RiSE at Rutgers

Research in Science and Engineering

Summer Research Symposium

August 3, 2016

Sponsored by:

Rutgers Office of Diversity and Inclusion
Rutgers Graduate School - New Brunswick
and the
Graduate School of Biomedical Sciences – New Brunswick/Piscataway

2016 Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

Wednesday, August 3, 2016

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

9:00 – 9:30 AM	**Registration and Coffee**	**Fireside Lounge**
9:30 – 10:30 AM	**Plenary Session**	**Center Hall**

Héctor G. Arce, Ph.D.
Associate Professor of Astronomy
Yale University

"Stars in our galaxy and in your life: making it work"

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 Partner Program

REU in Cellular Bioengineering: From Biomaterials to Stem Cells

REU in Structured Organic Particulate Systems (SOPS)

Rutgers University Pipeline-Initiative to Maximize Student Development Program (RU-IMSD)

REU in Physics and Astronomy

Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program

PLENARY SPEAKER

Héctor G. Arce, Ph.D

"Stars in our galaxy and in your life: making it work"

Stars are considered the fundamental units of astronomy. It is mostly through their radiation that we probe the structure and evolution of the luminous matter in the universe. It is, therefore, essential to astrophysics to know how stars form and what determines their properties. Observations using radio telescopes are of particular importance to this field, as they can trace the dynamics and distribution of the gas and dust involved in the formation of stars and planets. I will present recent results on research in star and planet formation using new and powerful telescopes. I will also discuss the importance of having stellar people in your life. Strong support from family, friends, advisors, mentors and colleagues is essential to survive and succeed in science and academia.

Héctor G. Arce was born and raised in San Juan, Puerto Rico, where he attended public school. He later moved to the US to pursue a major in physics from Cornell University. He obtained his B.S. in 1995, and then moved to Massachusetts to conduct graduate studies in astronomy at Harvard University. After earning his PhD in 2001, Hector spent the following three years as a post-doctorate researcher at the California Institute of Technology in the Radio Astronomy group, where he used the Owens Valley Radio Observatory (OVRO) millimeter array to conduct his research on star formation. In 2004 he earned an NSF Astronomy and Astrophysics Postdoctoral Fellowship, which he took to the Astrophysics Department at the American Museum of Natural History (AMNH) in New York City. There Héctor continued his research and taught computer programming and astronomy to high school students from low-income families as part of an after-school program at the AMNH. In January 2008 he joined the faculty of the Department of Astronomy at Yale University. Hector's main research interests include studying the formation of stars and the physical and chemical processes in the interstellar medium. He is also active in efforts to increase the number of underrepresented minorities in the physical sciences.

SUMMER PROGRAMS

RiSE (Research in Science and Engineering) at Rutgers

RiSE 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. Sponsored by the Office of Diversity and Inclusion, RiSE is hosting 35 scholars this summer. These students, selected from over 700 applicants, represent 29 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. For more information about RiSE and to meet our current Scholars and alumni, visit http://rise.rutgers.edu.

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 sixth 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, Mayagüez. 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 in Physics and Astronomy

Thanks to funding from the National Science Foundation via grants PHY-1263280 and PHY-1560077, 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/.

Rutgers University Pipeline-Initiative to Maximize Student Development Program

The Rutgers University Pipeline-Initiative to Maximize Student Development (**RUP-IMSD**) Program seeks to increase the participation of students from groups under-represented in the biomedical/biological sciences in research and research-related careers, especially at the PhD level. Funded by a grant from the National Institute of General Sciences of the National Institutes of Health (NIGMS/NIH; R25 GM055145), the program supports PhD students, mostly from under-represented groups, in the early stages of their graduate studies. In addition, the RUP-IMSD program provides opportunities and financial support for Rutgers undergraduates from under-represented and other diverse groups to participate in the summer RiSE research program, and to pursue summer and academic year research in biological/biomedical research disciplines at Rutgers. The program also provides students with on-going mentoring and exposure to career opportunities. For more information visit: http://rwjms.rutgers.edu/gsbs/prospective/diversity.html

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, the School of Public Health, 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 institutional support and grants from the National Institutes of Health (R25ES020721) the American Society for Pharmacology and Experimental Therapeutics, and the Society of Toxicology. 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 Diversity and Inclusion

Graduate School – New Brunswick

Graduate School of Biomedical Sciences – New Brunswick/Piscataway

Ernest Mario School of Pharmacy

Protein Data Bank

~External Support~

NASA New Jersey Space Grant Consortium

NIH MARC Program

NSF Research Experiences for Undergraduates (REU) Program

NSF CAREER Awards (Dr. Anand Sarwate and Dr. Siobain Duffy)

NIH Summer Undergraduate Research Fellowship Program

U.S. Department of Education McNair Scholars Program

Howard Hughes Medical Institute

~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

Draw a Scientist: A Workshop on Science Identity

Mary Nucci, Ph.D
Research Assistant Professor, Department of Human Ecology, RUtgers

The Devil in the Details: Record Keeping and Laboratory Data

Terri Goss Kinzy, Ph.D.
Associate Vice President for Research Administration
Professor, Department of Biochemistry & Molecular Biology, Robert Wood Johnson Medical School

Graduate School: How to Get In, Get Funding and Meet Success

Samuel Kogan
MD-PhD Candidate, Graduate Program in Neuroscience,
Rutgers Graduate School of Biomedical Sciences

Christopher Lowe
Ph.D. candidate, Biomedical Engineering

Richard Padgett, Ph.D.
Professor, Waksman Institute of Microbiology, Rutgers

Talia Planas
PhD candidate, Toxicology, Rutgers

Charles Roth, Ph.D.
Professor, Biomedical Engineering and Chemical & Biochemical Engineering
Graduate Program Director, Chemical & Biochemical Engineering

Jill Tracey
PhD Candidate, Chemistry & Chemical Biology, Rutgers

How to Prepare Winning Applications for Fellowships and Funding
Ben Arenger, Ph.D.
Fellowship Advisor, GradFund, Graduate School-New Brunswick

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

Roselin Rosario, Ph.D.
Sr. Chemist, Makeup-Lipstick Research & Innovation Lab
L'Oréal USA, Piscataway, NJ

Paul Burnett, Ph.D.
Associate
Greenberg Traurig, LLP, Florham Park, NJ

Delia C. Pitts, Ph.D.
Associate Vice Chancellor
Office of Diversity and Inclusion
Rutgers University, New Brunswick, NJ

Maria Qadri, M.S.
Graduate Student, Science Policy
Biomedical Engineering
Piscataway, NJ 08854

Mentoring Up: Making the Most of your Mentoring Relationships

Rebecca Jordan, Ph.D.
Professor, Department of Human Ecology, Rutgers

Amanda Sorenson
Ph.D. Candidate, Ecology and Evolution

Innovation and Entrepreneurship

Michael Wiley
Vice President, Foundation Venture Capital Group
New Brunswick, NJ

SUMMER PROGRAM STAFF

Research in Science & Engineering (RiSE)

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

Rutgers University Pipeline-Initiative to Maximize Student Diversity (RUP-IMSD) Program

Jerome Langer, Ph.D., PI
Associate Professor of Pharmacology, Robert Wood Johnson Medical School

Patricia Irizarry, Ph.D
Program Coordinator, RUP-IMSD.
Rutgers Science Explorer Coordinator and Associate Director of the Rutgers Geology Museum

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 of Academic Programs, School of 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, Pharm.D., PhD., Director
Associate Professor, Pharmacology and Toxicology

Administrative Staff

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

Mr. Johnny Malpica, RiSE Program Coordinator
Office of Diversity and Inclusion

Ms. Linda Johnson
Rutgers Department of Biomedical Engineering

Teaching Fellows

Ms. Ana Rodriguez, PhD Candidate in Biomedical Engineering

Resident Advisors

Ms. Christina N. Ramirez, PhD Candidate in Cellular & Molecular Pharmacology

Mr. Jonathan Colon, PhD Candidate in Chemical & Biochemical Engineering

Website and Admissions Portal

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

Mr. David Pickens, GSNB

Mr. Shamir Khan, GSNB

Photography and Social Media

Mr. Johnny Malpica, RiSE Program Coordinator
Office of Diversity and Inclusion

POSTER PRESENTATIONS

SESSION A

10:45AM – 11:35AM

Name and Affiliation(s)	Title	Poster
Emily T. DiMartini *Cellular Bioengineering*	**Free radical scavenging potential of acrylated polyethylene glycol polymers for application in traumatic brain injury treatment**	1A
Maria I. Hawayek *Cellular Bioengineering*	**Hijacking cerebrospinal fluid dynamics: investigating effects of drugs on cancer cell lines**	2A
Alexander W. Magsam *Cellular Bioengineering*	**Skeletal visualization in rat embryos using optical projection tomography and a novel clearing agent**	3A
Caroline M. Wood *Cellular Bioengineering*	**Optimization of electroactive hydrogel characteristics for use in a composite skeletal muscle scaffold**	4A
Grace M. Haza *Physics & Astronomy*	**Search for type-III seesaw with multilepton final states by CMS**	5A
Hannah R. Ihlenfeldt *Physics & Astronomy*	**Helium Ion Microscopy characterization and analysis of biological structures**	6A
David R. Last *Physics & Astronomy*	**Finding bottom quarks with the CMS detector at the LHC**	7A
Michael I. Quinonez *Physics & Astronomy*	**Selected topics on isospin in nuclei**	8A
Raheel Ahmad *RiSE*	**Enrichment of Small Molecule Representation in the Protein Data Bank**	9A
Donna K. Brunnquell *RiSE*	**Examination of climate model precipitation over the Amazon using linear unidimensional scaling**	10A
Alvin A. Crespo *RiSE*	**Analyzing the mutational spectrum of RNA bacteriophage Φ6 host-range mutants**	11A
Katya Echazarreta *RiSE*	**Top-down and Sensory Processes in Volitionally Reversing Depth of Painted and Unpainted Stimuli**	12A

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Bryan Gutierrez *RiSE*	**Fabrication and Evaluation of Camptothecin Prodrug-loaded Microparticles.**	13A
Jessica Johnson *RiSE*	**Proton conductivity in re-stacked graphene oxide with embedded graphene oxide fibers**	14A
Cora E. Kerber *RiSE*	**Role of the eIF2 kinase PERK on whole body and hepatic stress responses to dietary methionine restriction**	15A
Anna K. Orta *RiSE*	**Investigating brain metastases from primary melanoma using luminescent or fluorescent-tagged melanoma cells**	16A
Frederick A. Stephens *RiSE*	**Alpha Functionalization of Amine**	17A
Laura R. Azouz *RiSE Associate*	**Computational design of auto-inhibited chemotherapeutic enzyme using Rosetta**	18A
Samantha N Cobos *Structured Organic Particulate Systems*	**Understanding protein adsorption to TEMPO-oxidized cellulose I**	19A
Ye Joon Seo *Structured Organic Particulate Systems*	**The formation of vesicles through the modification of tyrosine-derived ABA tri-block copolymer membranes**	20A
Iris Escobar *SURF/Pharmacy*	**Identification of unique markers to distinguish macrophage populations in mouse models resembling fatty liver disease**	21A
Caitlyn A. Tobita *SURF/Pharmacy*	**Characterizing recovery and adaptation after exercise in *C. elegans***	22A

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

Name and Affiliation(s)	Title	Poster
Yanira Gonzalez-Rodriguez *Cellular Bioengineering*	**Role of Topoisomerase II-beta in Neuronal Migration in vitro**	1B
Jamal J. Keyes *Cellular Bioengineering*	**The development and characterization of polyelectrolyte polymer-peptide nanoplexes for antimicrobial applications**	2B
Kurt F. Wagner *Cellular Bioengineering*	**Influencing Mesenchymal Stem Cell Differentiation Through Substrate Topography**	3B
Travis A. Court *Physics & Astronomy*	**SALT spectroscopy of ASASSN-15lh: The most luminous supernova, or something else?**	4B
Audrey M. Houghton *Physics & Astronomy*	**Interpreting the evolution of bulge growth in progenitors of Milky Way-type galaxies**	5B
Peter K. Kim *Physics & Astronomy*	**Self-Assembly of Rubrene Thin Films on Noble Metal Surfaces**	6B
Manuel J. Perez *Physics & Astronomy*	**Characterizing and cataloguing star-forming galaxies in preparation for the LADUMA survey**	7B
Jaclyn Schillinger *Physics & Astronomy*	**Imaging of doped iron pnictides across a structural phase transition**	8B
Pamela Amechi *RiSE*	**Enhancing ligands in the Protein Data Bank**	9B
Dean A. Coco *RiSE*	**Allocating privacy risk across multiple stages of a machine learning pipeline**	10B
Keyerra C. Daniels *RiSE*	**Bringing biological pathways to life**	11B
German Lagunas-Robles *RiSE*	**Implications of Codon Evolvability on RNA Virus Genome Structure**	12B

POSTER PRESENTATIONS

SESSION B

11:45AM – 12:35PM

Kelsey M. Gwynne *RiSE*	**Photoluminescence stability of blue organic phosphorescent materials on silver nanostructured surfaces**	13B
Lorne S. Joseph *RiSE*	**A novel solution for powering our planet: Comparative study of a novel Titania sol and a Titania powder for the improved efficiency of dye-sensitized solar cells**	14B
Ferralita S. Madere *RiSE*	**Comparing the influence of manipulations that preferentially affect apical myosin versus junctional myosin on Jub:GFP localization**	15B
Jade B. Redding *RiSE*	**Modeling, estimation, and control of a quadrotor**	16B
Abdulraouf Abdulraouf *RUP-IMSD/RiSE*	**Developing a novel model for studying depressive-like behavior in rats**	17B
Caroline B. Paz *RUP-IMSD/RiSE Associate*	**The Role of Polypyrimidine Tract Binding Protein Isoforms on CD40Ll Expression**	18B
José Á Pagán Muñoz *Structured Organic Particulate Systems*	**Development of "breathable" humidity-responsive biocompatible hydrocolloid films for food and health applications**	19B
Michael J. Swierczynski *Structured Organic Particulate Systems*	**Synthesis & characterization of sulfated zirconium-tin mixed oxide catalyst**	20B
Mary F. Stofan *SURF/Pharmacy*	**Analysis of the bile acid synthetic pathway in the absence of enzymes, CYP7A1 and CYP27A1**	21B

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Caroline M. Wood *Cellular Bioengineering*	Optimization of electroactive hydrogel characteristics for use in a composite skeletal muscle scaffold	4A

Cellular Bioengineering Business Pitches

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:

In-Fix – Technology for skeletal muscle regeneration
Seeakay Surgical: *Alex Magsam, Kurt Wagner, Caroline Wood*

RadiPeg - Technology for targeted delivery of chemotherapeutic
Radical Biomaterials: *Emily DiMartini, Yanira Gonzalez Rodriguez, Karen Orta*

Nanolytes: A platform technology for efficient drug delivery
JIM Pharmaceuticals: *Iris Escobar, Maria Hawayek, Jamal Keyes*

Abstracts and Student Biographies

Emily T. DiMartini **Poster # 1A**
The College of New Jersey

Mentors:
Chris Lowe, David I. Shreiber
Department of Biomedical Engineering
Rutgers, The State University of New Jersry

Free radical scavenging potential of acrylated polyethylene glycol polymers for application in traumatic brain injury treatment

Traumatic brain injuries (TBI) contribute to more than 50,000 deaths per year in the United States alone, yet no complete treatment currently exists. Physical trauma to the head causes immediate cell damage and death that cannot be reversed. In addition to this initial damage, secondary injury persists for months after the original trauma, which presents an opportunity for treatment. A component of this long-term, secondary injury is oxidative stress that is caused by free radicals. We are developing a potential treatment for TBI that uses the neuron-damaging radicals as a means to target a therapeutic. A functional biomaterial matrix composed of a drug covalently linked to acrylated polyethylene glycol (PEG) molecules has the potential to be a viable treatment option. PEG acrylates initiate crosslinking in the presence of radicals, which we hypothesize can immobilize a drug at the injury site. Additionally, the reaction of the acrylated PEG polymers with free radicals consumes the radicals, reducing their concentration to potentially limit oxidative stress. The purpose of this study was to determine if acrylated PEG molecules have the ability to react with different free radicals, including those produced during a TBI. Two cell-free assays were performed to achieve this goal: 1) a DPPH assay, which is a common antioxidant assay; and 2) a horseradish peroxidase assay, where horseradish peroxidase was combined with hydrogen peroxide to produce free radicals, and an indicator, TMB, was added to produce a colorimetric change. To generate cell-produced free radicals, rotenone, which interrups the electron transport chain in moitochondria to produce free radicals, was added to primary neurons. An MTT assay was used to determine neuron viability after injury with rotenone and treatment with PEG acrylates. Different molecular weights of PEG diacrylate (PEGDA) were analyzed to determine if a specific molecular weight was optimal to react with free radicals. Preliminary results indicate that 20K PEGDA is the most effective free radical scavenger. Acrylate functionalized PEGs have the potential to react with radicals and protect neurons from secondary injury.

Biography: Emily DiMartini is a rising senior at The College of New Jersey pursuing a Bachelor of Science degree in biomedical engineering with a concentration in mechanical engineering. She is a New Jersey native, was born and raised in Brick Township. After completing her undergraduate studies, Emily plans to continue her education at the graduate level and pursue a Ph.D. in biomedical engineering. This summer she is working in Dr. David Shreiber's lab under the mentorship of graduate student Chris Lowe researching targeted drug delivery to traumatic brain injuries. This REU in Cellular Bioengineering has given Emily the opportunity to participate in a research-intensive experience and the skills she has learned will be invaluable as she continues her education.

Abstracts and Student Biographies

Yanira Gonzalez-Rodriguez **Poster # 1B**
University of Puerto Rico Mayagüez

Mentors:
Dr. Li Cai, Misaal Patel, Jeremy Anderson
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Role of Topoisomerase II-beta in Neuronal Migration in vitro

The cerebral cortex is organized into well-defined layers populated with projection neurons that are originated from the ventricular zone and subventricular zone. Structural and functional abnormalities in this layered architecture have been linked to many forms of human neuronal migration disorders (NMDs), e.g., Lissencephaly and Heterotopia Many studies have revealed that the type II DNA topoisomerase IIbeta (Top2b) plays a critical role in regulating genes associated cell adhesion and migration. Top2b deficiency leads to the aberrant cortical lamination characterized by the absence of the subplate and the failure of late-born neurons to reach superficial layers of the cortical plate. However, it is not clear how Top2b controls the migration behavior of individual cortical neurons and at which step(s) Top2b affects neuronal migration.
In this study, Top2b function was disrupted by an enzymatic inhibitor ICRF-193 and its effects in cell migration was examined in vitro. Mouse neural stem cells (NSCs) and fibroblasts were seeded inside PDMS rings and in wells partially covered by stickers to restrict the area of cell growth. After initial culture, different concentrations of ICRF-193 (1µM, 3µM, and 5µM) were added to each well. After three days, PDMS rings and stickers were removed to allow cells to migrate outside the area of isolation. Microscopy images were taken and analyzed to determine the effect of ICRF-193 treatment on cell migration over a period of 0-72 hours. Compared to the untreated controls, the inhibition of Top2b with ICRF-193 on fibroblasts and NSCs caused a reduction in the length of cellular processes and the number of migrating cells; and no significant effect on cell proliferation and survival. Further research of the genetic changes that occur with Top2b inhibition may increase the understanding of neural migration and NMDs, and also allow for future therapeutics to be developed to treat NMDs.

Biography: Yanira Gonzalez Rodriguez was born in Arecibo, Puerto Rico. She is currently a rising senior studying Industrial Microbiology at the University of Puerto Rico- Mayagüez. She has previously performed research in Evolutionary and Population Genetics, but is now exploring and expanding her caliber by working on developmental biology and genetic engineering. Specifically, she is determining the role of topoisomerase II beta in neuronal migration in vitro. In the future, she plans to pursue a PhD in the area of Molecular Genetics.

Abstracts and Student Biographies

Maria I. Hawayek **Poster # 2A**
University of Puerto Rico at Mayagüez

Mentors:
Jay Sy, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Hijacking cerebrospinal fluid dynamics: investigating effects of drugs on cancer cell lines

Drug therapies for treating the brain are plagued by two problems: getting drug into the brain and rapid clearance of compounds via the cerebrospinal fluid (CSF). The continuous renewal of CSF prevents effective drug exposure in the brain. Studying CSF dynamics may lead to possible new strategies for improving drug delivery to the brain. In order to study CSF modulating dynamics, our research has focused on subjecting cells to two drugs, acetazolamide and verapamil. These drugs may have a regulatory effect on CSF production by inhibiting key enzymes involved in this process. We subjected three cancer cell lines representative of gliomas and glioblastomas two these two drugs and assessed their effects. The observations taken from these experiments will be the first step before subjecting these treatments into animal models and observing actual CSF modulation. We also tested for the utility of two proliferation assays, the MTT and the Cell Titer Real Time Glo assays. The MTT assay was used to measure metabolic activity after the 24-hour time point of drug exposure. In the case of the Glo assay, metabolic activity was measured ranging from 1 to 48 hours after drug exposure. We also assessed cell viability at 8 different concentrations for CSF-modulating drugs ranging from 0.1μM to 1mM. Data analysis suggests that these drugs do not cause an inherent harm to the cells, yet only in an animal model will we be able to see if they have a true regulatory effect on CSF and may be used in this way. Future work for this project will include proliferation assays subjecting the cells to different amounts of acetazolamide and verapamil in concomitance with two chemotherapeutics, doxorubicin and temozolamide.

Biography: Maria Isabel Hawayek attends the University of Puerto Rico at Mayagüez, and hopes to finish her B.S. in Biology in May 2017. Her research this summer focused on studying cerebrospinal fluid dynamics and how its modulation may be used to treat brain disease. She worked under the mentorship of Dr. Jay Sy and was in the Cellular Bioengineering program during the summer. Maria hopes to pursue an M.D. and incorporate research within her practice. She wants to use the manual and physical skills that she has acquired through this program in the lab and apply them into future work in order to better help her patients. She has learned a lot during this unforgettable summer and would like to thank the Rise at Rutgers Program coordinators for the opportunity.

Abstracts and Student Biographies

Jamal J. Keyes **Poster # 2B**
Jackson State University

Mentors:
Ritu Goyal, Ph.D
Post-Doctoral Research Associate, NJCBM
Rutgers University

David Devore, Ph.D
Founder, GRAPLON Technologies

Charles M. Roth, Ph.D.
Professor, Department of Biomedical Engineering
Rutgers University

The development and characterization of polyelectrolyte polymer-peptide nanoplexes for antimicrobial applications

Cationic antimicrobial peptides (CAMPs) have shown great potential for the treatment of infections involving gram-negative bacteria, however, they are hindered by their short life due to hydrolytic degradation in human plasma by proteolytic enzymes. Polyelectrolyte copolymers have been employed to extend the biological lifetime of CAMPs and to provide controlled release from the delivery complex. Polyelectrolyte polymers were prepared via free radical polymerization under N2 using azobisisobutyronitrile as the initiator. The copolymer was then prepared by attaching polyetheramine chains to polyelectrolyte polymers through carbodiimide coupling. CAMPs now had the ability to bind to the now grafted polyelectrolyte copolymers poly(methacrylic acid) and poly(propylacrylic acid). In a previous study, these complexes were shown to protect the CAMP, KSL-W, from degradation in human plasma for up to 24 hours while still maintaining some or most of the free KSL-W peptide's activity against the gram-positive bacteria, S. aureus. By altering the charge ratio, hydrophobicity, and polyetheramine pendant chain density, the nanocomplex's size, zeta potential, drug release, and CAMP binding can all be controlled. In this study, we characterized various combinations of the polyelectrolyte backbone, charge ratio, and CAMPs utilized to determine an optimal balance between drug protection, release, and activity.

Biography: Jamal Keyes is a physics major at Jackson State University. As a rising junior, Jamal is considering applying to an MD/PhD program following graduation. His main research interests now include drug delivery in both cancer and bacterial infections.

Abstracts and Student Biographies

Alexander W. Magsam **Poster # 3A**
University of Nebraska-Lincoln

Mentors:
Mark Pierce, Ph.D., David I. Shreiber, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Skeletal visualization in rat embryos using optical projection tomography and a novel clearing agent

In Developmental and Reproductive Toxicology (DART) studies, model organisms are commonly used to evaluate the effects of drugs on embryonic development. In these DART studies, one of the first aspects to be analyzed is bone formation and skeletal abnormalities. Current methods for skeletal visualization include digesting the soft tissue using a KOH based solution, or using X-Ray CT to visualize bone through soft tissue. We propose a method that is less time consuming and more cost efficient for visualizing the skeleton of model organisms through the use of optical projection tomography (OPT) and a novel clearing agent. Optical projection tomography is a form of 3D microscopy analogous to X-Ray CT, used to visualize organisms and their anatomy up to several cm3 in volume. The specimen is illuminated using visible, ultra-violet, or near-infrared light and is rotated about a vertical axis while numerous 2D images are taken. These 2D images are then put through mathematical algorithms to reconstruct the specimen in 3D. To view internal structures, however, the object must be essentially transparent. A new clearing agent was used to render the rat embryos transparent, and alizarin red was subsequently used to add contrast to bones for visualization. We then optimized a custom OPT system to visualize the skeleton. We investigated the effect of the illumination parameters on 2D image quality, developed improved 2D image acquisition methods, and assessed the influence of tomographic reconstruction algorithms on 3D image quality. We found that diffuse broadband transillumination to be the most effective illumination mode for skeletal visualization out of the various modes tested. We also determined that high dynamic range (HDR) 2D image processing is excellent at capturing anatomical detail that a single low dynamic range (LDR) 2D image would otherwise miss. Lastly, we found that by using HDR 2D images we could create a more accurate and complete 3D reconstruction.

Biography: Alex Magsam is a rising junior from the University of Nebraska-Lincoln. He is studying biomedical engineering and plans to graduate in December 2018. Currently, he is a part of the REU program in cellular bioengineering at Rutgers University. His research is in biomedical imaging under the supervision of Dr. Pierce, and his project is focused on imaging rat embryos using optical projection tomography paired with a novel clearing agent. After his undergraduate degree, he plans to further his education and pursue a Master's degree or a Ph.D. in biomedical engineering and hopes to work in industry afterwards.

Abstracts and Student Biographies

Kurt F. Wagner **Poster # 3B**
Rowan University

Mentors:
Prakhar Mishra, Daniel Martin
Department of Biomedical Engineering

Prabhas Moghe, Ph.D,
Department of Biomedical Engineering, Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Influencing Mesenchymal Stem Cell Differentiation Through Substrate Topography

Interactions of a cell with its microenviroment influence its morphology and complex phenotypic functions. These interactions can range from soluble growth factors to physical properties and forces affecting a cell. Though growth factors are commonly used in vitro, mechanical cues from the microenvironment have shown potential in regenerative medicine. Scaffold and substrate features can be designed to present specific mechanical microenvironments to control the differentiation of stem cells. The focus of this study is to investigate the influence of topography on human mesenchymal stem cell (hMSC) differentiation into adipocyte and osteoblast lineages. A range of surfaces and textures were created by applying a coating of two immiscible polymers through spin coating and dip coating, and taking advantage of their different solubilities to remove one of the polymers from the surface. The cells were grown in a 1:1 mixture of osteogenic and adipogenic media, and evaluated after 14 days for osteoblastic and adipocytic differentiation to examine the effect the different topographies had on stem cell fate. Further investigation of novel surfaces will expand and improve the current understanding of the mechanobiological pathways that influence stem cell differentiation.

Biography: Kurt Wagner is a rising Junior at Rowan University, where he is studying Mechanical Engineering and minoring in Biological Sciences. A New Jesey native, he has always been interested in pursuing a career in a STEM field, but recently has found a true interest in advancing medical technology through engineering. This RiSE/REU experience was his first exposure to working in a research lab, an opportunity that supplements regular course work with hands-on experience in biomedical engineering. Kurt is very grateful for the support of his mentors and faculty, and will continue to apply the skills learned this summer in his studies and future careers.

Abstracts and Student Biographies

Caroline M. Wood **Poster # 4A**
The College of New Jersey

Mentors:
Joseph Freeman, Ph.D., Daniel Browe, Tracy Scott, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Optimization of electroactive hydrogel characteristics for use in a composite skeletal muscle scaffold

Traumatic skeletal muscle injuries, tumor ablations, and muscular dystrophies often result in volumetric muscle loss. These types of muscle injury are too severe for natural regeneration processes to repair without leaving scar tissue, limiting the use of the muscle. Tissue engineers have developed biomaterial scaffolds to aid in skeletal muscle regeneration and function, but more research is needed to achieve clinical efficacy. We are developing an "artificial muscle" biodegradable scaffold using electroactive polymers in the form of a cross-linked hydrogel. When exposed to an electric field, the hydrogel actuates and produces contractile force. Our studies have quantified the angular speed of actuation through video analysis of a range of poly(ethylene glycol) diacrylate and acrylic acid concentrations and hydrogel thickness-to-length ratios. Mechanical properties of the same concentrations and thicknesses have been determined by tensile testing of the hydrogels. An optimal peak concentration and thickness maximizing angular speed have been determined. Increasing acrylic acid concentration increases hydrogel mechanical strength but decreases cell viability. Using these results, this scaffold component can be developed to produce the greatest amount of contractile stress while also providing similar mechanical properties to native muscle and supporting cell viability. These properties, with the addition of electrospun conductive nanofibers to the composite scaffold, provide an environment to aid in the proliferation and differentiation of myocytes into aligned myotubes.

Biography: Caroline Wood was born and raised in Pompton Plains, NJ and is a rising senior at The College of New Jersey. After earning her B.S. degree in biomedical engineering this spring, she hopes to further her education in this field by attending graduate school and pursuing a PhD. Caroline has a particular interest in tissue engineering and biomaterials. This summer she had the opportunity to be in the Cellular Bioengineering REU program and work under the guidance of Dr. Joseph Freeman and PhD candidate Daniel Browe in the musculoskeletal tissue regeneration laboratory. Specifically, she worked to develop optimal actuation and mechanical characteristics for the hydrogel to be used in the skeletal muscle scaffold they are developing. With little previous research experience, this opportunity has enabled her to learn and grow academically, and solidify her career goals. She is extremely grateful to have been a part of the program.

Abstracts and Student Biographies

Travis A. Court **Poster # 4B**
Allegheny College

Mentors:
Saurabh Jha, Yssavo Camacho, Kyle Dettman
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

SALT spectroscopy of ASASSN-15lh:
The most luminous supernova, or something else?

In August 2015, ASASSN-15lh was discovered as the most luminous supernova (SN) ever found (Dong et al., 2016), with a light curve showing it to be more than twice as bright as other so-called Super-Luminous Supernovae (SLSN). However, the spectral evolution of the transient is unlike any known supernova. To better understand this object, we have observed ASASSN-15lh with the Southern African Large Telescope (SALT). We obtained spectroscopic data in July 2016 and reduced and calibrated the spectrum for comparison with other supernovae. The new spectrum did not show strong supernova features and was dominated by light from the host galaxy. Subtracting this latest spectrum from earlier observations, we were able to isolate light from the transient in the earlier data, to look for stronger indications of supernova features. However, we still find that ASASSN-15lh does not clearly resemble any known supernova. Either it is unique, or perhaps an alternate explanation is needed. This project has been supported by funding from National Science Foundation grants PHY-1263280 and PHY-1560077.

Biography: Travis Court lives in Ellwood City, a small town overshadowed by much more exciting things to do in western Pennsylvania. He is pursuing a degree in Physics with a minor in Psychology and expects to graduate with a Bachelor of Science from Allegheny College in 2018. This summer he is working with Professor Jha studying exploding stars called supernovae using the Southern African Large Telescope. He hopes to pursue a Ph.D. in astronomy after graduation and then focus on teaching and popularizing science to learners of all ages. Travis enjoys reading, travelling, eating, or an excursion combining all three when possible.

Abstracts and Student Biographies

Grace M. Haza **Poster # 5A**
Indiana University

Mentors:
Grace Haza
Indiana University

Sunil Somalwar
Department of Physics and Astronomy
Rutgers University, The State University of New Jersey

Search for type-III seesaw with multilepton final states by CMS

The Large Hadron Collider (LHC) particle accelerator at CERN in Switzerland collides protons at nearly the speed of light. In data from the CMS detector, there is the possibility of discovering evidence for the Seesaw Mechanism, which could explain the vanishingly small mass of neutrinos. We look for a signal of the Seesaw Mechanism specifically in decay channels which produce at least three leptons (electrons or muons). In order to be able to distinguish the signal of the Seesaw Mechanism from the background (Standard Model) processes, we attempt to define a set of signatures ("channels") where the number of signal events compared to the background events is relatively high. We choose to look for new physics exclusively in multi-lepton events because these events are rarely produced by Standard Model processes.We then optimize the number of signal events compared to background events by selecting candidate events using variables such as the momentum of the leptons produced and the number of jets observed by the detector. After such channel selection, we use a statistical tool on the data which quantifies the hypothesis that the observations favor the presence of Seesaw Mechanism.This optimization process allows us not only to determine the conditions under which we would be most likely to observe the Seesaw Mechanism but also the allowed masses of hypothesized particles in the Mechanism given the amount of collected data. So far progress has been made on improving the ratio of Signal to background and we hope to continue until more possible masses can be excluded or a signal is found in the 2016 data. This project has been supported by funding from National Science Foundation grants PHY-1263280 and PHY-1560077.

Biography: Grace Haza is a rising senior at Indiana University where she is majoring in physics. She expects to graduate in May 2017 and hopes to pursue graduate study in experimental high energy physics.

Abstracts and Student Biographies

Audrey M. Houghton **Poster # 5B**
The University of Montana

Mentors:
Alyson Brooks
Department of Physics and Astronomy
Rutgers University

Interpreting the evolution of bulge growth in progenitors of Milky Way-type galaxies

The *sunrise* package was used to understand how the bulge to total flux ratio of a galaxy changes over time. The *sunrise* package is a Monte Carlo ray-tracing program that is paired with N-body + SPH simulations to generate mock spectra of galaxies that account for galaxy kinematics, include emission lines, and can be convolved with mock telescope filters to mimic real observations. The graphs were then fit, using *Galfit*, and the fit was checked, using a comprehensive IDL code. *Galfit* is a data analysis algorithm that fits 2-D analytic functions to galaxies and point sources directly to digital images. A single galaxy was studied as a function of time in order to understand what processes drive the growth of galaxy bulges. This project has been supported by funding from National Science Foundation grants PHY-1263280 and PHY-1560077.

Biography: Audrey Houghton studies Physics and Astronomy at The University of Montana in Missoula, Montana and plans on graduating May 2017. She began research with Dr. Nate McCrady to discover exoplanets with Project MINERVA in January 2015. The project is partnered with Pennsylvania State University, Harvard University, and The University of New South Wales. This summer, she has been researching with Dr. Alyson Brooks to understand the time evolution of galaxies through simulations. She hopes to attend graduate school for Astrophysics, focusing on observational astronomy with a more refined focus on exoplanets.

Abstracts and Student Biographies

Hannah R. Ihlenfeldt **Poster # 6A**
University of Wisconsin - Platteville

Mentors:
Viacheslav Manichev
Department of Chemistry and Chemical Biology

Torgny Gustafsson, Hao Wang
Department of Physics and Astronomy, and Laboratory for Surface Modification
Institute for Advanced Materials, Devices and Nanotechnology
Rutgers, The State University of New Jersey

Helium Ion Microscopy characterization and analysis of biological structures

The helium ion microscope (HIM) is the latest advancement in ultra-microscopy. Among its advantages are excellent lateral resolution (~0.3 nm), improved depth of field, and the ability to image uncoated insulating materials with high resolution (all compared to existing technology, the Scanning Electron Microscope (SEM)). In HIM, a gas field ion source generates a beam of helium ions that is accelerated and then rastered across the sample surface. The incident ions excite secondary electrons in the sample, which are ejected and collected. The number of secondaries depends on the chemical identity of the surface atoms, so in this way a picture of the sample is obtained. The HIM can also be used for cutting thin samples and to sculpt new nanoscale structures.

An important strength of the HIM is its ability to image biological and insulating samples without needing to coat the sample with an electrically conducting heavy metal (i.e. gold or platinum). In SEM, the metal coating can obscure or distort important surface structures. In HIM, as the incident particle is positively charged, an electron flood gun is easily used to neutralize charging. In this project, we used HIM to produce high-resolution images of coated and uncoated tissue samples of rat retinas and kidneys. A newly discovered drug that promotes tissue regeneration was tested on some of the samples. We found pronounced differences between in the kidneys and retinas of healthy and diseased rats which verify the results of the drug.

Funding for this project was provided by the National Science Foundation grants PHY-1263280 and PHY-1560077.

Biography: Hannah Ihlenfeldt is a rising junior at the University of Wisconsin – Platteville pursuing a B.S. in Engineering Physics with a math minor. Her major is a combination of electrical and mechanical engineering with applied physics, and she plans to do an emphasis in material science. This summer Hannah participated in the Physics REU program and has been working under Dr. Torgny Gustafsson imaging nanostructures with the Zeiss OrionPlus Helium Ion Microscope. After completing her undergraduate degree, Hannah will either pursue a Ph. D. in condensed matter physics or pursue an engineering job. Born and raised near Green Bay, Wisconsin, Hannah enjoys running, spending time with her family and friends, and participating in any outdoor activity. At her home university, she is a member of the Society of Women Engineers, a math tutor, and a mentor for freshman and sophomore women in engineering, math, and science. Hannah also runs for UW-Platteville on the cross country and track teams.

Abstracts and Student Biographies

Peter K. Kim **Poster # 6B**
Vassar College

Mentors:
Sylvie Rangan, Robert A. Bartynski
Department of Physics and Astronomy
Rutgers University

Self-Assembly of Rubrene Thin Films on Noble Metal Surfaces

Over the last two decades, organic semiconductors have been gaining momentum in research and development with potential applications to organic field effect transistors, light-emitting diodes, photovoltaics, and photodetectors. Compared to their conventional inorganic counterparts, organic semiconductors offer many advantages in that they are inexpensive, optically transparent, flexible, unbreakable, and low power consumers. The research presented here studies rubrene (5,6,11,12-tetraphenyltetracene), an organic semiconductor that readily forms single crystals at room temperatures and exhibits impressive hole mobilities of over 20 $cm^2V^{-1}s^{-1}$ when measured in field-effect transistors. Although the formation of single crystals is a well know process, the more practical formation of stable crystalline rubrene grown epitaxially on surfaces is not well understood. This study concerns the fundamentals of the self-assembly of rubrene in thin films grown in situ on noble metal surfaces (Au(111) and Ag(100)) mainly through the use of scanning tunneling microscopy (STM) at room temperature in ultra-high vacuum. Although the rubrene/surface interaction is found to be weak and allows for large molecular mobility at room temperature, it is found that rubrene self-assembles into highly ordered monolayers, with a packing geometry dependent on the substrate symmetry. Additionally, more stable molecular packing can be obtained by annealing the surface to mild temperatures. Along with reconstruction of the underlying substrate, these evident limits to the energetics involved in the self-assembly of rubrene. Models for rubrene adsorption on Au and Ag surfaces will be presented and discussed, taking into account possible conformational effects as well. This project has been supported by funding from National Science Foundation grants PHY-1263280 and PHY-1560077.

Biography: Born in Flushing, NY and raised all along the Hudson River, Peter Kim is a rising senior at Vassar College in Poughkeepsie studying physics and mathematics. Peter has worked various jobs as a research assistant, student tutor, campus safety operator, and TA for lab courses. Throughout the school year, Peter heads a local student run organization, Modern Science, where he helps to bring in speakers and programming that engage students and faculty from various disciplines in the scientific community. This summer, Peter has been researching organic semiconducting materials with Professor Bartynski at Rutgers, where he focused on characterizing and modeling the self-assembly of rubrene on various surfaces. Aside from his academic life, Peter also enjoys playing the violin, hiking, and traveling. Peter plans to pursue a PhD in physics and hopes to go on to a career in academia.

Abstracts and Student Biographies

David R. Last **Poster # 7A**
Carnegie Mellon University

Mentors:
Abhijith Gandrakota, Ian Graham, Eva Halkiadakis, and Amitabh Lath
Department of Physics
Rutgers University

Finding bottom quarks with the CMS detector at the LHC

Theoretical models for "new physics" (physics beyond the standard model) predict that new particles will often decay to hadrons containing bottom (b) quarks. The CMS (Compact Muon Solenoid) detector at CERN is one of four detectors collecting data from the proton-proton collisions produced by the LHC (Large Hadron Collider). Data collected in 2015 and beyond (Run II) was for collisions of 13 TeV center-of-mass energy. A subset of this data, known as the Scouting dataset, allows for "new physics" searches in lower mass regions than are capable in the primary data. In the analysis of this specialized dataset, it is imperative that we are able to accurately identify when a group of particles that are spatially near to each other, known as a jet, comes from hadrons containing b quarks (b-jet). In this study, we examine the ability of the CSV (combined secondary vertex) variable in the Scouting dataset to identify when a jet is a b-jet. The CSV variable has a value between 0 and 1 where 1 indicates an increased likelihood that the jet came from a hadron containing a b quark. By isolating events through cuts on the data where we can identify that a top quark was produced, we identify b-jets without cutting on CSV which allows us to compare to Monte Carlo simulation of top decays to understand how efficient the variable is at identifying b-jets. This project has been supported by funding from National Science Foundation grants PHY-1263280 and PHY-1560077.

Biography: David Last is a senior attending Carnegie Mellon University in Pittsburgh, Pennsylvania who expects to graduate with a Bachelor's of Science and Arts in Physics and Music Composition at the end of the Spring 2017 semester. For the past year and a half at his home institution he has worked with Prof. Roy Briere on the BelleII high energy experiment studying charm fragmentation in Monte Carlo simulations in preparation for the beginning of data collection in 2017. This summer he has worked with Professors Amitbah Lath and Eva Halkiadakis on an efficiency study in CMS data. He expects to continue in the field of high energy physics as he pursues a PhD after graduation.

Abstracts and Student Biographies

Manuel J. Perez **Poster # 7B**
University of Redlands

Mentors:
Andrew J. Baker, John F. Wu
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Characterizing and cataloguing star-forming galaxies in preparation for the LADUMA survey

Looking At the Distant Universe with the MeerKAT Array (LADUMA) is a survey that will probe the cosmic evolution of neutral hydrogen (HI) with the 64-dish MeerKAT radio telescope array in South Africa. The survey's HI data will be used to study relationships like the Tully-Fisher relation, galaxy evolution, various mass functions, and other intrinsic properties of galaxies as a function of redshift. An essential component of this research will rely on previous catalogs of star-forming galaxies in the Extended Chandra Deep Field South (ECDFS) in relation to star-formation rates (SFRs), various metallicity diagnostics (such as R_23), stellar color excesses, and redshifts. In this work, we process, characterize, and catalog the optical spectra of ~ 1,500 star-forming galaxies located in the ECDFS, which will be used for stacking experiments by the LADUMA team. An automated pipeline calculates the intrinsic flux densities of the optical spectra by first using fitting routines that calculate the flux from any nebular emission/absorption line profile. The pipeline then uses Balmer decrements (i.e., Hα-to-Hβ ratios) to determine extinction corrections and SFRs, while additional emission line profiles are used in various metallicity diagnostics. The pipeline ultimately provides a visualization of the objects and their intrinsic properties as related to redshift for future analysis by the LADUMA team. This project has been supported by funding from National Science Foundation grants PHY-1263280 and PHY-1560077.

Biography: Manuel J. Perez III is a quadruple major studying towards a Bachelor of Science in Physics and Mathematics, with a double minor in Astronomy and Computer Science, as well as a Bachelor of Music in Saxophone Performance and Composition. He attends the University of Redlands, a small, private liberal arts college in southern California. Primary research interests include galaxy evolution pertaining to gas content, computational astrophysics, active galactic nuclei, and acoustics and their relationship to technology.

Abstracts and Student Biographies

Michael I. Quinonez **Poster # 8A**
Central Connecticut State University

Mentors:
Mr. Arun Kingan and Larry Zamick, Ph.D.
Department of Physics and Astronomy
Rutgers University

Selected topics on isospin in nuclei

The strong nuclear interactions are charge independent. If we limit nucleon-nucleon interactions to these strong interactions, we have the isospin T as a good quantum number. We consider the lack of level repulsion of states of different isospin and how this effect manifests in nearest neighbor spacing (NNS) histograms, which provide a visual and statistical context in which to study distributions of energy level spacings. In particular, we study nucleons in the f-p model space for the nucleus ^{44}Ti. We then consider isoscalar and isovector J=1 states in ^{48}Cr and compare their transitions to lower J=0 and 2 states with the goal of observing selection rules.

Biography: Michael Quinonez is from Wallingford, Connecticut, and currently attends Central Connecticut State University as a physics major and mathematics minor. He plans to pursue a Ph.D in physics, and is interested primarily in theoretical nuclear and gravitational physics. This is reflected in his nuclear theory work with Dr. Larry Zamick at Rutgers University on studies involving effects of the isospin quantum number on energy level distributions and multipole transitions rates, as well as his celestial mechanics work with Dr. Oscar Perdomo at Central Connecticut State University on the stability of periodic solutions to the relativistic restricted 3-body problem. Michael has also conducted research in variable star astronomy at his home institution, under the supervision of Dr. Kristine Larsen, which involved the classification of semiregular variables. Outside of an academic context, Michael enjoys his free time through musical and artistic media as a guitarist, bassist, vocalist, and illustrator.

Abstracts and Student Biographies

Jaclyn Schillinger **Poster # 8B**
The University of Alabama, Tuscaloosa

Collaborating Undergraduate:
William Cheng

Mentors:
Girsh Blumberg, Brian Dennis, Hsiang-Hsi Kung, Shangfei Wu, and Alexander Lee
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Imaging of doped iron pnictides across a structural phase transition

The emergent anisotropy of a doped iron pnictide ($Ba(Fe_{0.987}Au_{0.012})_2As_2$) sample through a structural phase transition was detected using polarized laser light microscopy. $BaFe_2As_2$'s tetragonal structure distorts to an orthorhombic arrangement at low temperatures, a process which results in the formation of structural domains that can be observed as stripes across the sample. For undoped pnictides the structural phase transition temperature, TS, coincides with the Nèel temperature, TN, at which a magnetic phase transition occurs; however, in doped samples TS and TN split, for example for $Ba(Fe_{0.978}Au_{0.012})_2As_2$, to T_S =108 K while T_N =100 K. This experiment aims to study the emergence of these domains as the sample is cooled across phase transitions using a liquid He cryostat. The laser light source was defocused in such a way that it exited the objective lens as a nearly collimated beam in order to illuminate a wider area of the sample, and it was found that the stripes were most apparent using fully crossed polarizers. The images were analyzed by aligning and averaging groups of images taken at a single temperature and location on the sample as a method of reducing noise, by taking the difference of the images above and below T_S to isolate the stripes from the background, and by using Fourier transformations and comparing them to those of simulated striped patterns. This project has been supported by funding from National Science Foundation grants PHY-1263280, PHY-1560077, and DMR-1104884.

Biography: Jaclyn Schillinger is a rising senior at the University of Alabama, Tuscaloosa majoring in physics with minors in electrical engineering and studio art. She just finished a term as president of UA's Society of Physics Students chapter. This summer she worked in Dr. Girsh Blumberg's lab on imaging iron pnictide samples, and at her home institution she participates in research on micromagnetics with Dr. Claudia Mewes. She is considering graduate school in electrical engineering, among other options.

Abstracts and Student Biographies

Raheel Ahmad **Poster # 9A**
Rutgers University

Mentors:
John Westbrook, Monica Sekharan, Marina Zhuravleva, Luigi DiCostanzo, Yuhe Liang

Enrichment of Small Molecule Representation in the Protein Data Bank

The RCSB Protein Data Bank (RCSB PDB; rcsb.org) provides access to the Protein Data Bank archive—the single worldwide repository for three-dimensional, experimentally determined protein and nucleic acid-containing structures. It houses over 120,000 biomolecules with about 21,000 unique bound ligands. Currently, ligand entries in the PDB provide only basic identification information on their web pages, e.g. molecular formula or InChI string. To enrich the information represented on web pages of ligand entries and provide direct access to relevant compound data to users, we used multiple computer science techniques, implementing web service Application Programming Interfaces (API's). We used the python programming language to request information from these API's using Stereo-SMILES search inputs, validated by SMILES and InchiKey, from the PDB chemical component dictionary. We produced a data structure of enriched ligand definitions, holding information for 10 additional categories. This data structure has been used to map the data onto the web pages for ligand entries in order to provide improved searching and reporting protocols for users. In addition, the complementary data adds large value to scientist investigators using the PDB web resource, especially in the biological role, relevance to disease, and biochemical properties of the ligands.

The RCSB PDB is funded by a grant (DBI-1338415) from the National Science Foundation, the National Institutes of Health, and the US Department of Energy.

Biography: Raheel is currently pursuing a degree in Molecular Biology and Biochemistry and expects to graduate in Spring 2018 with a Bachelor of Arts from Rutgers University. In future, he wants to pursue an MD/PhD degree, leading to a research driven career. Raheel has expressed his excitement and to be participating in the RiSE program during the summer of 2016. At present, he is working in the RCSB Protein Data Bank. During the school year, he works in the Department of Chemistry and Chemical Biology, synthesizing drug compounds against malaria. In conjunction with his research work, Raheel enjoys fishing and boating in his free time. Recently he has decided to join the Rutgers Sailing Team in Fall of 2016.

Abstracts and Student Biographies

Pamela Amechi **Poster # 9B**
University of Maryland, Baltimore County

Mentors:
Christine Zardecki
Stephen Burley, MD., D.Phil
Monica Sekharan, PhD
Yuhe Liang, PhD

Enhancing ligands in the Protein Data Bank

The Protein Data Bank (PDB) is a digital resource for sharing three-dimensional macromolecule structures such as proteins, nucleic acids, and carbohydrates. It provides access to more than 120,000 structures with 21,000 of those entries complexed with small molecules. Biologists, software developers, computational and other scientists, as well as students utilize the PDB. Our goal is to expand the information on the 21,000 small molecules presented in the PDB so users will have direct access to more information. We used computer programming tools such as Python to access other small molecule databases and retrieve important information such as metabolism, toxicity, solubility, shape/appearance, biological role, compound source, chemical properties, FDA approval, mechanism of action, and half-life. The enriched ligand definitions in the PDB's chemical component dictionary will be implemented to enable better searching and reporting. In addition, we created a new article about the Tenofovir metabolic pathway. Here we present examples of the enriched definitions, describe the Tenofovir metabolism pathway, and examine the ligands involved in the Tenofovir pathway in detail.

Biography: I am a rising senior pursing a B.A. in biology at the University of Maryland, Baltimore County. My plan after graduating is to go to medical school. Currently, I am a research assistant in Dr. Danielle Beatty's psychology lab. The lab investigates psychological and social correlates of racial/ethnic disparities in cardiovascular disease risk. Aside from research, I am a dancer on the African Student Association Bumaye Dance team and will be a tutor for cellular biology in the upcoming fall semester. This summer, as a member of the Research in Science and Engineering (RiSE) Program, I am working at the Research Collaboratory for Structural Bioinformatics (RCSB) Protein Data Bank (PDB) under the mentorship of Christine Zardecki. My project is to gather information from various databases in order to enrich the data representation of the small molecules in the PDB so that users will be provided a better experience.

Abstracts and Student Biographies

Donna K. Brunnquell **Poster # 10A**
Grinnell College

Mentors:
Benjamin R. Lintner, Ph.D.
Department of Environmental Sciences
Rutgers, The State University of New Jersey

Examination of climate model precipitation over the Amazon using linear unidimensional scaling

Future climate projections for the Amazon are important for both the scientific community and policy makers due to the Amazon's tremendous influence on global climate and human and natural systems. Climate model analysis and evaluation are essential for both developing understanding of climate processes and improving climate prediction. Cluster analysis, Empirical Orthogonal Function (EOF) analysis, and Self-Organizing Maps are among the previously explored methods for assessing climate models. This project investigates the applicability of another method, Linear Unidimensional Scaling (LUS), to climate model evaluation. Given a set of objects, LUS arranges them along a single dimension based on a similarity measure between pairs of objects, with more similar objects placed closer along the scaling axis. This study applies LUS to maps of monthly precipitation climatology over the Amazon basin for 28 atmospheric model simulations from Phase 5 of the Coupled Model Intercomparison Project (CMIP5). Our analysis indicates similar rankings of the models across months within the same season. Although a statistically strong relationship between the LUS ordering of models and the domain average rainfall suggests that systematic differences impacting areal-mean rainfall influence model orderings, differences in the spatial distribution of rainfall within the domain nevertheless impact the model ordering. Furthermore, we also illustrate that the LUS is relatively insensitive to the inclusion of an observational target, so that it can be used as tool in evaluating the "goodness" of models. These results demonstrate the utility of LUS in comparing behavior across ensembles of climate models.

Biography: Donna Brunnquell currently attends Grinnell College in "the middle of nowhere," Iowa and expects to graduate in May 2017 with a Bachelor's Degree in Mathematics and Art History. Although she attends school in the Midwest, she is quite fond of her hometown, Washington Crossing, Pennsylvania. She had the good fortune of engaging in research for the first time this summer through the RiSE program and is incredibly grateful for the valuable, rewarding, and insightful opportunity to work in the Environmental Sciences department with Dr. Lintner. She aspires to use math in a meaningful way and to pursue a graduate degree in Applied Mathematics or a related field. She believes her unconventional joint study of Math and Art History is merely a reflection of her widespread medley of interests, including horsemanship, veganism, editing and publication, and painting.

Abstracts and Student Biographies

Dean A Coco **Poster # 10B**
California State Polytechnic University, Pomona

Mentors:
Anand D. Sarwate, Ph.D
Department of Electrical and Computer Engineering
Rutgers, The State University of New Jersey

Allocating privacy risk across multiple stages of a machine learning pipeline

Machine learning algorithms use statistical patterns from training data to build models or predictors that are useful for analyzing future inputs. With their increasing involvement in everyday applications, the concern for privacy when learning from private sensitive data has become a popular research topic. There have been previous cases where the lack of privacy protections allowed the de-anonymization of individual records from a data set. Differentially private algorithms quantify the privacy risk from publishing an output parameter, often called ε. Algorithms that guarantee differential privacy aim to learn from a collection of records while protecting the information of individual records from an adversary who can observe the output of the algorithm. This study aims to understand the privacy and utility tradeoff in a typical pipelined analysis for learning a classifier. The focus is on a binary classification machine learning algorithm with a two stage pipeline analysis. The stages, Principal Component Analysis (PCA) and Support Vector Machine (SVM), will be implemented in a differentially private version. Each stage will contribute to a loss of accuracy related to the randomized mechanism used to apply differential privacy. The differentially private pipeline analysis will be benchmarked for a range of εtotal cost, and with different splits of this total privacy risk across the two stages. These outputs will be compared to the output of a non-differentially private version to determine which stage costs the system the most accuracy and how to best allocate privacy risk across the two stages. Preliminary results indicate that the majority of the privacy should be spent on the dimension reduction stage.

Biography: From Baldwin Park, California, Dean Coco is a rising senior at California State Polytechnic University, Pomona. He is working towards a double major for B.S. Electrical and Computer engineering. This summer Dean has had the opportunity to work in Dr. Sarwate's lab with his peer mentor Hafiz Imtiaz, researching the application of differential privacy in machine learning algorithms. He has developed new techniques and skills to use moving forward, including the use of clusters for simulation. While at Cal Poly Pomona, he has done research in the application of computer vision for hazard detection in high-power rockets. Dean plans to receive a Ph.D. for computer engineering in the field of artificial intelligence and/or cyber security. He aspires to contribute to the development of AI and its integration in everyday life. His short term goals include applying for graduate studies in and out of the state of California. Some long term goals include promoting STEM and graduate education in his community.

Abstracts and Student Biographies

Alvin A. Crespo **Poster # 11A**
University of Puerto Rico- Mayagüez Campus

Mentors:
Siobain Duffy, Ph.D., Mansha Seth-Pasricha, Ph.D.
Department of Ecology, Evolution and Natural Resources
Rutgers, The State University of New Jersey

Analyzing the mutational spectrum of RNA bacteriophage Φ6 host-range mutants

RNA viruses, like Zika and Ebola, are fast-evolving pathogens that infect all known forms of life. Consequently, the study of how RNA viruses mutate to adapt to new hosts, or host-range mutations, is of particular importance to understand disease emergence and epidemiology in humans. Bacteriophage Φ6, pathogen to bacterial host *Pseudomonas syringae*, is a model system commonly used to study RNA virus evolution. It has been suggested that current genotypes may trap this virus in local adaptive peaks that constrain its evolution. Therefore, studying the number of different, successful host-range mutations that occur in viral genes after an initial host-range expansion may help in the prediction of disease outbreaks in human populations. For this study, we focused on the mutational spectrum of Φ6 mutant T10, whose mutation allows infection of host *Pseudomonas syringae* pv. *tomato* (PT). We exposed T10 to non-permissive novel host *Pseudomonas syringae* pv. *atrofaciens* (PA) to generate spontaneous mutants capable of infecting it. The P3 host-attachment gene, previously associated with all known host-range mutations, was sequenced and analyzed for thirty T10-mutants. Results revealed that one single amino acid substitution occurred in all of the mutants, suggesting it is the key host–range mutation in this T10 virus-host interaction. In contrast, previous experiments showed that direct exposure of Φ6 to novel host PA yielded a variety of host-range mutations. Thus, adapting into a new host seems to effectively reduce the mutational spectrum and evolution of the virus. Future studies will compare the fitness of T10-mutants to T10 in shared host PT to further understand the role of these mutations in RNA viral evolution.

Biography: Alvin Crespo was born and raised in the East Coast of the island of Puerto Rico. He is a rising senior at the University of Puerto Rico- Mayagüez Campus, majoring in Biology. For the past two years, he has done research in anaerobic microbiology in his home institution, focusing on the symbiotic relationship between syntrophic bacteria and hydrogenotrophic archaea. Alvin is a current MARC Scholar and will pursue a Ph.D. in the biological sciences once he graduates. He hopes to become a college professor. For the summer, he had the pleasure of working in Dr. Siobain Duffy's lab researching host-range mutations in RNA viruses. He learned many things in lab including new skills and microbiology techniques, and gained better understanding of the scientific method.

Abstracts and Student Biographies

Keyerra C. Daniels **Poster # 11B**
Winthrop University

Mentors:
Stephen Burley, M.D., D.Phil, Luigi Di Costanzo, Ph.D., Yuhe Liang, Ph.D., Monica Sekharan, Ph.D., Christine Zardecki, Marina Zhuravleva, Ph.D.
Center for Integrative Proteomics Research
Rutgers, The State University of New Jersey

Bringing biological pathways to life

The Protein Data Bank (PDB) is a resource that provides access to three-dimensional structures of more than 120,000 biological macromolecules such as proteins, nucleic acids and complex assemblies of macromolecules. PDB enables researchers to better understand molecular function while advancing biomedical research. Among these macromolecular complexes, 21,000 are small molecules that are bound to proteins or nucleic acids. In response to research progression, the PDB is constantly evolving to better meet the needs of the scientific community. For example, small molecule information currently in the PDB is limited to information such as molecular weight and chemical identifiers. To enhance user experience additional information about small molecules in the PDB would be beneficial. In order to accomplish this, we identified information that currently is not available to PDB users. At the Research Collaboratory for Structural Bioinformatics (RCSB) PDB resource, we explored new relevant topics, such as metabolism, pathways, and toxicity. We reviewed several public databases such as PubChem, ChemSpider, and SMPDB and determined that in addition to showing users biological assemblies of proteins, we can also provide biological pathways for proteins that are in the PDB. After analyzing many different pathways for the RCSB PDB website, we investigated the Paclitaxel pathway in detail with the goal of visualizing this pathway in a three dimensional context. Some proteins in this pathway have structures in the PDB, but most do not have experimental structures in the PDB. To create a 3D representation of these molecules, we utilized homology modeling and were able to further our understanding of the protein. These aspects are part of a broader long-term goal to enhance the RCSB PDB resource so that the most useful information is available to researchers through our site.

Biography: Keyerra was born in Florence, South Carolina and raised in Houston, Texas. She is a rising junior pursuing a B.S. in Biochemistry as well as a minor in Spanish, Math, Biology, and Physics at Winthrop University with expectations of graduating in May 2017. At Winthrop, she is a member of the Honors Program, Winthrop ambassadors, Student Affiliates of the American Chemical Society, Club Med, and is a peer tutor to students with disabilities. In her free time, Keyerra enjoys hiking, exercising, kayaking, and playing sports. She plans on continuing her research looking at the binding sites of the protein Nur with Dr. Nick Grossoehme at her home institution in the Fall. After graduation, she plans to attend a MD/PhD program. This summer, she is working with the RCSB Protein Data Bank.

Abstracts and Student Biographies

Katya Echazarreta **Poster # 12A**
Univeristy of California Los Angeles

Mentors:
Thomas Papathomas, PhD.
Center for Cognitive Science and Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Attila Farkas, PhD.
Center for Cognitive Science
Rutgers, The State University of New Jersey

Top-down and Sensory Processes in Volitionally Reversing Depth of Painted and Unpainted Stimuli

Top-down influences and bottom-up signals determine how the brain perceives the world . Top-down influences are schema-driven (our experiences, knowledge of the world, and memory) while bottom-up, data-driven signals are based on sensory signals (color, scale, depth, motion). Visual illusions such as the hollow mask illusion (where a hollow mask appears convex) and the art of reverspectives (where far points appear to be nearer) are tools we can use to analyze our perception processes since they each offer opposing visual renditions. Previous studies show a link between the perception of visual illusions and patients suffering from schizophrenia, making an understanding of top-down and bottom-up vital. We can identify the illusions for which the schema-driven process dominates bottom up, and employ them to analyze the relationships between illness severity and illusion perception. We used 12 stimuli to analyze whether paint and depth affect a person's ability to reverse the depth of objects (e.g. from convex to concave). Given one minute, the observer attempted to reverse the depth of the object- and the time was recorded if successful. Failure was also recorded. We aim to assess how bottom-up signals affect the ability of naïve participants to use their will to reverse the depth of proper and reverse perspective objects, as well as convex and concave masks (painted and unpainted). This enables us to analyze the effect of paint on stimulus. Our results indicate that it is difficult to reverse the depth of convex masks. With concave masks, the painted features make it easier to reverse depth because of our familiarity with faces. For painted scenes, the proper perspective is nearly impossible to reverse because both bottom-up and top-down influences favor the true depth. On the contrary, the painted reverse perspective is very easy to reverse because of our familiarity with perspective cues.

Biography: Katya Echazarreta is an Electrical Engineering major currently studying at UCLA and recipient of the university's Regents Scholarship which is considered the most prestigious scholarship of the university and the highest honor the Board of Regents can bestow. She is also the recipient of the Jack Kent Cooke Undergraduate Scholarship which covers up to 40 thousand dollars a year and includes a potential fellowship for graduate education. She is a Phi Theta Kappa Honor Society member and has previously served as vice-president of the Society of Women Engineers, a mentor with the Price Scholarship Program, First Year Experience program, and the MESA (Math, Engineering, Science Achievement) program at San Diego City College. This summer, Katya is especially grateful for the opportunity to conduct research at Rutgers University in the RiSE (Research in Science and Engineering) Program for which she has received a New Jersey Space Grant funded through NASA. On the dean’s list with a 3.88 GPA, Katya plans to obtain a PhD in engineering physics and seeks a position at either NASA or NASA’s Jet Propulsion Laboratory.

Abstracts and Student Biographies

German Lagunas-Robles **Poster # 12B**
California State Polytechnic University, Pomona

Mentors:
Siobain Duffy, Mansha Seth-Pasricha Ph. D.
Department of Ecology, Evolution, and Natural Resources
Rutgers, The State University of New Jersey

Implications of Codon Evolvability on RNA Virus Genome Structure

Single-stranded RNA viruses use their genomic nucleotides for more than encoding proteins, the genomes fold into complex secondary structures that match nucleotide sequences into stem/loop structures. Evolvability of stem regions is lower than in unpaired loops because of the need to continue complementing nucleotides. In fact, others have demonstrated this in stems of the HIV genome, and when a mutation persists in a stem region. The complementing base in the stem also mutates to continue the base pairing. Pairing nucleotides' codon positions may therefore affect the evolvability of genes that contain stem secondary structures: it will be easier for a mutation in a 1st or 2nd position to persist in a stem if it is paired to a flexible "wobble" 3rd position than if it is paired to another 1st or 2nd position, which would require another amino acid change to stabilize the first mutation. In stems of frequently changing viral proteins that are highly evolvable, we expect to see 1-3 and 2-3 base bonding – a reduction in 3-3 bonds to easily allow more amino acid changes in one part of the gene without requiring additional changes elsewhere. We expect that conserved proteins and conserved regions of proteins will have higher 3-3 bonding, which will help reduce the likelihood amino acid changes in stems. We used experimentally solved RNA genomic secondary structure sequences of Satellite Tobacco Mosaic Virus to determine the amount of 3-1 paired, 3-2 paired, 3-3 paired, and non-paired nucleotides in coding regions without overlapping genes. Our results show statistical differences when comparing 3-3 in the secondary structures.

Biography: German Lagunas-Robles is a rising senior Biotechnology major at California State Polytechnic University, Pomona. He is a member of the 2015 class of Presidents Commission Scholars, the Ronald E. McNair Scholars Program, and the New Jersey Space Grant Consortium. He is grateful for the opportunity to be a part of the summer RiSE program at Rutgers. He has the great pleasure of working in the Duffy Lab with Dr. Siobain Duffy and– Dr. Mansha Seth-Pasricha. He plans to continue his education by obtaining a Ph.D. and intends to pursue a career in academia. German would like nothing more than to be able to return to Cal Poly Pomona and be a mentor to future scientists.

Abstracts and Student Biographies

Bryan Gutierrez **Poster # 13A**
Pacific Lutheran University

Mentors:
Patrick Sinko, Ph.D, Zoltan Szekely, Ph.D, Kristia A. Rivera
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Fabrication and Evaluation of Camptothecin Prodrug-loaded Microparticles.

Camptothecin (CPT) is a highly potent drug against cancer cells that failed clinical trials due to high toxicity and poor solubility. This makes it an excellent candidate for chemical modifications/formulation in order to improve its physico-chemical properties. Our experimental method involved the synthesis of several prodrugs of CTP and then loaded them into gelatin microparticles. The fabrications of gelatin microparticles (MPs) were loaded with different CPT prodrugs, utilizing the water-in-oil emulsification technique. Several batches of microparticles were prepared, characterized and tested for drug release. We ran in vitro hydrolysis studies using three sodium phosphate buffers with pH values 6.6, 7.0, 7.4 (representative pH of tumor, lung, and physiological/extracellular matrix) and monitored by LC/MS. The release profile was done through a calibration curve and taking the data from under the curve to calculate drug release over time. The results showed that CPT release rate and amount was faster at higher pH. In addition, a higher degree of crosslinking (higher volume of glutaraldehyde) allowed more of CPT to be released in the phosphate buffer.

Biography: Bryan Gutierrez was born and raised in Tacoma, Washington. He expects to graduate from Pacific Lutheran University (PLU) in May of 2017 with a Bachelor of Science in Chemistry with a minor in Biology and Mathematics. After graduation, his future goals include obtaining a Ph.D. and engaging in chemical research at the graduate and industrial levels. He plans to pursue a career as a synthetic organic chemist in the pharmaceutical industry. He is most interested in compounds that can be used as controlled release of monomers from drug polymer conjugates which are triggered in the body by heat or water stimulus. Last summer of 2015, he performed research in Dr. Neal Yakelis' lab at PLU where he conducted multiple synthetic organic chemistry experiments. He worked with his professor and two others doing hetero-Diels-Alder reactions. This summer, he is working at the Ernest Mario School of Pharmacy at Rutgers University with Drs. Patrick Sinko and Zoltan Szekely. Bryan is collaborating with a graduate student on the fabrication, and associated release studies, of camptothecin prodrug-loaded microparticles. Outside of academics, Bryan loves playing video games and he is a proud member of the Asian Pacific Islander and Chemistry Clubs at PLU. He is very grateful to be a part of the RiSE/REU program because it has provided him with the amazing opportunity to do research on drug delivery, a special interest in his career.

Abstracts and Student Biographies

Kelsey M. Gwynne **Poster # 13B**
Wagner College

Mentors:
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Department of Materials Science and Engineering
Rutgers, The State University of New Jersey

Deirdre O'Carroll, Ph.D.
Department of Materials Science and Engineering, Department of Chemistry and Chemical Biology, and Institute for Advanced Materials, Devices and Nanotechnology
Rutgers, The State University of New Jersey

Photoluminescence stability of blue organic phosphorescent materials on silver nanostructured surfaces

Emerging flat panel display technologies, such as televisions and handheld electronics, use phosphorescent organic light-emitting devices (Ph-OLEDs) because they are thinner, flexible, and less pixelated than inorganic OLEDs. However, due to instabilities caused by triplet-quenching processes, blue organic phosphorescent materials in Ph-OLEDs are currently substituted with blue organic fluorescent materials, which increases the device's energy consumption. Phosphorescent materials require less energy to generate light than fluorescent materials, and have a theoretical potential to achieve three times higher internal quantum efficiency. While various researchers are exploring ways to increase the stability of blue organic phosphorescent materials through altering and creating new hosts, and new host and dopant mixtures, this study aims to investigate an alternative approach that uses the optical properties of silver nanostructures combined with the organic phosphorescent emissive layer. The emissive layer consists of the blue organic phosphorescent dopant, bis[2-(4,6-difluorophenyl)pyridinato-C^2,N](picolinato)iridium(III) (FIrpic) and an organic conjugated polymer host, poly(N-vinylcarbazole) (PVK). The impact of combining silver nanostructures with the emissive layer is tested using UV/Visible absorption spectroscopy and photoluminescence spectroscopy. It is anticipated that adding silver nanostructures to the emissive layer will increase both emissive layer stability and light extraction efficiency. Demonstration of high-stability blue organic phosphorescent materials would eliminate the need for lower efficiency (but stable) blue organic fluorescent materials in OLEDs and minimize the energy usage of emerging flat panel displays.

Biography: Kelsey Gwynne is from Glen Mills, PA. She is a senior Chemistry major with Physics and Anthropology minors at Wagner College. She is passionate about the environment and sustainability. Kelsey plans on pursuing a PhD after she graduates this spring. She is very grateful for RiSE, Dr. O'Carroll, and Catrice Carter for giving her an unforgettable experience, for teaching her in and outside the lab, and for helping her focus her future career goals.

Abstracts and Student Biographies

Jessica Johnson **Poster # 14A**
Hunter College, City University of New York

Mentors:
Jessica Johnson, Jieun Yang, Professor Manish Chhowalla
Nano-Materials and Devices Group
Material Science and Engineering Department
Rutgers, The State University of New Jersey

Proton conductivity in re-stacked graphene oxide with embedded graphene oxide fibers

There is both a need and growing market for more efficient energy devices as we struggle to simultaneously meet the energy demands of emerging economies and reduce energy consumption. Fuel cells use hydrogen gas instead of fossil fuels making them a possible alternative energy device. However, several hurdles remain before fuel cells can be used in mass. The high cost and permeability of Nafion® is one such hurdle. Nafion® is the most common material used as an electrolytic membrane, a constituent component of proton exchange membrane (PEM) fuel cells. The electrically insulating material graphene oxide (GO) may be a more desirable membrane for its cheaper cost, greater impermeability, and greater proton conductivity compared to Nafion®. The addition of the more tightly compacted GO fibers to re-stacked GO may enhance conductivity by limiting transport to the horizontal plane. Conductance was measured using varying concentrations of KCl, and CaCl2 for both simple GO and GO with embedded strands of GO fibers.

Biography: Jessica Johnson is a rising senior at the City University of New York, Hunter College. Between school, family life, and soon to be 3 year old son, she stays very busy and excited for every day as she finds all her responsibilities a joy. She uses her toddler son's constant curiosity as inspiration for her investigations in the lab.

Abstracts and Student Biographies

Lorne S. Joseph **Poster # 14B**
University of the Virgin Islands

Mentors:
Lorne S. Joseph, Lisa C. Klein, Ph.D.
Department of Materials Science and Engineering
Rutgers, The State University of New Jersey

A novel solution for powering our planet: Comparative study of a novel Titania sol and a Titania powder for the improved efficiency of dye-sensitized solar cells

Over the next 50 years, the world's energy needs are set to double and it is estimated that photovoltaics or solar cells can provide over 90 % of the world's electricity. Photovoltaics based on dye-sensitization of titania (TiO2) electrodes are a renewable, low-cost alternative to conventional solid-state photovoltaic devices. TiO2is an ideal semiconductor for photocatalysis in dye-sensitized solar cells (DSSCs). It lends itself to being an important catalyst due to its nanoparticle size, high photocatalytic activity, low cost and its safe use in the environment. The application method and properties of the photocatalyst considerably contribute to its efficiency. Currently, titania dye-sensitized solar cells have a reported efficiency of 10 % and an increased efficiency would have a profound impact on the contribution of renewable technologies in electricity production. A comparison study of a new titanium dioxide sol (i.e., colloidal solution) and a titanium dioxide powder was performed to determine the difference in efficiency of titania DSSCs. We aimed to determine whether the sol, with its easier handling properties, is an efficient alternative semiconductor in dye-sensitized solar cells compared to the titanium dioxide powder. The dye sensitized TiO2 solar cells were examined using scanning electron microscopy (SEM). Additionally, titania dye-sensitized cells were assembled on fluorine-doped tin oxide (FTO) coated glass, Copper/Gold stained FTO coated glass and the open circuit voltage was measured in various lighting conditions. The open circuit voltage measurements indicate that the output of the DSSCs made from the titania sol is higher than that of the DSSCs made with the powder over time; additionally, the Copper/Gold FTO substrates have an influence on the performance of both the sol and the powder. The sol on a FTO substrate and with the addition of this Copper/Gold coated FTO substrate could potentially contribute to TiO2 DSSCs efficiency.

Biography: Lorne S. Joseph is a rising senior at the University of the Virgin Islands, she is currently pursuing a B.S degree in Chemistry with a concentration in Environmental Science. After graduation, she is interested in pursuing a graduate degree in the areas of Environmental Engineering or Materials Science. In addition to her studies, Lorne is a member of the American Chemical Society and the president of her institutions chapter. She is very active in her community serving as a 4H Youth Mentor, volunteering her time tutoring and working with at risk youth.

Abstracts and Student Biographies

Cora E. Kerber **Poster # 15A**
Transylvania University

Mentors:
Cora Kerber
Transylvania University

Mentors:
Tracy Anthony Ph.D., Ashley Pettit Ph.D.
Department of Nutritional Sciences
Rutgers, The State University of New Jersey

Role of the eIF2 kinase PERK on whole body and hepatic stress responses to dietary methionine restriction

The growing prevalence of diabetes and obesity has prompted studies linking dietary protein intake to overall health. Decreasing the levels of the essential amino acid, methionine (methionine restriction, MR), has been shown to have profound effects on lipid metabolism and energy balance. In order to progress these studies, a greater understanding of the pathways and proteins involved in MR is necessary. Previous studies have shown that MR is sensed and signaled through the integrated stress response (ISR) pathway involving several eukaryotic initiation factor 2 (eIF2) kinases, including: (1) general control non-derepressible 2 (GCN2), a sensor of amino acid deficiency, and (2) PKR-like endoplasmic reticulum (ER) kinase (PERK), an ER stress mediator. We hypothesized that PERK plays an integral role in adapting to amino acid insufficiency during MR at 5 weeks. To address this hypothesis, adult mice expressing PERK (Cre-) or liver specific knockouts of PERK (Cre+) were fed an obesity-promoting diet (60% kcal fat, OD) with sufficient levels of methionine (0.86% kcal met) for one week. Controls then remained on an OD while experimental groups were switched to an obesity-promoting, methionine-restricted diet (60% kcal fat, 0.12% kcal met, MR) for 5 weeks. Results demonstrated Cre- and Cre+ MR groups showing similar increases (~9%) in food consumption despite decreases (~5%) in body weight. OD groups demonstrated no change in food consumption and increases (~8%) in body weight. Additionally, MR groups had ~44% less gonadal fat. Activation of the ISR pathway was monitored via phosphorylation of eIF2 (peIF2) in liver tissue, in which MR groups expressed three times more peIF2 than OD groups. Cre- and Cre+ animals on both diets demonstrated similar responses to wild type and GCN2 knockout mice. These results indicated that while GCN2 is a primary contributor to MR adaptation, PERK is not at the 5-week time point.

Biography: Cora was born and raised in Kentucky, where she is currently a rising senior at Transylvania University in Lexington, Kentucky. She is pursuing a degree in biochemistry with a minor in environmental studies. Outside of academics, she enjoys hiking, cooking, and running for her university's track and cross country teams. This summer Cora has had the pleasure to conduct research in Dr. Tracy Anthony's lab under the guidance of Dr. Ashley Pettit. Cora is currently undecided with regards to post-graduate plans, but is confident that her research experiences through RiSE will help in whichever endeavor she chooses.

Abstracts and Student Biographies

Ferralita S. Madere **Poster # 15B**
Xavier University of Louisiana

Mentors:
Estelle Cervantes
Division of Life Sciences Undergraduate Research Fellowship

Kenneth Irvine
Howard Hughes Medical Institute
Waksman Institute of Microbiology and Department of Molecular Biology and Biochemistry

Cordelia Rauskolb
Waksman Institute of Microbiology
Rutgers, The State University of New Jersey

Comparing the influence of manipulations that preferentially affect apical myosin versus junctional myosin on Jub:GFP localization

Organ growth within the wings of *Drosophila* has been attributed to mechanical forces such as cytoskeletal tension. Myosin has been found to be a source of cytoskeletal tension that causes the localization to adherens junctions of Jub, a negative regulator protein for Warts protein within the Hippo pathway. Yorkie, a transcription factor responsible for organ growth whose function is normally blocked by Warts, has been found to be activated when Jub is localized at adherens junctions . This has been the background for earlier studies stating that myosin activity, the source of cytoskeletal tension, is responsible for the localization of Jub and therefore organ growth within *Drosophila*. This study looks to determine whether junctional myosin or apical-medial myosin are equally or differentially responsible for promoting Jub localization to adherens junctions in *Drosophila* larval wing discs, and growth within this organ. To test this hypothesis we are using the Gal4-UAS system to express transgenes that are expected to preferentially influence junctional myosin, apical-medial myosin, or both and visualizing Jub localization by using Jub:GFP. Experimentation has shown that increasing myosin has no significant effect on Jub localization, while decreasing myosin activity has been seen to decrease Jub localization. This would suggest that decreased cytoskeletal tension may lessen organ growth within *Drosophila*, while increased cytoskeletal tension will not affect organ growth. Due to a homologous interaction between cytoskeletal tension and the Hippo pathway in humans, an understanding of this connection in *Drosophila* can be vital to uncovering the mechanisms behind irregular organ growth seen in cancers and congenital diseases.

Biography: Born and raised in New Orleans, Louisiana, Ferralita Madere is a rising senior at Xavier University of Louisiana. She is pursuing a B.S. in Biology with a minor in Chemistry. Under a faculty mentor at XULA, she has done research in a tissue culture lab studying alternative breast cancer treatments through the use of naturally occurring phytochemicals. In addition to her studies, Ferralita is involved in multiple societies and organizations both on and off campus. She serves as a math tutor fellow to XULA undergraduate students and as a Volunteer leader for YoungLife. After graduation, she plans to pursue a Ph.D. in Virology or Immunology and work as an industry researcher. This summer, she had the pleasure of working in Dr. Kenneth Irvine's laboratory with her mentor, Dr. Cordelia Rauskolb, researching the localization of Jub protein to cellular junctions due to cytoskeletal tension caused by apical-medial and junctional myosin. She has learned to work with the Drosophila model system and many laboratory skills and techniques that will be essential to her future studies.

Abstracts and Student Biographies

Anna K. Orta **Poster # 16A**
University of Texas at El Paso

Mentors:
Ann Robinson
Department of Chemical Biology
Rutgers, the State University of New Jersey

Suzie Chen, PhD
Department of Chemical Biology
Ernest Mario School of Pharmacy
Rutgers, the State University of New Jersey

Investigating brain metastases from primary melanoma using luminescent or fluorescent-tagged melanoma cells

Melanoma is the most dangerous form of skin cancer, with the ability to metastasize to different organs. Previous studies by our laboratory have shown that aberrant expression of a normal neuronal receptor, metabotropic glutamate receptor 1(Grm1), in melanocytes is sufficient to induce spontaneous metastatic melanoma in animal models. In order to study the progression to metastasis, the Chen group created several stable clones from mouse melanocytic cell line melan-a with exogenous Grm1 cDNA. Mass clones form robust tumors in immuno-competent and immuno-compromised mice. Mass20 melanocytes were then tagged with red fluorescent protein (RFP) to track metastasis in the same animal using a small animal imaging system (IVIS). RFP-tagged Mass20 cells were subcutaneously injected in immuno-competent mice leading to the formation of primary tumors. Animals harboring tumors were imaged for RFP, however the IVIS imaging system gave no specific signal from the primary tumors. Primary tumors were excised and assessed for the presence of RFP using western blots. Protein bands at 27kD position confirmed RFP presence in the primary tumors. As a second approach to track metastasis of transformed melanocytes in vivo, we tagged Mass20 cells with the luminescent enzyme luciferase. Unlike RFP, luciferase produces luminescence upon addition of a substrate, luciferone, which permits imaging before and after substrate injection leading to a clearer distinction between specific and non-specific signals. Recombinant plasmid containing the luciferase coding sequences were transformed into competent bacterial cells. We verified successful plasmid isolation through the diagnostic restriction enzyme cuts specific for the plasmid. Luciferase plasmid was used to transfect the Mass20 cells. We selected for successful transfected cells using hygromycin selection. Clones will be isolated and tested for luciferase activity. The presence of the luciferase will allow imaging primary tumors and any distant metastases in the murine model for human melanoma.

Biography: Anna Karen Orta is an undergraduate student majoring in Biochemistry at the University of Texas at El Paso. Since the summer of 2013, Orta has been mentored by Dr. Keith Pannell and Dr. Ricardo Bernal. Through an NSF scholarship, Orta began her research on chaperonin phiEL, the first known virally encoded chaperonin. Orta was then admitted into the MARC program which allowed her to begin her project on the characterization of heat-shock protein HSP27. During the summer of 2016, Orta had the opportunity to work under Dr. Suzie Chen and graduate student Ann Robinson in the department of Chemical Biology at Rutgers University through the RiSE Program. They were able to generate luminescent murine melanocytes to investigate brain metastasis derived by primary melanoma. This summer experience fueled a new interest in cancer research and has inspired Orta to pursue a career in research through a PhD.

Abstracts and Student Biographies

Jade B. Redding **Poster # 16B**
University of Miami

Mentors:
Xiaoli Bai, Ph.D. and Haym Benaroya, Ph.D.
Department of Mechanical & Aerospace Engineering
Rutgers, The State University of New Jersey

Modeling, estimation, and control of a quadrotor

Quadrotors have found applications in various areas ranging from the military to traffic surveillance. A quadrotor is a multi-rotor helicopter that is lifted and propelled by four individual rotors attached to a rigid cross airframe. Quadrotors are mostly operated using programmed remote controllers but studies suggests that computer models can be developed to provide a more precise system to stabilize the quadrotor, as well as eliminate drifting. We designed and completed a series of experiments to obtain all the required parameters of the equations that govern the quadrotor. There are four channels required for control of the quadrotor. Channel 1-4, U_1-U_4, are mapped by equations. However, these equations are too broad for our quadrotor's real system. We need to rewrite the equation in terms more specific to our real system. Since we know the output force and the set of control values, we can generate a relationship between the two to control the speed of the rotors. Only one rotor has to be investigated since all four rotors are of the same mass. Our strategy involved experimenting with one rotor to calculate the output RPM (Ω) for each PWM (u) values ranging from 0 to 1000 at a rate of 5 Hz or 0.2 seconds. The PWM values are the pulse width modulation, and we call them control values. RPM represents the revolutions per minute or the real motor speed. We used graphs to analyze and observe the relationship. The relationship between the control values and the real motor speed is defined as $\Omega=ku+p$, where k is the slope and p is the y-intercept of the line of best fit. By knowing this relationship between these input PWM values and output RPM, we are able to rewrite in terms of u for a more specific system for our quadrotor.

Biography: Jade B. Redding was born and raised in Montezuma, Georgia. Jade is a junior majoring in Applied Analysis with a minor in Physics at the University of Miami. She anticipates to graduate with a B.S. in December 2017. This summer, Jade is working with Dr. Bai on developing a computer model for a quadrotor. She's also working with Dr. Benaroya on lunar structures. Jade has been extremely grateful for the opportunity to participate in this year's RISE program. While planning to enroll in graduate school upon graduating, Jade is confident that her experience here will give her better insights on various research fields, as well as a firsthand look at the graduate school experience.

Abstracts and Student Biographies

Frederick A. Stephens **Poster # 17A**
University of Alabama at Birmingham

Mentors:
Mr. Anirudra Paul, Daniel Siedel Ph.D.
Department of Chemistry and Chemical Biology
Rutgers, the State University of New Jersey

Alpha Functionalization of Amine

Natural products have been found to be effective candidates in the development of many pharmaceuticals. This began with many common drugs from the past (i.e. penicillin, aspirin, quinine, etc…) and has continued into the future. Many of these products contain heterocylic ring structures; a lack of simple and economic carbon-carbon bond formation is a weak point of current synthetic pathways. However use of azomethine-ylide could allow for carbon-carbon bond production. Our strategy consisted of adding different electron withdrawing groups to methylbenzaldehyde. These benzaldehyde derivatives were then tested for use with a secondary amine (tetra-hydroisoquinine or L-proline). Benzaldehyde derivatives containing a phenyl group were found to yield only trace amounts of the desired product. Derivatives with nitro groups did form a heterocylicic structure when reacted with a secondary amine; this reaction was completed with 80% yield. Our results imply that weak electron withdrawing groups such as benzene were ineffective while stronger withdrawing groups such and nitro groups showed much more promise. This suggests that azomethine-ylide based carbon-carbon bond formation is a feasible method for the formation of complex heterocyclic structures. This creates a new avenue for the economical formation of a variety of amines.

Biography: Frederick Stephens currently attends the University of Alabama at Birmingham, where he is a member of both the Chemistry Scholars program and the Science and Technology Honors Program. He expects to graduate in spring 2017 with a Bachelor's degree in Chemistry. This summer, he has been working with Dr. Siedel's organic synthesis group, carrying out research on azomethine ylide mediated carbon-carbon bond formation reactions. Frederick hopes to either research as a commissioned Air Force officer or continue his studies towards a graduate degree in chemistry.

Abstracts and Student Biographies

Abdulraouf Abdulraouf **Poster # 17B**
Rutgers University

Mentors:
Hannah E. Bowrey, Morgan H. James, Gary Aston-Jones

Developing a novel model for studying depressive-like behavior in rats

Depression is one of the most common psychiatric health problems in the world, and many anti-depression pharmacological treatments are suboptimal. Although several animal models of depression exist, few, if any, meet the criteria for a valid, repeatable and sensitive assay of depression. The sucrose preference test (SPT), a common assay of depressive-like behavior in animals, measures the preference for a sweet solution, a proxy for anhedonia (failure to feel pleasure). Although motivation is thought to be involved in depression-like behavior, it is rarely reported. An effective assay that measures both motivation and anhedonia, is needed to test the effective state of the animal, as well as efficacy of pharmacological treatments for depression. Behavioral economics (BE) is a modelling technique that offers a sensitive measure of how consumption of a reward is affected by changes in 'price'. Unlike the SPT, this technique allows for the independent measurement of hedonic set-point and motivation. Despite these two traits being effected in depression, BE has never been utilized as an assay for depressive-like behavior. Therefore, we trained rats to self-administer sweet pellets whilst also varying the 'price' (effort the animal must expend in order to receive a pellet). Work to validate the BE model by correlating it with established assays of depression is ongoing. We expect the BE model for sweet pellet demand may be a more sensitive assay than the existing models of depressive-like behavior, and thus will be better able to examine current and future pharmacological treatments of depression.

Biography: Abdulraouf Abdulraouf, or just Abdul is an undergraduate student majoring in Cell Biology and Neuroscience. If you know him, you would probably think he is a neuroscience nerd, and he is, and he is proud of it. In his free time, Abdul likes to read neuroscience journal articles, and the rest of his daily life is working in a neuroscience research lab studying neural circuitries in rats, mice, mice cultured neurons…you name it. If you ask him why he likes neuroscience, hse actually does not know, and that is the part he enjoys the most about trying to pursue a career in it. Most people would have a reason of why they like whatever they are pursuing, but he doesn't and he thinks he will be fine with that…hopefully. Twenty years from now, he sees himself as a professor at a research university researching the neural circuitries behind complex behavior as obesity, depression, Anorexia Nervosa, Parkinsons, among other diseases. Or rather simply, diseases associated with neuromodulations in mesolimbic system circuitries. He wish to teach many many students in his future life time who share similar aspirations as him to further enhance our understanding of diseases that have taken the joy out of many people who suffer from it, and filled many peoples lives with endless sadness because of loss of loved ones. Furthermore, besides research, he is also the Cell Biology and Neuroscience Undergraduate society public relations chair, he will be a chemistry student teaching intern, and is also a volunteer at the local hospital. Overall, this is the hypothesis of Abdul's life, and how he plans to pursue it, and just like any other hypothesis-it can never be proven and it might need to be modified, or rejected.

Abstracts and Student Biographies

Laura R. Azouz **Poster # 18A**
Michigan State University

Mentors:
Brahm Yachnin, Ph.D., and Sagar Khare, Ph.D.
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Computational design of auto-inhibited chemotherapeutic enzyme using Rosetta

Antibody-Directed Enzyme Prodrug Therapy (ADEPT) is a chemotherapeutic strategy in which an enzyme is directed to the surface of tumor cells using a covalently-linked tumor-directed antibody, and acts locally to convert a non-toxic prodrug into a cytotoxic drug. This can specifically target tumor cells without affecting other dividing cells in the body. One problem encountered with using ADEPT is the complexity of dosing required—the prodrug must be administered during a short window of time when the enzyme has been localized but not yet degraded. To allow for the administration of a prodrug and its associated enzyme at the same time, we aim to introduce an inactivating but cleavable subdomain to the ADEPT model system carboxypeptidase G2 (CPG2). The subdomain is designed to interfere with a conformational change required for catalysis by CPG2, and is attached to the protein terminus by a linker containing a protease recognition sequence. The Rosetta macromolecular modeling suite was used to insert a variety of small well-folded motifs to previously selected sites. Rosetta's potential energy scoring function was used to select favorable designs for further testing.

Biography: Laura grew up in Cairo, Egypt, and studies Chemical Engineering at Michigan State University. She expects to graduate in May 2017 with her Bachelor's, as well as a concentration in Biochemical Engineering. Upon graduation, she hopes to continue her research through a Ph.D. program in the field of protein engineering. Azouz currently does undergraduate research in the Timothy Whitehead Lab at MSU, and this summer she is completing a project in the Khare Lab at Rutgers, as part of the Rosetta Internship Program. Between her Chemical Engineering coursework, her research position, and her leadership roles in two student organizations, Laura doesn't have a ton of free time, but she enjoys the occasional book, swim, or nap.

Abstracts and Student Biographies

Caroline B. Paz **Poster # 18B**
Rutgers University

Mentors:
Covey, Lori, R. PhD

The Role of Polypyrimidine Tract Binding Protein Isoforms on CD40Ll Expression

CD40 ligand (CD40L or CD154) is critical for multiple immune responses. Failure to express CD154 in T cells leads to immunodeficiency. CD154 interactions are crucial in many signaling pathways that are essential for innate and adaptive immunity. CD154 is expressed on activated helper T cells and has been shown to undergo mRNA regulation at the post-transcriptional level by a RNA binding protein called polypyrimidine tract-binding protein (PTB). PTB is able to regulate other cellular processes by being involved in splicing events, mRNA stability, and localization. PTB has been shown to be responsible for regulating the CD154 transcript at extended times of T cell activation. Previous research has revealed that there are two isoforms of PTB, terms PTB-1 and PTB-4, expressed in T cells, due to alternative splicing events. The goal of this project is to understand if PTB-1 and PTB-4 have distinct roles in regulating CD154 expression. To address this, PTB-1 and PTB-4 were expressed in HEK 293 cells that contained CD154 plasmids. To differentiate between the PTB isoforms and endogenous PTB, the isoforms have an epitope flag that will allow these proteins to be identified. To analyze the effect of PTB isoforms on the CD154 transcript, immunoprecipitation will be done so that we can see how the PTB isoforms differ from the endogenous PTB proteins found in the HEK 293 cells. In conclusion, differences in PTB isoforms can help build a further understanding on the role CD154 plays on the immune system.

Biography: Caroline Paz was born in New Jersey, and is a rising senior at Rutgers University, pursuing a bachelor's degree in Biological Sciences. During the school year, she works in a molecular immunology lab with Dr. Covey on CD40L regulation. She enjoys being able to continue working in Dr. Covey's lab as a part of the RiSE program this summer. During her free time she loves to travel, watch movies, or read. Furthermore, she plans on pursuing a career in medicine in hopes of becoming a physician.

Abstracts and Student Biographies

Samantha N Cobos **Poster # 19A**
Pace University

Mentors:
Shishir Chundawat, Bhargava Nemmaru
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Understanding protein adsorption to TEMPO-oxidized cellulose I

Cellulose has gained attention as a biomedical material in the recent years, owing to its desirable physical properties and biocompatibility. TEMPO-oxidized cellulose and nanocellulose, in particular, have been explored as tissue scaffold materials, owing to their remarkable surface chemistry. However, a clear understanding of the structure-function relationships guiding protein adsorption to cellulose derivatives, is currently lacking. In the current study, we sought to obtain an understanding of the role played by cellulose surface charge density on protein adsorption. To achieve this goal, we created a library of oxidized cellulose variants with different surface charge densities, using NaClO and $NaClO_2$ as the primary oxidants, in presence of TEMPO. We used a carbohydrate binding module from family 3(CBM-3a), tagged to GFP, as the model protein. The effect of salt concentration on binding was analyzed for each variant and adsorption was modeled using Langmuir-type single site adsorption isotherms to obtain the binding affinity and binding capacity. Finally, we tried to explain the results obtained on the basis of the electrostatic potential map of the protein.

Biography: Samantha Cobos was born in New York City, New York. She is currently a rising senior at Pace University in New York City. She expects to graduate in May 2017 with a Bachelor's in Chemistry with a minor in Biology. She plans to pursue a Ph. D. in Chemistry after graduating from Pace in order to further her studies and train to become an organic chemist. She also enjoys singing opera, as well as playing volleyball, and painting. This summer, she has been able to join the RiSE program and work closely with Professor Shishir Chundawat in his laboratory in the Chemical Engineering Department. She hopes to use the experience that she gains from this and apply it onto her own studies in her home university.

Abstracts and Student Biographies

José Á Pagán Muñoz **Poster # 19B**
University of Puerto Rico-Mayagüez

Mentors:
Danlei Chen and Paul Takhistov, Ph.D.
Department of Food Science
Rutgers, The State University of New Jersey

Development of "breathable" humidity-responsive biocompatible hydrocolloid films for food and health applications

Humidity-responsive materials have found applications in numerous fields and are now seeking applications in edible packaging. Food scientists can manipulate the components of edible films (i.e. proteins, carbohydrates, lipids) to achieve desired packaging properties. In order to respond to humidity changes, bilayer systems can be developed so that films exhibit shape transitions corresponding to humidity absorption and release. In this study, bilayer systems composed of different viscosity grades of hydroxypropyl methyl cellulose (HPMC) and hydroxypropyl cellulose (HPC) were studied for these purposes. Humidity absorption, swelling parameters, and mechanical properties of individual and fabricated bilayer films were analyzed. The data obtained suggests that humidity-responsive "breathable" materials can be developed from hydrocolloid edible films.

Biography: José Pagán Muñoz was born in the city of San Juan, Puerto Rico. He is currently pursuing a bachelor's degree in Chemical Engineering at the University of Puerto Rico-Mayagüez while also minoring in Food Science and Technology. José loves food so much that he also wants to study it. For this reason, this summer he did research under the mentorship of Dr. Paul Takhistov at the Department of Food Science at Rutgers. In the future, he aspires to complete a graduate degree in this field and possibly work in the industry afterwards. In his free time, José enjoys reading, learning new things, (binge-)watching television series, and drinking coffee.

Abstracts and Student Biographies

Ye Joon Seo **Poster # 20A**
The City College of New York

Mentors:
Xiaolei Chu M.S., and Meenakshi Dutt Ph.D.
Department of Chemical and Biochemical Engineering
Rutgers University

The formation of vesicles through the modification of tyrosine-derived ABA tri-block copolymer membranes

Amphiphilic ABA triblock copolymers are studied as a promising biomimetic substitute for lipids that form vesicles, a nano-scale morphology that is used as a carrier for drug delivery. The hydrodynamics of the tyrosine-derived PEG-b-oligo(desaminotyrosyl tyrosine octyl ester-suberate)-b-PEG (PEG-oligo(DTO-SA)-PEG) was investigated using dissipative particle dynamics (DPD) simulation techniques. This technique is a coarse-grained (CG) molecular dynamics-based approach that uses soft repulsive interactions between beads that represent clusters of atoms or molecules. Computational results have shown that this polymer membrane forms a disk-shaped micelle only. Therefore, by inserting polymers that are folded 180 degrees throughout the membrane, we have modified the polymer membrane so that other morphologies are formed, namely vesicles. Varying chain lengths of both hydrophobic and hydrophilic segments have been shown to demonstrate different morphologies of this ABA triblock copolymer. For chain length combinations that form vesicles, the radius of the vesicle and the angle distribution of the polymers were computationally calculated and graphed based on the trajectory files from the simulations. These results show a strong linear relationship between the chain lengths and vesicle size. We also propose potential experimental applications of these results, which could demonstrate that these simulations can be observed in a laboratory setting.

Biography: Ye Joon Seo was born in Seoul, South Korea and immigrated to the United States at a young age. Raised in New York City, he attended Stuyvesant High School and was accepted into the Macaulay Honors Program at the City College of New York. Ye Joon is a rising senior pursuing a B.E. in Chemical Engineering, which he expects to complete by May 2017. He is the vice president of the American Institute of Chemical Engineers club and actively participates in polymer research. After graduating, Ye Joon hopes to use the experience garnered throughout his undergraduate career and enter the pharmaceutical R&D industry. However, a graduate level education is still a part of his career plan and the experience and knowledge earned from the RiSE program further solidified his dedication to potentially pursue a PhD degree in the future.

Abstracts and Student Biographies

Michael J. Swierczynski **Poster # 20B**
State University of New York College at Buffalo

Mentors:
George Tsilomelekis, PhD, Shreyas Acharya, MS
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Synthesis & characterization of sulfated zirconium-tin mixed oxide catalyst

Catalysts are abundantly used throughout the chemical industry. Heterogeneous solid acid catalysts provide many economical and environmental benefits such as the prevention of reactor corrosion and ease of disposal. Metal oxides, such as zirconium oxide, are well-known heterogeneous solid acid catalysts. Generally, the acidic and catalytic properties of metal oxides can be improved by incorporating sulfate groups on the external surface of the catalytic material. It has been reported that the sulfated metal oxides exhibit super acid properties, especially after doping with another metal oxide. Sulfated mixed metal oxides, which incorporate both of these characteristics, show promise as highly acidic and effective catalysts. An example of a sulfated mixed metal oxide catalyst is sulfated zirconium-titanium oxide, which has shown remarkable activity for the isopropylation of benzene. Few studies, however, have been performed on sulfated zirconium-tin oxide. This gives the opportunity to explore the molecular structure and the sulfate group of the mixed oxide, which can lead to its optimization and use as an industrial catalyst. The goal of this research is to synthesize and characterize zirconium-tin mixed metal oxide. Specific attention is placed on characterizing by means of vibrational spectroscopy the sulfate species deposited on the support. Synthesis was carried out by co-precipitation of metal precursors and wet impregnation of sulfuric acid. The molecular structure was explored using Raman and FTIR spectroscopy.

Biography: Michael Swierczynski was born in Buffalo, NY. He is expected to graduate with a bachelor's degree in chemistry from Buffalo State College in spring 2017. Afterwards, he plans to pursue a doctorate degree in inorganic chemistry. Outside of the classroom, he is a chemistry and biology tutor for the educational opportunity program. He has had the great opportunity to work in a chemical engineering laboratory under Dr. Tsilomelekis, gaining valuable experience not available at his home college.

Abstracts and Student Biographies

Iris Escobar **Poster # 21A**
Stockton University

Mentors:
Carol Gardner, Grace Guo, Debra L. Laskin
Department of Pharmacology and Toxicology
Ernest Mario School of Pharmacy

Identification of unique markers to distinguish macrophage populations in mouse models resembling fatty liver disease

Increasing evidence suggests that macrophages are involved in the pathogenesis of non-alcoholic fatty liver disease (NAFLD) and the metabolic syndrome (MetS). These chronic liver diseases are characterized by an accumulation of lipids in the liver, which may cause increased levels of inflammation, fibrosis, and tissue damage. However, it is unknown to what extent macrophages are involved, if they are involved at all, and which phenotypes they may exhibit. Generally, macrophages are polarized towards two cellular populations—M1 and M2—yet, macrophage heterogeneity and functional diversity is poorly understood. To assess how these cells may contribute to the development of these diseases, their phenotypes must be identified. This present study aimed to identify certain markers on the surface of macrophages that would allow us to distinguish between subtypes that appear in normal and diseased states. Immunohistochemistry protocols using individual antibodies (Galectin-3 and hemeoxygenase-1) were performed to detect different proteins corresponding to M1 and/or M2 macrophages found within the normal and diseased state of the liver. Whole body (FXR KO) and liver specific (AFXR KO) farnesoid X receptor (FXR) knockout mice were used as models to resemble the diseased state. Differences in the number of macrophages containing the marker of interest between the normal and diseased state were quantitated. This allowed us to determine the variation in macrophage populations in the liver following a control or high fat diet. Statistical analyses confirmed that there were significant differences or trends in the expression of Gal-3 and HO-1 between the control and high fat diet within the diseased and normal genotypes, but no significant differences in overall expression between the diseased and normal states. These findings suggest that Gal-3 and HO-1 may hold promise to act as distinguishing macrophage markers, given the trends in increased expression observed in the high fat diet. Future work is necessary to further characterize macrophage subtypes that may be involved in NAFLD and MetS to gain a better understanding of how these chronic liver diseases develop.

Biography: Iris Escobar grew up in Keyport, New Jersey, and is a current senior at Stockton University pursuing a Bachelor's of Science degree in Biochemistry and Molecular Biology. She will be graduating in Fall 2016 and plans to attend a doctorate program in either Neuroscience or Immunology. At Stockton, she conducts research in the field of medicinal chemistry, working to isolate the antifungal component in cutis oil. Currently this summer, Iris was also given the opportunity to participate in the RiSE and SURF program at Rutgers. Under the supervision of Dr. Carol Gardner, she worked to identify markers on macrophages that could be used to distinguish macrophage phenotypes that may be involved in the pathogenesis of chronic fatty liver diseases. Her research experience, thus far, has allowed her to gain insight in different fields and techniques. She plans take the skills she has developed with her to graduate school, yearning to improve them, as well as expand her fundamental knowledge in a specific field.

Abstracts and Student Biographies

Mary F. Stofan **Poster # 21B**
New Mexico State University

Mentors:
Brian Buckley, Ph.D., Grace Guo, Ph.D., Kyle Buckley, Dan Rizzolo
Environmental and Occupational Health Sciences Institute
Rutgers, The State University of New Jersey

Analysis of the bile acid synthetic pathway in the absence of enzymes, CYP7A1 and CYP27A1

Bile acids are amphipathic derivatives of cholesterol that are synthesized in the liver. In the digestion process, bile acids help emulsify and adsorb lipids. The two primary bile acids found in humans are cholic acid (CA) and chenodeoxycholic acid (CDCA), while in mice CA and muricholic acid (MCA) are the primary bile acids. They are synthesized from either the "classic" pathway that is catalyzed by the CYP7A1 enzyme or the "acidic" pathway that is catalyzed by the enzyme CYP27A1. The bile acid synthetic pathway in the absence of both CYP7A1 and CYP27A1 has not been examined thoroughly. We have generated the wild type, Cyp7a1 single knockout, Cyp27a1 single knockout, and Cyp7a1/Cyp27a1 double knockout mice. In order to analyze effects of Cyp7a1 and Cyp27a1 deficiency on bile acid synthesis, tissue from wild type, single, and double knockout mice was used. Bile acid profiles were characterized by liquid phase extraction and quantified through LC-MS. We expect the levels of both CA and CDCA to decrease in correlation to the wild type or single knockout mice. Our results showed expected levels of bile acids in the gallbladder samples. However, the plasma samples showed an unexpected result for the Cyp7a1 knockout mice as TCA, T-β-MCA, ω-MCA, β-MCA concentrations were elevated compared to the wild type; suggesting a secondary mechanism for the excess CAs in the plasma.

Biography: Mary Frances Stofan is a rising senior at New Mexico State University (NMSU) pursing a B.S. in Chemistry and plans to graduate in May 2017. At NMSU, she is apart of the Maximizing Access to Research Careers (MARC) Program and has worked in Dr. James Herndon's organic chemistry lab, focusing on selective Diels-Alder reactions using dialkynes. This summer at Rutgers, she was a co-participant of the RiSE and SURF programs working with Dr. Brian Buckley and Dr. Grace Guo on the analysis of the bile acid synthetic pathway and quantification of bile acids in different mouse tissues. After completing her undergraduate studies, she plans to pursue a Ph.D. in Toxicology.

Abstracts and Student Biographies

Caitlyn A. Tobita **Poster # 22A**
Chaminade University of Honolulu

Mentors:
Monica Driscoll, Sangeena Salam
Department of Molecular Biology and Biochemistry
Rutgers, The State University of New Jersey

Characterizing recovery and adaptation after exercise in *C. elegans*

Aging is important in medical areas, as aging is a major risk factor for degeneration in muscular and cognitive function. Exercise aids in maintaining those functions in aging humans. However, the knowledge of genetic and biological mechanisms by which exercise exerts systemic benefits on aging is lacking. *C. elegans* serves as a potentially useful model to observe the effects of exercise, as this simple animal is similar to humans genetically and in basic biological function.

C. elegans swim in M9 buffer to model exercise, and we observe their ability to recover from the prolonged exercise by comparing the distance the worms are able to crawl after exercise with a non-exercise group. We hypothesize that *C. elegans* is able to recover and adapt to exercise, and that if genes that regulate activity in metabolic pathways and mitochondrial function are dysfunctional, the time it takes for them to recover will be different than the wild-type nematode. After prolonged swimming, *C. elegans* showed a recovery starting at 15 minutes in wild-type worms. It is expected that the rate of recovery will decrease in the mutant strains *pmk*-1, *aak*-2, *sod*-1,5 and *sod*-2,3 and increase in the mutant strain *gei*-8. Testing this hypothesis will be essential as a first step in defining how gene activity relating to metabolism and mitochondrial function is important in systemic benefits of exercise.

Biography: Caitlyn Tobita is from the Hawaiian Isles and is a current student at Chaminade University of Honolulu. Pursuing a Bachelor's Degree in Biochemistry, she aspires to pursue a career in scientific research, but at the moment she is still unsure of what field to go into. She has worked on projects including immunology and signaling pathways, DIC, epi and confocal microscopy, and a brief dabbling in forensic entomology. This summer, she's been working with Dr. Driscoll in her lab, learning about the research setting away from her home institution, and about the charming worms known as *Caenorhabditis elegans*. Imagine a left-brained academic and a right-brained artist. Now combine them and add a pinch of curiosity and a dash of modesty. That is what makes up Caitlyn. Although she can appear as a single-minded academic, don't let that fool you. Her hobbies also include watching anime, gaming, drawing and doing service projects with her Kiwanis family.