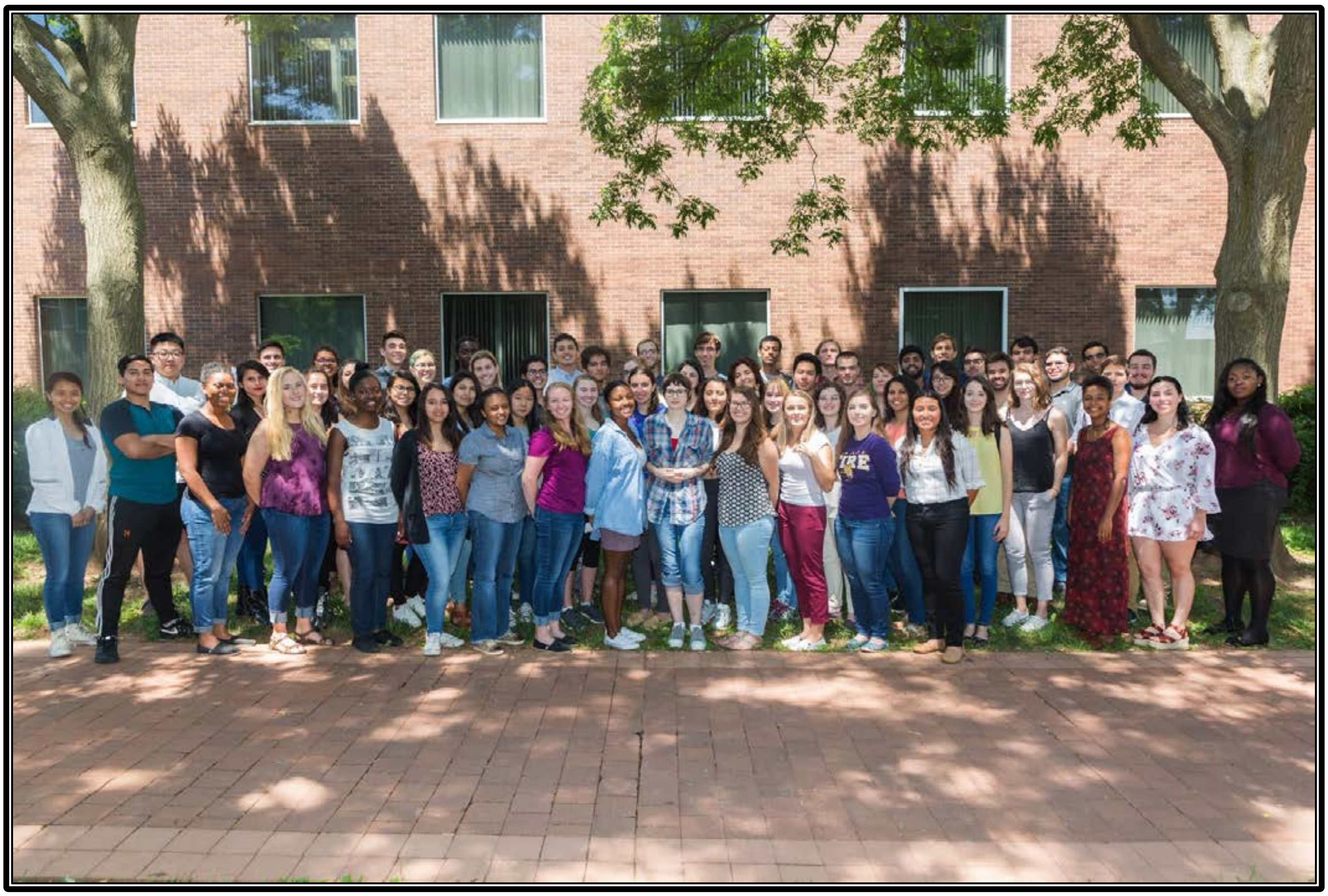
RiSE at Rutgers

Research in Science and Engineering

Summer Research Symposium

Featuring Poster Presentations by RiSE and REU Summer Scholars

August 2, 2017



Sponsored by:

School of Graduate Studies
Rutgers, The State University of New Jersey

Wednesday, August 2, 2017

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

9:00 – 9:30 AM	**Registration and Coffee**	**Fireside Lounge**
9:30 – 9:35 AM	**Welcome**	**Center Hall**

Dr. Barbara Lee
Distinguished Professor of Human Resource Management
Senior Vice President for Academic Affairs

9:35 – 10:30 AM	**Keynote Address**	**Center Hall**

Juan D. González
Professor of Professional Practice
Journalism, and Media Studies
Rutgers School of Communications and Information

"News for All the People: The Epic Story of Race and the American Media"

10:30 – 10:40 AM	**Remarks**	**Center Hall**

Dr. Deba Dutta
Chancellor, Rutgers-New Brunswick

10:45 – 11:40 AM	**Student Research Posters-A**	**International Lounge**
11:40 – 11:50 AM	**Break**	
11:50 – 12:45 PM	**Student Research Posters-B**	**Multipurpose Room**
12:45 PM	**Buffet Luncheon**	**Multipurpose Room**

Sponsored by:
RiSE (Research in Science and Engineering) at Rutgers
and Partner Programs
REU in Cellular Bioengineering: From Biomaterials to Stem Cells
REU in Advanced Materials
REU in Green Energy Technology – Undergraduate Program (GET-UP)
Rutgers University Pipeline-Initiative for Maximizing Student Development Program (RUP-IMSD)
REU in Physics and Astronomy
Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program

PLENARY SPEAKER

Juan D. González

Professor of Professional Practice
Journalism & Media Studies
Rutgers School of Communication and Information

"News for All the People: The Epic Story of Race and the American Media"

Juan D. González is an award-winning broadcast journalist and investigative reporter. A two-time winner of the George Polk Award, he is co-host of "Democracy Now!", author of "Harvest of Empire: A History of Latinos in America," and a founder of the National Association of Hispanic Journalists. He spent 29 years as a columnist for the New York *Daily News*. Juan González's research interests include journalism; mass media history; federal mass communications policy; history of Latinos in the United States; Puerto Rico-U.S. relations; immigration, race and labor relations; and the role of dissident movements in promoting social change. Since the 1970s, he has been a general reporter and columnist in newspapers, radio, and television – both commercial and alternative media. His areas of expertise have centered on urban affairs and investigative reporting, with a special focus on municipal land use and tax policies, public education, criminal justice, race relations, the trade union movement, immigration, and the Latino community.

SUMMER PROGRAMS

RiSE (Research in Science and Engineering) at Rutgers

RiSE seeks to extend the pathway to graduate study, research careers, and the STEM workforce. We particularly encourage participation by underrepresented minority, disadvantaged, and first generation college students as well as by students from Predominantly Undergraduate Institutions with limited academic-year research opportunities. RiSE is hosting 54 Scholars this summer. These students, selected from over 1000 applicants, represent 40 sending schools throughout the United States and its territories, and reflect a broad spectrum of STEM, social/behavioral science, and humanities disciplines. Students spend the summer actively engaged in cutting-edge research and scholarship under the guidance of carefully matched faculty mentors. A rigorous suite of professional development activities, including training in scholarly writing and speaking, career guidance, guest speakers, and GRE preparation, complements the research. Some 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 2017 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- 1559968) is in its eighth 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 – Green Energy Technology for Undergraduates Program (GET-UP)

The Renewal REU Site: Rutgers University Green Energy Technology for Undergraduates Program (GET-UP) was developed to address the national need for environmentally friendly power and to this end, enrich the population of STEM professionals that are prepared to tackle the technical challenges associated with this national need. Thus, the goals of GET-UP are to engage undergraduate students in innovative "green" science and engineering research over 10 weeks during the summer and provide UG scholars with professional development and academic enrichment programs. The intellectual focus of GET-UP centers around three thrusts that are deemed to be critical for development of STEM professionals in green energy: *nanotechnology and materials, renewable and sustainable fuels, and devices and energy management systems for energy generation, conversion, and storage*.

REU – Advanced Materials at Rutgers Engineering

NSF award on "Research Experiences for Undergraduates (REU) Site in Advanced Materials at Rutgers Engineering" (DMR-1659099) supports 9 students this summer. This is the first year of our NSF-REU activity. The objective of the activity is providing selected undergraduate students the chance to conduct research in advanced materials. A large portion of the student participants are recruited from academic institutions where research opportunities are limited. The impact of this program is to encourage undergraduates to continue their studies and develop their abilities as professionals, which can last for years. The technical goal is development and study of novel advanced materials of structural levels ranging from nano-scale to macro-scale, both theoretical and experimental.

REU in Physics and Astronomy

Thanks to funding from the National Science Foundation via grant 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 Rose Center for Earth and Space 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 for Maximizing Student Development Program

The Rutgers University Pipeline-Initiative for Maximizing 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~

School of Graduate Studies

Office of the Chancellor-New Brunswick

Ernest Mario School of Pharmacy

School of Biological and Environmental Sciences

School of Arts and Sciences

School of Engineering

RCSB Protein Data Bank

Master of Business and Science Program

~External Support~

NASA New Jersey Space Grant Consortium

NIH MARC Program

NSF Research Experiences for Undergraduates (REU) Program

NSF CAREER Awards
Summer Undergraduate Research Fellowship Program

U.S. Department of Education McNair Scholars Program

A.W. Mellon Foundation
Big Ten Academic Alliance Graduate School Exploration Fellowship (GSEF)

~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 David Shreiber and Linda Johnson for collecting and organizing the abstracts for the Summer Research Symposium booklet.

GUEST SPEAKERS

The Devil in the Details: Record Keeping and Laboratory Data

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

Mentoring Up: Making the Most of your Mentoring Relationships
Rebecca Jordan, Ph.D.
Professor, Departments of Human Ecology and Ecology, Evolution & Natural Resources
Director, Program in Science Learning

Amanda Sorenson, Ph.D.
Ecology and Evolution

Draw a Scientist: A Workshop on Science Identity

Xenia Morin, Ph.D.
Senior Associate Dean for Learning, School of Environmental & Biological Sciences
Associate Teaching Professor, Dept. of Plant Biology

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

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

Crystal Bedley, Ph.D.
Research Manager
Office for the Promotion of Women in Science, Engineering & Mathematics (WiSEM)

Anna Giarratana
M.D./Ph.D. Candidate, Department of Neuroscience & Cell Biology
Robert Wood Johnson Medical School

Christopher Lowe
Ph.D. candidate, Biomedical Engineering

Eileen Oni, Ph.D.
Cell & Developmental Biology

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

Jerry Shan, Ph.D.
Professor, Mechanical & Aerospace Engineering
Graduate Program Director, Mechanical & Aerospace Engineering

George Wagner, Ph.D.
Professor, Psychology
Graduate Program Director, Psychology

Difficult Conversations in Diversity and Inclusion

Dean Mark Schuster
Dean for Graduate Student Life, Office of Student Affairs

Mr. Matthew Cinnirella
Administrative Specialist, Office of Student Affairs

LinkedIn and Social Media Networking

Ms. Paola Dominguez
University Career Services

Fellowships and Funding: Position Yourself for Success

Ms. Miya Cary and Ms. Dara Walker
GradFund, School of Graduate Studies

Innovation and Entrepreneurship

Michael Johnson, Ph.D.
Visikol Corporation

Careers for PhDs in Social Science Research

Rebecca Baerga, Ph.D.
Educational Testing Service

SUMMER PROGRAM STAFF

RiSE at Rutgers
Evelyn S. Erenrich, Ph.D., Director
Associate Dean, School of Graduate Studies
Director, Graduate Recruitment, Retention and Diversity (GR^2aD)
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
David I. Shreiber, Ph.D., Director
Professor and Chair, Department of Biomedical Engineering

Susan Engelhardt
Director, Center for Innovative Ventures of Emerging Technology

REU in Green Energy Technology Undergraduate Program (GET UP)
Kimberly Cook-Chennault, Ph.D., Director
Associate Professor, Department of Mechanical & Aerospace Engineering

REU in Advanced Materials
Masanori Hara, Ph.D., Director
Professor, Dept. of Chemical and Biochemical Engineering

REU in Physics and Astronomy
Andrew Baker, Ph.D., Director
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

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Ms. Dawn Lopez, RiSE Program Coordinator
School of Graduate Studies

Ms. Erica Reed, RiSE Program Coordinator
School of Graduate Studies

Ms. Linda Johnson, REU-CB Program Coordinator
Department of Biomedical Engineering

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Resident Advisors
Ms. Tasleen Akal, PhD Candidate in Nutritional Sciences

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

Admissions Portal
Mr. Shamir Khan, GSNB

Website and Social Media
Ms. Erica Reed, School of Graduate Studies

Mr. Johnny Malpica, Office of Diversity and Inclusion

Photographer
Mr. Justin Jajalla

Contributions to Panels and Teaching
Chelsee Holloway, PhD Candidate in Nutritional Sciences

Yssavo Camacho, PhD Candidate in Physics & Astronomy

Analia Albuja, PhD Candidate in Psychology

Marissa Ringgold, PhD Candidate in Chemistry & Chemical Biology

Eileen Oni, PhD, Department of Cell & Developmental Biology

POSTER PRESENTATIONS

SESSION A – International Lounge

10:45AM – 11:40AM

Name and Affiliation(s)	Title	Poster
Ana H Berthel *Cellular Bioengineering*	**A computational framework for genome-wide pathway activity analysis: a case study in methylprednisolone**	1A
Vincent Cali *Cellular Bioengineering*	**Hydroxyapatite Mineralization by Nacre WSM Proteins**	2A
Eric R. Dubofsky *Cellular Bioengineering*	**Characterization of a custom-built, open-source micromotion bioreactor**	3A
Carolina Leynes *Cellular Bioengineering*	**Optimization of PEGDA/AA Hydrogel for Skeletal Muscle Tissue Engineering Scaffold Fabrication Using 3D Printer**	4A
Amanda M. Solbach *Cellular Bioengineering*	**The efficacy of a novel nanoparticle as a delivery mechanism for miR-7 to SH-SY5Y cells**	5A
Rose Warren *Cellular Bioengineering*	**The impact of Vascular Ehlers-Danlos syndrome mutations on integrin-to-collagen III binding**	6A
Anne Cardenas *Advanced Materials*	**Metallic MoS_2 nanosheets as super capacitors**	7A
Juan J. Lopez *Advanced Materials*	**Hydrothermal coatings of Y_2O_3 on Al_2O_3 substrates**	8A
Maricely Ramírez-Hernández *Advanced Materials*	**Ionic surfactants in the processing of inorganic polymers**	9A
Christopher J. Stabile *Advanced Materials*	**A comparative analysis of carbon fiber reinforced polymers and graphene reinforced polymer matrix composites**	10A
Christian Álvarez Sánchez *Green Energy Technology (GET-UP)*	**Investigation of novel coatings for aluminum particles for composite dielectric materials**	11A
Firehiwot W. Gurara *Green Energy Technology (GET-UP)*	**I SPY Who's in Power: Modeling of Energy Consumption**	12A

POSTER PRESENTATIONS

SESSION A – International Lounge

10:45AM – 11:40AM

Zichen Lao *Green Energy Technology (GET-UP)*	**Analysis and Fabrication of Proof of Concept Actuator**	13A
Lauren Ostopowicz *Green Energy Technology (GET-UP)*	**Ammonia evolution reaction in ambient conditions**	14A
Steven V. Clark *Physics & Astronomy*	**Track reconstruction and the proton radius puzzle**	15A
Umran N. Haji *Physics & Astronomy*	**The eccentric orbits problem: Comparing the orbits of Milky Way satellite galaxies to simulation results**	16A
Gabrielle A. Koknat *Physics & Astronomy*	**Strain-tunable metal-insulator transition in ultra-thin rare-earth nickelate films**	17A
Sandy A. Spicer *Physics & Astronomy*	**Tracing the origin of black hole accretion through numerical hydrodynamic simulations**	18A
Jenna T. Abyad *RiSE*	**Analyzing the evolutionary origin of bacterial drug-resistant enzymes in 3D**	19A
Rebecca Revilla *RiSE*	**Predicting academic achievement in urban middle school students using classroom relationships and social-emotional and character development (SECD) reflection and feedback**	20A
Brittany J. Camacho *RiSE/GSEF*	**"No Man Walks Alone Anymore": African Resistance, War, and the Law on Hispaniola, 1520-1550**	21A
Bresasha C. Duquaine *RiSE/GSEF*	**The Campus Climate Sexual Assault Survey and Sexual Minority Student Victimization**	22A
Mario A. Gaviria *RiSE*	**Synthesis of a Series of tetrahydrobenzonaphthyridines as Novel Anti-Malarials**	23A
Megan Hupp *RiSE*	**Contribution of Activating Transcription Factor 4 (ATF4) to the Hepatic Integrated Stress Response in Mice undergoing Dietary Methionine Restriction**	24A
Sadiyah Malcolm *RiSE*	**Ghetto Flowers: Young Black Women and Social Isolation in Philadelphia**	25A

POSTER PRESENTATIONS

SESSION A – International Lounge

10:45AM – 11:40AM

Angelica M. Barreto-Galvez *RiSE*	**Studying role of formins in morphogenesis using C.elegans model organism**	26A
Zeiny B. Aubdoollah *RUP-IMSD*	**Therapy for Wound Healing**	27A
Kevin Guerrero *RUP-IMSD*	**Assessing the role of ribosomal association for SBP2L by probing fractions of rabbit reticulocyte lysates**	28A
Alyssa Rodriguez *RUP-IMSD*	**Dynamic Changes in Auditory Brainstem Response Associated with Sound Training and Extinction**	29A
Ariadna Uribe *RUP-IMSD*	**Analyzing the expression of the aryl hydrocarbon receptor in wild-type and mutant Bowes melanoma cells.**	30A
Erin Q. Jennings *SURF/RiSE*	**Examining the contribution of the microbiota to the healthy aging AC5KO phenotype**	31A
Kristal R. Reyes-Sanchez *SURF/RiSE*	**Regulation of glutaminase in GRM1-expressing melanoma cells**	32A

POSTER PRESENTATIONS

SESSION B – Multi-Purpose Room

11:50AM – 12:45PM

Name and Affiliation(s)	Title	Poster
Philip Binaco *Cellular Bioengineering*	**Determining the Toxicity Effects of Polymers Synthesized using PET-Raft**	1B
Rebecca L. Davis *Cellular Bioengineering*	**Imaging of Spinal Tissues using Optical Microscopy Techniques**	2B
Audrey Hao *Cellular Bioengineering*	**Traumatic brain injury induces neural stem cell activation**	3B
Kaylie J Sheehan *Cellular Bioengineering*	**The effect of piezoelectricity on human mesenchymal stem cell differentiation**	4B
Victor Manuel Suarez *Cellular Bioengineering*	**Native Free Radical Mediated Crosslinking of Functionalized PEGs as a Targeted Delivery Mechanism**	5B
Maria Adrover *Advanced Materials*	**Imaging the emission angle distribution of semiconducting conjugated polymer thin films on nanohole silver surface**	6B
Jennifer Delgado *Advanced Materials*	**Effects of varying electrolytes in dye-sensitized solar cells (DSSCs)**	7B
Exequiel Punzalan *Advanced Materials*	**Adsorption and Degradation of Chemical Agents on Mesoporous Metal Oxides**	8B
Emran M. Reshid *Advanced Materials*	**Self-Assembling Peptides: Characterization of Nanostructures**	9B
Monica Wall *Advanced Materials*	**Modeling and improvement of constant pressure cake filtration**	10B
Dennis Chacko *Green Energy Technology (GET-UP)*	**Extrapolating polymer viscosity with laser dewetting**	11B
Daisy A. Hernandez *Green Energy Technology (GET-UP)*	**Bioaugmentation of Chemours Chambers Works AOC1 inactive locations**	12B

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Mary Anne G. Nova *Green Energy Technology (GET-UP)*	**Investigation of novel composites materials for engineered tissue scaffolds**	13B
Grace S. Cai *Physics & Astronomy*	**3D piezoresponse force microscopy using contact resonances**	14B
Hannah M. Glaser *Physics & Astronomy*	**Search for low mass three-jet resonances at the Compact Muon Solenoid**	15B
Nicholas J. H. James *Physics & Astronomy*	**Exploring gravitational lensing model variations in the Frontier Fields galaxy clusters**	16B
Margarita E. Rivers *Physics & Astronomy*	**Characterizing ion beam induced sample damage in the Helium Ion Microscope**	17B
Abigail C. Warden *Physics & Astronomy*	**Dark mediators in four top search at the LHC**	18B
Emmanuel E. Alvarez *RiSE*	**A comparison of dark adaptation techniques in flash electroretinography**	19B
Matthew R Bredder *RiSE*	**Effects of resonance breathing on subjective craving and neural reactivity to alcohol cues**	20B
Crystal A. Clements *RiSE*	**Single middle-class African-American women's perceptions of childbearing opportunities**	21B
Callie R. Ellis *RiSE/GSEF*	**The effect of a quiz on intertemporal planning with temptation, or anticipating your lazy disorganized self**	22B
Joshua M. Goddard *RiSE*	**Interspecies comparative analysis of tRNA-derived RNA fragment (tRF) expression**	23B
Héctor G. Loyola Irizarry *RiSE*	**Codon usage bias and strandedness in CRESS DNA viral genomes**	24B
Chielozor I Okafor *RiSE*	**Optimization of computational tools for protein design and structure analysis**	25B

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SESSION B – Multi-Purpose Room

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Priscilla M. Salcedo *RiSE*	**Correlating enzymes to antimicrobial resistance in the Protein Data Bank**	26B
Immanuella N. Boah *RUP-IMSD*	***In vivo* T cell responses to B lymphomas in the draining lymph node and spleen of transplanted M-TRAF3-/- mice**	27B
Kevin Nolasco *RUP-IMSD*	**Dasatinib's effect on the heat shock response in C. elegans**	28B
Natalie Samper *RUP-IMSD*	**Comparing the morphology of neurons derived from Tuberous Sclerosis patients and controls**	29B
Kenny Gonzalez-Rivera *SURF/RiSE*	**Epigenetic Regulation of MDR1 Expression in Human Blood-brain Barrier Cells**	30B
Ricardo A. Navarro *SURF/RiSE*	**Damage responses induced by the sulfur mustard analog mechlorethamine in human HaCaT keratinocytes**	31B

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Alphabetical List of Scholars and Presentations

Margarita E. Rivers *Physics & Astronomy*	**Characterizing ion beam induced sample damage in the Helium Ion Microscope**	17B
Alyssa Rodriguez *RUP-IMSD*	**Dynamic Changes in Auditory Brainstem Response Associated with Sound Training and Extinction**	29A
Priscilla M. Salcedo *RiSE*	**Correlating enzymes to antimicrobial resistance in the Protein Data Bank**	26B
Natalie Samper *RUP-IMSD*	**Comparing the morphology of neurons derived from Tuberous Sclerosis patients and controls**	29B
Kaylie J Sheehan *Cellular Bioengineering*	**The effect of piezoelectricity on human mesenchymal stem cell differentiation**	4B
Amanda M. Solbach *Cellular Bioengineering*	**The efficacy of a novel nanoparticle as a delivery mechanism for miR-7 to SH-SY5Y cells**	5A
Sandy A. Spicer *Physics & Astronomy*	**Tracing the origin of black hole accretion through numerical hydrodynamic simulations**	18A
Christopher J. Stabile *Advanced Materials*	**A comparative analysis of carbon fiber reinforced polymers and graphene reinforced polymer matrix composites**	10A
Victor Manuel Suarez *Cellular Bioengineering*	**Native Free Radical Mediated Crosslinking of Functionalized PEGs as a Targeted Delivery Mechanism**	5B
Ariadna Uribe *RUP-IMSD*	**Analyzing the expression of the aryl hydrocarbon receptor in wild-type and mutant Bowes melanoma cells.**	30A
Monica Wall *Advanced Materials*	**Modeling and improvement of constant pressure cake filtration**	10B
Abigail C. Warden *Physics & Astronomy*	**Dark mediators in four top search at the LHC**	18B
Rose Warren *Cellular Bioengineering*	**The impact of Vascular Ehlers-Danlos syndrome mutations on integrin-to-collagen III binding**	6A

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:

Cerego – Technology for permanently and effectively treating Alzheimer's disease
Cerego, Inc: *Ana Berthel, Eric Dubofsky, Kaylie Sheehan*

OsteoGel - Technology for a hydrogel that speeds bone healing
Osteogel: *Philip Binaco, Vincent Joseph Cali, Rebecca Davis, Rose Warren*

miRacle - Technology for the treatment of Parkinson's Disease
AVCA Therapeutics: *Audrey Hao, Carolina Leynes, Amanda Solbach, Victor Suarez*

Abstracts and Student Biographies

Ana H Berthel **Poster # 1A**
Mount Holyoke College

Mentors:
Ioannis Androulakis, Alison Acevedo
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

A computational framework for genome-wide pathway activity analysis: a case study in methylprednisolone

High-throughput –omics data allows us to capture the changes in expression levels of thousands of genes or gene products at once, and is therefore useful for studying the wide-ranging consequences of drugs on biological systems. In order to make use of these large data sets and identify relevant trends within them, computational techniques continue to be developed. Specifically, we want to understand the changes in the transcriptome and proteome of the liver over time as they are precipitated by methyl-prednisolone (MPL). Our developed statistical framework utilizes genome wide pathway analysis modified with pathway activity analysis to capture the activity of each gene pathway over time, as well as its statistical significance. For each pathway, it generates a pathway activity level which describes the dominant pattern of expression, as well as a clustered heatmap in which sub-patterns can be identified. The first iteration of the framework used scripts in both Matlab and R, with some manual steps. We want to be able to provide the framework as a tool for other researchers working with similar data, so in order to make it more efficient and easily useable, we endeavor to make the framework single platform and maximally automated. In this endeavor, we are re-developing the framework exclusively in R with improvement of previous manual steps. Our goal is not only to understand the effects of MPL on the transcriptome and proteome, but to provide a tool for other researchers to perform similar experiments.

Biography: Ana Berthel was born and raised in Mendham, NJ. She attends Mount Holyoke College, where she is studying biochemistry and computer science. Her future plans include attending graduate school for bioinformatics. She is very grateful to Dr. Ioannis Androulakis and Alison Acevedo for showing her how a research lab operates. The experience has re-confirmed her future academic plans. In her free time, Ana plays the flute in Mount Holyoke’s jazz band and flute choir. She also does crochet and a variety of other yarn crafts.

Abstracts and Student Biographies

Philip Binaco **Poster # 1B**
The College of New Jersey

Mentors:
Shashank Ksuri, Matt Tamasi, Jason DiStefano, Kelsey Swingle

Determining the Toxicity Effects of Polymers Synthesized using PET-Raft

Extensive libraries of small or macromolecular compounds are used to test hundreds of drugs at random to find ones that will affect cell signaling pathways at a specific receptor. Drugs work in a very similar way to proteins; they bind to the cellular receptor causing the signaling response. Synthetic polymers mimicking proteins is a proposed approach to elicit the same response. Polymers have the possibility of mimicking the shape, size and multivalent binding of specific proteins in a customizable way. This novel idea of treatment is only just being explored, so it is important to test the toxicity of the polymers before proceeding to cellular testing. Rat brain cancer cells (9L-Lacz) were used in this study for high throughput testing of polymers by the MTT assay. Many different polymers were tested for toxicity including traditional polymers like hydroxypropyl methacrylate (HPMA), as well as triblock copolymers of N-Acryloylmorpholine (NAM) and N-isopropylacrylamide (NIPAM). HPMA was tested for toxicity using the 9L-Lacz (10,000 cells per well) in a 96 well plate. HPMA was tested at varying degrees of polymerization (DP of 200, 150, 100 and 50). The polymers were plated at a starting concentration of 5 µM, with serial dilutions to the final concentration of 3.91*10-2 µM. The results of the MTT assay using HPMA showed based on absorbance that there was no toxicity of the cells in any of the concentrations tested.The triblock copolymer was in total a DP of 150, with each individual part of the chain being 50 monomers of NAM, then NIPAM, and then NAM (NAM50-NIPAM50-NAM50). This triblock copolymer was tested at a starting concentration of 5µM and an ending concentration of 3.91*10-2 µM. The individual monomers took a total of 4 hours to finish po1ymerization before the second polymer block could be added. The triblock copolymer after creation was now soluble in cell culture media. Both NIPAM and NAM solubility in media were tested before the creation of this triblock copolymer. NIPAM was found not to be soluble, but NAM was soluble in media.

Biography: Philip Binaco was born and raised in Point Pleasant, NJ and is a rising senior at The College of New Jersey (TCNJ) pursuing a BS in biomedical engineering. He will be graduating in May of 2018. Philip is a varsity athlete at TCNJ in swimming. He has competed at NCAA national championships, has been named an Academic All American, and has been a finalist in the nation competition. Without swimming he would not have had the drive to do the RiSE program, and without the RiSE program, he would not have had the opportunity to work with Dr. Gormley and find out how much he enjoys research. This experience has helped him develop his professional skills and realize what he needs to do to continue to grow as an engineer.

Abstracts and Student Biographies

Vincent Cali **Poster # 2A**
Queens College

Mentors:
Ronke Mojoyinola Olabisi, Kristopher White

Hydroxyapatite Mineralization by Nacre WSM Proteins

Nacre, mother of pearl, is found on the inner surface of mollusk shells and has potential as a synthetic bone graft biomaterial. Nacre, specifically the water-soluble matrix (WSM), is a non-immunogenic, osteogenic nucleator of hydroxyapatite (HAP), the main mineral component of bone. Previous work in the Olabisi lab has demonstrated the ability of WSM proteins covalently immobilized to a PEG (poly-ethylene glycol) hydrogel to control the mineralization within an osteoblast monolayer. The goal of this study is to assess the capacity of WSM proteins alone to exert controlled nucleation of HAP on glass substrates. The nucleation capacity of adsorbed and covalently immobilized WSM proteins will be assessed using an established in vitro nucleation test and FE-SEM. Our preliminary results show that WSM proteins are indeed effective in inducing mineralization. PEG-conjugated WSM proteins have a decreased mineralization activity (52%) compared to WSM proteins alone. However, there is more mineralization present than with negative controls.

Biography: Vincent is a native New Yorker, attending Queens College as a senior. He is a biology and psychology double major graduating in May of 2018 with a B.A. and honors in mathematics and sciences. Vincent was accepted to the Cellular Bioengineering REU program at Rutgers University working with Dr. Ronke Olabisi and Kristopher White. He will be investigating the ability of matrix proteins from nacre, mother of pearl, to induce spatially controlled mineralization in hopes of identifying a novel implant biomaterial. He is a fan of Star Trek and anime who has been a member of the Scifi-Anime club at his institution for years.

Abstracts and Student Biographies

Rebecca L. Davis **Poster # 2B**
West Virginia Wesleyan College

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

Imaging of Spinal Tissues using Optical Microscopy Techniques

New optical imaging methods can potentially provide insights into how axons are injured during brain and spinal cord trauma. With traditional methods, extensive sample preparation and manipulation is required prior to imaging. Alternative methods such as confocal microscopy, light sheet microscopy, and optical coherence tomography can allow for imaging of larger volumes of tissues, and potentially imaging without sectioning. As a model tissue sample, chick spinal cords dissected on embryonic day eighteen were used. The axons were immunostained with antibodies targeted against neurofilament proteins followed by an Alexa Fluor 488 secondary antibody with the peak emission at a 525nm wavelength. Samples were imaged using an optical coherence tomography (OCT) system at a wavelength of 1310nm. Confocal microscopy was utilized with 405nm and 488nm excitation wavelengths with fluorescence lifetime capability. Finally, light sheet microscopy illuminated the samples at 445nm wavelengths with 2x and 10x objective lenses. To optimize light sheet microscopy, a clearing agent, Visikol, was used to make the soft tissue surrounding the spinal cords clear. This allowed for light to pass through the samples more effectively resulting in a more homogenous image of the fluorescence. We found that, while OCT generated a 3D rendering of our sample, it was unable to display fluorescence. In regards to confocal microscopy, although we were able to obtain high-resolution fluorescence images, limitations occurred when a sample was over 300µm thick. Light sheet imaging, in conjunction with the clearing agent, Visikol, allowed us to image thick samples effectively. We found that the light sheet microscope tends to image out of focus light, but this could potentially be eliminated by optimization of the light sheet properties. By finding the optimum process for imaging these neurofilament proteins, more effective studies of spinal cord injuries can be conducted with the goal of understanding how axons are affected when stretching occurs. Future directions would include further image processing and stretching of the samples and observing physiological differences of the axons to provide new preventative measures for spinal cord injuries.

Biography: A senior attending West Virginia Wesleyan College (WVWC), Rebecca Davis plans to complete a double major degree in Applied Physics and Mathematics with a minor in Biology. As an involved student leader, Becca is the captain of WVWC's collegiate golf team, president of the Sigma Pi Sigma National Physics Honor Society at WVWC and a sister of Alpha Xi Delta, whose philanthropy is Autism Speaks. Outside of the classroom, she has an immerse passion for outreach and volunteering to provide service and education to those in need. Her previous work involved the study of iron fluoride crystal thin films and their growth patterns for battery applications. This summer she is studying different imaging techniques to find the optimal image process to view extracted chick spinal cords. Once she has finished her undergraduate career, she intends to pursue a Ph.D. in Bioengineering.

Abstracts and Student Biographies

Eric R. Dubofsky **Poster # 3A**
California Polytechnic State University – San Luis Obispo

Mentors:
Dr. Jay Sy, Rutgers University

Characterization of a custom-built, open-source micromotion bioreactor

Electrical implants installed into the brain hold great promise for treating neurodegenerative and neuropsychiatric disorders. However, astrocytes and microglia in the brain react to the implant and create a glial scar around the implant. Also, micromotions from the patient breathing or their heart pumping shake the brain by a few microns, and this constant, chronic and unavoidable motion seems a likely contributor to the chronic inflammation of the glial scar. This glial scar displaces neurons near the implant, leading to a loss of signal and eventual probe failure. Probe coatings with lower moduli may decrease the severity of the glial scar by softening the interface between brain and probe. To test different probe coatings, a micromotion bioreactor was created using open-source, easily obtainable parts. The bioreactor uses a linear actuator to drive a custom gearing system that terminates in a probe mount that will connect a sample neural probe to a culture of astrocytes or microglia. The velocity and backlash (a delay from the motor changing direction) of the bioreactor were characterized to ensure a test environment consistent with real-life conditions. By adjusting the RPM of the initial motor and recording the motion at the end of the bioreactor using a Zeiss Axiozoom v16 digital microscope, a linear calibration curve relating motor RPM and probe velocity was established. Interestingly, the bioreactor's velocity was different when moving in opposite directions, producing two different linear calibration curves. Backlash was calculated using a similar method, but had approximately constant values regardless of initial motor RPM. Future work with the bioreactor will use the calibration curves to set the actuator's velocity and thereby the probe's micromotion. After the cells have been exposed to probe micromotion, in vitro assays like ELISA or other cytochemical tests will investigate the cells' inflammatory responses.

Biography: Eric Dubofsky is a rising junior studying Biomedical Engineering at California Polytechnic State University, San Luis Obispo. He finds the intersection of mechanics and biology fascinating, and plans to pursue a graduate degree in biomechanics or biomaterials. This summer, Eric worked in Dr. Jay Sy's lab to quantify the velocity and backlash of a micromotion device. Outside of school, Eric plays Ultimate Frisbee, clarinet in Cal Poly's marching band, and enjoys reading, writing, and watching science fiction.

Abstracts and Student Biographies

Audrey Hao **Poster # 3B**
University of California, Berkeley

Mentors:
Li Cai, PhD
Jeremy Anderson
Biomedical Engineering, Rutgers University

Traumatic brain injury induces neural stem cell activation

In the United States of America, traumatic brain injury (TBI) is a major cause of death and disability, contributing to about 30% of all injury deaths. Although cell transplantation has been a promising field of study for TBI, immune rejection and possible tumor formation continue to challenge the practicality of transplantation.. Our lab focuses on understanding the molecular mechanisms behind injury-induced Neural Stem Cell (NSC) activation and proliferation, with the eventual goal of utilizing these molecular pathways to develop drug therapies. My project this summer focused on determining the identity of injury-induced GFP+ cell in Notch1CR2-GFP transgenic mice, in which the Notch1 enhancer, CR2, directs GFP expression in NSCs. Using this TBI mouse model, I conducted indirect immunofluorescence to examine the identities and fate of injury-induced GFP+ cells. My preliminary results show that after injury, GFP+ cells appear to increase in number in the dentate gyrus of the hippocampus. This implies that after injury, the number of NSCs tends to increase linearly as time progresses. By co-staining GFP+ cells with cell identity markers, my results show that cell death and NSC activation may peak at 1 day post injury, and GFP+ cells appear to differentiate into astrocytes and neurons at about 5 days post injury. These findings validate the use of the Notch1CR2-GFP transgenic mouse as a model for further study of TBI, as well as hint towards the cell fate and identities of NSCs after injury. Since my results are exploratory, further analyses will be required to confirm whether activation, proliferation or both play a role in the increased number of GFP+ cells after injury, as well as to confirm the fate and identity of injury-induced GFP+ cells.

Biography: Audrey Hao was born in Los Angeles and completed high school in Vancouver, BC. She currently resides in San Francisco, where she attends school at the University of California, Berkeley. She is a rising junior majoring in molecular environmental biology, with a passion for yoga, listening to musicals, reading, and recycling. She would like to give a special thanks to her mentor, Dr Li Cai, and graduate student Jeremy Anderson for their guidance and support throughout the project. She would also like to thank other members of the Cai Lab for their camaraderie and teamwork . Lastly, she would like to express gratitude towards the RiSE and Cellular Bioengineering program for the enriching experience this summer.

Abstracts and Student Biographies

Carolina Leynes **Poster # 4A**
University of Texas Rio Grande Valley

Mentors:
Joseph W. Freeman, PhD., Daniel Browe, & Robert Warren
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Optimization of PEGDA/AA Hydrogel for Skeletal Muscle Tissue Engineering Scaffold Fabrication Using 3D Printer

Skeletal muscles can heal themselves with minimal injuries. However, when muscles are severely injured due to trauma or chronic diseases, normal physiological conditions that promote repair are unattainable and external help is required. A relatively modern approach that is currently being researched is tissue engineering. Tissue engineering will be a better treatment method as the body's own resources are used to promote regeneration. One of the problems that scientists are facing is providing architectural support for cells and/or bioactive factors. Novel techniques on scaffold fabrication have been established, one of which is 3D printing. 3D printing allows for a controlled architecture and repeatable samples. In this work, we will modify a hydrogel to make it a printable material. The hydrogel has electroactive properties which allow it to change its direction and shape in response to an electrical stimulus. This allows it to mimic skeletal muscle making it an ideal vessel for cells and bioactive factors. To make this possible it is essential to optimize the hydrogels viscosity and crosslinking time for consistent print and controlled design. Hydrogels were fabricated using poly(ethylene glycol) diacrylate (PEGDA) and acrylic acid (AA). The photoinitator required for the crosslinking of PEGDA and AA was composed of 2,2-dimethoxy-2-phenyl acetophenone dissolved in n-vinyl-2-pyrrolidione. We hypothesized that an increase in photoinitator would cause a decrease in crosslinking time and that adding Poly(ethylene oxide) will increase the viscosity of the hydrogel. Four different concentrations of photoinititor were tested (10,12,15,20 X) at intervals of 5 seconds. For viscosity, four different amounts of PEO were tested (5,10,15,20 %) using a rheometer along with qualitative observations. Results demonstrated that the optimal concentration of photoinitator was 15 X the original amount. When concentration was increased further an increase in crosslinking time was noted. Furthermore, the optimal viscosity range was achieved by using a PEO concentration between 5 % and 10%. The scaffold in this work will mimic skeletal muscle which will promote cell differentiation and proliferation aiding with skeletal muscle regeneration.

Biography: Carolina Leynes is a rising junior at the University of Texas Rio Grande Valley majoring in Biomedical Science with a minor in Engineering Physics. She was born and raised in Texas for the most part of her life. This summer she was a participant in the Cellular Bioengineering program. She worked under the supervision of Dr. Joseph Freeman on a skeletal muscle tissue engineering project were she focused on printing hydrogel material by modifying its viscosity and crosslinking time.

Abstracts and Student Biographies

Kaylie J Sheehan **Poster # 4B**
University of North Texas

Mentors:
Ronke Olabisi, PhD, Rabab Chalaby
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

The effect of piezoelectricity on human mesenchymal stem cell differentiation

Piezoelectric materials are materials that generate electric fields when introduced to a mechanical stress, and deform when subjected to electrical input. Because these materials allow for electrical input without attaching wires that could lead to infection, they are currently investigated as scaffolds for tissue repair, particularly since they mimic the piezoelectricity found in certain tissues. Not all piezoelectric materials are good choices; for instance, piezoceramics can be toxic when used in the human body. In this study, the piezopolymer poly(vinylidene fluoride) (PVDF) was chosen for its piezoelectric properties, as well as its flexibility and biocompatibility. Tensile tests and displacement test were run on the PVDF films to obtain their physical and piezoelectric properties. Poled PVDF films, or PVDF films that have been placed under a strong electric field to induce the separation of positive and negative charges, were seeded with human mesenchymal stem cells (hMSCs) and vibrated at 100Hz for 24 hours. The samples were then observed daily for differentiation starting at 8 days after vibration, and will continue through 21 days after vibration. Previous work in the lab revealed that these hMSCs could be differentiated into osteogenic and neural cells. Current and future work is investigating whether hMSCs can be differentiated into additional cell types, and what stimulation frequencies are required for each cell type. Such a capability could one day translate into a hMSC-seeded scaffold that repairs a variety tissues when vibrated at the correct frequency.

Biography: Kaylie is a rising senior pursuing a Bachelor's of Science in Materials Science and Engineering at the University of North Texas (UNT) in Denton, TX. She is actively involved with many clubs and organizations at UNT, including UNT's Honors College, the UNT section of the Society of Women Engineers, where she serves as secretary, and the Quiz Bowl Club, where she serves as treasurer. Attending the RiSE/REU in Cellular Bioengineering program has been a wonderful experience for Kaylie, and has helped her make decisions about where she wants to be education and career wise in the future. After graduation, she has plans to pursue a Masters of Engineering in a biomedical/bioengineering related field.

Abstracts and Student Biographies

Amanda M. Solbach **Poster # 5A**
Texas A&M University San Antonio

Mentors:
Amanda Solbach[1], Michael Holloway[2], Charles Roth[2], David Devore[2]
1. Department of Biology, Texas A&M University, San Antonio, TX
2. Department of Biomedical Engineering, Rutgers University, Piscataway, NJ

The efficacy of a novel nanoparticle as a delivery mechanism for miR-7 to SH-SY5Y cells

Parkinson's Disease results from the accumulation of alpha-synuclein protein aggregates in dopaminergic neurons in the substantia nigra, which invariably leads to cell death mediated by disruption of cell signaling pathways. Previous studies have shown that exogenous augmentation of miRNA-7 has had success in mitigating the over expression of alpha-synuclein and targeting RelA of nuclear factor KB (NF-KB), also responsible for cell-mediated apoptosis. The problem lies within the ability of the miR-7 to reach damaged or susceptible neurons due to being hindered by barriers at both the cellular and systemic level. To address this delivery challenge, a cationic liposome, dioleoyl-3-trimethylammonium-propane (DOTAP), and an anionic copolymer, propyl acrylic acid (PPAA) modified with poly(oxalkylene amine)(Jeffamine), will be nanoassembled to deliver a mimic miR-7 to SH-SY5Y neuronal cells. A liposome is very similar to biological membranes, thus making it an ideal structure to initiate close contact and entry into the cell. The role of the "smart" anionic polymer, PPAA, is to facilitate cell lysis at an endosomal pH (~5–6) while leaving membranes intact at a physiological pH (~ 7.2). This anionic polymer is also grafted with a hydrophilic poly(oxyalkylene amines) (Jeffamine) to stabilize the drug through its protective effect against serum nuclease degradation. A PicoGreen fluorescence assay indicated that at a 12.5 ng/ml miRNA concentration there was an initial spike of RNA being released from the particle but plateaued after two hours showing no further release from the particle. A CellTiter Proliferation Assay was conducted using MDA-MB-231 cells, an alternative cell line, to test cell viability after being transfected using the mimic miR-7 and a negative control RNA and being treated with and without mitochondrial complex I inhibitor 1-methyl-4-phenylpyridinium (MPP). Preliminary data indicate that, while there is a protective effect by the miRNA transfected cells, more data is needed at this time to discern whether there is a direct effect from the mimic miR-7.

Biography: A rising senior and military veteran attending Texas A&M University San Antonio (TAMUSA), Amanda Solbach will complete a Bachelor of Science degree in Biology with a minor in Chemistry. She has a strong involvement as acting Vice President of the TriBeta Biological Honor Society and is active serving as an officer for the Pre-Health Society club at TAMUSA. Amanda has also successfully worked as an Emergency Room medical scribe at a premier Level 1 Trauma hospital where she cultivated a deep appreciation for medicine. Her ultimate pursuit is to complete graduate level education in the field of Neuroscience and be able to collaborate in translational medicine as it pertains to neurodegenerative processes. During her time off she likes hiking with her dog, target practice at the shooting range, concerts, travel and a good horror film.

Abstracts and Student Biographies

Victor Manuel Suarez **Poster # 5B**
Kean University

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

Native Free Radical Mediated Crosslinking of Functionalized PEGs as a Targeted Delivery Mechanism

A localized, elevated concentration of free radicals (FRs) is a shared trait among many different injuries and disease states. Low levels of FRs are regulated through native mechanisms, but in injury or disease these mechanisms are overcome, and FRs indiscriminately oxidize nucleic acids, proteins, and lipid membranes. However, in polymer chemistry, FRs act as effective initiators of polymerization and crosslinking. We hypothesize that native FRs that arise due to injury or disease can be leveraged to specifically target and distribute therapeutics to afflicted tissues, by means of coupling therapeutics to FR reactive polymers. FR reactive polymers will crosslink the presence of elevated concentrations of FRs, immobilizing therapeutics to the damaged tissue. In this study, polyethylene glycol (PEG) functionalized with different FR sensitive functional groups were evaluated to assess their ability to react with biologically relevant FRs such as reactive oxygen species (ROS) and reactive nitrogen species (RNS). Using hydroxide and nitric oxide generated radicals along with DPPH, a known stable radical, characterization of reactivity was obtained indicating that thiolated and acrylated PEGs react strongly to detoxify the elevated FRs. In addition to reactivity, the cellular metabolic activity of rat dermal fibroblasts (RDFs) was examined to test for potential cytotoxicity of functionalized PEGs to confirm viability of the compounds in vitro. Preliminary data indicate that thiolated and acrylated PEGs react strongly with ROS. Further studies will seek to characterize the coupling of the compounds via rheometry, NMR, and gel permeation chromatography.

Biography: A rising senior attending Kean University, Victor Suarez will complete an accelerated B.S./M.S. degree in Molecular Biology and Biotechnology through the NJCSTM Honors College coupled with B.A. in Chemistry through the College of Natural, Applied & Health Sciences with a minor in Mathematical Sciences. Involved in many extracurriculars, he will enter his senior year acting as president for both the Biotechnology Club and the TriBeta Biological Honor Society in addition to being Head Mathematics Tutor of the Residential Student Tutoring Center. Outside of the classroom, Victor is an active community leader, volunteering as Head Tutor for Projecto Adelente, a nonprofit outreach program that aims to inspire inner city students to pursue higher education, and at Trinitas Regional Hospital as an Hospital Elder Life Program (H.E.L.P.) volunteer. With his intense passion for medicine, biomedical research, and improving quality of life, he intends on pursuing an M.D./Ph.D. following graduation. As a participant in the Cellular Bioengineering REU program, Victor investigated the radical chemistries of different functional groups attached to PEGDA as potential delivery vehicles for therapeutic agents to elevated free radical injury sites.

Abstracts and Student Biographies

Rose Warren **Poster # 6A**
University of Vermont

Mentors:
Mentors:
Jean Baum, PhD and Allysa P. Kemraj; Department of Chemistry & Chemical Biology
David I. Shreiber, PhD and Madison Godesky; Department of Biomedical Engineering

The impact of Vascular Ehlers-Danlos syndrome mutations on integrin-to-collagen III binding

Vascular Ehlers-Danlos Syndrome (vEDS) is a rare connective tissue disorder characterized by fragile muscles, organs, and blood vessels. This condition is caused by a missense mutation in COL3A1, the gene encoding collagen III. The mutation results in an amino acid substitution at the second glycine in GROGER, a binding motif with high affinity to integrin a2b1. We hypothesize that these mutations in GROGER lower collagen III's helical stability and integrin affinity, thereby weakening the collagen-to-integrin bonds that adhere endothelial cells to the extracellular matrix as well as to the collagen III fibrils themselves. To test the stability and affinity of these mutant binding sites, we will use four collagen mimetic peptides: three mutated peptides (GRORER, GROAER, or GROVER) and one containing the wildtype GROGER sequence. These sequences are flanked by regions of repeating GPO triplets, which enable the sequences to self-assemble into a triple helix. We will utilize CD spectroscopy to determine the melting points (i.e. stability) of the helices formed by both the control and mutant sequences. Then, integrin affinity will be quantified using ELISAs. To confirm the ELISA results and characterize vEDS collagen-to-integrin binding in vitro, we will conduct a competitive cellular adhesion assay in which the mutant GROXER sequences compete with healthy collagen III for adhesion to human endothelial cells. Overall, we anticipate that the mutated binding motifs will have lower melting points and integrin affinities than those of the control GROGER peptide. Identifying the mechanisms behind vEDS tissue fragility can lead to greater understanding of more common cardiovascular conditions and may point to therapeutic opportunities to address vEDS.

Biography: Rose was born in Basel, Switzerland. She is a sophomore at the University of Vermont and expects to graduate in 2020 with a B.S. in biomedical engineering. This summer, Rose worked with both Dr. David Shreiber and Dr. Jean Baum to investigate the collagen mutations responsible for Vascular Ehlers-Danlos Syndrome. She plans to attend graduate school and pursue a career researching the mechanics of human joints, and she is grateful to RiSE at Rutgers for giving her the tools to do so. In her free time, Rose plays violin, writes sci-fi novels, and reads every book she can get her hands on.

Abstracts and Student Biographies

Maria Adrover **Poster # 6B**
University of Puerto Rico at Rio Piedras

Mentors:
Dr. Deirdre O'Carroll (1, 2) and Zeqing Shen (2)
1. Department of Materials Science and Engineering
2. Department of Chemistry & Chemical Biology
Rutgers, The State University of New Jersey

Imaging the emission angle distribution of semiconducting conjugated polymer thin films on nanohole silver surface

Control of the emission pattern and emission direction of light emitting materials is critical for many photonic and optoelectronic applications. Recently, it has been demonstrated that nanostructured silver (Ag) surfaces can enhance the photoluminescence emission intensity from semiconducting conjugated polymer thin films compared to those on planar Ag surfaces. However, modifications to the emission angular distribution of the polymer thin films by the nanostructured Ag surfaces remain unclear due to lack of appropriate detection methods. Fourier Plane Imaging Microscopy is becoming an important technique for the study of nano-optics because it can give direct, quantitative information about the local emission angular distribution of light emitted by nanostructured materials. In this study, we applied a 4F arrangement to convert a conventional bright-field/dark-field optical microscope into a Fourier Plane Imaging Microscope (FPIM) where 4F is the distance between all the components. A pair of achromatic doublet lenses with a specific focal length combination was used to image the objective's back focal plane (BFP) and, hence, to form a direct image of the emission angular distribution of an object. Ag nanograting surfaces, Ag nanohole surfaces and Ag nanoparticle surfaces were employed to help align and calibrate the system. Our preliminary study with the FPIM microscope working in dark-field mode showed that different nanostructures exhibited different BFP image patterns, indicating different nanostructures can scatter light into different directions depending on their nanoscale geometry. Further meticulous alignment and calibration of the system is planned with the help of Ag nanograting surfaces before the emission patterns of polymer thin films on different nanostructured Ag surfaced are measured.

Biography: Maria Adrover is from Jayuya, Puerto Rico and is currently a chemistry major undergraduate student at the University of Puerto Rico at Río Piedras (UPR-RP). She is a member of the National Society of Collegiate Scholars, American Chemical Society and Golden Key International Honour Society. Maria is also a researcher and she works on organic synthesis under the supervision of Dr. José Rivera at the Molecular Science Research Center of UPR-RP. This summer, she was working under the guidance of Dr. Deirdre O'Carroll and Ms. Zeqing Shen at Rutgers University to investigate the light-emitting patterns of thin-film organic optoelectronic materials using Fourier Plane Imaging Microscopy. Maria plans to pursue a Ph.D. in organic chemistry after graduation from UPR-RP.

Abstracts and Student Biographies

Anne Cardenas **Poster # 7A**
University of California San Diego

Mentors:
Anne Cardenas
Department of NanoEngineering
University of California San Diego

Anne Cardenas, Raymond Raphael Fullon, Jieun Yang, Manish Chhowalla
Materials Science & Engineering
Rutgers, the State University of New Jersey

Metallic MoS_2 nanosheets as super capacitors

Super capacitors, or electrochemical capacitors, are devices capable of storing energy through ion adsorption. They have the potential to either complement or replace batteries in electrical storage applications where quick charge and discharge times are of the essence. Molybdenum disulfide, or MoS_2, is a 2-dimensional material, which means it has a layered nature that allows it to intercalate ions with a high efficiency. MoS_2 has a naturally occurring 2H phase crystal structure that is semi-conducting, meaning it does not conduct electricity well. However, the 1T phase of MoS_2, which can be obtained from the 2H phase, is metastable and metallic. This, coupled with its layered nature, makes the 1T phase of MoS_2 a potentially good material for a supercapacitor. Our aim was to transition the phase of thermodynamically stable 2H MoS_2 to the metallic 1T phase, as well as to intercalate +1 and +2 cations into the 1T phase. Previous research has shown the capacitance obtained from intercalating +1 cations into 1T MoS_2, the purpose of intercalating +2 ions is to increase capacitance by storing more charge in a sample. The results from both the +1 and +2 cation trials suggest that it is not the size of the ion that has an effect on capacitance, but the size of the charge on the ion. In addition, the results suggest that the +1 cations have a larger capacitance than their +2 counterparts, which means that the +2 cations have a harder time intercalating into the 1T MoS_2 than the +1 cations.

Biography: Anne is studying NanoEngineering at the University of California San Diego. She is currently working in Dr. Chowalla's lab at Rutgers University, researching the supercapacitor behavior of 1T MoS_2. When not in lab, she likes to watch superhero movies and cuddle with her dog, Caffi.

Abstracts and Student Biographies

Jennifer Delgado **Poster # 7B**
University of Chicago

Mentors:
Lisa C. Klein, Ph.D.

Effects of varying electrolytes in dye-sensitized solar cells (DSSCs)

A dye-sensitized solar cell (DSSC) is a solar cell that runs on a photoelectrical system. Its four main components are titanium dioxide paste, dye, electrolyte, and two conductive fluorine doped tin oxide (FTO) glasses. Benefits of DSSCs include low cost and low toxicity of its components. This is particularly appealing because economic advantages of renewable energy over fossil fuels would facilitate the shift towards renewable energy. This research focuses on the effects of different electrolytes on the DSSC. Liquid electrolyte, in particular organic solvents, were used for this research.The electrolyte is responsible for the final step in which the oxidized dye is regenerated and influences the efficiency and stability of the solar cell. Finding ways to improve electrolytes directly impacts the efficiency and longevity of the solar cell. High ionic conductivity and low viscosity are desirable qualities in an electrolyte, but are not usually found in a single organic solvent. Electrolyte mixtures of two organic solvents, propylene carbonate (P.C) and ethylene glycol (E.G), were created in different ratios in an attempt to maximize positive qualities. The voltages of these DSSCs were measured over time under different light sources, including sunlight, light from an incandescent lamp, and fluorescent light. Results showed that over time, under any light source, the mixtures of either 50% E.G 50% P.C or 75% P.C 25% E.G always had higher voltages than 100% E.G or 100% P.C. This showed that mixing the organic solvents was advantageous to a DSSC. Additionally, in an attempt to further improve the efficiency and longevity of DSSCs, a seal is being prepared out of Duramax to help prevent the leakage and evaporation of electrolytes.

Biography: Jennifer is a rising junior at University of Chicago majoring in Chemistry and minoring in Spanish literature. At school, she is a member of the chemistry club and the ceramics club. In her free time, she enjoys exercising and cooking. She is interested in using her background in chemistry to help further advancement in renewable technology. She hopes to attend graduate school to attain a Ph.D. in either chemistry or chemical engineering.

Abstracts and Student Biographies

Juan J. Lopez **Poster # 8A**
University of Toledo

Mentors:
Richard Riman, Ph.D., Dechao Yu, Ph.D., and Daniel Kopp, Ph.D.
Department of Materials Science and Engineering
Rutgers University

Hydrothermal coatings of Y_2O_3 on Al_2O_3 substrates

In the combustion environments of gas turbines, Al_2O_3/Al_2O_3 ceramic matrix composites (CMCs) are widely used to increase performance, including efficiency and durability. However, the high temperatures of these applications promote grain growth, sintering, and deformation. Due to the degradation of the Al_2O_3/Al_2O_3 CMCs in these environments, damage tolerance is reduced. Along with this, Al_2O_3/Al_2O_3 CMCs experience further degradation due to the formation of aluminum hydroxide when disposed to rapid flowing, water-vapor rich combustion gasses. Therefore, environmental stability for said materials is an issue which must be addressed. Y_2O_3, yttria, is recognized as a chemically and thermodynamically stable material, and the thermal expansions of α-Y_2O_3 and alumina are extremely similar. Hence, in this study, the crystallization of yttria through hydrothermal synthesis was explored as the properties of yttria suggest a promising coating candidate for Al_2O_3/Al_2O_3 CMCs. Using yttrium chloride and yttrium nitrate precursors, many reactions were completed through the hydrothermal and solvothermal method in attempt to produce and collect yttria without post-treatment. The results suggest that higher temperatures and hold times are required for the formation of yttria when compared to the studied parameters in this study. However, there exist other pathways via hydrothermal and solvothermal synthesis that could potentially crystallize yttria. In conclusion, these results illuminate a path to the creation of yttrium oxide coatings for aluminum oxide substrates.

Reference:
Mechnich, Peter, and Wolfgang Braue. "Air Plasma-sprayed Y_2O_3 Coatings for Al_2O_3/Al_2O_3 Ceramic Matrix Composites." Journal of the European Ceramic Society 33.13-14 (2013): 2645-653.

Biography: Juan Lopez attends the University of Toledo and will be a third-year student this upcoming fall. Juan majors in Applied Mathematics and Applied Physics. He plans to attend graduate school to obtain an advanced degree in engineering or physics. Juan believes in giving back to society and constantly working towards creating a brighter future for generations to come. Juan's research interests revolve around renewable energy and general energy efficiency. Juan is inspired by his family, friends, instructors, and former instructors.

Abstracts and Student Biographies

Exequiel Punzalan **Poster # 8B**
California State University-Los Angeles

Mentors:
Colón-Ortiz, Jonathan; Neimark, Alexander

Adsorption and Degradation of Chemical Agents on Mesoporous Metal Oxides

The history of modern warfare has shown that chemical agents can bring extensive damage to humans in small quantities. In recent years, the use of these agents has made it more critical to develop materials that quickly degrade these weapons. Ordered mesoporous metal oxides are favorable candidates because of their desirable structure, surface, and porosity. The present work examines the adsorption behavior and degradation of chemical warfare agent substitutes on mesoporous transition metal oxides such as cerium, zinc, and zirconium oxides. The metal oxides were prepared by nanocasting using ordered mesoporous silica (SBA-15) as the hard template. The textural and structural properties of the metal oxides are characterized and reported. Moreover, the reactive adsorption and degradation of CWA substitutes on metal oxides are tested.

Biography: Exequiel Punzalan is currently a chemistry major from California State University-Los Angeles. He plans to attend graduate school with a specialization in physical and theoretical chemistry. His work at his home institution has involved synthesizing and characterizing iron oxide nanoparticles for applications in drug delivery. Recently, he has been involved in studying the structure and behavior of the multi-drug resistant P-glycoprotein through modeling and simulations. He is interested in the design of functional materials directed toward medicinal, energy, and industrial-related problems.

Abstracts and Student Biographies

Maricely Ramírez-Hernández **Poster # 9A**
University of Puerto Rico- Mayagüez

Mentors:
Monika Kazancioglu
Masanori Hara,PhD
Department of Chemical & Biochemical Engineering

Richard Lehman,PhD
Department of Materials Science and Engineering

Rutgers, The State University of New Jersey

Ionic surfactants in the processing of inorganic polymers

Polymers are one of the major material groups and are found in a vast array of commercial and industrial applications. While there have been numerous advances, they are limited by their tendency to degrade at moderate temperatures and are becoming increasingly scarce since the majority of them are based on fossil fuels. Our group is focused on developing a new class of polymers that are comprised of silicone backbone and contain ionic and secondary bonds. This new generation of polymers can be flame resistant, have improved durability, are non-toxic and raw materials for their formation are more readily available.

Our aim for this project is to investigate the effect of sodium dodecylsulfate (SDS) and cetrimonium bromide (CTAB) concentrations in sodium metasilicate on its glass transition temperature. Work was done in a benchtop by dissolving sodium metasilicate in distilled water and subsequently adding surfactant solution and left to dry. Compression molding with fixed pressure and temperature was carried out with the prepared silicate-surfactant samples and characterized using differential scanning calorimetry.

While there were no noticeable glass transition temperatures noted, the retrieved thermograms for the samples suggest there are interactions between surfactants and sodium metasilicate glass due to the absence of characteristic phase transitions. Incorporation of surfactants resulted in lower melting temperatures when compared to glass and surfactant references. This is probably due with surfactant and sodium metasilicate interactions occurring in the system. However, more sensitive instruments are needed to corroborate if glass transitions are being affected.

Biography: Maricely Ramirez-Hernandez is a chemical engineering senior at University of Puerto Rico Mayagüez. Throughout her studies, she has actively participated in materials research and has a special interest on surface interactions. Besides research, her interests include outreach for low income communities in STEM within Puerto Rico. Upon graduation this upcoming January, she plans to pursue graduate studies in Chemical Engineering in New Jersey. She hopes that with further preparation, she can contribute towards building a more solid scientific and innovative community in Puerto Rico to promote economic development.

Abstracts and Student Biographies

Emran M. Reshid **Poster # 9B**
New Jersey Institute of Technology

Mentors:
Ms. Kassandra Schmidt, Mr. Srinivas Mushnoori, Meenakshi Dutt, Ph.D.,
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Self-Assembling Peptides: Characterization of Nanostructures

Self-Assembling Peptides: Characterization of Nanostructures
Peptide nanostructures are widely seen in nature from enzymes and camouflage, to antibodies. Although the path of reaching such complex uses will take time, the simpler models can have a revolutionary impact in nanotechnology. By knowing the final shape of the assembling peptide, engineers and scientists can develop various applications in the nanoscale. The current technology used by the research group to characterize nanostructures is through the visual analysis of the peptides using the Visual Molecular Dynamic software. This method of characterizing peptides is not reliable as its basis comes from the perception of the viewer and can change from person to person. The goal for this summer research project is to develop the framework of a program that can quantitatively classify nanostructures and support the characterization made from VMD. The method to coding the program is to first contrast between the nanostructures, which in this case are a nano-bilayer, a nanovesicle, and a nanotube. Then, the program is initially designed to assume perfection meaning outliers, curvature, and the initial position of the structure is disregarded. Lastly, the program is modified to account for the previously mentioned imperfections. The resulting output of the program suggests that the program does not account for all imperfections of the nanostructure. For example, the equation used to characterize a nano-bilayer is not calibrated to account for the many curves seen in the structure. In addition, the characterization equations for all structures do not differentiate between the two hydrophilic backbone layers. From these results, the program can be revised to address the aspects of the experiment that deviates from the ideal equations used to classify them as well as apply additional features that can identify more characteristics of the nanostructure.

Biography: Emran Reshid is a rising Junior pursuing a degree in Electrical Engineering with a minor in Computer Science from NJIT. Emran is a co-participant of the NSF-funded REU Advanced Materials program. This summer Emran has had the pleasure of working in the Computational Hybrid Soft Materials Laboratory with Professor Meenakshi Dutt, and graduate students Kassandra Schmidt and Srinivas Mushnoori. There the group studied the computational characterization of self-assembling peptide nanostructures. Emran plans to obtain more research opportunities in the future to gain a better feel for graduate studies.

Abstracts and Student Biographies

Christopher J. Stabile **Poster # 10A**
The College of New Jersey

Mentors:
Thomas Nosker, Arya Tewatia
Department of Materials Science and Engineering
Rutgers, The State University of New Jersey

A comparative analysis of carbon fiber reinforced polymers and graphene reinforced polymer matrix composites

Compared to traditional engineering materials such as steels and aluminums, polymers exhibit similar tensile strengths despite their lower densities. However, polymers are limited by poor stiffness, or low tensile moduli. In order to improve polymer stiffness, a reinforcing material such as carbon fiber can be incorporated into a polymer matrix resin and the resultant mixture can be extruded or molded into a composite part. Although carbon fiber reinforced polymers (CFRPs) exhibit high specific strength and stiffness values, their applications are limited due to the excessive energy inputs, emissions and costs associated with their production. Considering these limitations, use of graphene reinforced polymer matrix composites (G-PMCs) is being examined as a potential alternative to CFRPs. G-PMCs can be formed by using a recently developed novel single screw compounding extruder to exfoliating graphite into graphene within a polymer matrix resin. While G-PMCs have been shown to exhibit mechanical properties comparable to CFRPs, there have been no formal assessments of the energy inputs, emissions and costs associated with their production. As a result, this study consisted of a life cycle assessment and comparison of CFRPs and G-PMCs. The scope of the assessment ranged from the production of raw materials to the fabrication of a 1 kg injection molded part. Additionally, composites consisting of 35% by weight carbon fiber or graphene and a polyether ether ketone polymer matrix were used as the basis for calculations. The data showed that the production of G-PMCs over CFRPs results in reductions in the required energy input, emissions and costs of approximately 55 to 84 MJ/kg, 10 kgCO2e/kg and 5 USD/kg, respectively.

Biography: Christopher Stabile is currently a mechanical engineering student at The College of New Jersey (TCNJ). He expects to graduate in May of 2018 with a Bachelor of Science in Mechanical Engineering. At TCNJ, Chris is a member of the Tau Beta Pi Engineering Honor Society and the Society of Automotive Engineers Baja team. He also conducts research related to tissue engineering alongside Dr. Karen Yan. This summer, Chris worked at Rutgers University's Advanced Polymer Center. Under the guidance of Dr. Thomas Nosker and Arya Tewatia, he conducted an analysis to compare the research group's novel graphene reinforced polymer matrix composite to existing carbon fiber reinforced polymers. After graduating from TCNJ, Chris plans to pursue a graduate degree in mechanical engineering.

Abstracts and Student Biographies

Monica Wall **Poster # 10B**
University of Florida

Mentors:
Monica Wall, Zainab Abd Al-Jaleel, Dr. Nina Shapley

Modeling and improvement of constant pressure cake filtration

Filtration is widely used in the catalyst industry to separate precipitated or crystallized product from solution. However, current industrial processes are largely empirical and plagued by challenges such as low flow rates, high pressure drops and low particle capture. This project seeks to improve industrial methods of cake filtration by 1) identifying if changes in the applied pressure or filter mesh size alter filter cake permeability or filtration quality and 2) characterizing the formed filter cakes to better understand their method of formation. This project utilizes a highly simplified model of non-porous, non-compressible glass beads mixed in water as the slurry solution. After varying particle size, pressure drop and filter mesh size it became clear that only changes in particle size yielded consistent changes in filtration behavior. Filtration using small beads (1-20 micron in diameter) showed ideal filtration behavior when filtration occurred, but was inconsistent in what parameters yielded successful filtration. In contrast, larger beads (10-50 micron in diameter) yielded consistently successful filtration but settled too quickly to show ideal behavior under Darcy's law conditions. Future work will include alteration of slurry pH and varied particle size distributions to continue improving this filtration model. Analyzing the formed filter cakes showed a clear shift in size distribution from the bottom of the cake to the top. Filter cakes were consistently composed of the full distribution of particle sizes at the bottom of the cake and showed higher concentrations of small particles closer to the top of the filter cake.

Biography: Monica is a rising senior studying materials engineering with a focus in polymers and biomaterials at The University of Florida. At the University of Florida, Monica is a member of The Schmidt Lab where she researches naturally based hydrogels, modified to contain long porous architecture, for use as nerve guidance conduits for peripheral nerve injury repair. In addition to her lab work, Monica is a member of The Society for Biomaterials, where she will serve as outreach coordinator for her university chapter this upcoming year. Additionally, Monica served as a mentor for the STEPUP engineering summer bridge program and spent a semester competing with the university's mock trial program as an expert witness. Monica's awards include membership to the "University Scholars Program" through the office of undergraduate research and "Most Outstanding Female Engineering Student" from the STEPUP summer bridge program. After completing her undergraduate studies Monica plans to attend graduate school and study tissue engineering in pursuit of a doctoral degree.

Abstracts and Student Biographies

Christian Álvarez Sánchez **Poster # 11A**
University of Puerto Rico Rio Piedras Campus

Mentors:
Kimberly Cook-Chennault
Department of mechanical and aerospace engineering

Udhay Sundar
Department of mechanical and aerospace engineering

Investigation of novel coatings for aluminum particles for composite dielectric materials

Piezoelectric ceramics and dielectric polymers have been extensively studied for energy storage (capacitor) and data storage applications. Polymer dielectrics are used because of their high dielectric breakdown strength but they have low relative permittivity values. On the other hand, ceramic dielectric materials have higher dielectric values but suffer from lower breakdown field strength and tend to overheat, which results high energy loss and lower energy conversion efficiency. Dielectric composites that incorporate a high permittivity material (usually a ceramic) in a matrix with high breakdown field strength (typically a polymer) are of interest where opportunities of leveraging both characteristics is ideal. Different types of composites have been made using barium titanate, barium-strontium titanate, and aluminum particles with polymer matrices. However, the high dielectric materials are typically inorganic compounds that do not exhibit good adhesion with the organic matrix, resulting in inconsistent dielectric properties over large frequency ranges and leaching over the cycle life of the device or as a function of high concentration of active filler. Recently, researchers have turned towards core-shell processing techniques that result in an organic chain coating that enhances the interaction between the inorganic and organic phases of the composite. In this work, the materials of interest were surface treated aluminum – epoxy composites. The dielectric composite solution was spin coated onto stainless steel sheets and were corona polarized at 45 kV/mm under a constant temperature of 75ºC. The capacitance and dissipation spectra (2 kHz to 20 MHz) were captured to understand the dielectric properties of the devices. Hysteresis loops were observed to determine the dielectric breakdown of the material and to characterize the appropriateness for application as capacitor materials.

Biography: Christian Álvarez Sánchez was born in San Juan Puerto Rico in November 18, 1995. He is currently pursuing a Chemistry Bachelor's degree in the University of Puerto Rico Rio Piedras Campus, this August will his fifth and final year as an undergraduate. On May 2017, he was awarded the Maximizing Access to Research Careers (MARC) Undergraduate Student Training in Academic Research (U-STAR) Award by the NIH. Since energy is one of the most important components in our society, it is of Christian's interest to do research in this area. In Puerto Rico most of the energy comes from burning fossil fuels and the emissions produced are contributing to the buildup of greenhouse gases in the atmosphere. Also, Puerto Rico has the potential to apply renewable energy by using solar, wind and hydropower sources. One of his principal goals is to contribute in the development of an efficient system that could be viable for the island to implement and produce cleaner energy taking advantage of our tropical environment. Through research, he expects to contribute enhance the efficiency of renewable energy and make it an appealing option in the future for countries that are not considering it now. To achieve this goal he plans to finish the bachelor's degree, then apply for a PhD in material sciences; where he will be able to research, study and develop materials to enhance the energy conversion or storage.

Abstracts and Student Biographies

Dennis Chacko **Poster # 11B**
University of Maryland Baltimore County

Mentors:

Tianxing Ma, Jonathan P. Singer
Department of Mechanical and Aerospace Engineering,
Rutgers, The State University of New Jersey

Extrapolating polymer viscosity with laser dewetting

Rheological methods to attain the temperature-dependent viscosity profiles require substantial amounts of the material. This work seeks to develop a method to extrapolate the temperature-dependent viscosity profile of a polymer utilizing the thickness evolution of a thin film during focused laser spike (FlaSk) dewetting. This method would only require nanograms of material and would be particularly useful for materials that are difficult to generate or expensive to obtain. The FLaSk technique utilizes a focused laser to produce a localized thermal gradient. This activates the thermocapillary effect, where the melt, once it has exceeded its softening temperature, moves down the thermal gradient, to an area of higher surface tension. This technique has been used to produce sub-micrometer features on thin films of polymers, metals, and semiconductors. The laser power and exposure time dependent dewetted thickness has been well studied and modeled for liquid thin films, however, these models assume that the temperature dependence of the viscosity is negligible. Here, we employ polymer films as a model system. These are dewetted using various laser powers and exposure times, and then the resulting central thickness is measured using a microreflectometer. Such data will be incorporated into models for the temperature-dependent viscosity and aid in the understanding of the physical differences between thin films and the bulk material.

Biography: Dennis was born and raised in Adelphi, Maryland. Dennis Chacko is a junior chemical engineering major attending the University of Maryland Baltimore County (UMBC) and a member of the Meyerhoff Scholars Program. The Meyerhoff Scholars program is a scholarship program whose mission is to prepare students in STEM disciplines to obtain a PhD and pursue a career in research. This summer, he is researching laser dewetting of thin films in the Hybrid Nano/Micro Manufacturing laboratory, being mentored by Dr. Jonathan Singer. The project seeks to develop a method to extrapolate temperature dependent viscosity profiles of polymers by measuring the change inf height from laser dewetting. During the academic year, he conducts research in peptide based hydrogels in Dr. Bruce Yu's lab at the University of Maryland Baltimore School of Pharmacy. In addition to research, he is also active in leadership at his home institution. Since the Fall 2016 semester, he has been a teaching assistant for general chemistry, and is planning to continue. In the Spring 2017 semester, he was elected the Vice President of UMBC's chapter of American Institute of Chemical Engineers, as well as the Recording Secretary for the Maryland Delta Chapter of Tau Beta Pi. Following his undergraduate career, Dennis plans to pursue a PhD in chemical engineering.

Abstracts and Student Biographies

Firehiwot W. Gurara **Poster # 12A**
Cornell University

Mentors:
Dr. Hana Godrich
Department of Electrical and Computer Engineering
Rutgers University

I SPY Who's in Power: Modeling of Energy Consumption

Rapidly increasing human population, climate change and limited quantity of fossil fuels are some of the factors that initiate questions about the way we use energy. Power demand pattern can be controlled with the use of energy saving appliances, smart power monitoring sensors and dynamic pricing system in residential sector. To take advantage of this, power companies need to be able to regulate power consumption and implement peak shifting strategies, such as controlling charging of PEVs (Plug-in Electric Vehicles) concurrently with other loads. Installing power measurement sensors for each appliance is expensive and requires handling big data. Therefore, the goal of this project is to build consumption profiles of different loads and identify their signature from aggregate power measurements. It involves residential and ORBIT testbed experiments that focus on collecting and analyzing power consumption data at Rutgers University Wireless Information Network Laboratory (WINLAB). The residential experiment conducted at WINLAB's kitchen involves both individual and aggregate power measurements to study load behaviors on a smaller scale. The ORBIT nodes, high speed computers used for network research, mimic a controllable environment in homes since they can easily be turned on and off. The analysis method involves event analytics, understanding pattern or correlation of events, and customer analytics that supports relating consumption pattern with a particular project group. Each experiment will be done at varying resolution to find the optimal time for data collection. The data collected from individual appliances demonstrated different consumption patterns and usage frequency which varies with the time and day of the week. The next step involves aggregate power measurement and analysis from both household appliances and ORBIT nodes. This technique will ultimately be used for building demand prediction models in residential areas.

Biography: Firehiwot Gurara was born and raised in Ethiopia. She is a junior Electrical and Computer Engineering student at Cornell University. Before Cornell, she attended Montgomery College, a community college in Maryland. She is currently working with Dr. Hana Godrich, Dr. Ivan Seskar and Jakub Kolodziejski through the GET UP program. Their project is focused on building a predictive model for the energy consumption of the nodes at the Wireless Information Network Lab (WINLAB) which can ultimately be scaled to modeling energy consumption in residential areas. She had previously conducted research at the National Institute of Standards and Technology on optimization of polymer based solar cells and improving uniformity of magnets. At Montgomery College, she was part of the Renaissance Honors program, an interdisciplinary honors program that comes with a scholarship. Firehiwot was also one of the outreach chairs in the Cornell chapter of Society of Women Engineers and a participant in a weekly tutoring program for Ithaca high school students. After finishing her undergraduate degree, she intends to go to graduate school to study power electronics and integration of renewable energy sources with the power grid. Her motivation for focusing on this area is to contribute to solving power shortage issues in the developing world.

Abstracts and Student Biographies

Daisy A. Hernandez **Poster # 12B**
California State Polytechnic University, Pomona

Mentors:
Donna E. Fennell

Bioaugmentation of Chemours Chambers Works AOC1 inactive locations

Cleanup of contamination has often been a difficult task to accomplish, usually being hazardous, time-consuming, and expensive. The use of bioremediation and bioaugmentation has been increasingly growing in the green industry as a solution to widespread contaminants, due to its safer and cheaper approach. This research project focused on use of bioremediation and bioaugmentation to remove pollutants from an industrial site, Chambers Works, located in southern New Jersey. The project focused on degradation of aniline under aerobic conditions and the bioaugmentation of anaerobic microcosms to dechlorinate tetrachloroethylene (PCE) and trichloroethylene (TCE). Aniline degrading bacteria were isolated using sealed culture bottles with minimal growth medium, aniline, and sediment from the Chemours site. After months of inactivity, anaerobic microcosms with anaerobic minimal growth medium, PCE, TCE, and sediment from the Chemours site were bioaugmented with Dehalococcoides to spark up dechlorination. Degradation of aniline and lactic acid was monitored using high performance liquid chromatography (HPLC), while dechlorination of PCE and TCE was monitored using gas chromatography. This study is important for providing Chemours Chamber Works with information on the most effective and efficient ways to remove the contaminants that have been found on the site for the past century.

Biography: Born in Arizona, Daisy Ahumada Hernandez is now a senior at California State Polytechnic University, Pomona where she is studying environmental biology with an emphasis in microbiology and biotechnology. Daisy is a member of her university's Kellogg Honors College, as well as the Achieve Scholars Program, designed to assist students with research readiness, mentorship, and academic success. Additionally, she is president of her 2016-2017 cohort under the McNair Scholars Program, which provides qualified undergraduates with preparation for doctoral study. In recognition of her academic success, Daisy has been on her university's President's List every year since 2014. Daisy's research interests include ecology, plant microbiology, and sustainability. Since 2016, she has been working in a research project exploring the allelopathic effects of juglone on California native plant species. This summer, she has been participating in the Green Energy Technology Undergraduate Program (GET UP) at Rutgers University conducting research involving the biodegradation of industrial contaminants at a superfund site. Daisy will be applying to Ph.D. programs in Fall 2017. Her ultimate plans are to work in a research lab to explore the field of microbiology and plant biology, as well as to become a professor.

Abstracts and Student Biographies

Zichen Lao **Poster # 13A**
Rutgers University

Mentors:
Dr. Kimberly Cook-Chennault / Dr. W. Du / Udhay Sundar

Analysis and Fabrication of Proof of Concept Actuator

The goal of this GET UP project is to investigate the influence of replacing a lead-based piezoelectric material, lead Zirconate Titanate (PZT) with Barium Titanate (BT) and electrically conductive filler (aluminum (Al) or multi-walled carbon nanotubes (MWCNTs), in dome-shaped actuator devices. The longitudinal piezoelectric strain coefficient, permittivity and impedance spectra were compared. Dome-shaped actuators are interested, because curved piezoelectric structure render higher deformation, constant energy conversion efficiency and can withstand large loading, in comparison to planar piezoelectric devices. This project leverages several advances made by the Hybrid Energy Systems and Material Laboratory towards addressing air void density, filler agglomeration and filler matric chemical incompatibility, and seeks to understand if the improvements in processing techniques can result in overall good piezoelectric properties. The experimental control was two-phase (BT and epoxy) devices that were compared to three-phase actuators (BT, epoxy and MWCNTs or Al). The volume fraction of Al or MWCNTs was fixed at 0% or 10%, and the volume fraction of BT was varied from 10% to 70%. A silane coupling agent was used to modify the surface of nano-BT particle in ethanol prior to spin coating the piezoelectric solution onto the device dome structure. Devices were corona polarized at 45kV/mm for 45 minutes on 75 degree-C hot plate, then cured in furnace at 75 degree-C for 7 hours. Piezoelectric strain coefficient d_{33} and d_{31}, permittivity spectra and impedance spectra were measured. The value d_{33} of 10%Al-20%BT-70%epoxy was obtained (0.46 pC/N), which is much higher than the value d_{33} of 20%PZT-80%epoxy (0.16 pC/N).

Biography: Zichen Lao was born in Chongqing, China. He is currently studying mechanical engineering with an energy concentration at Rutgers University. He will graduate in the spring of 2018. During his sophomore and junior years, Zichen worked as a learning assistant and study group leader through the Rutgers Learning Center's Learning Assistant Program (LAP). LAP is a new innovative educational program that engages selected undergraduates in classroom teaching and learning, wherein learning assistants receive a pedagogy course in peer education. He helped students to learn Analytical Physics in the recitation and study group sessions. Zichen will use the skills obtained in this program to achieve his ultimate goal of becoming an engineering professor. During his junior year, Zichen was in the Aresty program working in Dr. Cook-Chennault's Hybrid Energy System and Material (HESM) Lab. The project concentrates in investigation of novel coatings for nano-BT particles for composite dielectric materials. In the summer of 2017, Zichen participates in the Green Energy Technology Undergraduate Program (GET-UP) also working in HESM Lab. The research focuses on processing parameters on dome-shaped piezoelectric composites. In future, Zichen Lao wants to pursue a Ph.D. degree in material science engineering. Ultimately, he wants to be a professor in the engineering field, since he believes training the next generation of engineers is truly important.

Abstracts and Student Biographies

Mary Anne G. Nova **Poster # 13B**
Rutgers University

Mentors:
Kimberly Cook-Chennault, Ph.D.
Department of Mechanical and Aerospace Engineering
Rutgers, The State University of New Jersey

Investigation of novel composites materials for engineered tissue scaffolds

Bone tissue substitute materials incorporating hydroxyapatite (HAp) have been developed throughout the years because of the material's excellent biocompatibility and bioactivity. In addition, calcium phosphate crystals have been shown to grow on polarized piezoelectric materials specifically on the negatively charged surfaces. Research on developing biomaterials that have ideal mechanical and electrical properties without compromising biocompatibility is crucial for constructing scaffolds that induce cell growth, adhesion and branching. This project focuses on understanding the combined influences between scaffold processing and composition in order to better understand the mechanisms that drive bone tissue adhesion, branching and health growth on bioengineered scaffolds. The scaffolds of interest are composed of barium titanate ($BaTiO_3$) a piezoelectric material, and HAp for bone tissue engineering applications. In this study, a series of $BaTiO_3$/HAp composites of varying volume fractions were fabricated by dry/wet mixing, compression mold and sintering. The piezoelectric and dielectric properties of these composites were then measured. Results from this study will further the understanding of polarized $BaTiO_3$/HAp as materials for scaffolds, ultimately providing a cutting-edge alternative to past bone replacement methods.

Biography: Mary Anne Gallaza Nova was born in the Philippines and was raised in Teaneck, New Jersey. Currently, she is a rising sophomore studying Aerospace Engineering at Rutgers University. She is a Samuel & Marcella S. Geltman Scholarship recipient. Mary Anne is an active member of the Reilly Douglass Engineering Living-Learning Community and Phi Sigma Rho (National Social Sorority for Women in Engineering). This summer, Mary Anne is part of the GET-Up REU working in Dr. Kimberly Cook-Chennault's lab. Her research in this program focuses on developing composite materials for engineered tissue scaffolds. She intends to graduate with her bachelor's degree in Aerospace Engineering and pursue a career in the Aerospace industry working for companies like Boeing, Lockheed Martin, and ultimately NASA.

Abstracts and Student Biographies

Lauren Ostopowicz **Poster # 14A**
Millersville University

Mentors:
Christopher R. Dziedziak; Anders B. Laursen, PhD; G. Charles Dismukes, PhD
Department of Chemistry and Chemical Biology
Rutgers University

Ammonia evolution reaction in ambient conditions

Synthesis of ammonia is currently restricted by the absence of a sufficiently active catalyst required to break the strong N2 triple bond; therefore, an excessive amount of energy is required to overcome the energy barrier – which is applied in the form of high temperature and pressure. To improve the existing process and exploit the favorable thermodynamics at room temperature, electrochemical ammonia evolution reaction (AER) converts a clean, abundant resource, nitrogen gas, into an incredibly important industrial chemical, ammonia. A reactive ruthenium oxide (RuOx) on carbon nanoparticles provides the catalyst for the AER. This catalyst, commercially available from Premetek, is shown to produce ammonia under alkaline electrolyte and ambient conditions. The flow rate of nitrogen gas and current density are kept constant during the duration of each experiment, while measuring the potential variation with time. The ammonia evolution rate is determined as a function of the steady state potential to provide insight into the kinetics of the ruthenium-carbon catalyst surface. The rate of ammonia evolution is also converted to the partial current responsible for producing the ammonia to determine the fraction of the current going to the desired AER. Further electrochemical experiments, followed by specific analyses and calculations, are still required to completely understand the kinetics of the ruthenium oxide on carbon nanoparticles catalyst, which is an important step towards producing ammonia at ambient conditions.

Biography: Lauren Ostopowicz is from Lansdale, Pennsylvania, and she is a rising senior at Millersville University of Pennsylvania. She is chemistry major, with a minor in mathematics, and a member of her university's Honors College. Lauren is currently working on an independent, organic synthesis, research project under the advisement of Dr. Steven Bonser, that will soon be published as an undergraduate thesis. Her work in the advanced laboratory class has also contributed to two online journal publications in organic synthesis. Additionally at Millersville, Lauren serves as the Secretary on the board of Millersville University's American Chemical Society Student Chapter and is working closely with the Vice President to obtain the requirements for the American Chemistry Student Chapter Green Energy Award. She is also the Liaison and Primary Editor for the Made in Millersville Conference Proceedings Journal. Lauren also spends her free time running classroom style tutoring sessions for most of the chemistry courses offered at her university. Millersville University's Honors College has recognized her near perfect GPA by awarding her with the "Academic Achievement Award" all three of the years that she has attended. She was also awarded the "Polymer Chemistry Award" earlier this year, by Millersville's chemistry faculty, for her outstanding work in the general and organic chemistry series. In addition to her work and achievements at Millersville, Lauren is spending the summer at Rutgers University working in Dr. Charles Dismukes' laboratory, under the advisement of Dr. Anders Laursen, as a part of Rutgers University's Research in Science and Engineering (RiSE) program. She has a concern for the environment, which helped to land her a position in the NSF sponsored Green Energy Technology Undergraduate Program (GET UP) REU. Upon graduating from Millersville, Lauren intends to pursue graduate study in Environmental Chemistry.

Abstracts and Student Biographies

Grace S. Cai **Poster # 14B**
Mount Holyoke College

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

3D piezoresponse force microscopy using contact resonances

Piezoresponse force microscopy (PFM), a common method for characterization of ferroelectric materials at nanometer scales, is used to study multiferroic hexagonal manganites $HoMnO_3$ and $YbMnO_3$. For a material with unknown orientation, there could be both out-of-plane and in-plane piezoelectric responses. The out-of-plane deformation leads to vertical deflection of the cantilever, while the in-plane deformation leads to torsional and buckling deformation of the cantilever. The torsional mode of the atomic force microscopy (AFM) cantilever results in a “lateral” signal of the AFM position sensor, while both deflection and buckling result in a “deflection” signal, which complicates the analysis of ferroelectric domain pattern in PFM images. Herein, we propose a method to differentiate these two modes without rotating the sample utilizing the contact resonance of either deflection or buckling mode. If we succeed, this would allow 3D PFM imaging without sample rotation. We performed controlled PFM experiments on two different surfaces, (110) and (001), of hexagonal manganites with in-plane and out-of-plane polarization, respectively. The buckling contact resonance is approximately 400 kHz, and the deflection contact resonance is approximately 450 kHz. Preliminary results indicate that the ratio of the two contributions can be varied significantly by changing excitation frequency. Due to the close proximity of the buckling and deflection contact resonances, however, it is difficult to achieve complete separation of these two responses. This project is supported by funding from National Science Foundation grant PHY-1560077 and grant DMR-1506618.

Biography: Grace Cai is a rising senior at Mount Holyoke College. As a participant in the Physics & Astronomy REU program, she is working with Professor Weida Wu and Mr. Wenbo Wang on the PFM; the project involves the nanoscale characterization of multiferroic hexagonal manganites. At MHC, Grace works in Professor Kerstin Nordstrom’s soft matter physics lab on simulating the flow of granular material. She is the vice president of MHC’s chapter of the Society of Physics Students.

Abstracts and Student Biographies

Steven V. Clark **Poster # 15A**
Colorado School of Mines

Mentors:
E. Cline, R. Gilman
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Track reconstruction and the proton radius puzzle

In 2010, Pohl et al. (Nature 466, 213) measured the proton charge radius to be 0.84184(67) fm using muonic hydrogen spectroscopy. This value differs by about 5σ from the CODATA proton radius from measurements with electrons. Other experiments with muons and electrons have confirmed the difference and the discrepancy has been termed the “Proton Radius Puzzle.” Currently there are no explanations for the puzzle. The MUon proton Scattering Experiment (MUSE) will make a significant measurement of the proton radius with muon scattering for the first time. The experiment tracks elastic scattering of electrons and muons off of liquid hydrogen. Particle tracks are reconstructed with track fitting software GenFit. Using a simulation of MUSE, GenFit has been determined to be proficient at track reconstruction. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Steven Clark is currently a rising senior studying Engineering Physics at Colorado School of Mines. He works on campus as a Hall Director and is involved in the Society of Physics Students, physics honors society Sigma Pi Sigma, engineering honors society Tau Beta Pi, and Mines Catholic Campus Ministry. He plans to pursue a Ph.D. in Physics upon graduation.

Abstracts and Student Biographies

Hannah M. Glaser **Poster # 15B**
Virginia Tech

Mentors:
Amitabh Lath, Elliot Hughes, Eva Halkiadakis, Abhijith Gandrakota, Yuri Gershtein
Department of Physics and Astronomy
Rutgers University

Search for low mass three-jet resonances at the Compact Muon Solenoid

The Standard Model of physics describes everything we currently know about fundamental particles and their interactions; however it is not complete. One approach used in the search for new physics is to perform an analysis on experimental data which would be sensitive to a "supersymmetric partner" to a known particle. This new particle would possess the same properties as one of the Standard Model, save for a reversed spin and a higher mass. Due to the unique behavior of the gluon as both a carrier of and participant in the Strong Force, this particle is known to decay into a set of three quarks observed as a three-jet resonance in the detector. A theoretical partner to the gluon, the "gluino," would leave a similar signature, making it a viable target for multi-jet analysis. This work applies the techniques of this approach to a lower mass range than has yet been examined to determine whether such a discovery could potentially lie within their scope at this scale. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Hannah Glaser is a senior Physics major at Virginia Tech in Blacksburg, VA, having transferred there after earning her Associate of Science degree at Northern Virginia Community College. As a result of her curiosity and tendency to agonize over details, her interests have naturally gravitated towards fundamental particle physics. She plans to complete her Bachelor's degree this fall, and hopes to pursue a PhD in Physics in the future. It is her dream to become an experimental high-energy particle physicist one day so that she can officially worry too much about the little things for a living.

Abstracts and Student Biographies

Umran N. Haji **Poster # 16A**
University of California, Berkeley

Mentors:
Carlton Pryor, Rutgers University

The eccentric orbits problem: Comparing the orbits of Milky Way satellite galaxies to simulation results

We are studying the orbital properties of the satellite galaxies of the Milky Way and comparing them to the orbital properties of satellites found in simulated Milky Way-like systems, as a means of testing cosmological simulations of galaxy formation. The particular problem that we are investigating is a discrepancy in the distributions of orbital eccentricities. Previous studies (Cautun & Frenk 2017; CF17 hereafter) of Milky Way-mass systems generated in simulations have found that the satellites tend to have larger fractions of their kinetic energy invested in radial motion with respect to their central galaxy than do the real-world Milky Way satellites; less than 1.5% of simulated systems yield results as extreme as the Milky Way system. One possible explanation for the discrepancy is that the simulations used by CF17 do not accurately model small-scale structure such as satellite systems. Alternatively, it is possible that the simulations are correct but Milky Way-like systems are simply rare in the universe. If this is the case, then simulations of systems that are more similar to the Milky Way in other respects should be more likely to yield orbital properties that agree with observation.

We analyze four simulations of Milky Way-like systems, each with higher resolution and better input physics than those in CF17. The one system whose distribution of satellite radial kinetic energy fractions closely resembles that of the Milky Way is the very system whose formation history most closely matches that of the Milky Way. With only four simulated systems, we cannot determine whether more accurate modeling or a specific formation history has improved the agreement with observations, but our results suggest examining larger sets of simulations and explicitly comparing samples of systems with different formation histories. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Umran Haji is from Chico, California and is a rising senior at UC Berkeley, studying philosophy and astrophysics. During the academic year, he works on SETI research at the Berkeley SETI Research Center. In his free time, he likes to indulge in reading, swing dancing, Baroque music, and classic country music.

Abstracts and Student Biographies

Nicholas J. H. James **Poster # 16B**
Harvard College

Mentors:
Catie Raney, Sean Brennan, Charles R. Keeton
Department of Physics and Astronomy
Rutgers-School of Arts and Sciences

Exploring gravitational lensing model variations in the Frontier Fields galaxy clusters

The phenomenon of gravitational lensing is a result of the deflection of light from a distant source by intervening matter. The light is often split into multiple images, which are magnified and distorted by the intervening mass. The mass distribution of the lensing object can be modeled based on the image pattern that it produces, making gravitational lensing a useful probe of the difficult-to-detect dark matter. Multiple groups have been working on modeling the mass distributions of the six lensing galaxy clusters in the Hubble Space Telescope Frontier Fields data set. The magnification maps produced from these mass models will be important for the future study of the lensed background galaxies, but there exists significant variation in the different groups' models and magnification maps. We introduce two-dimensional histograms as a tool for visualizing these magnification map variations. Using a number of simple, one- or two-halo singular isothermal sphere models, we explore the features that are produced in 2D histogram model comparisons when parameters such as halo mass, ellipticity, and location are allowed to vary. Our analysis demonstrates the potential of 2D histograms as a means of observing the full range of differences between the Frontier Fields groups' models.
This project has been supported by funding from National Science Foundation grants PHY-1560077 and AST-1211385, and from the Space Telescope Science Institute.

Biography: Nick James is a rising senior at Harvard College, where he studies astrophysics and physics. After graduating, Nick plans to pursue a PhD in astrophysics. Nick's past research at Harvard has focused on interstellar dust in nearby galaxies. His research this summer relates to gravitational lensing by galaxy clusters. In his free time, Nick enjoys reading and playing the violin.

Abstracts and Student Biographies

Gabrielle A. Koknat **Poster # 17A**
University of Cincinnati

Mentors:
Mikhail Kareev, Xiaoran Liu, Banabir Pal, Fangdi Wen, Yanwei Cao, Jak Chakhalian Department of Physics and Astronomy, Rutgers University, Piscataway, NJ 08854

Strain-tunable metal-insulator transition in ultra-thin rare-earth nickelate films

Metal-insulator transition (MIT) is a widely observed phenomenon in condensed matter physics, where a transition from metals to insulators is promoted by tuning various parameters such as temperature, pressure, and doping. The study of MIT is not only fundamentally important for basic science but also for device applications. Due to the entanglement of lattice degrees of freedom, charge, spin, and orbital, the origin of MIT in rare-earth nickelates has remained an open question for the past twenty years. Artificial epitaxy of materials at the atomic scale has been proven a powerful tool for tuning the lattice degrees of freedom, charge, spin, and orbital and investigating the underlying physics. Taking NNO as a prototype and utilizing the state-of-art laser molecular beam epitaxy (laser-MBE), I will demonstrate how to control the MIT with heterointerface engineering. We acknowledge the financial support of the National Science Foundation through grant PHY-1560077.

Biography: Gabrielle is a going into her third year at the University of Cincinnati. She is studying math and physics with the interest of pursuing a career in condensed matter physics research. For her project in the Physics and Astronomy REU program at Rutgers, she works with Jak Chakhalian on pulsed-laser deposition growth and characterization of thin films. At the University of Cincinnati, she works with Dr. Leigh Smith in exfoliating electronic materials to fabricate optically sensitive devices. Outside of academic pursuits, Gabrielle enjoys hiking, cooking, and spending time with her family.

Abstracts and Student Biographies

Margarita E. Rivers **Poster # 17B**
Wellesley College

Mentors:
Viacheslav Manichev
Department of Chemistry and Chemical Biology

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

Characterizing ion beam induced sample damage in the Helium Ion Microscope

The Helium Ion Microscope (HIM), a new form of sub-nanometer microscopy, has several advantages over traditional electron based forms of imaging, such as the ability to image insulating samples without a conducting overlayer. HIM images are generated by rastering a helium ion beam across a sample and collecting the emitted secondary electrons. The number of secondary electrons corresponds to different grayscale values, creating a black and white image.

Rutherford Backscattering physics presents a method for determining the elemental composition of the atoms in samples: The energy of a backscattered helium ion depends on the mass of the sample atom it has scattered from. By measuring the flight time of the backscattered ion, we determine this energy. Therefore, by detecting the backscattered helium ions, we can create images of samples that convey this elemental information and how those elements are distributed.

In order to create accurate images, it is important to understand how the sample is damaged by the incident ions. We therefore exposed a 1.3 nm thin platinum film on silicon to varying ion beam doses and observed how the composition of the surface changed with dose. From this we calculated the sputtering coefficient for platinum. In a separate experiment, using X-ray photoelectron spectroscopy, we verified the thickness of the platinum film. Our results show that elemental identification is possible on the 500 nanometer scale using this "time of flight" configuration but that there is a limit to our ability to sensitively identify elements as a result of beam deterioration. We found a sputtering coefficient that is smaller than the accepted value in the literature of ion beam sputtering; possible systematic errors to explain this difficulty will be discussed.

This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Maggie Rivers is a rising junior and B.A. candidate in physics at Wellesley College. She is opting to complete the mathematical physics option within her major and plans to pursue a Ph.D. in physics upon graduation. When she isn't calling Wellesley home, Maggie is with her family in Miami, FL.

Abstracts and Student Biographies

Sandy A. Spicer **Poster # 18A**
Siena College

Mentors:
Rachel Somerville, Ena Choi, Ryan Brennan
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Tracing the origin of black hole accretion through numerical hydrodynamic simulations

The existence of supermassive black holes at the centers of galaxies is now a widely accepted idea that has revolutionized our understanding of galaxy formation and evolution. Certain events like black hole accretion occur when gas, dust, and other material fall close to the black hole and interact with it. This process can be observed through the radiation that it produces; however, computer simulations help us understand it over longer timescales. Through simulations, we can trace the inflow and outflow of gas within galaxies from the early formation period up to present-day. We track gas particles that black holes interact with over time to trace the origin of the gas that feeds supermassive black holes. These gas particles can come from satellite galaxies or mergers, or be a result of stellar evolution. Tracking gas particles will tell us what type of gas is feeding the black hole, where it is coming from, and how this changes based on halo mass and age. Answering these questions will help us determine the role supermassive black holes play in galaxy evolution. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Sandy Spicer is a rising junior physics major at Siena College in Loudonville, NY. She is currently conducting computational astrophysics research with Dr. Rachel Somerville through the Physics and Astronomy REU program at Rutgers. At Siena, she has done observational astronomy and particle physics research with Dr. Rose Finn and Dr. Matthew Bellis. She works with Dr. Rose Finn on an ongoing project that involves probing star-forming regions in local galaxy clusters. Aside from research, she works as a media and sports photographer, is a physics tutor, and is part of the Yearbook Committee on campus. In her free time, she enjoys hiking, traveling, and playing softball.

Abstracts and Student Biographies

Abigail C. Warden **Poster # 18B**
University of Missouri-Columbia

Mentors:
Matthew R. Buckley
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Dark mediators in four top search at the LHC

Dark matter consists of about 27% of the known universe and yet its properties cannot be described by the Standard Model. We hypothesize in a new physics model that top quarks can decay to dark matter by an unknown mediator particle. My project seeks to understand this mediator particle by setting limits to the coupling factor, the strength of its interaction to the top quark. Assuming the mediator particle would intermittently decay back to top quarks, this would give results we can detect at the Large Hadron Collider. Therefore, I simulated a completed CMS multi-lepton search experiment in which four top quarks were produced. After validating my simulated results to CMS's, the new physics model was tested using the same simulated search and further calculations gave an upper limit of 3.42 for the coupling factor. More data with events producing four top quarks would possibly lower this limit and thus indicate stronger theoretical phenomena. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Abigail Warden grew up in Owensville, MO and is currently an upcoming senior at the University of Missouri-Columbia, double majoring in physics and mathematics. She is a member of her college's Society of Physics Students along with the Physics Club. Abigail's research experiences include modeling the dust properties of variable stars with Dr. Angela Speck and setting limits on a mediator particle connecting dark matter to the top quark in a new physics model with Dr. Buckley at Rutgers University. After graduating, she plans to obtain her PhD in theoretical particle physics and one day work in a national laboratory.

Abstracts and Student Biographies

Jenna T. Abyad **Poster # 19A**
Drew University

Mentors:
Luigi DiCostanzo Ph.D., Christine Zardecki, Brian Hudson Ph.D.,
Monica Sekharan Ph.D., Sutapa Ghosh Ph.D., Stephen Burley Ph.D.
Center for Integrative Proteomics Research
Rutgers, The State University of New Jersey

Analyzing the evolutionary origin of bacterial drug-resistant enzymes in 3D

Antimicrobial resistance (AMR) is a growing public health concern as microorganisms are becoming resistant to the current antibiotics used to treat bacterial infections. AMR could result in 10 million anticipated deaths each year by 2050. The Research Collaboratory for Structural Bioinformatics Protein Data Bank (RCSB PDB, rcsb.org) is a free online public resource that provides an archive of the 3D atomic level structure of biological molecules including AMR-related structures such as drug-resistant enzymes. RCSB.org is a useful tool for scientists who are studying and developing novel antibiotics and inhibitors for drug-resistant enzymes. In this work, AMR-related structures were identified using the Comprehensive Antibiotic Resistance Database (CARD) and associated with entries found in the PDB. The National Center for Biotechnology Information Basic Local Alignment Search Tool Program (NCBI BLASTP) and RCSB PDB sequence search were used to determine the evolutionary origin of AMR- related aminoglycoside modifying enzymes. This research allows for a clearer understanding of these modifying enzymes and their origin while providing RCSB PDB users with easy access to AMR-related PDB entries.

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

Biography: Jenna Abyad is a NJ native majoring in Biochemistry and Molecular Biology at Drew University. She expects to graduate in May of 2018 with Honors. She has extensive research experience having interned at a food flavoring company, conducted biochemistry research at Stony Brook University, and is currently conducting organic chemistry research at Drew University. This summer, she is part of the RiSE summer program working with the Research Collaboratory for Structural Bioinformatics Protein Data Bank (RCSB PDB). Her focus is analyzing antimicrobial resistance (AMR) through structural biology and bioinformatics. In her free time, she enjoys playing tennis, running, and volunteering to help her local community. She is grateful for this opportunity as part of RiSE as it allows her to experience cutting edge research at the prestigious, Rutgers University. This opportunity has also helped confirm her love and passion for scientific research. She will be applying to graduate school this fall to pursue a PhD. She hopes to contribute to the field of drug discovery.

Abstracts and Student Biographies

Emmanuel E. Alvarez **Poster # 19B**
Rowan University

Mentors:
Steven Silverstein, Ph.D. Division of Schizophrenia Research Rutgers University Behavioral Health Care

A comparison of dark adaptation techniques in flash electroretinography

Studying the retina in individuals with schizophrenia may provide insights into the pathophysiology of the disorder. Current literature suggests retinal dysfunctions in individuals with schizophrenia and, to a lesser extent, in children at high risk. Current methods to study the retina include the flash electroretinogram (fERG). The fERG records electrical potentials of the retina under two general conditions: photopic and scoptic. Phototopic, or light-adapted, tests are conducted after light exposure to assess for cone cell functioning. In scotopic, or dark-adapted, tests, results reflect rod cell functioning as cones are not active under low light conditions. Scotopic tests require a 20-minute dark adaption period which may cause discomfort for individuals with active psychosis. Therefore, the current study aimed to determine whether wearing red-tinted goggles under normal lighting conditions could substantially shorten the time needed for dark adaptation. Psychiatrically healthy participants were exposed to two conditions: a standard 20-minute dark-adaptation period and a condition under which red-tinted goggles were worn for 20 minutes under normal lighting, followed by 4 minutes of dark adaptation. Data was analyzed in terms of both covariation between waveform amplitudes and latencies across the two conditions (using correlation), and absolute differences in values across conditions (using paired t-tests). Preliminary results (n=13) hint that use of red-tinted goggles may be an adequate replacement for standard dark adaptation. Some findings, specifically right eye latencies, however, suggest that a brief extension of the dark adaptation period after wearing goggles would be optimal.

Biography: A Gates Millennium Scholar, Emmanuel (Manny) Alvarez is currently a rising junior at Rowan University working towards a Bachelor’s in Psychological Science with a minor in biology and is on track to graduate in May 2019. He has conducted research as a member of the Rowan University Schizophrenia-Spectrum Lab (RUSSL) under the direction Dr. Thomas Dinzeo since his freshman year and was awarded the “Outstanding Contribution as an Underclassman” in May 2017. His previous research involved schizophrenia-spectrum disorders, particularly schizotypy and its physiological relationships to hypomania in a subclinical sample. He has enjoyed his RiSE experience, working with Dr. Steven Silverstein and the Division of Schizophrenia Research. His current project involves the use of Flash Electroretinography (fERG) and the reduction of the dark adaptation period. In the future, Manny aspires to obtain his Ph.D. in a neuropsychology or neuroscience related field. Longer term, he would like to research cognitive neuroscience, as well as teach it as a research professor. In his spare time, Manny enjoys cycling, searching out great places to eat, and playing his trumpet.

Abstracts and Student Biographies

Rebecca Revilla **Poster # 20A**
University of Texas at San Antonio

Mentors:
Maurice Elias, Ph.D.
Department of Psychology
Rutgers, The State University of New Jersey

Predicting academic achievement in urban middle school students using classroom relationships and social-emotional and character development (SECD) reflection and feedback

Social-emotional and character development (SECD) in schools provides students with crucial life skills that can prevent behavior problems, interpersonal violence, and substance abuse while promoting academic achievement and lifelong success. The MOSAIC (Mastering Our Skills and Inspiring Character) Project is a SECD curriculum that is being implemented in six low-performing, high-poverty, largely minority urban middle schools. One method of evaluating the MOSAIC Project is assessing the impact on academic achievement. Although SECD and academic achievement have a positive relationship, the specific variables involved are not fully understood. The objectives of this study are: (1) to evaluate the reliability and correlation among four proposed subscales developed from a 10-item quantitative reflection and feedback survey filled out by students participating in the MOSAIC project and (2) to identify which subscale is the strongest predictor of academic achievement in these students. Demographics and grades were collected from each school and 682 students completed the survey. The survey items were grouped by construct based on literature into four subscales: Teacher-Student Relationship, Peer Relationship, Self-Perceived Character, and Curriculum Expectations. We examined the proposed subscales using SPSS to determine reliability and correlation. Results show that the two items in each subscale “hang together” and are significantly correlated ($p < .001$). Correlations among all of the subscales show that each subscale is distinct ($r < .5$). A hierarchical regression analysis was conducted using gender and ethnicity as controls. Contrary to our hypothesis, only the Self-Perceived Character Subscale was significantly positively predictive of academic achievement ($\beta = .32$, $p < .001$). Based on our results, it appears that internal perception of self was more predictive of academic grades than relational variables. This implies that constructs relating to self-perceived character, such as self-efficacy, could be used in future research to understand the relationship between SECD and academic achievement.

Biography: Rebecca Revilla was born and raised in Texas. She is a rising senior Psychology student at the University of Texas at San Antonio. At her home institution, she is a participant in the Maximizing Access to Research Careers Undergraduate Student Training in Academic Research (MARC U-STAR) Program and conducts research in Dr. Mary McNaughton-Cassill’s Stress Adaption Lab. This summer, Rebecca worked in Dr. Maurice Elias’ Social-Emotional and Character Development Lab. After graduating, she plans to attend a PhD program in Clinical Psychology.

Abstracts and Student Biographies

Matthew R Bredder **Poster # 20B**
Washington University in St. Louis

Mentors:
Sarah Grace Helton, Laura Banu, Marsha E Bates
Center of Alcohol Studies
Rutgers, The State University of New Jersey

Effects of resonance breathing on subjective craving and neural reactivity to alcohol cues

Alcohol use disorder (AUD) is characterized by undercontrolled alcohol consumption. Craving is a hallmark of AUD; this mental and physiological experience compels many to resume drinking even after long periods of abstinence. In addition to subjective craving, individuals with AUD also exhibit elevated neural reactivity to alcohol cues. Standard treatments, which largely aim to reduce craving through cognitive strategies, remain inadequate. The central autonomic network (CAN) presents a complementary treatment target, as it contains brain regions that regulate cardiac function, some of which are also implicated in craving. We hypothesized that a brief resonance breathing (RB) intervention, which enhances communication between the cardiovascular system and CAN, would reduce cue-induced craving and alter neural reactivity to alcohol cues. Participants included individuals with AUD and low-risk drinkers who were randomized to perform either RB or a control task between two sets of visual alcohol cues (A1, A2). Neural reactivity was measured with functional magnetic resonance imaging (fMRI), and subjective craving was assessed after each set of images with a visual analogue scale. Comparison of the data from A1 to A2 yielded three clusters showing significant changes in neural reactivity for the RB group. No changes were observed for the control group. Repeated measures ANOVA found no effect of RB on subjective craving. In addition, there was no correlation between neural reactivity and subjective craving. These results indicate brief RB modulates neural reactivity to alcohol cues, but may not affect subjective craving response. Future work will probe the specific brain regions involved.

Biography: Matthew Bredder studies biology and psychology at Washington University in St. Louis and will graduate in December 2017 with majors in both. He has been grateful to participate in research seeking to leverage the link between heart rate variability and alcohol craving to explore novel treatments for alcoholism. Exposure to this work in Dr. Bates' Lab at Rutgers, as a part of RiSE, has solidified his plan to work towards a PhD in neuroscience. At WUSTL, Matthew works in the Moron-Concepcion Lab, which investigates neural mechanisms involved in opioid dependence and pain. These research experiences, along with a personal link to the harm wrought by alcoholism, have spurred a drive to improve our understanding of addiction. Apart from his research interests, Matthew is a member of Psi Chi (International Honor Society in Psychology) and Zeta Beta Tau fraternity. He enjoys traveling, art, camping, dancing, and listening to and making music with friends.

Abstracts and Student Biographies

Brittany J. Camacho **Poster # 21A**
Colorado College

Mentors:
N/A

"No Man Walks Alone Anymore": African Resistance, War, and the Law on Hispaniola, 1520-1550

African voices in New World scholarship are seldom centralized in the historical record. They appear instead as secondary characters in exchanges between indigenous and European populations. Historical narratives concerning the presence and role of African populations on Hispaniola are especially hidden, primarily as a result of the historiographical tradition, noted by Erin W. Stone, of the island acting as an "antechamber" to the conquest of modern-day central and Latin America. By treating the Spanish conquest and occupation of Hispaniola as the primary, but altogether inconsequential step in the establishment of the Spanish empire, the flourishing and multi-faceted society that existed on the island in the sixteenth century is lost to history, and its subaltern populations reduced to nonexistence. This project focuses on African cimmarons, runaways from enslavement, on Hispaniola and their greater role as historical agents in the Black Atlantic and Spanish Caribbean. Cimarron communities and the wars they waged against the Spaniards influenced the government of Hispaniola between 1520—1550. Beginning with the Wolof rebellion on Diego Colón's sugar ingenio on Christmas Day, 1521, this paper will examine a dichotomous period of resistance and attempts at suppression to understand the development of society through established and evolving laws on Hispaniola. This will be done by referencing correspondence, royal decrees, and ordinances between government officials on Hispaniola and Spain. Dialogues concerning three cimarron leaders (Sebastian Lemba, Diego de Ocampo, and Diego de Guzman) in particular will shed light on the definitive role that African cimmaronaje played in shaping society in sixteenth-century Hispaniola. It is the hope that this project will facilitate further analysis concerning the African population of Hispaniola alongside indigenous resistance and nuanced debates on the Spanish conception of "human rights".

Biography: Born on St. Croix, U.S. Virgin Islands, Brittany Jurene Camacho is a descendant and emerging scholar of the African Diaspora. She is a Classics-History-Politics major at the Colorado College preparing to enter her senior year, and currently lives in New Jersey. A rising senior, she is an active performing artist who participates in at least three productions a semester, and a senior Admissions Fellow who will assist in the admission of the Colorado College Class of 2021. Brittany earned the privilege of researching at Rutgers University this summer under Professor Walter C. Rucker, PhD. and Professor Kim D. Butler, PhD. as a recipient of the ACM-CIC Mellon Graduate School Exploration Fellowship. She is one of the first humanities students to participate in the RiSE/REU program.

Abstracts and Student Biographies

Crystal A. Clements **Poster # 21B**
Dartmouth College

Mentors:
Dr. Dawne Mouzon & Dr. Peter Guarnaccia

Single middle-class African-American women's perceptions of childbearing opportunities

Family formations in the United States have unquestionably become more varied and flexible over time. However, despite rapid changes in the timing, sequencing, and maintenance of families, marriage and motherhood remain two normative expectations for women in the United States. In 2015 the Women's Family Formation Study was crafted in hopes of better understanding the marriage squeeze and Black-White differences in single middle-class women's perceptions of opportunities for both marriage and motherhood. Their sample consisted of 882 survey participants (60% African-American and 40% White-American) and data was collected via Qualtrics. The objective of this project was to use the data collected from the Women's Family Formation Study to better understand how single African-American women in the United States perceive reproductive technology and adoption as potential childbearing opportunities. After conducting a thorough literature review, the open-ended responses for the questions related to reproductive technology were manually coded and grouped into themes. Upon analysis, results suggest both that single middle-class African-American women favor adoption and fostering over the use of reproductive technology and that they are reluctant to become mothers without a having a partner or being married first.

Biography: Crystal Clements was born and raised in Queens, New York. Crystal is a rising senior at Dartmouth College double majoring in Anthropology and Spanish. Among many things, she enjoys traveling and watching Greys Anatomy. This summer she worked with Dr. Dawne Mouzon and Dr. Peter Guarnaccia studying the perceptions of marriage and motherhood across race and social class divides. She is looking forward to conducting research her senior year and is confident that her experience with RiSE this summer will be a key contributor to her future success.

Abstracts and Student Biographies

Bresasha C. Duquaine **Poster # 22A**
Beloit College

Mentors:
Dr. Judy L. Postmus, Dr. Sarah McMahon, Laura Johnson, Ph.D. Candidate

The Campus Climate Sexual Assault Survey and Sexual Minority Student Victimization

Sexual assaults on college campuses have always been an issue, but only recently has research been published on the severity of the problem. The Obama Administration funded campus climate surveys to assess the self reported experiences of people on college campuses with regard to sexual assault. Even with these surveys, the research is predominantly focused on heterosexual people's experiences, which gives limited attention to the Lesbian, Gay, and Bisexual (LGB) population and sexual violence. The purpose of this study was to compare victimization rates of gay/lesbian and bisexual students to heterosexual students. The groups were self identified. Furthermore, this study explored broader questions about the gay/lesbian and bisexual population, assessing their feelings of belonging on campus and their trust of fellow students and the university. Data was obtained from the 2014 campus climate sexual violence survey on the Rutgers New Brunswick campus. Statistical tests such as the One-Way Analyses of Variance (ANOVAs) and Chi Square Tests of Independence were used to find significance. Bisexual students reported a lower group sense of community, a higher victimization rates across all categories both at Rutgers and prior to arriving, and a greater apprehension of other Rutgers students and university response to sexual assault. Future studies will focus on campus sexual assault climate and the LGBTQA+ experience, specific reasons as to why bisexual students have such a high victimization rate, and further research into programming that could help decrease the prevalence of violence towards this population.

Biography: Bresasha C. Duquaine is a rising senior psychology major at Beloit College, a small liberal arts school in Wisconsin. At her home institution, she is a member of Psi Chi and Mortar Board honors society. She is also a member of Kappa Delta sorority, which has philanthropy affiliations with Prevent Child Abuse America and the Girl Scouts of the USA. Bresasha's past research has analyzed student's health and wellness attitudes at Beloit College. Her research this summer was at the Center of Violence Against Women and Children and analyzed the relationships between sexual victimization and sexual orientation. After researching at the school of social work this summer, Bresasha is thinking about completing a master's of social work in the future.

Abstracts and Student Biographies

Callie R. Ellis **Poster # 22B**
Knox College

Mentors:
Dr. Barry Sopher

The effect of a quiz on intertemporal planning with temptation, or anticipating your lazy disorganized self

The study of economics often assumes that humans are rational human actors: they are interested in maximizing their utility, or getting the most use that they can out of goods or money. This is an important understanding to how humans behave when making economic decisions. However, this axiom does not always hold in real life, as a result of unforeseen future constraints. This behavior is often seen in deferred payment plans. Studying deferred payment plans gives us an understanding of how consumers act and how that information can be used to capitalize off of, on an individual sense by reconsidering the efficiency of one's decisions, or corporations to make additional funds. Dr. Barry Sopher, Dr. Kaylan Chatterjee, and Dr. R. Vijay Krishna have recently put this to the test: assessing the likelihood of subjects to return for deferred payment plans, effectively shadowing how subjects quantify their own time valuation. However, there are constraints to the collection of funds, such as having a job they have to be at, not having transportation to the collection center, or even not having the desire to go to the collection center. Together these situations mimic a decision failure observed in deferred payment loans. From these experiments Dr. Sopher and Callie work on determining the effect of making a small quiz necessary for payment in this experiment, effectively simulating the necessity of bringing a receipt of purchase when returning an item to a store. We hypothesized that the presence of the quiz in a payment option will deter subjects from choosing the said payment option, and choose an option that may be worth less, but will not have a quiz. Results suggest that the presence of a quiz does impact choices between the dominant and nondominant option.

Biography: Callie Ellis is a rising senior currently attending Knox College where she is pursuing a Bachelor's Degree in Economics, with a minor in Statistics. She is conducting research this summer with Dr. Sopher and the RiSE Program, with funding from the GSEF Program. This summer she is pursuing research on deferred payment plans and the willingness of individuals to follow through on payment plans. After graduating with her Bachelor's Degree, Callie plans to pursue a Ph. D. in Economics and aspires to someday work for the Federal Reserve. Callie is originally from Belle, Missouri, a small Midwestern town that kindled Callie's economic interests in poverty and rising wealth and income inequality in the United States. Aside from academics, Callie enjoys playing video games and working as a Residential Assistant, Information Technology Help Desk Assistant, and Economics and Mathematics tutor.

Abstracts and Student Biographies

Mario A. Gaviria **Poster # 23A**
Pomona College

Mentors:
Dr. Spencer Knapp, Robert Barrows

Synthesis of a Series of tetrahydrobenzonaphthyridines as Novel Anti-Malarials

At the start of 2016, approximately 50% of the world's population was at risk of malaria. The disease is caused by Plasmodium parasites, which are transmitted to people through the bite of infected Anopheles female mosquitoes. The world standard for treating malaria involves the use of artemisinin therapies, but resistance to this class of compounds has been observed in three of the five species that infect humans. Therefore, it is vital to develop novel anti-malarials to combat these resistant strains. Using high-throughput phenotypic screening, a process that uses automation to assay a library of compounds for activity, a molecule was identified that is both active and structurally deviant from traditional therapeutics. The molecule, a tetrahydrobenzonaphthyridine, was found to have poor water solubility, so analogues were synthesized with the goal of improving this property. These analogues contained structural modifications at two key locations, and were designed to have a molecular weight no greater than 450 daltons for increased oral availability. The total synthesis of the analogues involves a four-step synthetic pathway. The initial step uses the Pfitzinger reaction to make the initial scaffold for the analogues, and then a series of aniline derivatives were used to functionalize the first key location; a carboxylic acid. A secondary amine was the other key location that was targeted for modification. A series of reductive alkylations were successfully completed using various aldehydes and acids, consisting of alkyl chains, ethers, heterocycles, and benzyl derivatives, making sure to avoid metabolically problematic groups. This pathway was used to synthesize a series of analogues that will be sent out for activity testing in the hopes of finding a "lead" compound to continue modifying until a potential drug candidate is obtained.

Biography: Mario Gaviria was born in Cali, Colombia, but moved to Miami, Florida at a young age. Mario is a rising senior pursuing a Bachelor's degree in Chemistry from Pomona College and is on track to graduate in May 2018. After graduation, he plans to pursue a Ph.D in Organic Chemistry and plans to work in drug discovery and development. This summer, Mario is enjoying research in Dr. Knapp's lab on the development of novel anti-malarial agents. He is grateful for the opportunity to be a part of the RiSE program since this experience has helped him decide on what to study in graduate school.

Abstracts and Student Biographies

Joshua M. Goddard **Poster # 23B**
Cornell University

Mentors:
Xing, Jinchuan

Interspecies comparative analysis of tRNA-derived RNA fragment (tRF) expression

Current research on cellular regulation has revealed the vital roles that many small non-coding RNA molecules play in cellular function. Small RNAs can participate in processes such as post-transcriptional gene expression, cellular growth, transposon activity regulation, and fertility. One class of small RNAs recently discovered is tRNA-derived RNA fragments (tRFs). These 15-32bp RNA molecules play important roles in cellular regulation and proliferation, especially in controlling transposon activity. In this study, a comparative genomics approach was applied to identify evolutionarily conserved tRF expression patterns to further understand tRF functions and purpose. Specifically, which tRNA genes code for tRFs, and which mammalian species they are prevalent in. tRF datasets were obtained from studies on piwi-interacting RNA in human and common marmoset (Callithrix jacchus) testes (Hirano et al. 2014, Ho et al 2014). These small RNA data sets were filtered and processed to ensure only high-quality tRF candidates were contained. These reads were then matched to a library of annotated tRNA genes, with the resulting aligned reads being inspected on a gene, isoacceptor, and amino acid level. Comparative analysis revealed that tRF expression is conserved in human and marmosets. Four of the five amino acids with highest production of tRFs are common to both species. Furthermore, assessment of the 62 isoacceptors revealed that four of the top five tRF expressive isoacceptors were also shared between species. These four shared isoacceptors produce 44% of marmoset and 50% human total tRF expression. Conserved expression patterns across species contribute to mounting evidence that tRFs hold biological roles, and point to research potential of an evolutionary approach to tRF analysis.

Biography: Joshua Goddard was born and raised in Yucca Valley, CA. He is currently a rising senior at Cornell University, studying Animal Science with a concentration in Computational Genetics. He is also an active member of the Cornell Raptor Program and PEGS, and engages in research in the Selvaraj Lab. This summer, he is working in the Xing Lab of Genomics, conducting comparative genomics research on novel RNA fragments. Joshua plans to pursue a Ph.D. in genetics upon completion of his undergraduate degree. He wants to work on genomic innovations in biotechnology and the developing world of synthetic biology.

Abstracts and Student Biographies

Megan Hupp **Poster # 24A**
University of California, Davis

Mentors:
Tracy G. Anthony (1), Ashley P. Pettit (1), Emily T. Mirek (1), Nick S. Margolies(1)

(1) Department of Nutritional Sciences, Rutgers, The State University of New Jersey

Contribution of Activating Transcription Factor 4 (ATF4) to the Hepatic Integrated Stress Response in Mice undergoing Dietary Methionine Restriction

Dietary restriction of the amino acid methionine coupled with cysteine deprivation has been shown to promote leanness by increasing energy expenditure. The Integrated Stress Response(ISR) senses amino acid restriction by General Control Non-derepressible 2(GCN2) kinase and eukaryotic initiation factor(eIF2)kinase, promoting synthesis of Activating Transcription Factor 4(ATF4) to alter gene expression. ATF4's role in regulating genes that correspond with a lean phenotype during methionine restriction(MR) is unstudied. This study aimed to determine Atf4's role on the relative hepatic expression levels of genes involved in lipid metabolism. We hypothesized that a global knockout of Atf4 in mice would blunt liver transcriptional responses during MR. C57Bl/6J-Swiss Webster hybrid mice(control;WT)or C57Bl/6J-Swiss Webster hybrid mice homozygous null for Atf4(Atf4-KO) were placed on a 60% high fat control diet (HF,0.86% Met) or a high fat/methionine-restricted diet (MR,0.12%) for five weeks(n=3-7/group).Hepatic mRNA levels were measured via Real-Time quantitative PCR(normalized to Gapdh).MR increased fibroblast growth factor21(Fgf21) hepatic mRNA expression in both strains; however, livers from Atf4-KO mice showed higher mRNA levels compared with WT regardless of diet. Nuclear protein 1(Nupr1) and peroxisome proliferator activator receptor(Ppar) gamma expression levels were increased by MR in an ATF4-dependent manner. Atf4-KO mice, regardless of diet, had lower Stearoyl-coenzyme A desaturase(Scd1) expression levels than WTHF, similar to WTMR. Pparα and Atf5 expression levels were not altered by diet or strain. Western blots showed phosphorylated-eIF2 protein was increased in Atf4-KO mice, with no change from MR. Global absence of Atf4 altered the hepatic ISR and the liver transcriptional signature to MR. Differences between strains, including Fgf21 and Scd1, appear to be driven by the Atf4-KO lean phenotype. These results indicate that ATF4 has limited control over the transcriptional changes during dietary MR at 5 weeks. These data suggest that there is a compensatory mechanism which upregulates lipid metabolism when Atf4 is absent. NIDDK DK109714

Biography: Megan Hupp graduated from University of California, Davis in March 2017 with a Bachelor's degree in Clinical Nutrition. She has always had a passion for understanding the science behind nutrition recommendations and treatments. Here at Rutgers she was able to work in Dr. Anthony's lab to understand the role of ATF4 in the beneficial outcomes (leanness and increased longevity) of a methionine-restricted diet. Megan is extremely grateful to have been given this opportunity with RiSE because it was a pivotal moment in her academic journey. She plans to apply for a PhD program in Nutrition Science and hopes to do more research regarding personalized nutrition (nutrigenomics and metabolomics). In her spare time, Megan loves to dance, longboard, cook healthy recipes, and play Ninja Turtles her four-year-old nephew. Megan would like to thank Dr. Anthony and Dr. Pettit for being such amazing and uplifting mentors throughout the summer.

Abstracts and Student Biographies

Héctor G. Loyola Irizarry **Poster # 24B**
University of Puerto Rico - Mayagüez

Mentors:
Lele Zhao, Erik Lavington, Siobain Duffy
Department of Ecology, Evolution, and Natural Resources
Rutgers, The State University of New Jersey

Codon usage bias and strandedness in CRESS DNA viral genomes

Recent advancements in metagenomics techniques have allowed for the discovery of novel circular Rep-encoding single stranded (CRESS) DNA viral sequences in a variety of hosts. Some of these ubiquitous viruses are pathogenic to crops and livestock, making it an economic priority to characterize CRESS DNA viral genomes. Most members of this diverse group contain ambisense genomes, and the orientation of the genes is an important criterion in determining the classification of a novel sequence to genus and family. Our goal was to analyze codon usage bias (CUB) in a comparatively well-studied CRESS DNA virus family (Circoviridae) in order to identify a pattern that can be used to correctly determine the sense of protein-coding sequences in ambisense genomes. This pattern should present itself as an over representation of T-ending codons in sense sequences and A-ending codons in antisense sequences, due to the effect of cytosine (C) to thymine (T) deaminations, which are more prevalent in single stranded DNA. Overrepresented codons were determined for two sequences (rep and cp) in the reference genome of each ambisense species in the two genera of Circoviridae. Circovirus has rep in the sense orientation, Cyclovirus has rep in the antisense orientation. CUB followed the expected pattern in both genera of Circoviridae, suggesting that C to T deaminations have a role in defining codon usage bias in CRESS DNA viruses. The pattern identified could potentially be used as a reference to classify the sense of CRESS DNA viral sequences. In addition, since many ssDNA viral genera have a specific genomic architecture associated with it, this analysis introduces a potential method to complement viral taxonomic classification.

Biography: Héctor G. Loyola Irizarry is a rising senior at the University of Puerto Rico, Mayagüez Campus. His major is in Industrial Microbiology, and he plans to pursue graduate studies in Molecular Genetics. Héctor's long term goal is to go back to Puerto Rico, after he finishes his Ph.D., and be a professor at the University of Puerto Rico, where he can help bring forward the new generation of Puerto Rican scientists. Working toward his goal, Héctor was part of the Biology REU at the University of Notre Dame, where he conducted research on the effect of diet on the gut eukaryotic microbiome of long-tailed macaques. He also researches Puerto Rico's diversity of bamboo species using DNA Barcoding in his home institution. Hector is a part of the MARC program, as well as a member of UPR-Mayagüez's student chapter of the American Society for Microbiology. RiSE at Rutgers was a great learning experience for Héctor, for which he is grateful. Thank to this program, he has learned about various opportunities, expanded his research skills, and clarified his research and professional goals.

Abstracts and Student Biographies

Sadiyah Malcolm **Poster # 25A**
Howard University

Mentors:

Ghetto Flowers: Young Black Women and Social Isolation in Philadelphia

In Dr. Joyce Ladner's ground-breaking investigation into the lives and experiences of young black adolescent girls in urban slums, Tomorrow's Tomorrow: The Black Woman, she sets a precedent for framing the study of urban life for Black women and girls. In essence, Ladner argues, the experiences of black women in low-income neighbourhoods have implications of "the more intricate elements that characterize the day-to-day lives of the black masses" . This study aims to build on Ladner's work by asking the primary question: how does social isolation structure the experiences of young Black women in high-crime, low-income areas in Philadelphia? The question is examined through the frame of social isolation, which argues, marginalized social groups have limited contacts with certain people, groups, or institutions. The question was explored through secondary analysis of previously conducted in-depth interviews with residents, ages 14 to 24,from seven Philadelphia neighbourhoods designated as both low-income and high-crime. For the explicit purposes of this study, only the black female respondents' responses were examined. The interviews showcase these women's narratives, and underline the complexity of their experiences and factors that significantly impact social processes. Among themes explored were respondents' notion of an ideal neighborhood, their views on children, experiences "hustling" for money and thoughts about school. This study concludes with a discussion of practical implications for community-based agencies and organizations and considerations for future research.

Biography: Sadiyah Malcolm is a senior sociology and Africana Studies double major studying at Howard University. Born to Jamaican parents, she is a native of Philadelphia, Pennsylvania and was named among students of the 2013 cohort of Gates Millennium Scholars. Sadiyah is also the founder of Sistas Elevating Learning and Healing (SELaH), a young women's empowerment group based in her hometown since 2010. Following the completion of her undergraduate career, Sadiyah plans to enroll in a Ph.D. program in sociology, where she plans to research the experiences of young black girls in inner cities, and later aspires to continue investigating this topic on both the community level, and as faculty at the academic level, simultaneously as her life-long work.

Abstracts and Student Biographies

Chielozor I Okafor **Poster # 25B**
Rutgers University - New Brunswick

Mentors:
Vikas Nanda, PhD., Douglas Pike, and Daniel Grisham
Center for Advanced Biotechnology and Medicine
Rutgers, The State University of New Jersey

Optimization of computational tools for protein design and structure analysis

The study of protein structure relies largely on the computational tools that scientists have at their disposal. The speed and accuracy at which scientists can design novel protein folds and solve the structures of natural ones depends on the quality of the computer programs that they use. An example of such a program is protCAD (protein Computer Automated Design), which is used to study various aspects of both naturally occurring and theoretical proteins. Like most computer programs, protCAD cannot perfectly mimic the way proteins behave in nature. However, it can get quite close if the right modifications are made. To improve the accuracy by which protCAD predicts the behavior of both natural and theoretical protein folds, we ran different protein sets through protCAD and recorded the free energy values that were calculated. The first sets were comprised of native protein structures from the Protein Data Bank (PDB), so that we could have a baseline for the initial modifications that needed to be made. Next, we used sets that were made up of decoy proteins, which mimic the structure of natural proteins. Decoy proteins are computer-generated models of protein sequences that have similar qualities to PDB proteins, but are different enough to have unique free energy values. They are not found in nature. With valid parameters, protCAD should successfully discriminate the decoys as having higher free energies than the corresponding native proteins. We also made mutations to each PDB file and recorded how their thermostability changed. These values were compared to experimentally determined changes in stability, to assess the extent of correlation. A high correlation coefficient would suggest that protCAD accurately modeled the change in thermostability of the PDB files. This project is a valuable way to assist scientists who synthesize proteins with novel folds for use in various fields, such as medicine and biotechnology.

Biography: Born and raised in New Brunswick, NJ, Chielozor Okafor is currently a rising junior at Rutgers University majoring in Biology and minoring in Spanish. He plans to graduate in the Spring of 2019. Chielozor is considering pursuing an MD/PhD, but would like to gain more experience doing research before he makes a definitive decision. That is why this summer he worked in Dr. Nanda's Lab, studying protein design as part of the RUP-IMSD Program. Outside of academics, he likes to go to the gym and actively participates in pick-up and intramural soccer at Rutgers University.

Abstracts and Student Biographies

Angelica M. Barreto-Galvez **Poster # 26A**
New Jersey City University

Mentors:
Martha Soto, Ph.D., Sofya Borinskaya, Ph.D., and Erik Larsen, Department of Pathology, Robert Wood Johnson Medical School, Rutgers University, New Brunswick

Studying role of formins in morphogenesis using C.elegans model organism

Caenorhabditis elegans is an ideal model organism for the study of morphogenesis and development. Actin, a dynamic protein involved in morphogenesis, polymerizes with the help of actin nucleators to generate either branched actin networks or linear actin bundles. Mutations in branched and linear actin regulators are frequently found in cancers, so understanding how actin nucleation is properly regulated has broad implications for human health. Using special genetic tools, the Soto lab has shown that branched actin plays important roles in the polarization of the cells during migration and morphogenesis, in apical junction formation, and ventral enclosure. However, some cellular movements still happen in the absence of branched actin. Our hypothesis is that these cellular events require linear actin. Therefore, the focus of this study is on linear actin and its regulators, formin proteins. We analyze the possible roles that the seven formin proteins, (FOZI-1, INFT-1, DAAM-1, FRL-1, INFT-2, PHOD-1, and CYK-1), found in C. elegans, play in morphogenesis. This analysis is carried out using gBlocks to help with cloning, RNAi by ingestion method, and genetic experiments. Using the RNAi, we will knock down the seven formin proteins at the same time, and individually. It will allow us to see what happens to the development of the embryos in the absence of linear actin, and what roles each formin plays. In addition, with the genetic experiments we will be able to see if mutations on some formins affect the expression of junctional proteins.

Biography: Angelica M. Barreto-Galvez was born and raised in Bogotá, Colombia. She moved to Cliffside Park, NJ in 2015 in the junior year of her undergraduate degree. She completed three years of Biology at the Pontifical Xavierian University in Colombia. Then, she transferred to New Jersey City University(NJCU) where she is a rising senior. She has been elected as the vice-president of the Biology Club at NJCU for the upcoming academic year (2017-18). At NJCU she is doing research in Dr. Coleman's lab studying NMDA receptors as a therapeutic target for breast, prostate, lung, and melanoma cancer. She is currently a RiSE student at Rutgers University doing research in Dr. Martha Soto's lab. She is studying proteins involved in morphogenesis and development using the model organism C. elegans. Angelica is taking this opportunity to get more research experience and to explore fields of interest to continue her scientific training in the future. Her goal is to pursue a PhD in the molecular biology field. Besides studying, she loves traveling and visiting new places and cultures.

Abstracts and Student Biographies

Priscilla M. Salcedo **Poster # 26B**
California State University, Northridge

Mentors:
Priscilla Salcedo
Department of Biology
California State University, Northridge

Luigi DiCostanzo, Ph.D., Mrs. Christine Zardecki, Monica Sekharan, Ph.D., Sutapa Ghosh, Ph.D., Brian Hudson, Ph.D., Stephen Burley, M.D., D.Phil.
Rutgers-RCSB Protein Data Bank

Correlating enzymes to antimicrobial resistance in the Protein Data Bank

Antibiotic resistant bacteria are predicted to be the leading cause of death worldwide, with an expected death rate of 10 million people annually by 2050. It is vital that antimicrobial resistance (AMR) be understood at the molecular level. The Protein Data Bank (PDB) archive holds over 130,000 3D structures of macromolecular machines that can be analyzed using the RCSB PDB website at RCSB.org. Studying these 3D structures enables scientific research and education in a variety of fields, including drug discovery, nanotechnology, green energy, and disease. In this study, PDB structures related to antibiotic inhibitors were identified. Metallo Beta Lactamases (MBL) have a large correlation to AMR and have been studied in great detail, with many examples in the PDB. Prominent enzymes in this category include the New Delhi Beta Lactamase which can cleave most if not all antibiotics. In order to better understand this enzyme and many others, AMR-related PDB structures were identified and further analyzed using additional bioinformatic resources including The Comprehensive Antibiotic Resistance Database (CARD). CARD holds up to date clinically relevant antibiotic related information. The website specifically provides MBL sequences used in this study. The findings of this research presented here will be used to develop novel AMR tools at RCSB.org that will provide antimicrobial details of enzymes that were unavailable before.

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

Biography: Priscilla Marie Salcedo is a rising junior at California State University Northridge. In spring 2020, she will be graduating with a bachelor’s degree in Microbiology. She is currently doing biomedical research in environmental microbiology. As a undergraduate research assistant in Dr. Gilberto Flores’ Lab, her goal is to isolate different strains of a bacterium found in the human gut microbiome. This summer she is working in developing her bioinformatics skills in structural biology. Her RiSE project consisted of studying molecules in the Protein Data Bank archive that are related to antimicrobial resistance with a focus on Beta lactamases. Her work has led to the development of materials for future undergraduate courses and AMR-focused features at RCSB.org. After the summer ends she will continue to serve as a board member of the Microbiology Student Association and participate in the BUILD research program funded by the National Institute of Health. She will attend an MD/PhD program to further advance the understanding of antimicrobial resistance. In her free time, she loves spending time with her family, exploring new cities, and exercising in the great outdoors.

Zeiny B. Aubdoollah **Poster # 27A**
Rutgers University

Mentors:
Matthew Teryek

Therapy for Wound Healing

Chronic wounds affect more than six million people annually, which results in a toll of twenty-five billion dollars on the health care system through increased hospital visits and longer hospital stays. Chronic wounds are wounds that have failed to fully undergo through the reparative process over a period of three months. In many cases, chronic wounds affect the epidermis, dermis, muscle, and bone. Current standard of care includes debridement of devitalized tissues, daily dressing changes, and maintaining a moist wound environment. When these fail, a variety of alternative treatments such as topical application of insulin or mesenchymal stem cells. Insulin acts as a chemo-initiator to the AKT pathway, which is part of the wound healing response. Mesenchymal stem cells (MSCs) secrete many pro-wound healing factors. Previous work in the lab demonstrated an accelerated in vivo and in vitro wound healing response when insulin and MSCs were combined. Since insulin was delivered with an insulinoma cell line that also released somatostatin, an insulin inhibitor, our aim is to test how the co-encapsulation of somatostatin-free insulin producing cells (IPCs) and MSCs in a hydrogel dressing affects cell migration and wound closure. Thus, we will compare the efficacy of somatostatin-free IPCs to the previous somatostatin-releasing IPCs by repeating the previous experiments by testing the following groups: polyethylene glycol diacrylate (PEGDA) hydrogel sheets containing IPCs, MSCs, a combination of both, and a control empty hydrogels. Insulin levels of both IPC types were assessed with ELISA and bioactivity was evaluated with keratinocyte scratch assays. The results will then bring us a step closer in eliminating chronic wounds.

Biography: Zeiny Aubdoollah was born in Mauritius an African-island in the Indian Ocean, but has been living in the United States since her first birthday. She is a rising junior majoring in Biomedical Engineering and minoring in Business Administration at Rutgers University. Amongst many clubs and activities, she is part of the inaugural class of the Honors College at Rutgers University. After obtaining her bachelor’s degree, she plans on pursuing her masters in the same field. Zeiny is working in Dr. Olabisi’s lab studying how co-encapsulating insulin and mesenchymal stem cells in a hydrogel dressing will accelerate the wound healing process in chronic wounds. She is grateful to the RUP-IMSD program for the opportunity to explore tissue engineering and allowing her to narrow her interest in research fields.

Abstracts and Student Biographies

Immanuella N. Boah **Poster # 27B**
Rutgers, The State University of New Jersey

Mentors:
Ping Xie, Ph. D., Juan Jin, Ph. D., Sining Zhu, Samantha Gokhale
Department of Cell Biology and Neuroscience
Rutgers, The State University of New Jersey

In vivo T cell responses to B lymphomas in the draining lymph node and spleen of transplanted M-TRAF3-/- mice

Tumor necrosis factor receptor-associated factor 3 (TRAF3) belongs to a family of seven TRAF proteins and is involved in the immune response. These cytoplasmic adaptor proteins are expressed in a variety of cells in the immune system and are responsible for regulating signaling. TRAF3 regulates signal transduction of CD40, a protein that is essential for the activation of immune responses. It is also a tumor suppressor gene in B lymphocytes. The deletion of TRAF3 in myeloid cells results in spontaneous inflammation and tumor development in aging mice. Our lab generated myeloid cell-specific TRAF3-deficient (M-TRAF3-/-) mice to study the *in vivo* functions of TRAF3 in myeloid cells, which are the key components of the innate immune system. The broad focus of this project is exploring how tumor immunity is affected in the absence of TRAF3 in myeloid cells. To develop an *in vivo* model to investigate tumor immune surveillance in M-TRAF3-/- mice, two cell lines (291-6 and 291-7) were generated in our lab from primary B lymphomas that spontaneously developed in aging M-TRAF3-/- mice. We aim to test whether these cell lines can activate tumor-specific T cell responses in M-TRAF3-/- mice. Littermate control (LMC) and M-TRAF3-/- mice were subcutaneously injected with mixed 291-6 and 291-7 tumor cells. After seven days and nine days the draining lymph nodes and splenocytes of the mice were harvested and stimulated by co-culture with tumor cells or by PMA and ionomycin treatment. Fluorescence-activated cell sorting (FACS) was utilized to observe the activation of CD8 and CD4 T cell subsets in the stimulated cells. Comparable levels of activated T cells were found in both LMC and M-TRAF3-/- mice. Our results demonstrate that the 291-6 and 291-7 B lymphoma cell lines are immunogenic and can activate tumor-specific T cell responses in our mouse model. Ongoing experiments will reveal whether and how TRAF3 deficiency in myeloid cells affects tumor-specific T cell responses in the presence of chronic inflammation.

Biography: Immanuella is a rising junior at Rutgers University-New Brunswick, majoring in Biological Sciences with a minor in Spanish. She was born in Accra, Ghana and raised in Union, New Jersey. As a participant of the RUP-IMSD program, she is working with Dr. Ping Xie on the molecular mechanisms of immune regulation and cancer pathogenesis. In the future she plans to pursue a medical degree. She has aspired to become a pediatrician, but recently cancer pathology has piqued her interest and she may consider pediatric oncology. As her first research experience ever, she has found her time in Dr. Xie's lab to be a wonderful learning experience and is grateful for all the resources the RUP-IMSD program has made available to her.

Abstracts and Student Biographies

Kevin Guerrero **Poster # 28A**
Rutgers University

Mentors:
Mark Pinkerton
Department of Biochemistry and Molecular Biology

Paul Copeland, PhD
Department of Biochemistry and Molecular Biology
Rutgers, The State University of New Jersey

Assessing the role of ribosomal association for SBP2L by probing fractions of rabbit reticulocyte lysates

Selenium is an essential micronutrient for humans. A deficiency in selenium can result in male infertility, increased risk of disruption of thyroid function and of susceptibility to infection. Selenium is incorporated into a small group of selenoproteins after its conversion to the modified amino acid, selenocysteine (Sec). The incorporation of selenocysteine (Sec) into proteins is a complex process that requires numerous factors. The Sec Insertion Sequence Binding Protein 2L (SBP2L) has been shown to be involved in post-transcriptional gene regulation, but it does not play a direct role in Sec incorporation. However, we have no concrete knowledge if it associates with ribosomes. To answer this question, we performed a series of tests to answer this question. Understanding that SBP2L and SBP2 are like each other, and that SBP2 has been proven to associate with ribosomes, which in turn is enough to incorporate Sec, then SBP2L should also associate with ribosomes thus, allowing for Sec incorporation. We used fractions of Rabbit Reticulocyte Lysates (RRL), which have all the required factors to produce functional selenoproteins, to help us prove this statement. We prepared our samples of Ribosomal Salt Wash (RSW), the supernatant of RRL (S300) and the proper dyes. We ran the samples on a 8% gel and then through the techniques of electrophoresis and western blot, we were able to obtain our data. After analyzing the blots, we discovered that SBP2L is not present in RSW, which indicates that it does not associate with ribosomes. This result proves that SBP2L cannot incorporate Sec in vitro and this leads to more questions about its role and function in the incorporation complex.

Biography: Kevin Guerrero was born in North Bergen, New Jersey, but was raised in West New York, New Jersey. As a minority student, he takes pride in being the son of two hard working individuals who immigrated into this country to work towards their dream for a better future. He is a rising EOF Junior at Rutgers, where he is pursuing a degree in Exercise and Sport Studies and Applied Kinesiology. One of his goals is to become the first college graduate in his family by May 2019. As a scholar, his best attributes are his perseverance and dedication. He expresses appreciation to the Education Opportunity Fund program for providing him the support that enabled him to excel in his current position. He enjoys sports and fitness, particularly soccer which has helped develop his character. This summer he was given the opportunity to participate in the RUP-IMSD program, where he researches the specific binding proteins that influence proper selenocysteine incorporation in vitro in Dr. Paul Copeland’s lab. This experience will help strengthen his skills for future work in a scientifically professional setting. He hopes to attend medical school, continue to conduct research, and become an orthopedic surgeon with a subspecialty in sports medicine. As a bonus, he would like to open his own fitness center and promote the importance of an active lifestyle.

Abstracts and Student Biographies

Kevin Nolasco **Poster # 28B**
Rutgers, The State University of New Jersey

Mentors:
Federico Sesti, PhD
Department of Neuroscience & Cell Biology
Rutgers, The State University of New Jersey

Dasatinib's effect on the heat shock response in C. elegans

Increased temperature is often associated to inflammatory injury. The heat shock response plays a major role in trying to ensure that proteins are correctly folded when an organism is exposed to stressors such as high temperatures. When these stressors are present, unfolded proteins cause HSF-1, a transcriptional regulator, to bind to heat shock elements in the promoter region of the heat shock protein genes to increase the rate of transcription. Increasing the heat shock response when these stressors are present increases the chance of survival for the organism. Several tyrosine kinase inhibitors increase the response. Therefore, we tested the effects of Dasatinib, an FDA-approved tyrosine kinase inhibitor used as a first line to treat certain forms of leukemia. To this end, we prepared populations of C. elegans that were age-synchronized in their growth phase, and tested the effects of Dasatinib on the heat shock response. These age-synchronized worms were treated with dasatinib at a concentration of 10μg/μL. Two days after treatment, the animals were exposed to a lethal temperature of 37° Celsius for four hours. The survival rate of C. elegans that were treated with the Dasatinib was 26.6 % while untreated worms had a 5.8 % survival rate. If this model of heat-shock survival mimics inflammation in higher organisms, our data suggests that Dasatinib may be used to treat inflammation apart from its current use to treat leukemia. Further analysis on higher level animals is required to demonstrate it will have a similar effect on humans.

Biography: Kevin Nolasco was born in West New York, NJ, but often finds himself traveling to El Salvador where his parents were born. During this summer, he worked in Dr. Sesti's laboratory studying the heat shock response in C. elegans. He had the opportunity to do this research at Rutgers University as part of the RUP-IMSD program, where he is also a rising senior majoring in Cell Biology and Neuroscience. He previously transferred from the pharmacy school to pursue a career closer to Biomedical Sciences. However, he does not regret his time in pharmacy school or working as a Walgreens intern since those experiences shaped his character and the kind of professional he wants to become. With his degree, Kevin plans on pursuing an MD at Robert Wood Johnson Medical School. During the semester, he works as an expository-writing tutor at the Livingston Writing Center and is secretary for the national honor society Chi Alpha Epsilon. In his downtime, he does laps at the pool since it reminds him of his time on his High School swim team.

Abstracts and Student Biographies

Alyssa Rodriguez **Poster # 29A**
Rutgers University

Mentors:
Elena K. Rotondo, M.S. and Kasia M. Bieszczad, Ph.D
Department of Psychology
Rutgers, The State University of New Jersey

Dynamic Changes in Auditory Brainstem Response Associated with Sound Training and Extinction

While sensory structures are traditionally thought of as passive relay stations for sensory information, they can also exhibit plasticity induced by auditory learning. Furthermore, there is strong evidence that plasticity in the auditory cortex is long-lasting, which could form the neural substrate of auditory memory storage. However, plasticity in the auditory brainstem and its role in storing sensory details in memory are less understood. The auditory brainstem response (ABR) recording is a useful electrophysiological assessment to address this issue because it can provide a comprehensive view of auditory system plasticity. Using adult rats as a model system, we tested the hypothesis that the auditory brainstem is also sensitive to auditory learning and memory storage with two forms of associative auditory learning: tone-reward training and extinction training. If the brainstem stores learned information about the associative value of sound, then tone-reward and extinction learning will affect the auditory brainstem response. During tone-reward training, rats learn a strong associative memory between a specific tone and a reward. Extinction training challenges that original association with learning that the same tone is no longer available with reward. Therefore, if the auditory brainstem is affected by associative auditory learning, then tone-reward training should induce plasticity detected in the tone-evoked ABR data while extinction training should oppose the ABR plasticity related to the previously acquired tone-reward association. In addition, if the auditory brain also exhibits sensitivity to frequency-specific sounds, then the ABR evoked by the frequency of the signal tone used in tone-reward training should reflect greater representational plasticity than the ABR evoked by other tone-frequencies. Our results indicate that the ABR peak is sensitive to auditory associative learning: peak latencies become faster after tone-reward training while ABR peak latencies become slower after extinction training. Furthermore, we found these changes to be most evident in the ABR evoked by the signal tone than in the ABR evoked by other distant tone-frequencies. This experiment suggests that like the auditory cortex, the auditory brainstem is also attuned to frequency-specific signal importance and that its plasticity is sensitive to the remembered significance of sound. Because brainstem plasticity appears to reflect characteristics of auditory learning, ABR recordings may provide further insight into uncovering predictive relationships between ABR plasticity and behaviors elicited by sound.

Biography: Alyssa Rodriguez is a rising junior at Rutgers University. She is currently majoring in Laboratory Animal Science in the School of Environmental and Biological Sciences (SEBS), with a strong interest in animal behavior. Her other research interests include speech impediments and language processing. Through the RiSE Program, Alyssa is working in Dr. Kasia M. Bieszczad's lab with her mentor, Elena K. Rotondo, using rats as a model for the human auditory system to study the relationship between auditory brainstem plasticity and behavior. She also enjoys hiking and watching TED Talks. Her future plans entail either one of two options: attending veterinary school or pursuing her PhD in a field related to her research interests. Alyssa would like to thank the RiSE Program and C.L.E.F. Lab for affording her the opportunity to advance her research studies.

Abstracts and Student Biographies

Natalie Samper **Poster # 29B**
Rutgers University

Mentors:
Gabriella D'Arcangelo, PhD, Valentina Dal Pozzo, Beth Crowell
Department of Cell Biology and Neuroscience
Rutgers, The State University of New Jersey

Comparing the morphology of neurons derived from Tuberous Sclerosis patients and controls

The tuberous sclerosis complex (TSC) is an autosomal dominant disease characterized by tumor susceptibility and skin lesions. It often causes neurological disorders, including epilepsy mental retardation and autism that correlates with cerebral cortical tubers present in the majority of patients. Effective patient therapies are yet to be developed and this may be in part due to the limitations that come with the use of rodent models. In an attempt to resolve this issue, Dr. D'Arcangelo's lab began the use of in-vitro induced neurons produced from induced pluripotent stem cell (iPSC) samples from the TSC patient and a sibling used as a control. We use these cell cultures to compare the phenotypes of the neurons of the patient and the sibling at different time points; specifically, I will analyze dendrite counts and soma size. We expect to see an initial difference between the two groups at one early time point and then less or no difference at later time points. Through learning more about the neurons of the patient and the control, and developing methods to lessen these abnormalities if they exist, we hope to eventually develop therapies to assist TSC patients.

Biography: Natalie is a rising junior at Rutgers University majoring in Cell Biology and Neuroscience. She is working in Dr. D'Arcangelo's lab this summer on finding the phenotypic differences between the induced neurons of Tuberous Sclerosis Complex siblings and patients. Outside of the lab, Natalie enjoys British literature, jogging and playing guitar. When she is done with her undergraduate degree, she plans to pursue an MD/PhD.

Abstracts and Student Biographies

Ariadna Uribe **Poster # 30A**
Rutgers University

Mentors:
Kyle Murphy

Analyzing the expression of the aryl hydrocarbon receptor in wild-type and mutant Bowes melanoma cells.

Melanoma is responsible for over 80% of all skin cancer deaths. Its likelihood of incidence is influenced by a plethora of factors, including but not limited to, exposure to UVA/UVB, age, genetic predisposition, lower/ decreased levels of melanin, immunodeficiency, and moles. A crucial part of melanoma's tumorigenicity is due to its ability to upregulate matrix metalloproteinases (MMP's,) that breakdown the skin's basement membrane and allow for vertical expansion of the tumor. Once the vertical growth phase occurs, melanoma becomes one of the most aggressive and deadly types of cancers. It has been shown that collagenase, MMP-1, is induced through the activation of the Aryl Hydrocarbon Receptor (AhR) pathway (Villano et. al 2005). It is also known that a mutation (V600E) in the BRaf molecule of the MAP kinase signaling pathway exists in over 60% of all advanced melanoma, and affects levels of MMP-1 (Whipple and Brinkerhoff 2015.) Furthermore, White and Murphy found that higher levels of AhR correlated with an increased level of MMP-1. AhR was also found to be essential for BRaf signaling in mutated melanoma cells.
We seek to elucidate how AhR and BRaf signaling affect MMP-1. We know both AhR and BRaf affect MMP-1 expression in melanoma cells individually; our previous system had an endogenously mutated BRaf (V600E) and high levels of AhR, which made it difficult to study them exclusively. Now we have a system that allows for the isolation and manipulation of BRaf and AhR. To analyze AhR's role in MMP-1 regulation, we will isolate RNA from two clones of Bowes melanoma cells; one BRaf wild type, Clone 8, and one BRaf mutant, Clone 21. The RNA will be treated, and used to produce a cDNA library. PCR will be used to amplify target sequences, which will allow us to analyze the expression of AhR.
The data we compile would provide the knowledge necessary to develop treatment options to those suffering from melanoma, potentially lessening the progression, resilience and overall tumorigenicity of the cancer.

Biography: Ariadna Uribe is a senior Cellular Biology and Neuroscience major at Rutgers, The State University of New Jersey. Ariadna had a varied upbringing. With her mother being a poet, and her father being a pharmaceutical chemist, Ariadna discovered her love for the arts and sciences at a very early age. Today, Ariadna remains a musician, dedicating her free time to the saxophone, the guitar, and her voice. As for the sciences, she has assisted post doctorates and graduate students in Entomological research. Currently, Ariadna is dedicating this summer to studying mechanisms and factors that may regulate the incidence and progression of melanoma and ovarian cancer. Ariadna is looking to remain in research for an indefinite period of time, before committing to the medical school career she will follow to become a surgeon for the non-profit organization, Doctors Without Borders.

Abstracts and Student Biographies

Kenny Gonzalez-Rivera **Poster # 30B**
University of Puerto Rico at Aguadilla

Mentors:
Kenny Gonzalez-Rivera
Department of Natural Sciences
Univerity of Puerto Rico at Aguadilla

Lauren Aleksunes, Xia Wen, Dahea (Diana) You
Department of Pharmacology and Toxicology
Rutgers, The State University of New Jersey

Epigenetic Regulation of MDR1 Expression in Human Blood-brain Barrier Cells

Clinically useful disease-modifying treatments for Alzheimer's disease have been elusive. Approved drug therapies have been useful providing symptomatic relief, but do not alter the course of the disease. A major pathological hallmark of Alzheimer's disease is the accumulation of neurotoxic amyloid-β peptides in the brain. The protein transporter P-glycoprotein (Pgp/ABCB1/MDR1) is an efflux pump found on the blood-brain barrier and has been shown to export amyloid-β from the brain into the blood. However, the activity of MDR1 decreases as the concentration of amyloid-β in the brain increases, as shown in rodents and humans. Treatment of hCMEC/D3 cells (human blood-brain barrier endothelial cells) with RG108 (N-Phthalyl-L-tryptophan), a DNA methyltransferase inhibitor, is expected to increase ABCB1 expression, suggesting that the expression of this transporter is regulated by DNA methylation. To study the effects of altered DNA methylation on the expression of ABCB1, western blot assays in hCMEC/D3 exposed to RG108 (0-25µM) for 24 hours. Finally, the ability of MDR1 transport to be altered by inhibition of DNA methylation was determined by measuring the ability of hCMEC/D3 cells to efflux the fluorescent dye rhodamine 123 after treatment with RG108. Preliminary data suggests that RG108 increases both the expression and function of MDR1 at the blood-brain barrier, laying the foundation of a novel therapeutic strategy for Alzheimer's disease. The findings also provide insight into the mechanisms by which epigenetic pathways regulate the expression of MDR1.

Biography: Kenny González-Rivera lives in Puerto Rico and is currently a rising senior at the University of Puerto Rico in Aguadilla (UPRAg). His studies focus on Biomedical Biology. He is a member of different student chapters like the National Biological Honor Society, the American Chemical Society, and the Childhood Cancer Association. Kenny shows his commitment to science and society by being part of CEBNAD (a nonprofit corporation dedicated to the education of children with Type 1 Diabetes) and coordinating a scientific outreach program focused on inspiring young women to follow careers related to STEM. In addition to this, he has worked as an undergraduate researcher at Dr. Walleska de Jesus' laboratory, studying the plant Alpinia zerumbet and its pharmacological properties. Kenny is currently working in Dr. Lauren Aleksunes' lab as part of the SURF program at Rutgers University, studying how epigenetic factors affecct MDR1 protein expression in the blood-brain barrier. After completing his undergraduate studies Kenny aspires to obtain a Ph.D. on Pharmacology, with special interest in Neuropharmacology.

Abstracts and Student Biographies

Erin Q. Jennings **Poster # 31A**
King University

Mentors:
Sara C. Campbell, PhD, FACSM; Robert Dowden, M.S.; P.J. Wisniewski, PhD Candidate
Department of Kinesiology and Health
Rutgers University

Examining the contribution of the microbiota to the healthy aging AC5KO phenotype

Healthy aging, including protection against diabetes, obesity, cardiovascular stress and enhanced exercise tolerance, have been observed in our adenylyl cyclase type 5 knock out (AC5KO) mouse model. This is a critical observation since the aging population would not enjoy extra years if they were accompanied by chronic conditions. Since the gut microbiota has been shown to be an important determinant of age-associated pathological states such as inflammation, diabetes, obesity and cardiovascular disease, we propose to conduct a head to head comparison of microbial communities (species and strains) between AC5KO and wild type (WT) mice to reveal whether there are differences that promote longevity and healthful aging (protect against disease states). Male and female AC5KO and WT mice were fed a normal diet and randomly assigned to exercise or sedentary groups. DNA extraction, PCR amplification, and data analysis tools were used to compare the microbial communities of different groups. After analysis, our data revealed different strains and compositions of microbiota between the AC5KO and WT mice. In future studies, our data will show that AC5KO mice demonstrate unique microbial species that are associated with healthful aging and that exercised AC5KO mice will have either an increase in their unique microbial species or new species present that are a result of exercise training.

Biography: Erin Jennings is from Smyrna, Tennessee and is a rising senior at King University in East Tennessee. She is majoring in Cell and Molecular Biology with minors in Math and Chemistry. During the academic year, Erin does research in Dr. Vanessa Fitsanakis' Environmental Toxicology Lab, working to identify a mechanism behind Parkinson's Disease and parkinsonian-like symptoms caused by neurodegeneration from pesticides. With this lab, she has presented at the Collegiate Meeting of the Tennessee Academy of Science—Eastern Division and the Blue Ridge Undergraduate Research Conference. Erin has recently submitted a paper to a peer-reviewed toxicology encyclopedia. She has been on the President's or Dean's list every semester and has also received awards for top female in general biology and general physics. In addition to her laboratory work, Erin is the President of the King University Women in STEM Club and a member of the King University Varsity Women's Soccer Team. After graduation Erin plans to pursue a PhD in Toxicology to prepare herself for her research career.

Abstracts and Student Biographies

Ricardo A. Navarro **Poster # 31B**
University of Puerto Rico, Mayagüez Campus

Mentors:
Dr. Yi Hua Jan

Damage responses induced by the sulfur mustard analog mechlorethamine in human HaCaT keratinocytes

Mustard compounds, including sulfur mustard and nitrogen mustard, are vesicant agents which cause inflammation and blistering in skin upon exposure. These chemicals have been used in chemical warfare since World War I, and have also been used in conflicts like the Iran-Iraq war and recently by extremist groups like ISIS. In contrast, nitrogen mustards such as mechlorethamine (2-chloro-N-(2-chloroethyl)-N-methylethanamine; HN2) and chlorambucil are also used as chemotherapy drugs. In this study, the effects of mechlorethamine on the damage responses of HaCaT keratinocytes were assessed with the goal of elucidating the mechanism by which this compound is cytotoxic. We found that HN2 causes a time- and concentration-dependent inhibition of cell proliferation as measured by the 5-ethynyl-2'-deoxyuridine (EdU) assay. This is associated with cell cycle arrest in S and G2/M phases. Western blotting analysis revealed that HN2 treatment of HaCaT cells causes a time-dependent increase in the expression of p27 Kip1 and a decrease in the expression of CDK2. In addition, HN2 treatment increases protein autophosphorylation on H2AX (Ser139), p53 (ser15), HSP27 (Ser82), and protein acetylation on histone 4 (Lys16), indicating that HN2 activates DNA damage and stress response signaling pathways in HaCaT cells. This is supported by our findings that HN2 treatment caused an up-regulation of heme oxygenase-1 (HO-1). HN2 also alkylates p53 proteins forming several higher molecular weight cross-links suggesting that p53 is a direct molecular target for vesicant modification. This may lead to alter the function of p53 contributing to vesicant-induced toxicity. Taken together, our studies demonstrated that HN2 induces DNA damage and stress responses, and modulates cell cycle checkpoint signaling. These might be the critical mechanisms of vesicant-induced cell cycle arrest and cytotoxicity.

Biography: Ricardo Navarro comes from Puerto Rico. He studies at the Mayagüez Campus of University of Puerto Rico and expects to graduate in May 2018 with a Bachelor of Science in Chemistry. This summer, Ricardo has been working in Dr. Jeffrey Laskin's research laboratory as part of the RiSE summer internship and co-participant of the SURF pharmacy fellowship. In his research project, he has been focusing on learning about the cytotoxic effects induced in keratinocyte cells by exposure to Nitrogen Mustard. He is very grateful for the opportunity to work at the RiSE/SURF program over the summer of 2017 and is gaining insight into different potential research areas for graduate school.

Abstracts and Student Biographies

Kristal R. Reyes-Sanchez **Poster # 32A**
University of Puerto Rico- Aguadilla

Mentors:
Suzie Chen, PhD
Department of Chemical Biology

Raj Shah, PhD Candidate
Department of Chemical Biology

Regulation of glutaminase in GRM1-expressing melanoma cells

Melanoma is the most aggressive type of skin cancer and it begins in the transformation of melanocytes. Our lab has described that the ectopic expression of metabotropic glutamate receptor 1 (GRM1) in melanocytes can transform cells *in vitro* and induce spontaneous melanoma formation in mice. Glutamate is the natural ligand of GRM1. Overexpression or ectopic expression of GRM1 led to excess extracellular glutamate that promotes cell proliferation *in vitro* and tumor progression *in vivo*. Recent interest in the reprogramming of tumor cell metabolisms particularly glutamine metabolism showed elevated expression of glutaminase (GLS), an enzyme responsible for conversion of glutamine to glutamate. c-Myc and c-Jun are transcription factors known to promote glutamine metabolism in many cancer cells by up-regulating GLS. We hypothesized that GLS overexpression produces excess glutamate to activate GRM1 which then induces downstream signaling cascades ultimately leading to increased tumor cell proliferation. By using western immunoblotting methods, c-Myc/c-Jun and GLS levels were found to be directly proportional to GRM1 expression. In this study, we strive to investigate whether both c-Myc/c-Jun or just one of them can alter GLS in GRM1-expressing melanoma cells. We utilized lentiviral particles (shRNA) to knockdown c-Myc expression and a JNK inhibitor (JNK-IN-8) that inhibits phosphorylation of c-Jun. Western blot analysis showed that when infecting C8161 and 1205Lu cells (GRM1+ human melanoma cells) with shMyc lentiviral particles the expression of c-Myc significantly reduced, but the GLS expression was unchanged suggesting that GLS is not under the regulation of c-Myc. Consequently, after treating 1205Lu cells with 5µM JNK-IN-8, we observed a robust decrease in c-Jun phosphorylation and a subsequent decrease in GLS expression. The experiments to confirm this observation in other melanoma cell lines are ongoing.

Biography: Kristal Reyes-Sánchez was born and raised in San Juan, Puerto Rico. She is currently a rising senior at the University of Puerto Rico-Aguadilla and expects to graduate in 2018 with a bachelor's degree in Biology with emphasis in Biomedical sciences. She is part of the American Chemical Association, Biology Honor Society (Tribeta Zeta Lambda), a community service program and the honorary study program- UPRag. While at Rutgers University this summer, she has been working in the Chemical Biology department, under Dr. Suzie Chen and Raj Shah, focusing on the regulation of glutaminase in GRM1-expressing melanoma cells. Outside of lab, she likes to practice sports and make pastel and carbon paintings. Kristal has been grateful for the opportunity to participate in the RiSE/SURF program because it has given her the chance to explore different research fields and will help her decide whether to continue her graduate studies to pursue a PhD in Pharmacology.