worked under the guidance of Dr. Mingzhu Fang to study the molecular mechanisms of breast cancer metastasis caused by disruptions in circadian rhythm. The RiSE program has provided Valerie with a realistic view of graduate school, a warm community of fellow aspiring scientists, and an enriching research experience.

Abstract and Student Biography

Jordanna Payne **Poster # 15B**
University of Nevada, Reno

Mentors:
Mark Pierce, Ph.D., Laura Higgins
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Measuring the mechanical properties of tissue using optical coherence tomography

Diseased tissue has unique mechanical properties as compared to healthy tissue. The changes that occur between healthy tissue and diseased tissue are seen in the extracellular matrix (ECM). If enough force is applied to the tissue to load the collagen matrix, the changes in the ECM can be detected. These differences cannot be detected with current imaging devices. These imaging devices include magnetic resonance imaging and ultrasound, neither of which can measure the tissue microstructure. A device was developed using optical coherence tomography (OCT) that has the ability to produce images with a high enough resolution and has the ability to simultaneously detect the mechanical changes in tissues by measuring their moduli of elasticity. To do this, the OCT-based platform, made up of a speaker used to load the collagen matrix and a table top OCT, was tested with a variety of frequencies and driving amplitudes to determine the device's ideal operating parameters. The device was tested with various simple, single-layered tissue phantoms, and will be tested with more complex, multi-layered phantoms to characterize the devices ability to measure mechanical properties. The experimentally obtained moduli of elasticity will be verified using an Instron machine. The device is expected to be successful in determining the mechanical properties of tissues and able to differentiate between diseased and healthy tissue.

Biography: Jordanna was born and raised in Las Vegas, Nevada. She currently attends the University of Nevada, Reno where she is majoring in Electrical Engineering with emphasis in Biomedical Engineering. She anticipates graduating in the spring of 2016 with a B.S. degree. After graduating, Jordanna intends to attend graduate school in either a Ph.D. or a Ph.D./MD program. Jordanna is extremely grateful to have the opportunity to conduct research in Dr. Pierce's lab working on Optical Coherence Tomography in disease detection. She is confident that her experiences in this program will greatly aid her in her future research and professional endeavors. When not working, Jordanna enjoys reading, writing, running and watching Star Trek.

Abstract and Student Biography

Talia M. Planas-Fontánez **Poster # 16B**
University of Puerto Rico, Rio Piedras Campus

Mentors:
Jaime Flores, PhD and Alan S. Goldman, PhD
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Synthesis of iridium complexes supported by new POC ligands for catalysis by bond activation

The development of organometallic catalysts is highly desirable for the activation of carbon-hydrogen (C-H) bonds. These transformations are a scientifically challenging problem, but one worth addressing due to its economic and environmental benefits. Pincer-ligated iridium complexes can catalyze processes such as alkane dehydrogenation and transfer-dehydrogenation with high efficiency. In these catalysts the pincer ligand has two phospines groups in a *trans* coordination to the metal. This feature brings thermal stability to the iridium complex and regioselectivity for the alkane dehydrogenation in terminal positions. However, tridentate pincer iridium complexes failed to catalyze the addition of aryl C-H bonds *ortho* to coordinating groups to alkenes, but when one of the phosphine arm is replaced by an amino arm (NCOP ligands) then the catalysis proceeds in good yields. Based on early experimental tests and DFT calculations it has been hypothesized that despite being hemilable, the amino arm does not play a determinant role in the overall catalytic cycle. Using a POC-Ir system, this project will determine if the amino group in the NCOP ligand is indeed unnecessary during the catalytic process and if the catalytic performance can be improved by varying the electronic effect in the catalytic structure. Analog iridium complexes were prepared with the bidentate bis(tertbutyl)phenylphosphinite (k^2-P,C-POC) system with varying substituents, such as fluorine and methyl groups, in the ligand backbone. The catalysts were characterized by multinuclear Nuclear Magnetic Resonance (NMR) spectroscopy and single crystal X-Ray crystallography. The complexes selectively activate aryl C-H bonds *ortho* to coordinating groups and catalyze its addition across the double carbon bond in terminal alkenes confirming that the amino arm in the NCOP (Ir) system does not participate in the catalytic process.

Biography: Born and raised in Puerto Rico, a beautiful island surrounded with clear waters and biodiversity, Talia has always been amazed with her surroundings. Talia is a rising senior at the University of Puerto Rico – Rio Piedras Campus and will be graduating with a B.S in Chemistry in May 2015. Currently she is a MARC (Minority Access to Research Careers) research fellow at her home institution. During the academic year, she conducts research which focuses on the cytotoxic effects of peroxo titanium complexes on normal and cancer cells, under the mentorship of Arthur Tinoco, PhD. This summer as a Research in Science and Engineering (RiSE) student, she worked under the guidance of Alan Goldman, PhD conducting research in organometallic chemistry, studying iridium pincer ligand catalysts for insertion of olefins into aryl carbon-hydrogen bonds. This program gives her the opportunity to obtain experience and training in a research-intensive university and also provides the skills to have a better preparation to continue graduate studies. She is interested in pursuing graduate studies in the biomedical sciences, specifically in pharmacology and toxicology, and preparing herself to become a professional and a renowned scientist. Talia is a curious and passive girl that likes running, reading and is always looking for the how and why of things that occur around her…and she loves science.

Abstract and Student Biography

Madeline R. Porter **Poster # 17B**
Concordia University Texas

Mentors:
Dr. Bonnie Firestein
Department of Cell Biology and Neuroscience
Rutgers, The State University of New Jersey

Ana Rodriguez
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

A novel role for cypin as a proteasome inhibitor

Neurological and cognitive disorders are marked by many structural and functional abnormalities in the nervous system, including alterations in the dendritic tree and spine morphology. Cytosolic PSD-95 interactor (cypin) is an abundant protein in some regions of the brain that increases dendritic branching. It was originally discovered as a binding partner of postsynaptic density protein-95 (PSD-95), a synaptic signaling and scaffolding protein found in the postsynaptic density of neurons. When cypin is overexpressed in hippocampal neurons, synaptic targeting of PSD-95 is disrupted, but global PSD-95 levels increase. Previous research in the Firestein laboratory confirmed that cypin binds to a subunit of the proteasome, leading us to hypothesize that cypin might inhibit proteasome-mediated degradation of PSD-95. To test this hypothesis, we co-transfected COS-7 cells with a proteasome sensor and either wild type cypin or one of two cypin mutants with a binding domain deletion. The proteasome sensor encodes for an unstable fluorescent protein, ZsGreen, which is rapidly degraded in the presence of active proteasomes. We used immunostaining and fluorescence microscopy to image cells and compared resulting ZsGreen intensity between experimental conditions. Our initial results show an increase in ZsGreen intensity in cypin-expressing cells, suggesting that cypin inhibits proteasome activity. Interestingly, when we express a cypin mutant that cannot bind to PSD-95, ZsGreen intensity does not increase significantly, suggesting that cypin's interaction with PSD-95 is necessary for its effect on proteasome activity. Further studies will focus on elucidating if other protein domains are necessary for cypin to inhibit proteasome activity.

Biography: Maddie attends Concordia University Texas, located in her hometown of Austin, where she serves as vice president of the biology club. She plans to graduate in May, 2015 with a Bachelor of Science in Biology, after which she will pursue a Ph.D. In her free time Maddie enjoys knitting, making jewelry and doing other crafts, as well as relaxing by the pool with her friends. As a participant in the Cellular Bioengineering REU and RiSE program, Maddie has been fortunate to spend the summer in Dr. Bonnie Firestein's lab in the Department of Cell Biology and Neuroscience. Thanks to Dr. Firestein, the rest of the lab members and especially her graduate student mentor, Ana, she has had a rewarding and enriching summer. Maddie is very grateful for the opportunity she has had at Rutgers to learn new techniques in the lab, develop her professional skills and make friends from all over the country.

Abstract and Student Biography

Maricely Ramirez-Hernandez **Poster # 18B**
University of Puerto Rico Mayaguez Campus

Mentors:
Paul Takhistov,Ph.D. and Phong T. Huynh, Ph.D.
Department of Food Science
Rutgers, The State University of New Jersey

Role of excipient API interactions in hot melt granulation

Low solubility of active pharmaceutical ingredients (API) makes it difficult to ensure controlled release of drugs and increases dosage frequency and negative side effects. This work aims to understand the physico-chemical interactions between API, surfactants and excipients for hot melt granulation/extrusion. Hot melt granulation/extrusion is emerging as a promising process in the pharmaceutical industry. This allows the observation of a drug's pharmacokinetics with a low risk of side effects. These interactions among components will be investigated for better drug formulation. For this project, PEG 3350 and PEG8000 were used as excipients, Poloxamers 188,338 and 407 were the surfactants of interest and aceclofenac and chlorpheniramine maleate was used as APIs. The surface energy of different components establishes their compatibility. This was measured using contact angle measurements. Turbidity measurements were used to establish critical micelle concentration for surfactants in polymer melts. Rheological measurements were used to understand the behavior of API in the polymer excipient melts and role of surfactants on the stability of API particles. Hot melt extrusion was performed using several different mixes of surfactant, polymer and API. Additional SEM and Raman analyses were carried out to determine API, surfactant and excipient distribution and interactions, respectively.

Biography: Maricely Ramirez is a Chemical Engineering junior minoring in Materials Science at University of Puerto Rico Mayaguez. She is part of the Structured Organic Particulate Systems (SOPS) program where she is working under the supervision of Dr.Paul Takhistov and Dr.Phong Huynh in determining material compatibility for hot melt granulation techniques. At her home institution, she is part of the USDA funded CETARS program, where she works on synthesizing metal nanoparticles for biomedical and food applications. Outside of her classes and labwork, Maricely is part of the Global Learning and Observations to Benefit the Environment (GLOBE) program where she gives workshops to K-12 students to introduce them to environmental and related sciences skills and she was part of the Women in Engineering chapter directive committee. Her future goals include graduating from her bachelor’s in December 2016 and continue graduate studies in Materials Science and Engineering to work on food science applications.

Abstract and Student Biography

Dhaval Rana **Poster # 19B**
Rutgers, The State University of New Jersey

Mentors:
Dr. Kimberly Cook-Chennault, Eric Bickford, Andrew Tang
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Design and testing of an acoustic impedance tube

Unwanted noise from vehicles and aircrafts negatively influences the health and well being of humans and animals. The noise from vehicles on roads can be reduced by as much as 50% when noise barriers are constructed between highways and homes. However, noise generated during various stages of aircraft operation still remains an area of much interest as the aircraft noise could potentially limit NASA capacity growth. Since 1980, the FAA has invested over $5B in airport noise reduction programs. Use of passive acoustic liners for attenuation of some forms of airframe noise has been proposed. An Acoustic impedance tube is required to measure the acoustic properties of materials used in acoustic liners. An acoustic impedance tube is built by using the standards that are provided by the American Society of Testing and Materials (ASTM). This work describes the preliminary results towards elucidating the impact tube design has on measured acoustic properties. An acoustic impedance tube is a hollow tube, which has a test specimen at one end and a sound source at the other, through which we sent a noise signal with uniform spectral density with frequency range of 50-5000 Hz. The acoustic properties were obtained using the transfer functions in Matlab from the data acquired by the pressure microphones mounted on top of the tube. The parameters that were investigated include the length of the tube, the test specimen, the material of the tube, the position and the distance between the microphones. To determine the microphone positioning, an 8-microphone tube was built and tested. Our test samples have included polyethylene foam, wood, acrylic, epoxy, PZT, and other piezoelectric materials. We can conclude that the length of the tube does not influence the data. We can also conclude that some sound is escaping through the walls of the PVC tube. We came to the conclusion that the material that is used to make the tube affects the results. For future work, tube material will be varied, as the ASTM recommends that a highly dense material be used.

Biography: Dhaval Rana is a student at Rutgers, The State University of New Jersey and currently lives in New Jersey. Dhaval was born in India but moved to the United States at the age of 12. He is studying Mechanical Engineering and will be graduating with a Bachelor's of Science in May 2015. Dhaval is a Louis Stokes Alliance for Minority Participation (LSAMP) scholar, which recognizes and awards students for pursuing research in a STEM field. He has received LSAMP scholarships in the summer of 2013 and 2014. After graduation, Dhaval would like to work in the industry to gain experience, and go back to school for a PhD in Mechanical Engineering. Dhaval's research thrust is devices and energy management systems for energy conversion.

Abstract and Student Biography

Benjamin J. Romano **Poster # 20B**
Virginia Tech

Mentors:
Christopher Lowe, Ijaz Ahmed, David I Shreiber
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

The effects of nanofiber scaffold features on astrocyte adherence and reactivity

Astrocytes are cells that serve a variety of roles in the brain and spinal cord, including the maintenance of homeostasis. When injury occurs, astrocytes undergo phenotypic and morphological changes that are characteristic of a reactive state. These reactive astrocytes attempt to maintain homeostasis by forming a glial scar around the injury site. However, this glial scarring prevents other cells and nutrients from accessing the injury, hindering natural regeneration. Thus, approaches that can control astrocyte reactivity in an injury environment could assist in repair and recovery following brain and spinal cord injury. Astrocytes have been shown to react positively to the surface features of polymer scaffolds compared to standard culture surfaces, but little is known about the cause of this reaction. In this study, we compared fibers of varying compositions and fiber diameters to evaluate the effect of scaffold features on astrocyte reactivity. PLLA (poly-lactic acid) and Nylon-6 were used as test polymers. They were compared to PLL (poly-L-Lysine) coated glass as a positive control and a commercial fiber that was previously characterized. Scaffolds were fabricated by an electrospinning and characterized using Scanning Electron Microscopy. By varying the weight percentages of the original electrospun solution, a wide range of fiber diameters were created. The response of quiescent and reactive astrocytes were examined 24 and 48 hours after seeding the cells on the scaffolds. Apparent reactivity increased with larger fiber diameter, based on morphological indicators. Qualitatively, cellular attachment did not seem to vary with respect to changing the polymer or the fiber diameter.

Biography: Ben Romano is currently a student at Virginia Tech, double majoring in Chemical Engineering and Biochemistry. He is a New Jersey native, and is excited to attend Rutgers to learn through an entirely different program. While at Virginia Tech, Ben is also a Resident Advisor to a living learning community for an all-male engineering community, and he is also involved in Circle K, a collegiate service organization. Ben plans to use this REU opportunity to help determine his future plans. He is working in Dr. Shreiber’s lab to determine the effect of physical environment changes on astrocyte reactivity. The project is trying to determine if fiber diameter of electrospun scaffolds changes the morphological responses of the astrocytes.

Abstract and Student Biography

Caresse O. Simmonds **Poster # 21B**
Rutgers, The State University of New Jersey

Mentors:
Daniel Browe, Dr. Joseph Freeman
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Electrical stimulation of contractile electrospun scaffolds for skeletal muscle tissue engineering

Over 500,000 traumatic injuries to peripheral nerves and/or skeletal muscles occur each year in the United States. Muscle autografts are considered the standard treatment for functional restoration of muscle tissue for large defects. However, this procedure can result in a loss of muscle volume and function at the donor site. The Musculoskeletal Tissue Regeneration (MoTR) laboratory is developing a new biodegradable, biocompatible, conductive scaffold for muscle tissue regeneration. Previous research in the MoTR lab has shown that electrospun polycaprolactone polymer scaffolds with a uniformly distributed electroactive hydrogel layer will bend in an electric field. We hypothesize that applying the hydrogel solution in a banding pattern will cause many small bends in the scaffold when placed in an electric field. This should lead to an accordion-style contraction. Sample strips of scaffolds with various banding patterns were suspended in saline solution between two platinum electrodes and a constant current was applied. Videos of the experiments were analyzed in ImageJ to determine the contraction and angular movement of the scaffolds. The results of this study show that there was no clear trend between the size of the hydrogel bands and the percent change in length of the scaffolds. Nevertheless, scaffolds with banding patterns of crosslinked hydrogel were able to move in an electric field. This is important because a mechanical response triggered by an electrical stimulus can aid in cell growth and alignment on the scaffold. Along with possible mechanical stimulation, direct electrical stimulation of myoblasts has been shown to alter their proliferation and development. As a result, a low-cost bioreactor to apply electrical stimulation was built to determine cell proliferation of rat myoblasts seeded onto these contractile scaffolds in response to an electric field. This study showed that applying electrical stimulation in the form of a sine wave with a frequency of 1 Hz and an amplitude at 1 V for 1 hour improved proliferation of the cells. Future work may include using a new type of conductive polymer for the scaffold to improve the amount of contraction. In addition, we plan to optimize the design of the bioreactor so that we can apply a wider range of electrical stimulation to the scaffolds.

Biography: Caresse is currently pursuing a Biomedical Engineering degree at Rutgers, The State University of New Jersey and expects to graduate in the Spring of 2015. Her career plans include going on to earning a post-graduate degree in this field of study. After college she will seek employment with a medical technology as a project engineer; developing new technologies and products, or improving existing ones that will be used to improve treatment outcomes of patients. Presently, she is working in Dr. Freeman's lab in the Biomedical Engineering department at Rutgers on a muscle regeneration project. In addition to her curriculum and research undertakings, Caresse works as a Resident Assistant, a tutor for the School of Engineering, and an ambassador for the Louis Stokes Alliance for Minority Participation (LSAMP). She feels blessed and thanks everyone she has worked with this summer and the REU-RiSE program for providing her with this incredible opportunity.

Abstract and Student Biography

Kevin J. Smith **Poster # 22B**
University of Connecticut

Mentors:
Prabhas Moghe, Ph.D., Nicola Francis, Ph.D., Mr. Neal Bennett
Department of Biomedical Engineering, Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Investigating the effects of stromal cell - neuronal cell co-culture on neuronal maturity and neuronal viability under oxidative stress

The goal of this research was to address one possible remedy for neurodegenerative disease, a widespread health issue affecting millions of Americans projected to affect twice as many patients by 2040. Neurodegenerative disease is characterized by the loss of neurons in various regions of the brain. A potential therapy for neurodegenerative disease is the transplantation of mature neural networks into the diseased brain; however, efforts to transplant neurons into the central nervous system have been met with limited survival and integration. We have developed a culture and transplantation platform of networked, human reprogrammed neurons via 3-D microscaffolds. This project investigated whether the design of a co-culture of mesenchymal stem cells (MSCs) and induced human neurons further improved neuronal survival under stress. Calcium imaging was used to determine the percent of induced neurons responsive to an electrical stimulus, indicative of neuronal population maturity. An oxidative stress test was used to study the neuroprotective effects of MSCs. The data from these experiments suggest that MSCs possess neuroprotective effects in oxidative environments, and that the positive effect of the MSCs on neuronal maturity is largely due to soluble factors. Overall, the MSCs appear to be an excellent supporting cell type to enhance the survival of neurons, a mechanism that will potentially be critical to increase the yield of grafted neurons upon transplantation in vivo.

Biography: Kevin Smith is a junior at the University of Connecticut. He is on track to graduate in May 2016 with a B.S.E in Biomedical Engineering and minors in Mathematics, Chemistry, and Materials Science. This is his first structured research experience, and he is very grateful to have been accepted into the REU in Cellular Bioengineering at Rutgers. He is currently conducting research in the lab of Dr. Prabhas Moghe with mentors Dr. Nicola Francis and Neal Bennett. He is intrigued with the research he is conducting this summer and this program has definitely inspired Kevin to pursue a graduate degree after graduation.

Abstract and Student Biography

Cayla A. Stifler **Poster # 23B**
Providence College

Mentors:
Amitabh Lath, Christopher Irslinger
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Jet finding efficiencies for single and multiple matched partons

One of the primary goals of Run II of the LHC is to search for supersymmetric (SUSY) particles. One particular SUSY model is where supersymmetric tops, stops, are produced by violating the symmetry of R-parity. SUSY searches with a final state of jets are promising search channels for stop searches, and for heavy stops can decay to a final state of partons that become merged into a single jet with some substructure. The merged jet can be studied by making smaller subjets corresponding to smaller parton showers. I looked at the optimal jet cone size for different jet algorithms with different generators to simulate the fragmentation of the partons. This technique provides an alternative to using substructure variables to discriminate merged jets from those that come from a single parton. A potential advantage of such a technique is the reduction of pile up included in the jet. Funding from National Science Foundation grant PHY-1263280 has supported this project.

Biography: Cayla is from Glen Rock, PA and is a rising junior at Providence College where she majors in Applied Physics. She is president of Providence College's chapter of the Society of Physics Students and tutors students in science and mathematics. This summer, Cayla participated in the Physics and Astronomy REU program, working in high-energy physics.

Abstract and Student Biography

Taylor E. Sweet **Poster # 24B**
New College of Florida

Mentors:
Stephen Bien-Aime , Kathryn Uhrich, Ph.D.
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Obtaining constant, controlled, and extended release using salicylate-based poly(anhydride-esters)

Polymer prodrugs are surface eroding, meaning that the inside material does not begin to degrade until all of the surrounding material has degraded. This enables release of the bioactive material in a constant, controlled, and extended manner to reduce the possible side effects that could occur if the drug were released immediately. However there is a need for larger amounts of drug to be attached to the polymer and also a need to produce polymers that completely degrade into non-cytotoxic acid counterparts. Considering these shortcomings, the demand for polymer prodrugs that degrade completely and deliver a higher percentage of the bioactive becomes evident. To approach these issues, we first chemically incorporated salicylic acid (SA) into a poly anhydride-ester (PAE) backbone via a melt-condensation polymerization process, where each repeat unit consists of 2 salicylic acid moieties connected by a linker molecule. These linker molecules increase the drug load of the polymer backbone, enabling the polymer to deliver more salicylic acid, from 62 up to 74 wt %. The PAE polymers by (DSC), (GPC), (TGA), and (H-NMR). Next, we formulated the SA-PAEs into microspheres using oil in water emulsions.

Biography: Taylor Sweet was born on September 4, 1993 in Long Island,NY. She was raised in Jamaica, Queens until moving to Orlando, Florida at the age of 14. Taylor is currently a rising senior at New College of Florida, in Sarasota, Florida. She desires to complete her Bachelor's degree in Chemistry and graduate next spring 2015. With interests in both cosmetics and medicine, Taylor hopes to pursue either a masters degree in personal care science or an PhD in Toxicology. Taylor is an American Chemical Society Scholar and Bright Future Award Recipient. She has previous research experience at both her home institution and at Princetion University, where she worked as part of the PRISM program to find the best formulation for droplet shrinking using Binary Heterogeneous Azeotropic distillation with commercially available oils, surfactants, and solvents. This summer, Taylor is participating in the RiSE program at Rutgers, The State University of New Jersey, where she is working in Kathryn Uhrich's laboratory to produce polymer prodrugs that offer constant, controlled, and extended release of salicylic acid. A well-rounded young woman, Taylor also enjoys cooking, listening to Beyonce, writing music, shopping, watching movies, traveling the world, and spending quality time with friends and family.

Abstract and Student Biography

Mariel Tader **Poster # 25B**
Case Western Reserve University

Mentors:
Sunil Somalwar, Patrick Zywicki
Department of Physics, Rutgers, The State University of New Jersey

Lower limit for the Minimal Type III Seesaw Mechanism fermionic triplet mass with CMS multi-lepton analysis

The Standard Model (SM) of particle physics has been widely successful in describing physics at high energies, but many theoretical extensions of the model predict new physics at the 1 TeV scale. The Compact Muon Solenoid (CMS) detector at CERN examines the results of high-energy proton-proton collisions within the Large Hadron Collider (LHC) that occur at this energy scale. The CMS multi-lepton group leverages the relatively low background of physics events that produce 3 or more leptons to examine models that attempt to improve the Standard Model. One such SM extension, the Seesaw Mechanism, attempts to explain the smallness—and existence—of the masses of the neutrinos. We studied the Type III Seesaw model in particular, which predicts the both existence of new, left-handed triplets of very heavy, mass-degenerate fermions and that the neutrinos are their own anti-particles. Pairs of these fermions from the lightest triplet, two of which are electromagnetically charged, could be directly produced most often in the LHC. We identified the allowed paths of decay for these fermions that would be most readily distinguished from SM background processes in CMS data. For the selected processes, we then generated Monte Carlo simulations for pair-produced heavy fermions and the resulting chains of their decay, via SM bosons, to multi-lepton final states. By comparing these theoretical signal events to observed physics, using 19.5 fb-1 of sqrt(s) = 8 TeV data from the CMS detector, we find no statistically significant excess above the SM background predictions for the energy range of our analysis. With 95% confidence, we therefore set a lower limit for the Type III Seesaw Mechanism fermion mass. This project has been supported by funding from National Science Foundation grant PHY-1263280.

Biography: Mariel Tader, a rising junior at Case Western Reserve University, is a physics and math major and plans to pursue a doctorate in physics. Mariel is especially interested in experiment and theory regarding high-energy physics, cosmology, and nuclear physics. Her previous research opportunities include a nuclear physics mentorship at UConn under Dr. Richard Jones with the GlueX experiment, two years of research at CWRU with Dr. Daniel Akerib and Dr. Thomas Shutt on the LUX and LZ dark matter searches, and a URochester REU with Dr. Kevin McFarland for the MINERvA neutrino experiment at FermiLab. This summer, Mariel participated in the Rutgers Physics REU program, with the guidance of Dr. Sunil Somalwar and Patrick Zywicki, working to exclude a mass sector of the heavy fermion triplet predicted by the Type III Seesaw Mechanism, using data from the CMS experiment at the CERN LHC.

Abstract and Student Biography

Eleni G. Temeche **Poster # 26B**
Jackson State University

Mentors:
Lisa Klein
Department of Material Science and Engineering
Rutgers, The State University of New Jersey

Effect of Fruit-based Dyes on the Output of Dye-sensitized Solar Cells

Dye-sensitized solar cells (DSSCs) are recognized as one of the world's leading innovations in nanosciences and photovoltaic technology. DSSCs are a type of photovoltaic cells that are able to convert solar rays into electrical energy without emitting carbon dioxide. DSSCs are less expensive than the silicon-based solar cells that are usually involved in energy production. However, the conversion efficiency of DSSCs is about 10%, lower than other thin film solar cells. In order to increase their efficiency, different fruit-based dyes are being investigated to choose the one that is most effective in DSSCs. Sol-gel processes are mostly used for the preparation of the TiO_2 layers due to the advantages of the method in purity, homogeneity, and stoichiometry control. A titania- silica coating is being used to make the DSSCs self-cleaning. Titania- silica photocatalyst films of well-defined thicknesses are being synthesized by the sol-gel technique with dip-coating as the deposition method. The photocatalytic activity of the prepared photocatalyst films is being evaluated for the photo-oxidative degradation of dyes. The absorption of three fruit dyes (pomegranate, blue berry, and black berry) was measured using Evolution 300 UV-VIS thermo scientific spectrometer. The absorption of the pomegranate dye was significantly higher for the wavelength range 400-600nm, making it the best choice for visible light absorption. The percentage transparency of three layers (1-layer, 2-layer, and 3-layer) of titania-silica coating was measured using the spectrometer. Transparency increases proportionally with the layer thickness. The 3-layer film has the highest transparency of 40-60% in the wavelength range of 400-1100nm. For future work, the photo-oxidation degradation process will help determine the titania-silica coating that is efficient for self cleaning the DSSCs. The main steps for successful future commercialization of the DSSCs are the improvements of stability, efficiency, and simplification of the production process.

Biography: Eleni Temeche was born in Addis Ababa, Ethiopia. She is a rising junior in Jackson State University double majoring in Computer Engineering and Physics. She is a member of her university's National Honor Society. During the semester, she conducts research about analog discovery and mobile studio. This summer, Eleni has been working with Dr. Klein on the Effect of Fruit-based Dyes on the Output of Dye-Sensitized solar cells at Rutgers, The State University of New Jersey. She is planning to pursue graduate study in Software Engineering and Material Science.

Abstract and Student Biography

Ayzha D. Ward **Poster # 27B**
Texas Southern University

Mentors:
Dr. Benjamin Lintner and Mr. Maxwell Pike
Department of Environmental Science
Rutgers, The State University of New Jersey

Climatology and cluster analysis: self-organizing maps (SOMs)

Global climate models (GCMs) are tools used to study climate processes and make future projections. However, they are known to have biases or errors that cause them to differ from reality. We hypothesize that self-organizing maps (SOMs), a computational tool for identifying and isolating underlying structures in large data sets, can be useful for stimulating improved understanding of how real-world climate processes and models work. Using the Matlab "SOM toolbox", which contains the required code to execute self-organizing maps, we have investigated the effectiveness of SOMs to distill large amounts of climate data, specifically daily precipitation over the Pacific Ocean, into representative categories. In our analysis, two large-scale precipitation features of interest are the Inter-Tropical Convergence Zone (ITCZ), a zonal band of rainfall situated just north of the equator, and the South Pacific Convergence Zone (SPCZ), a diagonally-oriented band of rainfall extending from the western Pacific equatorial warm pool to midlatitudes in the Southern Hemisphere. We first performed SOMs on real-world observations from NASA's Tropical Rainfall Measuring Mission (TRMM) satellite; using the resultant TRMM-based SOMs as a benchmark, we then performed SOMS on models from Phase 5 of the Coupled Model Intercomparison Project (CMIP5), a set of current-generation GCMs. While the SOMs from the models capture broadly similar large-scale structures, some differences in the orientation and shape of the ITCZ and SPCZ are evident. Additionally, the SOM analysis on the model data produced an anomaly which is most likely due to the model's over accentuation of certain climate parameters. Our results highlight the utility of SOMs as a tool for diagnosing model behavior. Further research is being performed to isolate precipitation pattern differences between individual SOMs and hopefully attribute these to specific processes.

Biography: Ayzha Ward is an undergraduate computer science major that attends Texas Southern University. This summer, she participated in a research project that was under the supervision of Dr. Benjamin Lintner and worked in conjunction with graduate student, Max Pike. Although she graduates in the fall of 2015, Ayzha plans to take the GRE this upcoming fall semester in preparation for graduate school. Apart from academia, she is a member of Refuge Temple Ministries and enjoys participating in ministry work for her church. Additionally, she enjoys spending time with her family and traveling.

Abstract and Student Biography

Bianca M. West **Poster # 28B**
University of Maryland, Baltimore County

Mentors:
Zaire Dinzey-Flores, Ph.D.
Department of Sociology and Department of Latino and Hispanic Caribbean Studies
Rutgers, The State University of New Jersey

Lauren Krivo, Ph.D., Ms. Idit Fast, and Ms. Brooklynn Hitchens
Department of Sociology
Rutgers, The State University of New Jersey

Social observation in neighborhoods: a comparison of methods

For over 40 years, social scientists have used Systematic Social Observation (SSO) to collect data on people and their environment. Researchers traditionally use SSO to collect data in-person using fixed questions to note the same aspects of environments in every area observed. More recently, scholars have begun using SSO through online observational tools, such as Google Street View. This research study aimed to assess how different applications of SSO (in-person, online, open-ended, structured) shape data on people and their environments and to learn the most effective way to collect data using social observation. More specifically, the study sought to address (1) what aspects are missing from previous SSO instruments, (2) the differences between in-person and online social observation data collection and (3) the differences between inductive evaluations of environments and structured SSO assessments. To address these objectives, first, in-person open coding was conducted in three areas of New York and New Jersey. Next, an SSO instrument was created based on those initial observations. The SSO instrument was used for in-person closed coding and online closed coding (using Google Street View) of the same three areas for which open coding was completed. Results show that previous SSO instruments are missing quantifiable data. Therefore, questions which allow observers to record the quantity – rather than simply the presence – of phenomena were included in the new SSO instrument. Differences were found between in-person and online assessments, most notably the ability to more precisely capture quantifiable data online as compared to in-person. In addition, there were noticeable differences between open and closed coding: open coding captured more specific information about neighborhood phenomena as compared to closed coding.
Keywords: Systematic Social Observation, Open Coding, Closed Coding, Google Street View, Environmental Analysis

Biography: Bianca West is a recent May 2014 graduate from the University of Maryland, Baltimore County with a bachelor's degree in psychology and a minor in writing. A first generation college student and McNair Scholar, Bianca has been grateful to be a participant in RiSE at Rutgers and gain important research experience. She is very excited to be working under the direction of her mentors Dr. Zaire Dinzey-Flores and Dr. Lauren Krivo in the Department of Sociology. She is also thankful for the assistance she has received from graduate student mentor Idit Fast as well as graduate student Brooklynn Hitchens.

Abstract and Student Biography

Rojae O. Wright **Poster # 29B**
Alabama A&M University

Mentors:
Sang-Wook Cheong, Rongwei Hu, Yazhong Wang, Xueyun Wang

Growth of Crystals with Exotic Physical Properties

Bi_2Se_3, Bi_2Te_3, and Sb_2Te_3 nanostructures have garnered a lot of attention in crystal growth due to their fascinating physical properties. They have been discovered to be three dimensional topological insulators (3D) with insulating bulk and metallic surface states, which are attractive for fundamental research and applications in new technology such as spintronics, low energy dissipation electronics and quantum information. In order to enhance the surface state effects and study their surface properties, an attempt to grow Bi_2Te_3 nanoplates, with large surface to volume ratio, has commenced at Rutgers, The State University of New Jersey using physical vapor deposition (PVD) method. The experimental setup for this process consist of a furnace, two quartz tubes (with difference in diameter) and a gas flow system. For the synthesis, Bi_2Te_3 powder along with silicon wafers are placed in the inner quartz tube then the tube is initially flushed with ultrapure Ar several times to remove oxygen residue. The furnace is set at different temperatures ranging from 450-550 °C and this determines the position of where the Bi_2Te_3 powder and silicon wafers are placed inside the quartz tube. Our current results show that micron-sized Bi_2Te_3 crystals have been deposited on the silicon wafers, therefore variations of temperature and gas flow rate are to be applied to experiment to get the desired nanoplates. This project has been supported by funding from National Science Foundation grant PHY-1263280 at Rutgers, The State University of New Jersey.

Biography: Rojae Wright is a junior from Alabama A&M University. He is currently pursuing a B.S. in Physics with a minor in Chemistry. Rojae is expected to graduate in the spring of 2015 and he aspires to attend graduate school for a Ph.D in Physics. In the summer of 2013 he completed a REU program at the University of Illinois in Urbana Champaign, where he worked with Mattthias Perdekamp on measuring the position resolution of a UIUC drift chamber prototype. This summer he is working with Sang-Wook Cheong on the growth of crystals with exotic properties.