RISE at Rutgers

Research Intensive Summer Experience

2018 Summer Research Symposium

August 1, 2018

Featuring Poster Presentations by RISE and REU Summer Scholars

Sponsored by:

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

Wednesday, August 1, 2018

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

9:00 – 9:30 AM	**Registration and Coffee**	**Fireside Lounge**
9:30 – 9:40 AM	**Welcome**	**Center Hall**

Dr. Prabhas Moghe
Vice Chancellor for Research and Innovation

Dr. Jerome J. Kukor
Dean, School of Graduate Studies

9:40 – 9:55 AM **Winners, 5-Minute Presentation (5MP) Competition**

Jordan Troutman, University of Maryland Baltimore County
"Fairness in Machine Learning"

Navar Mercer White, Vassar College
"We're Running on Fumes:
Improving the Output of Dye-Sensitized Solar Cells Through Electrolyte/Electrode Modification"

9:55 – 10:50 AM	**Keynote Address**	**Center Hall**

José Manautou, Ph.D.
Professor of Pharmacology and Toxicology
University of Connecticut

"Acetaminophen in Opiates: Should I Worry About My Liver?"

11:00 – 11:55 AM	**Student Research Posters-Odd numbers**	
11:55 – 12 PM	**Break**	
12:00 – 12:55 PM	**Student Research Posters-Even numbers**	
1:00 PM	**Networking Buffet Luncheon**	**Multipurpose Room**

Research posters are located in The Cove, the Fireside Lounge, and the International Lounge

Sponsored by
RISE (Research Intensive Summer Experience) 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
INSPIRE Postdoctoral Training Program

PLENARY SPEAKER

José E. Manautou, Ph.D.

Professor of Pharmacology and Toxicology
University of Connecticut

"Acetaminophen in Opiates: Should I Worry About My Liver?"

José E. Manautou is the Interim Department Head of Pharmaceutical Sciences, Assistant Dean of Graduate Education and Research and Professor of Toxicology at the University of Connecticut School of Pharmacy. His long-term research interests are on biochemical and molecular mechanisms of xenobiotic-induced hepatotoxicity and defining compensatory responses to liver injury that enhance tissue resistance to toxicant re-exposure (i.e., adaptation). Dr. Manautou has published over 200 originally research articles, abstracts, commentaries and other reports. He has been the principal and co-investigator of numerous extra- and intramural grants. His service to the scientific community and to the discipline of toxicology is exemplary. In 2003, Manautou was elected councilor of the Society of Toxicology (SOT) and has served in key committees and task forces of the society. He was the recipient of the 2006 Achievement Award of the SOT. Dr. Manautou has served as member of review panels for the National Academies of Sciences, Medicine and Engineering. His involvement in the review of extramural and intramural science for the National Institutes of Health (NIH) has been also significant. He was member of the NIH Xenobiotic and Nutrient Disposition and Action Study Section, NIH College of CSR Reviewers, and the NIEHS Board of Scientific Counselors. Currently, he is a member of the National Advisory Environmental Health Sciences Council and the Food and the Drug Administration's Nonprescription Drugs Advisory Committee. He is also on The Board of Trustees for the Health and Environmental Sciences Institute (HESI). Dr. Manautou is Associate Editor of *Toxicology and Applied Toxicology*, and is also a member of the editorial board of seven other journals. He obtained his BS in pharmacy from the University of Puerto Rico, Ph.D. in pharmacology and toxicology at Purdue University in 1991, and postdoctoral training at the University of Connecticut. He also conducted sabbatical training at the Academic Medical Center in Amsterdam.

SUMMER PROGRAMS

RISE (Research Intensive Summer Experience) 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 62 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 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 2018 Scholars and our 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 ninth 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, which included clinical immersion at the Robert Wood Johnson University Hospital.

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 REU site aims to provide 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

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.

INSPIRE POSTDOCTORAL TRAINING PROGRAM

The RISE-INSPIRE Program is a joint project between the NIH-funded INSPIRE Postdoctoral Program and the Office of the Senior Vice President for Academic Affairs (SVPAA) for Rutgers University. The INSPIRE (IRACDA New Jersey/New York for Science Partnerships in Research & Education) Postdoctoral Program at Robert Wood Johnson Medical School (RWJMS), promotes two important goals: to prepare diverse university-trained Ph.D. scholars for successful careers as scientist-educators while increasing the participation of diverse student populations in biomedical science research fields. Five students are invited to Rutgers labs each summer from the three INSPIRE partner schools, Medgar Evers College – CUNY, New Jersey City University and William Paterson University, with the support of the SVPAA. The students are mentored by five INSPIRE Fellows in biomedical research. For more information please see: http://rwjms.umdnj.edu/research/postdoc/inspire/.

NSF INCLUDES Program, "Early Engagement in Research: Key to STEM Retention" Exploring a Hybrid Research Internship Model through the STEM New York New Jersey Alliance (NYNJAs)

Lamont-Doherty Earth Observatory of Columbia University is leading an effort to pilot several models for providing research internships for underserved and underrepresented high school youth at grant-driven research institutions through a National Science Foundation planning grant. As a member of the STEM New York New Jersey Alliance (STEM NYNJs), Rutgers University is testing a hybrid model where high school students use course management software to virtually interact with professors during the week. By using on-line software called Sakai, professors provide on-line lectures and interact with students using VoiceThreads software. Students also participate in online forums with their peers and graduate students. This online mentorship is designed to help them practice their questioning strategies and argumentation skills. In addition, students make weekly face-to-face visits to the Rutgers campus for laboratory work and mentoring by collaborating professors. Central to our mentoring program, Rutgers Cooperative Extension's 4-H Youth Development program is providing mentoring support for both the graduate students and youth participants to ensure a rich and productive research experience. The program is five weeks long and supports five high-school students, two undergraduate students, one graduate student, one classroom teacher, and four Rutgers faculty members in exploring micro-plastics in the Raritan River. The youth are also working with a local Newark based non-profit to communicate and share their results in their community.

ACKNOWLEDGMENTS

~Institutional Sponsorship~

School of Graduate Studies

Office of the Chancellor-New Brunswick – Summer Undergraduate Pipeline to Excellence at Rutgers Graduate Fellowship Program (SUPER-Grad)

Office of the Senior Vice President for Academic Affairs

Ernest Mario School of Pharmacy

School of Biological and Environmental Sciences

School of Arts and Sciences

School of Engineering

RCSB Protein Data Bank

Rutgers Raritan River Consortium

~External Support~

NASA New Jersey Space Grant Consortium

NIH MARC Program

NIH Initiative for Maximizing Student Development (IMSD)

NIH IRACDA Postdoctoral Training Program

NSF Research Experiences for Undergraduates (REU) Program

Faculty cost-share from NSF CAREER Awards, other research grants, and start-up funds

Summer Undergraduate Research Fellowship 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

Kimberly Cook-Chennault, Ph.D.
Associate Professor of Mechanical & Aerospace Engineering

Mentoring Up: Making the Most of your Mentoring Relationships

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

Joy Cox, Ph.D.
School of Communication and Information

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

Laura Callejas
Research Manager
Ph.D. Candidate, Department of Sociology

Sam Kogan
M.D.-Ph.D. Candidate in Cellular and Molecular Pharmacology

Christopher Lowe, Ph.D
Biomedical Engineering

Marissa Ringgold
Ph.D. Candidate in Chemistry & Chemical Biology

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

Tamara Sears, Ph.D.
Professor, Art History
Graduate Program Director, Art History

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

Communicating Your Research: Presentations that Wow and Win

Jennifer Theiss, Ph.D.
Associate Professor, School of Communications & Information
Graduate Program Director, Communications

LinkedIn and Social Media Networking

Paola Dominguez
University Career Services

Fellowships and Funding: Position Yourself for Success

Teresa Delcorso, Director
GradFund, School of Graduate Studies

Innovation and Entrepreneurship

Michael Wiley, Vice President
Foundation Venture Capital Group, LLC

SUMMER PROGRAM FACULTY & 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 for Maximizing Student Development (RUP-IMSD)

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

Patricia Irizarry, Ph.D.
Program Coordinator, RUP-IMSD
Director of Outreach and Assistant Professor of Professional Practice, Office of STEM Education
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

INSPIRE Postdoctoral Training Grant

Martha Soto, Ph.D., Principal Investigator
Associate Professor, Department of Pathology & Laboratory Medicine, Robert Wood Johnson Medical School
Gary Brewer, Ph.D., co-Principal Investigator
Professor, Department of Biochemistry & Molecular Biology, Robert Wood Johnson Medical School
Jianping Xu, Ph.D. Program Coordinator

Administrative Staff
Dawn Lopez, MBA, RISE Program Coordinator
Brandon Mauclair-Augustin, Graduate Assistant
Monique Thomas, Program Assistant

Linda Johnson, Undergraduate Program Administrator, Department of Biomedical Engineering

Teaching Fellows
Alejandra Laureano-Ruiz, PhD Candidate in Cell Biology & Neuroscience
Andrea Casuras, PhD Candidate in Chemistry & Chemical Biology

Resident Advisors
Xiomara (Isabel) Perez, PhD candidate in Biomedical Engineering
Amin Khalili, PhD candidate in Biomedical Engineering
Elena Chung, MS candidate in Toxicology

Admissions Portal
Shamir Khan, SGS

Communications and Social Media
J.D. Thomas, Ph.D., School of Graduate Studies
Erica Reed, School of Graduate Studies

Photography and Videography
Justin Jajalla
Larry Fried

Contributions to Panels and Teaching
Jonathan Colon Ortiz, PhD Candidate in Chemical & Biochemical Engineering
Caroline Wood, PhD Candidate in Biomedical Engineering
Talia Planas, PhD Candidate in Toxicology
Lorne Joseph, PhD Candidate in Chemistry & Chemical Biology
Joshua Leipheimer, PhD Candidate in Biomedical Engineering

5-minute Presentation Competition Judges

Jonathan Colon Ortiz, PhD Candidate in Chemical & Biochemical Engineering
Pedro Cesar Lopes, PhD Candidate in Industrial & Systems Engineering
Alicia Raia-Hawrylak, PhD Candidate in Sociology
Rachel Dean, PhD Candidate in Microbial Biology
Urmimala Basu, PhD Candidate in Biochemistry
Laina Lockett, PhD Candidate in Ecology & Evolution

Stephanie Brescia, 3-minute Thesis Liaison

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Stephanie M. Albarracin *Advanced Materials*	**Synthesis of Inorganic Polymers from Silicate Glass**	Cove-1
Andrew G. Alvarez *Advanced Materials*	**Computer Modeling and Molecular Simulations of Tension-Induced Rupture of Lipid Bilayers**	Cove-2
Zachary A. Finkel *Advanced Materials*	**Study of Hydrophobic Mismatch in Membrane Protein Systems: Role of Peptide Orientation and Lipid Density Profile**	Cove-3
Robert A. Green-Warren *Advanced Materials*	**Optimizing the Energetic Requirements for Hydrothermal Production of Sodium Silicate via Computational Thermodynamic Modeling**	Cove-4
Christopher J. Heckert *Advanced Materials*	**Removal of heavy metals from wastewater through environmentally safe polymers**	Cove-5
Trystan G. Irmiere *Advanced Materials*	**Solution processed blue light emitting quantum dot films**	Cove-6
Jenny Martinez *Advanced Materials*	**Optimization of metals' Work Function for MoS_2 transistors**	Cove-7
Navar Mercer White *Advanced Materials*	**We're running on fumes: improving the output of dye sensitized solar cells (DSSC) through electrolyte/electrode modification**	Cove-8
Sarah Snider Leonhauser *Advanced Materials*	**Mesoporous carbon templated synthesis and characterization of nanosized titanium dioxide for the reduction of carbon dioxide to methane**	Cove-9
Loriann De Sousa Rego *INCLUDES*	**A Comparison of MicroPlastics in the Raritan and Passaic Water Bodies**	Cove-10
Riya Goel *INCLUDES*	**The Impact of MicroPlastics on Living Organisms**	Cove-11
Nicholas D. Bolden *RISE*	**Would *grg*A mutants confer resistance to benzylidene acylhydrazides in Chlamydia?**	Cove-12

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Jennifer Guzman Pichardo *RISE*	**Controlling Morphology of Melting Gels by Electrospray Deposition**	Cove-13
Makayla L. Hickmon *RISE*	**Early performance differences in rats learning a sound-reward association task reveal potential effects of an Alzheimer's disease gene**	Cove-14
José F. Mercado Ortiz *RISE*	**Synthesis of new antimalarials**	Cove-15
Rebecca R. Miller *RISE*	**Developing a pipeline for computationally improving ligand geometry in the Protein Data Bank**	Cove-16
Karen M. Nicolas *RISE*	**Viral Emergence: Evolution and host range of bacteriophage Φ6mutant E8G**	Cove-17
Desiree Pastrana Otero *RISE*	**Green and Resilient NJ: Protection, Resistance and Adaptation to Disaster Scenarios**	Cove-18
Natasha M. Ramos Padilla *RISE*	**Changes in sediment carbon cycling by saline intrusion in the Raritan River**	Cove-19
Liya P. Simon *RISE*	***Brassica napus*** **transformation vectors to select nuclear gene mutations controlling chloroplast transformation**	Cove-20
Alain Abonge Yufanyi *RUP-IMSD*	**The centromere and the role of Cenp-C (centromere protein) in chromosome segregation.**	Cove-21
Kia I. Ansine *RUP-IMSD*	**The energy expenditure of mice fed a high-fat diet supplemented with grape polyphenols**	Cove-22
Shereen M. Bartholomew *RUP-IMSD*	**Timing of Liver Sensing of Dietary Leucine and Sulfur Amino Acid Deprivation in Mice**	Cove-23
Heineken Queen Daguplo *RUP-IMSD*	**Structure determination of the mitochondrial helicase Twinkle by cryo-electron microscopy (cryo-EM)**	Cove-24
Noura Darwish *RUP-IMSD*	**The impact of lipid transfer protein overexpression against plant fungal pathogens in wheat and barley**	Cove-25

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Nora Laine Herzog *RUP-IMSD*	**Harnessing seasonal influenza vaccine to combat cancer in mouse models**	Cove-26
Darling P. Rojas *RUP-IMSD*	**Regulation of glutaminase (GLS) in metabotropic glutamate receptor 1 (GRM1) expressing melanoma cells**	Cove-27
Jessica M Romero *RUP-IMSD*	**The Impact of Touch Information Processing in Locomotion**	Cove-28
Kayla Bendinelli *SURF*	**Restoration of the circadian rhythm by FGF in prevention of Non-Alcoholic Fatty Liver Disease**	Cove-29
Destiny Durante *SURF*	**Comparing ocular therapies to improve corneal mustard-induced injuries**	Cove-30
Zakiyah R. Henry *SURF*	**Mechanisms of Sulfur Mustard-Induced Lung Injury**	Cove-31
David J. Viramontes *SURF*	**Interaction of Organophosphate Flame Retardants with Efflux Transporters**	Cove-32

<u>POSTER PRESENTATIONS</u>

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Carlos Abarca *GET-UP*	**Autonomous Robotic Environmental Control System Applied to Growth of Mobile Plan**	Fireside Lounge-1
Francisco Franco *GET-UP*	**Investigation of novel composite materials for engineered tissue scaffolds**	Fireside Lounge-2
Christopher J. Kern *GET-UP*	**Benchmarking an Electrolyzer for Conversion of CO2 into Useful Chemicals**	Fireside Lounge-3
Anthony Rodrigues *GET-UP*	**Computed analysis of PVDF films subjected to dynamic loadings**	Fireside Lounge-4
Hannah L. Simerly *GET-UP*	**Au-doped TiO2-coated mesh for increased efficiency of dye-sensitized solar cells**	Fireside Lounge-5
Yadiel Varela *GET-UP*	**Fabrication of nanoparticles loaded with mebendazole via flash nanoprecipitation**	Fireside Lounge-6
Carlos Huang *GET-UP*	**Synthesis of (^{iPr4}PSP)Ru(C_2H_4)$_2$ catalyst and reactivity in olefin isomerization**	Fireside Lounge-7
Marcelo A. Almora Rios *Physics & Astronomy*	**Jet shape analyses in Au+Au collisions at RHIC**	Fireside Lounge-8
Maine I. Christos *Physics & Astronomy*	**The search for the Type III Seesaw Mechanism with multivariate analysis**	Fireside Lounge-9
Marcell R. Howard *Physics & Astronomy*	**Probing the Evolution of Galaxies by Stacking Stellar Mass Selected Samples**	Fireside Lounge-10
Zachary B. Huber *Physics & Astronomy*	**Surface preparation of Weyl semimetal Mn_3Sn**	Fireside Lounge-11
Sean P MacBride *Physics & Astronomy*	**A search for tidal tails in the satellite galaxy Carina**	Fireside Lounge-12
Emma G. McLaughlin *Physics & Astronomy*	**Shear viscosity to entropy density ratio of the Quark Gluon Plasma at finite baryon densities**	Fireside Lounge-13

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Leonardo Ruales *Physics & Astronomy*	**Focusing Cosmic Telescopes on the Distant Universe**	Fireside Lounge-14
Ellis A. Thompson *Physics & Astronomy*	**Growth and characterization of pyrochlore thin films**	Fireside Lounge-15
Owen W. Tower *Physics & Astronomy*	**Quark-Gluon discrimination at the Large Hadron Collider**	Fireside Lounge-16

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Nickolas Almodovar *Cellular Bioengineering*	**Calibration of FRET controls in iBMK cells to measure FRET efficiency in a fluorescent vinculin tension-sensing probe**	International Lounge-1
Esteban G. Bermúdez *Cellular Bioengineering*	**Release Profile of Liposome-Encapsulated Bupivacaine**	International Lounge-2
Alexus Cruz *Cellular Bioengineering*	**The Incorporation of Polymerized Hemoglobin (PolyHb) in a Liver Bioreactor**	International Lounge-3
Reem Eldabagh *Cellular Bioengineering*	**Controlled Synthesis and Solubility Characterization of Polymer-Peptide Conjugates for Biomedical Applications**	International Lounge-4
Fabian Hernandez *Cellular Bioengineering*	**Formulation of polyelectrolyte nanocomplexes for delivery of antimicrobial peptides**	International Lounge-5
Liv M. Kelley *Cellular Bioengineering*	**An Integrated Cell Microcapsule to Expand and Genetically Engineer Human Cell Therapeutics**	International Lounge-6
Lauren E. Lisiewski *Cellular Bioengineering*	**Physical properties of electrospun nanofibrillar scaffolds and effect on astrocyte reactivity**	International Lounge-7
Terrence A. Lymon *Cellular Bioengineering*	**Development of an Electroactive and Bioactive Hybrid Hydrogel**	International Lounge-8
Alyson March *Cellular Bioengineering*	**Development of a 3D printed composite bone scaffold**	International Lounge-9
Stephen R. Mut *Cellular Bioengineering*	**An investigation of electroporation of cell suspensions and adherent cells**	International Lounge-10
Natalia M. Tumidajski *Cellular Bioengineering*	**Development of collagen type I scaffolds with antibacterial properties for clinical applications**	International Lounge-11
Briana Gipson *GSEF*	**'In Land We trust': Black female landowners impact on generational poverty in the cooperative economics movement**	International Lounge-12
Olivia C. Heck *GSEF*	**Impact of complexity of chaining procedures on staff implementation**	International Lounge-13

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Jessica E. Meis *GSEF*	**Women and Latin American Art: Activism from Colonial Religious Imagery to Contemporary Installations**	International Lounge-14
Joshua P. Randolph *GSEF*	**Linguistic institutionalization of anti-Romani racism: etymology, history, and pop culture**	International Lounge-15
Savannah L. Dziepak *INSPIRE*	**The effect of organophosphates on neurodevelopment in *Danio rerio***	International Lounge-16
Romina Generali *INSPIRE*	**Relationship between the number of orexin producing neurons and pathological demand for fentanyl**	International Lounge-17
Jeff B. Martinez *INSPIRE*	**Role of formins in morphogenesis and development of the *C. elegans* pharynx**	International Lounge-18
Tasmiya Moghul *INSPIRE*	**Mutations in essential genes by CRISPR-Cas9**	International Lounge-19
Thaybeth I. Malavé-Méndez *RISE*	**Engineering functional nucleic acids through lipid self-assembly**	International Lounge-20
Rocío Rivera Rodríguez *RISE*	**Determining the Combination Effect of Polyphenols from *Vitis vinifera* and Isothiocyanate from *Moringa oleifera* Extracts on Intestinal Epithelial Cell Dysfunctions**	International Lounge-21
Jordan T. Troutman *RISE*	**Fairness in Machine Learning**	International Lounge-22
Natalie R Verdiguel *RISE*	**Data Mining Literature Analysis of Cited Protein Data Bank (PDB) Data**	International Lounge-23
Tanya A. Zubov *RISE*	**The effects of chronic social defeat stress on en2 knockout mice**	International Lounge-24

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Carlos Abarca *GET-UP*	**Autonomous Robotic Environmental Control System Applied to Growth of Mobile Plan**	Fireside Lounge-1
Alain Abonge Yufanyi *RUP-IMSD*	**The centromere and the role of Cenp-C (centromere protein) in chromosome segregation.**	Cove-21
Stephanie M. Albarracin *Advanced Materials*	**Synthesis of Inorganic Polymers from Silicate Glass**	Cove-1
Nickolas Almodovar *Cellular Bioengineering*	**Calibration of FRET controls in iBMK cells to measure FRET efficiency in a fluorescent vinculin tension-sensing probe**	International Lounge-1
Marcelo A. Almora Rios *Physics & Astronomy*	**Jet shape analyses in Au+Au collisions at RHIC**	Fireside Lounge-8
Andrew G. Alvarez *Advanced Materials*	**Computer Modeling and Molecular Simulations of Tension-Induced Rupture of Lipid Bilayers**	Cove-2
Kia I. Ansine *RUP-IMSD*	**The energy expenditure of mice fed a high-fat diet supplemented with grape polyphenols**	Cove-22
Shereen M. Bartholomew *RUP-IMSD*	**Timing of Liver Sensing of Dietary Leucine and Sulfur Amino Acid Deprivation in Mice**	Cove-23
Kayla Bendinelli *SURF*	**Restoration of the circadian rhythm by FGF in prevention of Non-Alcoholic Fatty Liver Disease**	Cove-29
Esteban G. Bermúdez *Cellular Bioengineering*	**Release Profile of Liposome-Encapsulated Bupivacaine**	International Lounge-2
Nicholas D. Bolden *RISE*	**Would *grg*A mutants confer resistance to benzylidene acylhydrazides in Chlamydia?**	Cove-12
Maine I. Christos *Physics & Astronomy*	**The search for the Type III Seesaw Mechanism with multivariate analysis**	Fireside Lounge-9
Alexus Cruz *Cellular Bioengineering*	**The Incorporation of Polymerized Hemoglobin (PolyHb) in a Liver Bioreactor**	International Lounge-3

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Heineken Queen Daguplo *RUP-IMSD*	**Structure determination of the mitochondrial helicase Twinkle by cryo-electron microscopy (cryo-EM)**	Cove-24
Noura Darwish *RUP-IMSD*	**The impact of lipid transfer protein overexpression against plant fungal pathogens in wheat and barley**	Cove-25
Loriann De Sousa Rego *INCLUDES*	**A Comparison of MicroPlastics in the Raritan and Passaic Water Bodies**	Cove-10
Destiny Durante *SURF*	**Comparing ocular therapies to improve corneal mustard-induced injuries**	Cove-30
Savannah L. Dziepak *INSPIRE*	**The effect of organophosphates on neurodevelopment in *Danio rerio***	International Lounge-16
Reem Eldabagh *Cellular Bioengineering*	**Controlled Synthesis and Solubility Characterization of Polymer-Peptide Conjugates for Biomedical Applications**	International Lounge-4
Zachary A. Finkel *Advanced Materials*	**Study of Hydrophobic Mismatch in Membrane Protein Systems: Role of Peptide Orientation and Lipid Density Profile**	Cove-3
Francisco Franco *GET-UP*	**Investigation of novel composite materials for engineered tissue scaffolds**	Fireside Lounge-2
Romina Generali *INSPIRE*	**Relationship between the number of orexin producing neurons and pathological demand for fentanyl**	International Lounge-17
Briana Gipson *GSEF*	**'In Land We trust': Black female landowners impact on generational poverty in the cooperative economics movement**	International Lounge-12
Riya Goel *INCLUDES*	**The Impact of MicroPlastics on Living Organisms**	Cove-11
Robert A. Green-Warren *Advanced Materials*	**Optimizing the Energetic Requirements for Hydrothermal Production of Sodium Silicate via Computational Thermodynamic Modeling**	Cove-4
Jennifer Guzman Pichardo *RISE*	**Controlling Morphology of Melting Gels by Electrospray Deposition**	Cove-13

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Olivia C. Heck *GSEF*	**Impact of complexity of chaining procedures on staff implementation**	International Lounge-13
Christopher J. Heckert *Advanced Materials*	**Removal of heavy metals from wastewater through environmentally safe polymers**	Cove-5
Zakiyah R. Henry *SURF*	**Mechanisms of Sulfur Mustard-Induced Lung Injury**	Cove-31
Fabian Hernandez *Cellular Bioengineering*	**Formulation of polyelectrolyte nanocomplexes for delivery of antimicrobial peptides**	International Lounge-5
Nora Laine Herzog *RUP-IMSD*	**Harnessing seasonal influenza vaccine to combat cancer in mouse models**	Cove-26
Makayla L. Hickmon *RISE*	**Early performance differences in rats learning a sound-reward association task reveal potential effects of an Alzheimer's disease gene**	Cove-14
Marcell R. Howard *Physics & Astronomy*	**Probing the Evolution of Galaxies by Stacking Stellar Mass Selected Samples**	Fireside Lounge-10
Carlos Huang *GET-UP*	**Synthesis of (^{iPr4}PSP)Ru(C_2H_4)$_2$ catalyst and reactivity in olefin isomerization**	Fireside Lounge-7
Zachary B. Huber *Physics & Astronomy*	**Surface preparation of Weyl semimetal Mn_3Sn**	Fireside Lounge-11
Trystan G. Irmiere *Advanced Materials*	**Solution processed blue light emitting quantum dot films**	Cove-6
Liv M. Kelley *Cellular Bioengineering*	**An Integrated Cell Microcapsule to Expand and Genetically Engineer Human Cell Therapeutics**	International Lounge-6
Christopher J. Kern *GET-UP*	**Benchmarking an Electrolyzer for Conversion of CO2 into Useful Chemicals**	Fireside Lounge-3
Lauren E. Lisiewski *Cellular Bioengineering*	**Physical properties of electrospun nanofibrillar scaffolds and effect on astrocyte reactivity**	International Lounge-7

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Terrence A. Lymon *Cellular Bioengineering*	**Development of an Electroactive and Bioactive Hybrid Hydrogel**	International Lounge-8
Sean P MacBride *Physics & Astronomy*	**A search for tidal tails in the satellite galaxy Carina**	Fireside Lounge-12
Thaybeth I. Malavé-Méndez *RISE*	**Engineering functional nucleic acids through lipid self-assembly**	International Lounge-20
Alyson March *Cellular Bioengineering*	**Development of a 3D printed composite bone scaffold**	International Lounge-9
Jenny Martinez *Advanced Materials*	**Optimization of metals' Work Function for MoS_2 transistors**	Cove-7
Jeff B. Martinez *INSPIRE*	**Role of formins in morphogenesis and development of the *C. elegans* pharynx**	International Lounge-18
Emma G. McLaughlin *Physics & Astronomy*	**Shear viscosity to entropy density ratio of the Quark Gluon Plasma at finite baryon densities**	Fireside Lounge-13
Jessica E. Meis *GSEF*	**Women and Latin American Art: Activism from Colonial Religious Imagery to Contemporary Installations**	International Lounge-14
José F. Mercado Ortiz *RISE*	**Synthesis of new antimalarials**	Cove-15
Navar Mercer White *Advanced Materials*	**We're running on fumes: improving the output of dye sensitized solar cells (DSSC) through electrolyte/electrode modification**	Cove-8
Rebecca R. Miller *RISE*	**Developing a pipeline for computationally improving ligand geometry in the Protein Data Bank**	Cove-16
Tasmiya Moghul *INSPIRE*	**Mutations in essential genes by CRISPR-Cas9**	International Lounge-19
Stephen R. Mut *Cellular Bioengineering*	**An investigation of electroporation of cell suspensions and adherent cells**	International Lounge-10

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Karen M. Nicolas *RISE*	**Viral Emergence: Evolution and host range of bacteriophage Φ6mutant E8G**	Cove-17
Desiree Pastrana Otero *RISE*	**Green and Resilient NJ: Protection, Resistance and Adaptation to Disaster Scenarios**	Cove-18
Natasha M. Ramos Padilla *RISE*	**Changes in sediment carbon cycling by saline intrusion in the Raritan River**	Cove-19
Joshua P. Randolph *GSEF*	**Linguistic institutionalization of anti-Romani racism: etymology, history, and pop culture**	International Lounge-15
Rocío Rivera Rodríguez *RISE*	**Determining the Combination Effect of Polyphenols from Vitis vinifera and Isothiocyanate from Moringa oleifera Extracts on Intestinal Epithelial Cell Dysfunctions**	International Lounge-21
Anthony Rodrigues *GET-UP*	**Computed analysis of PVDF films subjected to dynamic loadings**	Fireside Lounge-4
Darling P. Rojas *RUP-IMSD*	**Regulation of glutaminase (GLS) in metabotropic glutamate receptor 1 (GRM1) expressing melanoma cells**	Cove-27
Jessica M Romero *RUP-IMSD*	**The Impact of Touch Information Processing in Locomotion**	Cove-28
Leonardo Ruales *Physics & Astronomy*	**Focusing Cosmic Telescopes on the Distant Universe**	Fireside Lounge-14
Hannah L. Simerly *GET-UP*	**Au-doped TiO_2-coated mesh for increased efficiency of dye-sensitized solar cells**	Fireside Lounge-5
Liya P. Simon *RISE*	***Brassica napus* transformation vectors to select nuclear gene mutations controlling chloroplast transformation**	Cove-20
Sarah Snider Leonhauser *Advanced Materials*	**Mesoporous carbon templated synthesis and characterization of nanosized titanium dioxide for the reduction of carbon dioxide to methane**	Cove-9
Ellis A. Thompson *Physics & Astronomy*	**Growth and characterization of pyrochlore thin films**	Fireside Lounge-15

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm

Even-numbered Posters: 12:00pm – 1:00pm

Owen W. Tower *Physics & Astronomy*	**Quark-Gluon discrimination at the Large Hadron Collider**	Fireside Lounge-16
Jordan T. Troutman *RISE*	**Fairness in Machine Learning**	International Lounge-22
Natalia M. Tumidajski *Cellular Bioengineering*	**Development of collagen type I scaffolds with antibacterial properties for clinical applications**	International Lounge-11
Yadiel Varela *GET-UP*	**Fabrication of nanoparticles loaded with mebendazole via flash nanoprecipitation**	Fireside Lounge-6
Natalie R Verdiguel *RISE*	**Data Mining Literature Analysis of Cited Protein Data Bank (PDB) Data**	International Lounge-23
David J. Viramontes *SURF*	**Interaction of Organophosphate Flame Retardants with Efflux Transporters**	Cove-32
Tanya A. Zubov *RISE*	**The effects of chronic social defeat stress on en2 knockout mice**	International Lounge-24

Cellular Bioengineering Business Pitches

International Lounge

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 three or four, the students concurrently develop a business pitch around technology derived from their own REU research projects, which are presented at the Symposium. Business pitch posters are located in the *International Lounge*.

The three products are:

InsuKnight – A controlled insulin releasing patch
InsuKnight, Inc*: Alexus Cruz, Fabian Hernandez, Reem Eldabagh*

ColliMed – Technology for implantable, antibacterial scaffold to improve CNS Therapy
BioColl Industries, Inc*: Lauren Lisiewski, Liv Kelley, Natalia Tumidajski, Stephen Mut*

Build-a-Bone scaffold (BABS) – Scaffold technology for improved bone healing
Orthocare, Inc*: Nickolas Almodovar, Alyson March, Terrance Lymon, Estaban Bermudez*

Abstracts and Student Biographies

Stephanie M. Albarracin **Poster # Cove-1**
CUNY- Hunter College

Mentors:
Masanori Hara, Ph.D
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey, Piscataway, NJ 08854

Richard Lehman, Ph.D
Department of Materials Science and Engineering
Rutgers, The State University of New Jersey, Piscataway, NJ 08854

Synthesis of Inorganic Polymers from Silicate Glass

Current plastics are petrochemical products and are essentially different rearrangements of hydrocarbons. To help the push for a greener earth, there is a need to replace plastics with a sustainable option. The overarching goal of our research is to create plastic-like materials from ordinary sources, such as sand, a great source of Si and O. By adding alkali ions to silicate glass and then combining the ground glass with varying ionic liquids, the product is an inorganic polymer. The chemistry suggests that the introduction of alkali ions along with the ionic liquid reduces silicate's high glass transition temperature (Tg) in the range of 400°C to accessible temperatures as low as 141°C. This project focuses on optimizing the synthesis of the polymer, specifically comparing the effects of a simple mortar and pestle mixing and a ball mixing on processing temperatures. Further analysis through differential scanning calorimetry (DSC), Fourier Transform Infrared Spectroscopy (FTIR), and mechanical testing will provide insight on other properties of this novel polymer. This research is funded in part by Rutgers University grant number TA - Hara 1/2/18.

Biography: Stephanie Maribel Albarracin is an undergraduate that City University of New York (CUNY): Hunter College where she is pursuing a degree in Physics and a certificate in Public Policy. As a NIGMS-RISE student, she does research in Dr.Greenbaum's solid state NMR/EPR lab group from the Department of Physics and Astronomy. This summer, she joined Dr. Hara's polymer processing and characterization lab, in collaboration with Dr.Lehman's glass lab from the Material Science and Engineering Department, to focus on inorganic polymer fabrication. Maribel plans to continue on with a Ph.D in material science and hope to pursue her interest in science policy at the graduate level.

Abstracts and Student Biographies

Andrew G. Alvarez **Poster # Cove-2**
Texas State University

Mentors:
Andrew Alvarez
Sean Burgess
Alexander Neimark

Computer Modeling and Molecular Simulations of Tension-Induced Rupture of Lipid Bilayers

Examining the tension at which a cell membranes ruptures is a critical research subject for those in the pharmaceutical, military, and biotechnology fields. We study tension induced rupture of dipalmitoylphosphatidylcholine (DMPC) lipid bilayers as a cell membrane analogue using the mesoscale computation method dissipative particle dynamics. Two lipid models are compared: one developed by Groot & Rabone (Biophysical Journal, 2001, 81, 725-736) which is developed based on reproduction of water compressibility, and one developed by Kranenburg et al. (Phys. Chem., 2004, 4142 -4151) that uses standardized water interactions. The Smit model may be advantageous because it can be used to standardize lipid DPD interaction parameters streamlining the process of simulation setup. The kinetics of membrane rupture is explained using the classical Deryagin-Gutop theory in conjunction with Kramer's kinetic model. A time and tension dependent rate of rupture probability is developed with corresponding lysis and line tensions for both models.

Biography: Andrew Alvarez is from Katy, Texas and is currently an Industrial Engineering undergraduate student at Texas State University. He is a member of Houston-Louis Stokes Alliance for Minority Participation Scholars Program (H-LSAMP) and the Semiconductor Research Corporation. Andrew is a researcher for Dr. Eduardo Perez, who has assigned him with the optimization of health care system engineering. The summer of 2018 he worked under Dr. Alexander V. Neimark and Sean Burgess at Rutgers university to study course graining simulation modeling in lipid bilayers. Andrew Alvarez cares to pursue a Ph.D. in Material Science after graduating at Texas State University.

Zachary A. Finkel **Poster # Cove-3**
Rowan University

Mentors:
Mr. Akash Banerjee, Dr. Meenakshi Dutt
Department of Chemical and Biochemical Engineering
Rutgers University School of Engineering

Study of Hydrophobic Mismatch in Membrane Protein Systems: Role of Peptide Orientation and Lipid Density Profile

Our simulations study the properties of alpha helical inter-membrane proteins within a lipid bilayer. This will be useful to mimic proteins required for transportation, signaling, enzymatic response, and channeling essential for cell viability. These peptides are also targets of drug delivery (channels), so an understanding of the relationship between alpha helical membrane proteins and the lipid membrane is necessary to further research regarding drug transportation. We are primarily interested in developing a fundamental understanding of the impact of molecular components on the structure and function of soft and biological materials. Membranes studied within our lab are composed of a bilayer made of 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) and the mismatched peptide is KALP of varying lengths. KALP peptides consist of repeating alanine-leucine sequences of different lengths flanked with lysine residues at each end. Various properties of the DPPC membrane were studied under set modeling conditions with varying degrees of hydrophobic mismatch. Through these models, we attempt to further characterize and define the adjustments made by the simulated cell membrane in the presence of a hydrophobic mismatch between an inter-membrane protein and the lipid bilayer. This will further enhance the understanding of the dynamics of the cell membrane and its relationship with proteins that reside within it.

Biography: Zachary Finkel is a fourth year biochemistry and biological sciences dual major at Rowan University. He serves as a mentor through the Harley Flack Mentoring Program and holds an e-board position in the Rowan University chapter of the Muslim students association. He also works as an Academic Success Coach and tutors a plethora of subjects during the semester at Rowan University. Zachary aspires to become a medical researcher with goals to obtain his MD/PhD following his dual undergraduate degrees. Following participation in the RISE program, he is continuing research in an electrochemistry lab on methods regarding electrochemical drug analysis. In his leisure time, he practices brazilian jiu jitsu, muay thai, and judo.

Abstracts and Student Biographies

Robert A. Green-Warren **Poster # Cove-4**
Eastern Michigan University

Mentors:
Mr. Robert Green-Warren
Department of Mechanical Engineering
Eastern Michigan University

Dr. Daniel Kopp, Ph.D.
Richard Riman, Ph.D.
Department of Material Science and Engineering
Rutgers University

Optimizing the Energetic Requirements for Hydrothermal Production of Sodium Silicate via Computational Thermodynamic Modeling

In this project, a thermodynamic simulation of a Rankine steam power cycle containing reheating components and regeneration has been utilized to determine optimal operating parameters for the working fluid, which predominantly consists of supercritical water. That is, working conditions vary in temperature from 200-620°C, and pressures of 0.9-50MPa. The MATLAB Simscape platform was utilized as a means of graphical representation of the phase transitions on a Rankine T-s diagram. This data was used to identified efficient T, P regimes for steam production. This data was compared to the kinetic study of $Na_2Si_2O_3$ crystallization to obtain insight on efficient production parameters. The reaction kinetics of five samples of Na_2CO_3 and SiO_2 with a molar ratio of 1:1 were studied experimentally via hydrothermal vapor synthesis (HVS). Each sample was reacted for 16 hours at 200, 250, 300, 350, 400, and 500°C. The samples were then characterized via x-ray diffraction(XRD) and themogravimetric analysis (TGA) methods to determine the percent yield of the Na_2SiO_3. Positive results demonstrating a higher percent yield would be indicial of more efficient operational parameters. Future research is suggested to conduct a time sensitive study to further understand the time dependency of product yield via HVS. Conventional production methods of glasses and ceramic materials have proven to be energetically unfavorable. A dearth of thermodynamic data utilizing a mechanical approach indicates the necessity of further research in this regard. This research can be applied to provide a more sustainable means of production for glass and ceramic products by reducing the amount of fossil fuels utilized in melting raw materials and material synthesis.

Biography: Robert Green-Warren is from Muskegon, Michigan and is a mechanical engineering major and mathematics minor at Eastern Michigan University (EMU). He is member of the Ronald E. McNair Scholars program, Formula SAE Club, Society of Automotive Engineers, and the EMU Honors College. Robert also did research this previous semester studying torque loss in alloyed joints under the supervision of Dr. MacArthur L. Stewart, P.E. This summer, he was working under supervision of Dr. Richard E. Riman, and Dr. Daniel Kopp studying the optimization of the hydrothermal synthesis of sodium silicate through computational thermodynamic modeling. Robert plans to pursue a Ph.D in mechanical engineering upon graduation from EMU.

Abstracts and Student Biographies

Christopher J. Heckert **Poster # Cove-5**
University of Maryland, Baltimore County

Mentors:
Dr. Nina Shapley, Anik Chaturbedi, Sanyukta Patil

Removal of heavy metals from wastewater through environmentally safe polymers

Both chitosan and calcium alginate particles have been determined to be effective at adsorbing heavy metals from wastewater and are environmentally benign. Both natural carbohydrates have demonstrated an effectiveness at adsorbing metal ions, tested with copper, with comparable efficacy to modern methods of ion removal. Removal of contaminants from wastewater is becoming increasingly important as this natural resource dwindles. The two carbohydrates being investigated are widely available from natural sources. Alginate is derived from several types of bacteria and algae and chitosan is extracted from the chitin of shellfish. The alginate particles were prepared via syringe pump while the chitosan was prepared by the crosslinking of chitosan particles with TPP. It has been determined that the adsorption mechanism in the alginate particles is one of sorption and ion exchange. The mechanism at work for the chitosan nanoparticles is likely one of chelation or ion exchange.When aggregated the properties of these two particles compliment each other to enhance the efficiency of adsorption. The chitosan particles improve the rate of adsorption while the alginate beads provide a stabilizing structure that also allows the particles to be filtered or settled out of the water stream efficiently. The alginate and chitosan are oppositely charged, potentially allowing for the adsorption of both positively and negatively charged ions. The aggregated structures of these particles are of great interest. One that has previously not been studied in detail is an isolated alginate bead being introduced to a bath of concentrated chitosan. Initial data has shown this to result in the most effective type of aggregate. Future experiments plan to focus on incorporating this aggregate into a working filter.

Biography: Christopher Heckert is from Baltimore County, Maryland and is currently a Chemical Engineering major at the University of Maryland, Baltimore County (UMBC). He is a Meyerhoff Scholar, as well as an officer in the MD Delta chapter of Tau Beta Pi, a member of the American Chemical Society, the American Institute of Chemical Engineers. Chris works as a researcher at UMBC in Dr. Jennie Leach's lab in the department of chemical, biochemical and environmental engineering, on polymer synthesis. This summer he was working under the guidance of Dr. Nina Schapley and Ms Sanyukta Patil at Rutgers to investigate the metal adsorption properties of chitosan and alginate particles. Chris plans to pursue a PhD in Nuclear Engineering.

Trystan G. Irmiere **Poster # Cove-6**
The College of New Jersey

Mentors:
Deirdre O'Carroll, Ph.D.
Department of Materials Science and Engineering
Department of Chemistry and Chemistry Biology
Rutgers, The State University of New Jersey

Kelsey Gwynne
Department of Materials Science and Engineering
Rutgers, The State University of New Jersey

Solution processed blue light emitting quantum dot films

Quantum Dots (QDs) are semiconductor nanocrystals that are being explored for uses in different optoelectronic applications, including solar cells, lighting, and TV displays. Due to quantum confinement effects, they exhibit size dependent emissive properties. For the purposes of solution processing, QDs are dispersed in organic solvents in order to be deposited onto a substrate for use in an LED. However, recent studies have shown that it is challenging to deposit a uniform QD film onto a substrate by means of spin coating from solution. Additionally, it has also been shown that an organic solvent with a high boiling point prevents QDs from adhering to the surface of a glass substrate during spin coating. This study aims to develop uniform thin films of CdS/ZnS core/-shell QDs with a carboxylic acid ligand doped into a transparent polymer, poly(methyl methacrylate) (PMMA) to study the emissive performance (stability, color, and efficiency) compared to organic light-emitting materials typically used in organic LEDs. An organic solvent with a low boiling point was chosen and the CdS/ZnS QDs with carboxylic acid were chosen for their ability to disperse in the chosen organic solvent. The optical density of the emissive layer is tested using UV/visible absorption spectroscopy and the uniformity of the film is observed using dark--field and bright--field optical microscopy. Results indicate that water rather than organic solvents disperse the carboxylic--acid--functionalized QDs, and a high polarity solvent does not allow for the QDs to dissolve. Since water acts as a better solvent, polyvinyl alcohol (PVA) must be used as the host polymer (rather than PMMA) due to PMMAs inability to dissolve in water. This study shows that the choice of solvent and ligand is critical for proper dispersion of QDs proper to solution processing.

Biography: Trystan Irmiere is from Montville, New Jersey and is currently a mechanical engineering major undergraduate student at The College of New Jersey. He is the president of the American Society of Mechanical Engineers chapter for the school, a member of the Society of Automotive Engineers, a peer educator for the offices of the Anti Violence Initiative, and a member of the Habitat for Humanity club on campus. Trystan has also assisted Dr. Karen Yan of The College of New Jersey with her research on tissue engineering. This summer, he worked under the guidance of Dr. Deirdre O'Carroll at Rutgers University to fabricate solution processed blue light emitting quantum dot films.

Abstracts and Student Biographies

Jenny Martinez **Poster # Cove-7**
California State Polytechnic, Pomona

Mentors:
Professor Manish Chhowalla
Yan Wang
Department of Material Science and Engineering
Rutgers, The State University of New Jersey

Optimization of metals' Work Function for MoS_2 transistors

A molybdenum disulfide (MoS_2) Field Effect Transistor (FET) is an atomically thin multilayer device vertically stacked. For the past ten years, two dimensional dichalcogenides have been the subject of intensive research. MoS_2 has been the most studied dichalcogenide due to its charge carrier mobility similar to silicon, superior thermodynamic limit, and band gap semi conductivity, not present in graphene. MoS_2 natural properties make it the most promising semiconducting material able to bring future development in physics, chemistry, and electric applications. Further efficiency in MoS_2 FET can be reached, by modifying the Work Function of the alloy or metal present in the metal-semiconductor interface. The main purpose of this project is to quantify, compare, and identify the minimum amount of energy required to transfer an electron from a metals surface to MoS_2, which is determined by the difference of the Work Function (WF) of the metal and the electron affinity of the semiconductor. In this project, we synthesize different metal and alloy compositions through Electron Beam Evaporation. We quantify and compare the WF of metals and alloys using Kelvin Probe Force Microscopy (KPFM). The identification of the ideal alloy closest to the Conduction or Valence band of MoS_2 allows an increase of the efficiency of Field Effect Transistors. Finally, we annealed the samples and analyzed the change of the WF due to heat treatment and alloy composition.

Biography: Jenny Martinez is from Bogota, Colombia and is currently a Mechanical Engineering major at California State Polytechnic University of Pomona (CPP). She is a member of Pi Tau Sigma the International Honor Society for Mechanical Engineers and a 2018 Ronald E. McNair Post-Baccalaureate Achievement Program scholar. Jenny is also a researcher under the supervision of Dr. Guiseppe Lomiento and his team developing an ideal metamaterial which structure would allow structures to exhibit qualities not found in nature. The metamaterial is be able to absorb energy in the vertical direction while keeping a high level of stiffness in its vertical axis. During the summer, Jenny was involved in the Advanced Materials and Nanotechnology department at Rutgers University in New Jersey. Under the mentoring expertise of Yan Wang and Professor Manish Chhowalla, she was able to identify and analyze the change of the WF in different alloys due to heat treatment and alloy composition. After graduation from CPP, Jenny plans to pursue a Ph.D. in nanoengineering.

Abstracts and Student Biographies

Navar Mercer White **Poster # Cove-8**
Vassar College

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

We're running on fumes:
improving the output of dye sensitized solar cells (DSSC) through electrolyte/electrode modification

In 1991 O'Regan and Grätzel published the first paper on dye sensitized solar cells (DSSC). Their paper sparked research into DSSC with the hopes of replacing the standard silicon solar cell with a more affordable DSSC solar cell. DSSC's are cheaper and easier to make, but they are not nearly as efficient as traditional silicon solar cells. DSSC's efficiency must be improved to become an acceptable replacement to the silicon solar cells. This study looked at changing the electrolyte present in DSSC cells as well as altering the counter electrode with a p-type semiconductor, $CuAlO_2$, to try and increase the longevity and efficiency of the DSSC cells.

Iodine dissolved in ethylene glycol is a commonly used electrolyte in the dye sensitized solar cell. The problem with ethylene glycol is that it evaporates. This hinders the performance of the cells over a long period of time. Adding glycerin, a viscous solvent that evaporates slower than ethylene glycol, to the currently used solvent extend the DSSC's life time. However it lowered the DSSC's base voltage.
CuAlO2 was used as an additive to the graphite counter electrode in the DSSC's. Altering the graphite counter electrode that was passively replenishing the electrolyte with electrons with a p-type semiconductor that actively pushes electrons back into the electrolyte tripled the max voltage of the cells. The final cell under peak conditions gave a max voltage of 757 mV whereas the graphite counter electrode had a max voltage of 251 mV under its peak conditions.

Biography: Mercer White Is from Palm Bay, Florida and is currently enrolled as an undergraduate student at Vassar college. He will be entering his senior year this fall and is pursuing a degree in chemistry with a minor in mathematics. This summer he worked on increasing the output of dye sensitized solar cells under the guidance of Professor Lisa Klein at Rutgers University. Mercer will be writing his senior thesis next year under the guidance of Professor Sarjit Kaur, professor of chemistry at Vassar College. Mercer plans to pursue a Ph.D. in Chemistry after graduating from Vassar College.

Abstracts and Student Biographies

Sarah Snider Leonhauser **Poster # Cove-9**
Ursinus College

Mentors:
Tao Zhang
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Tewodros Asefa, Ph.D.
Department of Chemical and Biochemical Engineering
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Mesoporous carbon templated synthesis and characterization of nanosized titanium dioxide for the reduction of carbon dioxide to methane

Titanium dioxide (titania) is a commonly used material that finds diverse application in areas including paint pigments and sunscreen products. Titania is also used for its semiconductor characteristics, which enable it to facilitate oxidation and reduction reactions of various compounds, such as the degradation of dyes, water oxidation, and in the present project, carbon dioxide reduction to produce hydrocarbons (synthetic fuels). While this material is commonly used for these types of reactions, the aggregation of the titania crystallites following its synthesis limits the redox potential of the material. This limitation is due to the presence of defective sites within the material as well as thermodynamically driven tendency of the crystallites to aggregate and reduce their surface energies. These sites trap the migrating electrons and electron hole pairs that are present in titania after excitation. As large aggregates of titania particles form, electrons must travel further to reach the surface of the material to participate in redox reactions, and will therefore have a higher chance of running into one of the defective sites. In this project, our goal is to make very small titania particles via self-assembly and templating synthetic routes in which we use 47 nm silica nanospheres as sacrificial templates. In the synthetic process, first we create polyaniline/silica nanosphere composite materials. We subsequently remove the silica nanospheres to leave a polyaniline derived mesoporous carbon (PDMC), whose pores are the negative replica of the silica nanospheres. Titania is then synthesized within the pores of the PDMC material by hydrolysis of titanium alkoxide. Once the PDMC framework is removed, the titania is not aggregated as in typical synthesis, but is present in separated nanoparticles. We propose that the resulting materials constituting smaller titania particles will have better ability to catalyze oxidation and reduction reactions, including carbon dioxide reduction. We also expect that their catalytic activities will be higher than those of many traditionally synthesized titania.

Biography: Sarah Snider Leonhauser is from Levittown, Pennsylvania and is currently a rising senior pursuing a bachelor's degree in chemistry with a minor in biology at Ursinus College. She is a sister of Tri Sigma Sorority, a UC Ambassador, Mini-THON committee member, Fellow of the Parlee Center for Science and the Common Good, and member of the Whitian Honor Society. She conducts research under her advisor Dr. Pfennig studying pyrazine-modified complexes for photocatalytic carbon dioxide reduction. This summer, she is conducting research at Rutgers University with Dr. Tewodros Asefa and Tao Zheng, on a project that addresses the novel synthesis and characterization of nanosized titanium dioxide to reduce carbon dioxide to methane. Sarah plans to pursue a Ph.D. in forensic chemistry after she graduates from Ursinus College.

Abstracts and Student Biographies

Emily Cepin, Loriann De Sousa Rego, Toi Slade **Poster # Cove-10**
Kearney High School, David Bearley High School, Benedictine Academy

Mentors:
Rutgers 4-H Youth Development Program

A Comparison of MicroPlastics in the Raritan and Passaic Water Bodies

Our group set forth to find if secondary micro-plastics are more prevalent than primary micro plastics in our local water ways. The question we explored is are there varying amounts of secondary and primary plastics in the Raritan Bay waterways vs the Passaic River. As a part of Project INCLUDE, we are working alongside scientists, who are helping us improve our methods for data collection. As rising freshman and sophomore high school students, we are grateful for this opportunity to increase our knowledge of such an important environmental issue.

Biography: Troi Slade is entering the 9th grade at Benedictine Academy. She will be researching where all the primary micro plastics because in her experience secondary micro plastics are the majority found in her samples. She enjoys drawing and learning about space.

Emily Cepin and is attending Kearny High school as a Sophomore. She enjoys reading, writing, swimming, and exploring different areas of science. She will be comparing different types of micro plastics in different bodies of water, in my local community and beyond.

Loriann De Sousa Rego will be a freshman this year at David Bearley High School. She enjoys plenty of things, from connecting to different types of people to taking care of kids and making new memories. She is researching what happens to the primary microplastics since secondary microplastics are the primary findings.

Abstracts and Student Biographies

Riya Goel, Tayor Grant, Garret Joyce **Poster # Cove-11**
West Orange High School, St. Benedicts Prep, McNair Academic High Schol

Mentors:
Katie McDonnell, Rutgers 4-H Youth Development Program

The Impact of MicroPlastics on Living Organisms

Samples collected both in the Passaic River and Raritan Bay were analyzed to make observations for microplastics. Our group set forth to find out if an increase in microplastics results in a decrease in the size of the species in those bodies of water. Our group is one of rising high school students that are working with scientists to support us in exploring our inquiries about microplastics and the effects of plastics on organisms and their growth. We analyzed data that we manually collected using handmade samplers and a series of sievs. With this quantitative and qualitative data we were able to explore how the size of organisms correlates to microplastic exposure.

Biography: Taylor Grant is a student at St.Benedicts Prep starting as a freshman this year. He is participating in research on the physical affects of microplastics in fish. He is interested in learning if the microplastics have a physical effect on the growth and development of fish after they've hatched.

Riya Goel is a rising sophomore at West Orange High School. She enjoys a plethora of activities from rowing to drawing and is doing research this summer on the effects of microplastics on fishes development.

Garrett Joyce is a rising junior at McNair Academic High School in Jersey City. He continuously engages in and enjoys science even more such as Science Research, and Environmental Science Club. This summer he is doing research on the effects of the pollution of microplastics on species in an environment.

Abstracts and Student Biographies

Nicholas D. Bolden **Poster # Cove-12**
University of Nevada, Reno

Mentors:
Huirong Zhang, Ph.D. and Huizhou Fan, M.D., Ph.D.
Department of Pharmacology
Rutgers-Robert Wood Johnson Medical School

Would *grg*A mutants confer resistance to benzylidene acylhydrazides in Chlamydia?

Chlamydia is one of the most prevalent sexually transmitted infections in today's society. If left untreated, chlamydial infection can lead to pelvic inflammatory disease (PID), infertility, and ectopic pregnancy. It is caused by the bacterium, *Chlamydia trachomatis*, which requires a host cell for replication. Broad-spectrum antibiotics are used for treatment; however, they also target normal host cells as well as normal gut and vaginal microbiota which are required to maintain our body's health. Since there is a need for more specific treatments, researchers from our lab have developed potential therapeutics in the class of benzylidene acylhydrazides "BAs" which specifically target chlamydial cells. However, the mechanism behind how the BAs inhibit chlamydial growth is unknown. Previous research in the lab identified four potential SNPs which allowed a mutant, designated MCR, to confer resistance against the BAs. Through genome recombination and clonal populations, we suggest that the fourth SNP, designated as *grg*A R51G, is required for resistance against the BAs. The SNP *grg*A activates transcription of the *def*A promoter which encodes for the protein, peptide deformylase (PDF). Here, we report our attempt to generate a *grg*A R51G mutant *C. trachomatis* using fluorescent-reported allelic exchange mutagenesis (FRAEM) methods to determine if the mutant confers resistance to the benzylidene acylhydrazides, as we expect that the *grg*A R51G mutant *C. trachomatis* will grow on plates containing one of the BA compounds as well as express green fluorescence under a fluorescent microscope. These expected results will firmly establish *grg*A as a potential target for therapeutic intervention during chlamydial infection.

Biography: Nicholas Bolden is from Albuquerque, New Mexico. He is a rising senior at the University of Nevada Reno (UNR) majoring in Molecular Microbiology and Immunology with a minor in Community Health Science. He is a member of the TriBeta Biological Honor Society, the McNair Scholars Program, and the Phi Kappa Phi Honor Society. At his home institution, he conducts research regarding the disease mechanisms of muscular dystrophy in mice under the guidance of Dr. Dean Burkin at the University of Nevada School of Medicine. Outside of school and the lab, Nicholas enjoys playing tennis, hiking, and watching movies. As a participant in the RISE program, Nicholas worked in Dr. Huizhou Fan's lab trying to identify the mechanism of how potential anti-chlamydials inhibit chlamydial growth. After graduating from UNR, Nicholas plans to pursue a Ph.D. in microbiology.

Abstracts and Student Biographies

Jennifer Guzman Pichardo **Poster # Cove-13**
CUNY Lehman College

Mentors:
Lin Lei, Jonathan P. Singer, Andrei Jitianu

Controlling Morphology of Melting Gels by Electrospray Deposition

Silica-based, organically-modified melting gels (MGs) are sol gel materials that can be applied as corrosion and hermetic barrier coatings for critical components of the electronic devices, making MGs a possible replacement material in the electronics industry. Unlike other classical hybrids, MGs are oligomeric with glass transition temperatures near room temperature. Because of this, they can be reversibly softened around 110 °C. If raised above their consolidation temperature, which is 120~170 °C, MGs irreversibly crosslink into hybrid glasses. In this study, we investigated the effects of different electrospray deposition conditions on the morphological and kinetic behaviors of the MG crosslinking. Electrospray deposition is a charged spray process that occurs under high field and can be performed at different flow rates and substrate temperatures. In particular, we were interested if the polarity of the charged spray affects the properties of the bonds between the organic and inorganic bonded in solution of MGs. Our project focused on the study of electrospray deposition to investigate the morphological and kinetic behaviors of MGs affected by the different experimental conditions. The parameters considered were spray polarity, flow rate, spraying distance, substrate temperature, and composition. Our results were obtained by quantifying the smoothness of the films using reflectometry mapping of film thickness. Different molar compositions of methyl and phenyl substituted MGs with α- terpineol were sprayed at different temperatures. The data showed that the films obtained from the methyl substituted MGs give the smoothest films when the substrate temperature is about 175°C, balancing the electrostatic and viscous forces during consolidation. Phenyl substituted MGs dewetted due to its high viscosity resulting in self-cohesive films that were not smoothed by the electrostatic force.

Biography: Jennifer Guzman Pichardo is an uprising senior at CUNY Lehman College. She is majoring in Biochemistry with a minor in Biology. She is the first one in her family to attend college. Her postgraduate studies plans are obtaining a Ph.D. in Bioengineering or Biochemistry. Participating in the RISE program has helped her gain more insight about her interest in pursuing a Ph.D. She enjoys spending time in the lab doing research as well as working as a teacher assistant for new students at Lehman College. During her free time, she loves to workout, watch movies, and go out with friends to the movies.

Abstracts and Student Biographies

Makayla L. Hickmon **Poster # Cove-14**
Edward Waters College

Mentors:
Sean Tsaur, Andrea Shang, Kasia Bieszczad, Ph.D.
Department of Psychology, Rutgers University,
The State University of New Jersey

Early performance differences in rats learning a sound-reward association task reveal potential effects of an Alzheimer's disease gene

Alzheimer's disease (AD) is a learning and memory disease. AD has been linked to several familial genes that, when inherited, cause early onset cognitive decline and dementia. One of these genes codes for Amyloid Precursor Protein (APP), which is associated with pathological amyloid plaques in AD brains. Our study focused on a Swedish familial APP mutation to examine how it affects learning, memory and plasticity in an auditory model. Young adult animals were tested to investigate potential early indications of learning and memory deficits in animals harboring the mutated APP gene. A *knock-in* rat model of AD has been recently produced by Dr. Luciano D'Adamio, in which rats harbor the "Swedish mutation" (APPswe) or healthy "humanized" (APPhum) versions of the APP gene. Rats were trained in an auditory associative learning task in which conditioned reinforced and non-reinforced sounds (5 kHz vs. 11.5 kHz pure tones) were used to control bar-pressing behavior. After training, the animals were evaluated through a memory test where 10 tones were used (8 of them new tones) to determine whether the animals remembered the precise frequencies used in training, or generalized their bar-pressing responses to novel tones. Initial data show that $APP^{s/s}$, $APP^{s/h}$ $APP^{h/h}$ performing differently. Animals homozygous for the Swedish mutation acquired the task more slowly, than heterozygous or homozygous humanized animals, who learned the task the fastest. These results could help us understand if early differences in learning abilities might help predict a pathological AD genotype and early therapeutic intervention.

Biography: Makayla was born and raised in Orlando, Fl. Makayla is a rising senior pursuing a degree in biological sciences from Edward Waters College in Jacksonville, Florida. At Edward Waters College, Makayla is a member of the cross country and track and field teams. As a participant in the RISE program, she is working with Professor Kasia Bieszczad in the "Cortex, Learning, Epigenetics, & Function" (CLEF) lab. In this project, they used "knock in" rat models harboring a Swedish mutation and a "healthy" Humanized version of the Amyloid Precursor Protein gene to investigate a potential pathological Alzheimer genotype.

José F. Mercado Ortiz **Poster # Cove-15**
University of Puerto Rico - Río Piedras

Mentors:
Spencer Knapp, Ph.D. - Rutgers University
Robert Barrows - Rutgers University

Synthesis of new antimalarials

Malaria is a life-threatening disease that half the world's population is currently at risk of contracting. Unfortunately, the parasite responsible for the disease develops resistances rapidly so novel antimalarials are continuously needed to combat it. A promising tetrahydrobenzonaphtypyridine carboxanilide (TBN) scaffold with antimalarial activity has been identified. The current synthetic route however, leaves much to be desired in terms of yield andhas only been achieved with limited aniline variability. A new synthetic approach has been devised to both increase yield and access TBNs with diverse carboxanilide substitutions. Previously, TBNs were formed from the alkylation of TBN carboxamides baring secondary amines. The new divergent route includes the conversion of the carboxylic acid to the methyl ester, then the alkylation of the amino group, and, finally, hydrolysis of the ester and amidation of the resulting acid. With this new route we are looking to accomplish the efficient synthesis of TBN analogs in higher yields and with more aniline substituents than was previously possible.

Biography: Half the world's population is at risk of contracting malaria, a life-threatening disease, so effective antimalarials are needed to combat it. A promising tetrahydrobenzonaphtypyridine antimalarial agent has been identified, bearing an aniline amide and a substituted amino group. However, the current synthetic route leaves much to be desired in terms of yield and has only been achieved with 3,4-difluoro substituted aniline. A new synthetic approach has been devised to increase yield and effectivity of the overall process and to achieve amidation with other substituted anilines. Previously, an amide was formed from the carboxylic acid and then the alkylation of the amino group was carried out. The new divergent route includes the conversion of the carboxylic acid to the methyl ester, then the alkylation of the amino group, and, finally, hydrolysis of the ester and amidation of the resulting acid. With this new route we are looking to accomplish the efficient total synthesis of the target compound in higher yields than before and with more aniline substituents than was previously possible.

Abstracts and Student Biographies

Rebecca R. Miller **Poster # Cove-16**
Smith College

Mentors:
Brian Hudson, PhD., Chenghua Shao, PhD., Christine Zardecki, Stephen Burley, PhD.
RCSB Protein Data Bank
Center for Integrative Proteomics Research
Rutgers, The State University of New Jersey

Lu Wang, PhD.
Department of Chemistry and Chemical Biology
Institute for Quantitative Biomedicine
Rutgers, The State University of New Jersey

Developing a pipeline for computationally improving ligand geometry in the Protein Data Bank

Information about the three-dimensional structures of complex biological molecules is an indispensable research tool for many fields of study including biology, chemistry, pharmacology and computer science. The Protein Data Bank (PDB) is a public digital archive for such information. Molecular structures in the PDB are constructed from experimental data and undergo statistical validation for structural plausibility using the program Mogul upon their deposition to the PDB, which cross references the deposited structure against similar data in the Cambridge Structural Database (CSD). Ligands associated with PDB structures are a common source of structural inaccuracy. In this study, a programmatic pipeline was developed to improve geometric accuracy of ligands in the PDB. Ligands with inaccurate geometry were identified through a Python mining code. A sample set of the identified structures were rearranged into minimum energy conformations using AMBER software and fit to original experimental density maps using the program Coot. The refined models were compared to the originally proposed models in the PDB as well as those in the CSD using the deposition statistical validation server. Preliminary results suggest that the pipeline effectively identifies and improves ligand structures with inaccurate geometry. This method can be used to evaluate the accuracy of specific ligands in archived structures or in those pending deposition.

Biography: Rebecca Miller is a rising junior at Smith College. She is a chemistry major and a computer science minor. At her home institution, she is a member of an organometallic chemistry research lab and is interested in exploring the discipline of molecular modeling applied to chemistry. Outside of her major studies, she enjoys learning foreign languages, playing rugby, drawing, and hiking in the Adirondack Mountains. After graduation, Rebecca will pursue a PhD in Chemistry.

Karen M. Nicolas **Poster # Cove-17**
Rutgers, The State University of New Jersey

Mentors:

Siobain Duffy, Ph.D., Mansha S. Pasricha, Ph.D.,Ms. Natasia Jacko
Department of Ecology, Evolution, and Natural Resources
Rutgers, The State University of New Jersey

Viral Emergence: Evolution and host range of bacteriophage Φ6mutant E8G

Bacteriophage ϕ6 is a *Pseudomonas* infecting, double stranded RNA (dsRNA) virus with a lipid coat and a tripartite segmented genome. These characteristics make ϕ6 an excellent model organism for the study of emergence on novel hosts in similar, human-infecting RNA viruses, such as Rotavirus. This study used a ϕ6mutant, E8G, which was previously evolved for 30 days on two novel hosts: either on *Pseudomonas syringae* pv. *tomato* (Tom), or *Pseudomonas pseudoalcaligenes* East River isolate A (ERA), or both novel hosts in alternation. Each treatment in this evolution experiment had four replicates, for a total of 12 evolved populations. We tested the host range of these 12 populations onto seven different hosts, four of which were able to be infected by the wildtype ϕ6, two of which were were the previously novel hosts that E8G was evolved on (Tom and ERA) as well as one host neither wild type phi6 or the E8G mutant could infect, *Pseudomonas syringae* pv. *atrofaciens* (Atro). We also Sanger sequenced the complete genomes of the 12 populations, which revealed frequent changes in two proteins associated with host range expansion: the P3 and P6 proteins which are responsible for host attachment and membrane fusion. Our results indicated that 11/12 populations retained the host range of their ancestor, E8G, but one replicate evolved on ERA unexpectedly expanded its host range and was able to infect Atro. Understanding how the model RNA virus ϕ6 adapts to novel host provides a guide for understanding how repeatable and expected an RNA virus is, which will improve disease emergence models used by public health agencies.

Biography: Karen Maria Nicolas is completing her final semester this fall at Rutgers University in the School of Arts and Sciences where she will complete her Bachelor of Science degree in Evolutionary Anthropology. Karen has completed her Certificate in Evolutionary Medicine and is also minoring in Geology. Karen has been a Rutgers Future Scholar since seventh grade and serves as one of the first ambassadors of the program. Karen has met with and persuaded donors such as Ernst & Young and Diversity Inc. to invest and mentor low income students from the New Brunswick, Piscataway, Newark and Camden Rutgers Campuses in their pursuit for a higher education. As a daughter of immigrants and a Mexican American, Karen has also invested her free time in issues that hit close to home by volunteering for New Labor, a non-profit in New Brunswick that helps the immigrant community statewide. Karen attended the Health Sciences Technology High School in New Brunswick where she interned at the Robert Wood Johnson University Hospital in their cytology and pathology department. As a participant in the RISE research program, Karen worked in Dr. Siobain Duffy's wet laboratory in the Department of Ecology, Evolution and Natural Resources at Rutgers University alongside Dr. Mansha Seth Pasricha and Natasia Jacko. Karen worked with different populations of the E8G mutant of bacteriophage phi6 using experimental evolution and bioinformatics techniques. After completing her Bachelor of Science in Evolutionary Anthropology, Karen plans to attend graduate school and earn her Ph.D. in Epidemiology from New York University in order to help better public health preparedness and control emerging disease transmission worldwide.

Desiree Pastrana Otero **Poster # Cove-18**
University of Puerto Rico - Rio Piedras

Mentors:
Clinton J. Andrews, PhD, LEED AP, Jennifer Senick, PhD, Ioanna Tsoulou, MEng, MCRP, Deborah Plotnik, B.Arch, LEED AP,

Green and Resilient NJ: Protection, Resistance and Adaptation to Disaster Scenarios

Within a changing climate, urban populations are increasingly vulnerable to natural disasters. A major local concern in highly urbanized regions worldwide is the effect of heat waves on the local population. Urban seniors are members of a subpopulation that is highly vulnerable to heat stress, especially if they are poor and socially isolated. Those who have limited access to resources and poor indoor and outdoor living conditions are especially vulnerable. It is imperative to adopt good practices in the design, construction, and operation of buildings to help vulnerable resident manage this risk, via distinct strategies of mitigation (reducing climate stressors) and adaptation (coping with existing stressors). To mitigate these risk, green buildings have been recently adopted, which have a focus on reducing the negative impact on the environment. Adaptive strategies, such as resilience, instead are aimed at promoting tolerance, resistance and the ability of the inhabitants to recover from disaster scenarios. But a big question is: Are green buildings also resilient buildings? How do green and resilient features appear and perform in practice? To study these questions, my team performed field studies at 3 public housing sites in the City of Elizabeth, NJ, which suffers from heat island effects and has the worst air quality in New Jersey. We monitored 24 apartments and interviewed 24 senior residents living at these sites. Each study site has its own profile in terms of outdoor landscaping options, building and apartment characteristics and residents' profiles. In this research we focused on site L and M to make comparisons between both on the characteristics of green buildings and resilient buildings to see if this affects the impact of heat waves on the occupants. Site L (built in 2011) is a LEED-certified green building with a very good building envelope and central air conditioning, but it has limited outdoor cooling options compared to site M (built in 1938). At both sites, south- and west-facing apartments were warmer than those with other orientations. When heat wave conditions coincide with electric power outages, the older site M is more resilient than the newer, greener Site L. The L site, despite being a green building, is less resilient to heat waves because it uses mechanical ventilation and if it does not have electricity, it does not provide the option of cross ventilation as site M provides. Finally, we identify strategies for making green buildings more resilient, and for making resilient buildings greener.

Biography: Desirée Pastrana Otero is currently studying a bachelor's degree in Environmental Design at the School of Architecture of the University of Puerto Rico at the Rio Piedras Campus. She is interested in pursuing a graduate degree in Urban Planning because her research interest include how cities are the way they are, why they work in that way, and how they can be improved through an architectural design that can offer specific solutions to social problems. This summer, she came to the RISE program and focused on research about Resilience in the Center for Green Building at the Edward Bloustein School of Planning and Public Policy. Desirée is grateful to be part of this summer research experience and to have worked with Dr. Clinton Andrews this summer.

Natasha M. Ramos Padilla **Poster # Cove-19**
University of Puerto Rico - Mayaguez

Mentors:
Nathan Yee, Ph.D., and Katherine Dawson, Ph.D.
Rutgers University, New Jersey

Changes in sediment carbon cycling by saline intrusion in the Raritan River

New Jersey, and other coastal Atlantic states are experiencing a faster sea level RISE than the global average (17.78mm) because of land sinking from post-glacial isostatic adjustment. In coastal aquatic systems, sea level RISE promotes inland exchange of ions between the sea and rivers via salt water intrusion. While ion concentrations in the river increase due to this conservative mixture, there is an unexpected loss of sulfate. Previous studies suggest that this loss may be due to an increase on bacterial sulfate reduction. Enhanced degradation of organic matter by freshwater bacteria, via the coupling of organic matter oxidation to sulfate reduction, can result in an accelerated flux of carbon between sediment and atmosphere. In this study, we propose assessing a chemical and biological profile of the Raritan River in New Jersey. Core samples were taken from three sites with different salinity (1.8%, 1.0% and <0.3%). Various incubation were made by exposing sediment from a site to its own water, water from a higher salinity site, and water from the Raritan Bay. Water chemistry determined by ion chromatography, as well as DNA sequencing were carried out over the course of the incubation to study changes in the microbial communities and chemical products of their activity. We saw a decrease in iron(III) reduction and sulfate concentrations as the core got deeper. However, when exposed to higher salinity during incubation, reduction of iron(III) was favored over sulfate reduction. We also expect to see an increase HS^-, CO_2, and N_2O as we expose the bacteria to higher salinity. This increase in greenhouse gases can lead to further warming and thus, a further increase in sea level RISE becoming, then, a positive feedback cycle.

Biography: Natasha is from the west coast of Puerto Rico. Currently, she is a rising senior in the University of Puerto Rico – Mayaguez Campus (UPRM). She majors in Chemistry and is highly interested in the application of Chemistry to Environmental Sciences. During her first internship at Massachusetts Institute of Technology (MIT), she was able to pursue her first research in Environmental Chemistry. Under Dr. Jesse Kroll's mentorship, she quantified the wet deposition of organic carbon in rainwater samples. After summer she worked on phytoremediation with Dr. Martha López. On her junior year, she participated in an exchange program at Cornell University through the Cornell-UPR Interuniversity Relief Program after hurricane María stroke the island. During this semester, she worked with Dr. Damian Helbling collecting data of potential pesticides partitioning into drinking water sources in Honduras. This summer, Natasha is working with Dr. Katherine Dawson at Rutgers University. Together, they are creating a biological and chemical profile for the Raritan Rive and studying the effects of saline intrusion in the bacterial community. Her hobbies include watching anime, playing cards and eating.

Liya P. Simon **Poster # Cove-20**
SUNY Farmingdale

Mentors:
Dr. Pal Maliga
PhD candidate Lisa LaManna
Department of Genetics, Waksman Institute

Brassica napus **transformation vectors to select nuclear gene mutations controlling chloroplast transformation**

The plastid genome of higher plants is 120-160 kb and encodes for about 110 genes, some of which are essential for photosynthesis. Upon a seedling's emergence into light, nuclear genes regulate the expression of plastid-encoded genes. The psbA and rbcL genes encode subunits of photosystem II and rubisco, respectively, but the nuclear genes that control their gene expression remain elusive. These nuclear genes can be identified using a selection system that allows visualization of the expression of either psbA or rbcL. I present here the design of the plastid transformation vectors in which a reporter gene is flanked by the regulatory sequences of psbA or rbcL. This vector was introduced into the chloroplast of *Brassica napus* via biolistic delivery. Upon acquiring fertile transplastomic plants from tissue culture, we mutagenized the transplastomic seeds with ethyl methanesulfonate and screen for the mutant M2 progeny. Once germinated, mutants that do not express the reporter gene was isolated for further analysis. This selection system facilitated the identification of candidate nuclear genes that regulate psbA or rbcL gene expression.

Biography: My name is Liya, a rising junior at SUNY Farmingdale, NY, pursuing a BS in Bioscience. I was born and raised in India for the most part of my life and have an immerse passion for dance, music, travelling and hiking. I have been doing research in my home institution with one of my professors, Dr. Kerry Lutz since sophomore year and had a great opportunity to present my research on Student Research Day. Outside of the classroom, I am the vice president of the South Asian Student Association club and is involved in extracurricular activities like volunteering, singing in the church choir and teaching at the Sunday school. I also do shadowing at hospitals in my downtime, where I cultivated a deep appreciation for medicine and I believe in giving back to my community because the idea of helping someone in need is such a rewarding thought. This summer, I work under the supervision of Dr. Pal Maliga and the PhD candidate Lisa LaManna on chloroplast transformation and I am grateful to them for their guidance and support they have given me throughout this project. This experience has helped him develop professional skills and realize what I need to continue to grow as a student.

Alain Abonge Yufanyi **Poster # Cove-21**
Rutgers University - New Brunswick

Mentors:
Dr. Kim McKim
Principal Investigator
Department of Genetics
Waksman Institute of Technology
Rutgers - New Brunswick.

Dr. Jessica Fellmeth
Postdoc Graduate
Mentor

The centromere and the role of Cenp-C (centromere protein) in chromosome segregation.

Reproduction is important in the lives of living organisms and there are many cellular processes involved with generating new offspring. Meiosis is a reproductive process in which diploid precursor cells generate haploid gametes after two consecutive cellular divisions involving the segregation of chromosomes. Incomplete chromosome segregation results in defects such as nondisjunction and aneuploidy (abnormal number of chromosomes in daughter cells). Our goal is to analyze a key structure of the chromosome known as the centromere - particularly a centromere protein Cenp-C, and determine its effect on chromosome segregation during meiosis. We used preliminary data from *Drosophila melanogaster* on the role of Cenp-C expression during segregation, from Dr. McKim's lab. This revealed that, interfering RNA (RNAi) against Cenp-C, under the control of NGTA (GAL4) will result in mis-segregation of chromosomes (nondisjunction) and increased crossing over near the centromere. Thus, shRNA (short hairpin RNA), when activated through the GAL4 system, inhibits Cenp-C activity by RNA interfernce (RNAi). We will perform fly crosses and observe the phenotypes of the progeny to verify nondisjunction by quantitative analysis. Previous studies show that during complete chromosomal segregation, there is a 50% chance of crossing over occurring. So, Cenp-C may also affect the rate of crossing over. In the future, we will conduct another set of fly crosses to examine the rate of crossing over and determine the effect of Cenp-C activity on the rate of crossing over. Does the rate of crossing over increase or decrease if Cenp-C is repressed?

Biography: Biography: Alain Abonge Yufanyi was born in Bamenda, North West Province, Cameroon and came into the U.S. in September of 2014. He enrolled at Raritan Valley Community College, Somerville, NJ in January 2015 and graduated Magnum Cum Laude with an A.S. Degree in Science and Math in May 2017. He is currently a rising senior at Rutgers University-New Brunswick majoring in Biological Sciences graduating in May of 2019 with the goal of entering Med school. Being a part of the RISE-IMSD summer 2018 program was a terrific opportunity and great experience for him, and he is grateful to his mentors at the Waksman Institute for their guidance and tutelage during the very first research experience of his educational/professional career.

Abstracts and Student Biographies

Kia I. Ansine **Poster # Cove-22**
Rutgers University- New Brunswick

Mentors:
Rocio Michelle Duran, Diana Roopchand, Ph.D.
Department of Food Science
Rutgers, The State University of New Jersey

The energy expenditure of mice fed a high-fat diet supplemented with grape polyphenols

In the absence of effective drug therapies, people with metabolic syndrome are at risk of developing type II diabetes and cardiovascular disease which can eventually lead to future strokes and heart failure. Dietary polyphenols are phytochemicals with antioxidant properties that are shown to attenuate the effects of metabolic syndrome. It is of particular interest of how individuals who consume dietary polyphenols are positively impacted, specifically, how their net energy use is affected. In this particular investigation, C57BL/6 J female mice (n=64) were purchased from (Jackson Laboratory, Bar Harbor, ME) were separated into 4 diet groups: low-fat diet (LFD), low-fat supplement with 1% grape polyphenols (LFD-GP), high-fat and high-sugar (HFHS), and high-fat and high- sugar supplemented with grape polyphenols (HFHS-GP). The energy expenditure of some of these female mice (n of 36) from each diet group respectively were tracked over the course of 48 hours by using a metabolic chamber (Oxymax/CLAMS). Through this experiment, we hope to determine the impact of dietary polyphenols on metabolism across the four diet groups could possibly have on the energy use of obese female mice.

Biography: Kia Ansine is a rising sophomore at Rutgers University who is majoring in Biological Sciences and minoring in Women and Gender Studies focused in international public health. She is a student of the Rutgers University Honors College as well as the Douglass Residential Women's College. She attributes her ten years of mixed martial arts training for her discipline and non-defeatist attitude which are two qualities that she expects to guide her throughout her studies and career. In the future, Kia plans to be a physician's assistant that not only treats patients but one who also conducts clinical research studies. This summer, she worked in Dr. Diana Roopchand's lab on a project that analyzed the impact of grape polyphenols on the energy expenditure of female mice fed a high-fat diet.

Shereen M. Bartholomew **Poster # Cove-23**
Rutgers University - Newark

Mentors:
Tracy G. Anthony, Ph.D., Emily T. Mirek, Inna A. Nikonorova, Ph.D
Department of Nutritional Sciences, Rutgers University, New Brunswick, NJ

Timing of Liver Sensing of Dietary Leucine and Sulfur Amino Acid Deprivation in Mice

One of the fundamental questions in the field of nutrition is how organisms sense and respond to changes in dietary essential amino acid (EAA) supply. While EAA deprivation cannot sustain life, recent studies show that diets severely restricted in certain EAA may promote leanness and longevity (11-12). This contradiction creates a need to understand how body tissues detect and respond to EAA deprivation versus restriction. One of the earliest biomarkers of EAA deprivation is phosphorylation of eukaryotic initiation factor 2 (eIF2), a protein factor which regulates mRNA translation in mammalian tissues. A greater understanding of the timing of eIF2 phosphorylation (eIF2~P) in response to different types of EAA deprivation is needed. To address this need, male and female C57BL/6 mice (total n=52) were overnight fasted (OF) or fed by gavage a liquid diet containing either complete amino acid nutrition (CD) or a liquid diet lacking the sulfur amino acids methionine and cysteine (MD), or a liquid diet lacking leucine (LD). All gavaged meals (50 uL/g) were matched for energy (2 Kcal/ml), carbohydrate (64.4%), lipid (17.8%), nitrogen and micronutrients. Mice were sacrificed at 30 min and 1 h after gavage and tissues were rapidly dissected and snap frozen in liquid nitrogen. Frozen liver samples were processed for SDS-PAGE and immunoblotting, using polyclonal antibodies for detection of eIF2~P. Results will indicate the timing and magnitude of liver eIF2~P in response to consuming MD versus LD relative to CD and fasting controls. Results will also be examined for sex differences in hepatic eIF2~P in response to meal gavage. This information will help identify optimal time points to further explore translational control in liver and serve as a comparison to other body tissues. Through this research, we may be able to identify novel or unique cellular events that can be targeted to prevent and/or treat metabolic diseases such as obesity and diabetes.

Biography: As a rising senior from Union, New Jersey, Shereen Bartholomew majors in Medical Imaging Sciences at Rutgers University Newark. Prior to Rutgers, Shereen received an Associates of Science degree in chemistry at Union County College, where she was a part of the American Honors program and served as president, NJSTARS, the women's volleyball team, and the Bridges to Baccalaureate program. At her current institution, her extracurricular activities consist of being an active member of the Minority Association of Pre-Health Students, a Tau Sigma National Honors Society member, a peer learning assistant and a lifeguard on campus. This summer, Shereen was a part of the IMSD program and her field of research was in nutritional sciences. Mentored by Dr. Anthony, she researched the timing of dietary amino acid insufficiency in mice. In her free time, she enjoys playing a variety of sports especially volleyball and wallyball, enjoys being outdoors, and overall a musicophile. After graduation, Shereen Bartholomew plans to pursue her intense passion in medicine and would like to help reduce health disparities in underrepresented communities worldwide.

Heineken Queen Daguplo **Poster # Cove-24**
Rutgers University, New Brunswick

Mentors:
Arek Kulczyk, MSc, PhD

Structure determination of the mitochondrial helicase Twinkle by cryo-electron microscopy (cryo-EM)

Mutations in the human mitochondrial helicase—Twinkle—are known to cause autosomal dominant progressive external ophthalmoplegia (adPEO), a type of mitochondrial disorder. The lack of structural data of the helicase impedes the development of pharmacological treatments for this disease, thus no current treatment exists. Cryo-electron microscopy (cryo-EM) is a technique that allows for high resolution imaging, up to 2 Å, of a sample in a thin layer of vitrified water. In cryo-EM, an electron beam passes through the specimen containing the purified and overexpressed desired protein or particle, and diffraction patterns, as well as magnified images, of specimen are produced. Particles visualized by cryo-EM are then subjected to single particle reconstruction (SPR) using an image processing framework such as SCIPION to obtain a three-dimensional model from two-dimensional class averages of imaged particles. In this study, we aim to visualize Twinkle using single-particle cryo-EM to achieve the near-atomic resolution structure that will enable us to determine the mechanisms by which the mutations cause adPEO. The helicase was overexpressed using SF9 insect cells, and prepared for cryo-EM by plunge-freezing the sample in liquid ethane, which has higher heat capacity than liquid nitrogen to avert crystal formation in the sample. Previous analyses showed contamination, unwanted artifacts such as thick layer of ice and cracked grids, vitiating images; therefore, parameters in sample preparation as well as data processing will be adjusted until high quality movies are acquired for reconstruction.

Biography: Born and raised in the Philippines, I moved to the United States when I was 15 years old. I am a biochemistry major with a concentration on biochemical toxicology at Rutgers University—New Brunswick. I transferred from Bergen Community College, Paramus, NJ, with an Associate's Degree in Natural Sciences and Mathematics (with honors). Cellular and molecular biology fascinate me a lot, which further drives me to pursue an advanced degree in such area. I am particularly interested in cancer research with an emphasis on immunotherapy, as well as the biochemistry of neurological disorders specifically Alzheimer's disease and brain tumors. This summer, I had the great privilege to work on a research project under the mentorship of Dr. Arek Kulczyk who has expertise in cryo-electron microscopy (cryo-EM), a cutting-edge technique in structural biology. I have no doubt that the experiences that I acquired through this project will continually serve as a great foundation in my professional career. In addition, I also have a passion for writing, be it fictional or academic and scientific writing. Outside of academic pursuits, I enjoy reading classic novels and playing piano and guitar.

Abstracts and Student Biographies

Noura Darwish **Poster # Cove-25**
Rutgers University

Mentors:
Noura Darwish[1], John McLaughlin[1], Neerja Tyagi[2], Harold Trick[2], Susan McCormick[3] and Nilgun Tumer[1]

1 Department of Plant Biology and Pathology, School of Environmental and Biological Sciences, Rutgers University, New Brunswick, NJ, United States of America
2 Department of Plant Pathology, Kansas State University, Manhattan, KS
3 Bacterial Foodborne Pathogens and Mycology Unit, USDA-ARS-NCAUR, Peoria, Illinois, United States of America

The impact of lipid transfer protein overexpression against plant fungal pathogens in wheat and barley

Fusarium head blight (FHB) caused by *Fusarium graminearum* infects wheat, barley, and other small grains worldwide. Deoxynivalenol, DON, produced by FHB are small molecule toxins that function as potent virulence factors during plant pathogenesis. Previous research in the Tumer laboratory identified a DON-resistant mutant in the plant model organism, *Arabidopsis*.The mutant caused the overexpression of the nonspecific lipid transfer protein (nsLTP) gene (AtLTP4.4) that conferred resistance to deoxynivalenol (DON). The resistance to DON was confirmed independently by overexpressing AtLTP4.4 in both *Arabidopsis* and in the brewer's yeast, S. cerevisiae. nsLTPs play a role in plant physiology by reversibly binding and transporting hydrophobic molecules in vitro but are also gaining attention as antimicrobial peptides. The Tumer laboratory cloned the *Arabidopsis* AtLTP4.4 gene and a wheat LTP gene (TaLTP3) into different wheat and barley lines to investigate the impact of LTP overexpression on resistance to F. graminearum. A number of different transgenic wheat lines overexpressing AtLTP4.4 and TaLTP3 are being confirmed by Western analysis. Resistance is being tested by inoculating wheat floral tissues at flowering with F. graminearum. To determine resistance, a qRT-PCR assay is used to determine the fungal DNA content relative to the plant DNA content at 7, 14, and 21 days post inoculation (DPI). To further characterize the protein against F. graminearum, AtLTP4.4 was expressed in Pichia pastoris and purified by affinity chromatography. A bioassay of F. graminearum treated with AtLTP4.4 revealed that AtLTP4.4 inhibits fungal growth. Experiments are being performed to understand the mechanism of resistance.

Biography: Noura Darwish is a rising senior pursuing a degree in Biotechnology with a minor in Biochemistry at Rutgers University. This summer, she is working in a plant pathology laboratory where she is studying a plant fungal pathogen called Fusarium graminearum. During the academic year, Noura is part of a professional agricultural fraternity where she dedicates her time and passion to offer community service at the Rutgers Garden, and support causes such the American Cancer Society through Relay for Life. Her goal is to fulfill her ongoing curiosity and contribute to the field of research while gaining valuable insights, inspirations and innovations that will help her throughout her learning journey. Noura will continue working on her summer project through the George H. Cook Scholars program and plans to attain her PhD through the graduate program of Molecular Biosciences at Rutgers University. In her leisure time, she likes to sing, play the piano and practice kickboxing.

Nora Laine Herzog **Poster # Cove-26**
Rutgers University

Mentors:
Andrew Zloza, Ph.D., Department of Surgical Oncology

Jenna Newman, Praveen Bommareddy, Microbiology & Molecular Genetics

Russell Pepe, Salvatore Aspromonte, Robert Wood Johnson School of Medicine

Ricardo Estupinian, Cell & Developmental Biology

Shengguo Li, Ph.D., Cancer Institute of New Jersey

Harnessing seasonal influenza vaccine to combat cancer in mouse models

The links between infection and cancer are poorly understood; records dating back to the surgeon Imhotep in Egypt around 2600 BCE have shown evidence that infection can cause tumor regression, however, the discovery of oncogenic viruses has clouded that perspective. The role of non-oncogenic, non-oncolytic viral infections is even less understood. When testing the effect of influenza virus (a non-oncogenic, non-oncolytic virus) on B16 F10 melanoma in C57Bl/6j mouse models, we found a distinction between live and inactivated viral treatments. Treatments with live virus were found to have no effect on tumor growth, whereas treatments with inactivated virus (either heat-inactivated or viral lysate) caused tumor growth to decrease. Multiple influenza vaccines were then tested for efficacy in controlling tumor growth and, while non-adjuvanted seasonal influenza vaccines were effective in controlling growth, FluAD—a vaccine adjuvanted with MF-59—was shown to have no effect on tumor growth. After analysis of LegendPlex, Nanostring, and Flow Cytometry data, we found that tumors in mice injected with Flucelvax (a standard non-adjuvanted vaccine) were shown to have increased CD8+ T cell infiltration in the tumor, as well as a much higher CD8+/CD4+ ratio than their counterparts treated with FluAD. In addition, adding MF-59 to Flucelvax eliminated the positive effect seen in the non-adjuvanted vaccine; MF-59 works to induce increased CD4+ T cell responses as well as memory T cell and memory B cell responses. Some preliminary data has suggested that increased B cell infiltration in the tumor could be a mechanistic factor in FluAD's inability to display decreased tumor growth. Further experiments will investigate the roles of IL-9, IL-10, and B cells in engineering the anti-tumor immune response.

Biography: Nora Laine Herzog is a rising senior at Rutgers University in New Brunswick, originally from Anchorage, Alaska. She is majoring in Cell Biology & Neuroscience with a double minor in Comparative Literature and Russian Language. She works in the Cancer Institute of New Jersey under Dr. Andrew Zloza, studying the link between infection and cancer. Her project specifically focuses on the contribution of Interferon Lambda to immune polarization in response to the dual challenge of influenza and melanoma. In addition to being a passionate researcher, she is also a published poet, a music and film enthusiast, and an excellent companion to her cat, Roxie. She hopes to someday become research faculty at a public university, studying oncogenic virology.

Darling P. Rojas **Poster # Cove-27**
Rutgers University- NB

Mentors:
Suzie Chen PhD., Department of Chemical Biology

Raj Shah, Ph.D Candidate, Department of Toxicology
Rutgers University - New Brunswick

Regulation of glutaminase (GLS) in metabotropic glutamate receptor 1 (GRM1) expressing melanoma cells

Various types of cancers, including malignant melanoma, have been linked to the excessively demanding glutamatergic signaling pathway. My lab group has previously demonstrated the role of ectopically expressed metabotropic glutamate receptor 1 (GRM1) in the neoplastic transformation of normal melanocytes. Glutamate, the natural ligand of GRM1, activates the receptor and causes a downstream signaling response related to proliferation, anti-apoptosis, and cellular development. Within this transduction pathway are various transcription factors that aid in executing responses that stimulate oncogenesis. Previously, we observed a correlation between expression of GRM1 and glutaminase (GLS), the rate-limiting enzyme that converts glutamine to glutamate. In this study, the mechanism by which ectopic expression of GRM1 leads to alterations in GLS expression was investigated. In cultured C8161 and UACC903 GRM1+ human melanoma cells, we expect inclusion of small molecule inhibitors, CAPE (caffeic acid phenylether ester) and Fludarabine, to downregulate functionality of their specific target proteins, NF-κB and STAT1. Upon pharmacological inhibition, we expect reduced phosphorylation of these two proteins. Interestingly, we hope to elucidate a possible relationship between inhibition of NF-κB and STAT1 and the expression or lack thereof of GLS. Moreover, this study will determine if there are two independent regulatory transduction pathways in mutant versus wild type BRAF melanoma cells. Overall, we strive to investigate the mechanistic aspects of how ectopic expression of GRM1 may influence glutaminolytic glutamate production by altering GLS expression/activity in GRM1-activated cancers including melanoma.

Biography: Darling Rojas was born in Costa Rica and moved to New Jersey when she was just 1 year and 5 months old. She is now a third-year undergraduate student at Rutgers University-New Brunswick and belongs to the Honors College, representing the School of Environmental and Biological Sciences. She has decided to major in Biological Sciences and pursue her dream of becoming a Doctor of Dental Medicine. Darling was accepted to the RUP-IMSD summer program at Rutgers and is working in Dr. Suzie Chen's lab investigating the relationship between the specific protein coupled receptor, metabotropic glutamate receptor 1 (GRM1), and malignant melanoma. She would like to give a special thank you to Dr. Chen for granting her the opportunity of working in her lab this summer, and her mentor, Raj Shah, for his support and guidance throughout the project. In her free time, Darling loves to play with her dog, go to the beach, and listen to music.

Jessica M Romero **Poster # Cove-28**
Rutgers University

Mentors:
N/A

The Impact of Touch Information Processing in Locomotion

The Central Pattern Generator is located in the Central Nervous System and plays a role in touch information processing. The dorsal horn in the spinal cord is essential in receiving synaptic input from sensory neurons called Low Threshold Mechanoreceptors (LTMR's), which lead to the sense of touch. RORβ is a developmental morphogen expressed by inhibitory interneurons located in the LTMR-Recipient Zone and has been noted to be essential in mice postnatally. However, RORβ continues to be expressed into adult life, which leads to the question of its continued importance. Retinoid Acid has been studied as being expressed by RORβ and is necessary for spine development. Within our lab, our mice of study are RORβ mutant, heterogeneous, and wildtype. Our mice are GFP knock-ins which allow us to do synaptic analysis. We use the software Neuromantics for morphological reconstructions on our neurons of interest, followed by the use of ImageJ for analysis and spine counting. In our comparisons of wildtype vs our knockout mice, we expect to see fewer spines in the knockout due to a lower expression of retinoic acid for spine development. In addition to neuronal analysis, we are focusing on behavior to develop an observed phenotype of these mice derived from their genotypes. The Digigait device is a treadmill that allows the mice to run at a desired speed, allowing us to do comparisons of gait. We observed a duck-like gait phenotype within our knockout mice and want to compare our mice with and without the usage of lidocaine. The use of lidocaine blocks sensory transmission, in this case, blocking the expressing of Rorβ, which we predicted to have an effect on the gait as the mice in this study showed. Our objective is to compare the gait of our mice with and without the lidocaine at a walking speed of 25 cm/s. We expect to see a difference in the WT and Het phenotypes, predicting they may show the hyperflexion phenotype that is observed in the mutant mice. Through synaptic analysis, we will study if Retinoic Acid acts through Rorβ. And through behavior, we will study the behavioral consequences of inactivating Retinoic Acid signaling in the adult spinal cord.

Biography: Jessica Romero was born and raised in Elizabeth, NJ with a family background of Honduras. Currently, she is a rising Junior attending Rutgers University. She is currently majoring in Cell Biology and Neuroscience with a minor in Psychology. This summer, she worked in the Keck Center with Victoria Abraira doing behavioral and neuronal analysis. She has been working with RORB knockout mice, also observing heterozygotes for the gene, and wildtype mice. Her project focuses on the influence this gene has on limb kinematics and locomotion, and the possible consequences the absence of Retinoic Acid has on the adult spinal cord. As a Rutgers student, Jessica plans to continue her work in the lab beyond her summer project. Jessica is an EMT and volunteers in Westfield, NJ. She is also a member of Phi Delta Epsilon and hopes to pursue a career in the Medical Field as a Neurosurgeon.

Kayla Bendinelli **Poster # Cove-29**
Dickinson College

Mentors:
Zhenning Yang, Mingzhu Fang, Helmut Zarbl Rutgers University School of Public Health
Bo Kong, Grace Guo Rutgers University Ernest Mario School of Pharmacy

Restoration of the circadian rhythm by FGF in prevention of Non-Alcoholic Fatty Liver Disease

Non-alcoholic fatty liver disease (NAFLD) is a growing epidemic that affects 30-40% of the general population. There is accumulating evidence suggesting that hepatic circadian disruption is linked with NAFLD development, which has been prevented by FGF in mouse models. This study explores the mechanism behind FGF prevention of NAFLD. RNA was isolated from wildtype, FGF transgenic and FGF knockout mice liver tissues and mRNA expression levels were evaluated using RT-qPCR. The effects of FGF on cellular circadian rhythm were also evaluated on circadian reporter cell lines using a bioluminescence assay. Collectively, these results will determine whether FGF rescues cellular circadian rhythm to prevent NAFLD development.

Biography: Kayla Bendinelli is a rising senior at Dickinson College where she studies Biochemistry and Molecular Biology. She is very grateful for the opportunities she has had at Dickinson including being a member of the field hockey team and working in a professor's lab on AML. Being a RISE/SURF fellow at Rutgers has given her the chance to further her lab experience and exposed her to the field of toxicology. These lab experiences have made Kayla determined to pursue a career in cancer research.

Destiny Durante **Poster # Cove-30**
The Pennsylvania State University

Mentors:
Rita Hahn, Peihong Zhou, Dr. Marion K. Gordon

Comparing ocular therapies to improve corneal mustard-induced injuries

Sulfur mustard, a chemical weapon used in World War I, the Iraq-Iran War, and in the Syrian conflict, is a vesicant that injures the eyes, lungs and skin. Ocular exposure leads to corneal microblistering, neovascularization, scarring, and loss of vision from separation of the corneal epithelium from its stroma. No drugs are FDA approved for ocular mustard injury. Here two FDA-approved drugs, oxytetracycline and Restasis, were tested as therapies for ocular mustard injury. Corneal organ cultures were exposed to nitrogen mustard (NM) for 2 hr, followed by recovery for 22 hr. Controls included unexposed corneas receiving no therapy, and unexposed corneas receiving Restasis or oxytetracycline. These showed no adverse effects. Test corneas included those exposed to NM for 2 hr without treatment, and NM-exposed eyes followed by Restasis treatment (one drop at 12 hr, one at 24 hr). A duplicate set of NM-exposed corneas was treated 3 times in 24 hr with 0.2 mg oxytetracycline (in 40 μL). After the exposures and treatments, corneas were collected and sectioned to examine the injury by viewing their histology. The images with either drug showed a reduction in NM-induced ocular damage compared to eyes receiving no drug after exposure, as assessed by the degree of epithelial-stromal separation. These data supported proceeding to an in vivo rabbit ocular exposure using sulfur mustard (SM), followed by testing the therapies over the course of 24 hr after a 2 hr SM exposure. Analogous ocular tests were assessed. Restasis was applied as in the organ cultures, but the in vivo oxytetracycline experiment included only 2 applications per day. Both the histology of organ cultured corneas and in vivo exposed corneas indicated that Restasis was more effective for attenuating ocular injury from nitrogen and sulfur mustard. Future work includes adding an antiangiogenic to Restasis to reduce neovascularization.

Biography: Destiny Durante is a rising junior at Penn State majoring in biochemistry. This summer she had the pleasure of working in Dr. Gordon's lab as a RISE and SURF participant. She plans to combine her love for science, interest in health, and passion for cosmetics to own her own skin care and hair care line in the future. Outside of her science and research interest, Destiny is co-captain of a dance team and serves on the executive board for a natural hair club at her home institute.

Zakiyah R. Henry **Poster # Cove-31**
Winston-Salem State University

Mentors:
Y. Wang, R. Malaviya, D.L. Laskin

Mechanisms of Sulfur Mustard-Induced Lung Injury

Sulfur Mustard (SM) is a chemical warfare agent known to target the respiratory tract. It is a cytotoxic vesicant with a lipophilic nature that quickly penetrates tissues and cells causing acute injury that progresses over time into chronic lung injury. Evidence suggests that macrophages play a role in both acute and chronic lung pathologies. During acute injury, proinflammatory macrophages (M1) release inflammatory mediators to promote injury whereas later anti-inflammatory/wound repair macrophages (M2) release mediators that promote fibrosis. Since SM causes acute lung injury which progresses overtime, we examined the role of macrophages in SM-induced injury in rat lung. Male Wistar rats were treated intratracheally with SM (0.4 mg/kg) or air (control) by vapor inhalation. The rats were euthanized 3, 7, 16, and 28 days post-exposure, lungs lavaged with PBS, and bronchoalveolar lavage (BAL) and lung tissue collected. SM exposure resulted in increased expression of antioxidant heme oxygenase (HO-1) at 3 days indicating oxidative stress. Expression of cyclooxygenase-2 (COX-2) and inducible nitric oxide synthase (iNOS), which are both proinflammatory enzymes, were also upregulated at 3 days. At this time, the M2 macrophage marker Ym-1 was also upregulated. These findings show that SM induces inflammation, oxidative stress, and induces fibrogenesis in the lung early after exposure.

Biography: Zakiyah Henry is a native of Nashville, NC. She attends Winston-Salem State University in Winston-Salem, NC, where she is majoring in biology and minoring in chemistry and physics. As an involved student, Zakiyah is a member of the Beta Beta Beta National Biological Honors Society, Women in Science and Health (WISH), the liaison of her school's Minority Association for Pre-Medical Students (MAPS) chapter, and is a member of Zeta Phi Beta Sorority, Inc. Her post-graduation plans include acquiring a PhD in toxicology. Being apart of the RISE and SURF programs have helped to guide Zakiyah on her path to graduate school. She is truly grateful for the opportunities that have been presented to her. Finally, during her free time, she enjoys cooking, playing her bassoon, and attending dance workout classes.

David J. Viramontes **Poster # Cove-32**
The University of Nevada, Reno

Mentors:
Dr. Xia Wen, Dr. Lauren M. Aleksunes

Dept. of Pharmacology and Toxicology, Rutgers University, Piscataway, NJ

Interaction of Organophosphate Flame Retardants with Efflux Transporters

Organophosphate-containing molecules are a diverse group of chemicals that have been used in pesticides and nerve agents and more recently, as flame retardants in clothing, plastics, building materials, electronics, and furniture. As the use of organophosphate flame retardants becomes more widespread, the exposure of humans also increases. Emerging data suggest organophosphate flame retardants are toxic to the reproductive, endocrine, and nervous systems. One mechanism to reduce the toxicity of chemicals is active efflux that prevents accumulation in tissues. Efflux transporters are a class of proteins that excrete substrates from the cell using energy generated from ATP hydrolysis. In this study, we sought to determine whether the flame retardants tricresyl phosphate and triphenyl phosphate are substrates for the efflux transporter multidrug resistance protein 1 (MDR1). To test this hypothesis, the cytotoxicity of both chemicals was tested in HEK293 cells expressing an empty vector or the human MDR1 gene. Cytotoxicity (LC50) was determined using the Alamar Blue assay. The positive control MDR1 substrate doxorubicin exhibited a 5-fold increase in LC50 in cells expressing MDR1. By comparison, the cytotoxicity of tricresyl phosphate and triphenyl phosphate were similar between the control and MDR1-expressing cell lines. While additional tests need to be performed, these data suggest that these flame retardants are not substrates for MDR1. Understanding which transporters interact with a chemical enables the prediction of tissues in the human body that may not be protected by efflux transport and are potentially at greater risk of toxicity. Supported by NIH R25ES020721 and R01ES021800, and the ASPET and SOT Intern Programs.

Biography: David Viramontes is an undergraduate at the University of Nevada, Reno majoring in Biotechnology B.S./M.S. and Molecular Microbiology & Immunology. He is a member of American Society for Microbiology, Society of Toxicology, and American Society for Pharmacology and Experimental Therapeutics. His first research experience was in molecular biology at the University of New Mexico under the guidance of Dr. Fordyce. Over the summer of 2018, David explored toxicology in Dr. Aleksunes's lab under the mentorship of Dr. Wen. He looks forward to continuing to explore the life science through his education and his life.

Abstracts and Student Biographies

Carlos Abarca **Poster # Fireside Lounge-1**
Pennsylvania State University

Mentors:
Dr. Qingze Zou, Chris Di Paola

Autonomous Robotic Environmental Control System Applied to Growth of Mobile Plan

The goal of the project is to maximize the rate of photosynthesis in plants with robotic assistance. Having the plant move through an environmental control system provides it with the ability to receive the nutrients it requires to grow. Previous work has led to the development and control of the robot. However, the design has been altered. Solar panels were switched with photo sensors for more accurate sunlight tracking. The number of ultrasonar sensors were limited to relieve clutter on the design. The control system was added and it is designed to control the three main components of photosynthesis: water, CO2, and light. This system will give the mobile plant the resources it may need in a closed environment for easier monitoring. The system and robot run off of the Arduino language, but rasberry pi is a viable option for future designs. When experimentation begins, the goal is to measure the rate of photosynthesis through a electrophysiology sensor. The measurements can then be compared to that of a stationary plant. The project focuses on the improvement and perfection of the system. The sensors and relays have been tested through various coding and trials. It has been decided that the moisture sensor should be removed due to the uncertainties that come with the data. The final code can begin to be assembled from the various test codes. While electrophysiology sensors are being researched, the sensors that were found can measure the electrical potential in the plants. This provides real time data and responses from the plant due to its environment. The final design is almost complete, and will be able to analyze a plant's response to many different environmental factors.

Biography: Carlos Abarca was raised in Bensalem, Pennsylvania. He is a rising sophomore at Pennsylvania State University studying in Mechanical Engineering. Carlos is a member of the Millennium Scholars Program which is merit-based scholarship program designed to prepare students for the pursuit of doctoral degrees in science, technology, engineering and mathematics (STEM) disciplines. Carlos was selected to participate in the RISE scholars program at Rutgers University. He plans to attend graduate school and receive his Ph.D in Mechanical Engineering. He would like to pursue a career in research, specifically with underwater vehicles.

Francisco Franco **Poster # Fireside Lounge-2**
California State Polytechnic University, Pomona

Mentors:
Kimberly Cook-Chennault

Investigation of novel composite materials for engineered tissue scaffolds

Hydroxyapatite (HAp) has been found to promote new bone growth through its piezoelectric and dielectric properties. These properties could be used to assist people with bone fractures, or those suffering from degenerative bone diseases. The issue with HAp is that it is a brittle material and is not viable for use in hard tissue applications, so researchers have tried to enhance the mechanical properties of HAp by adding Barium Titanate (BT), and Poly Vinyl Alcohol (PVA) to bind the HAp and BT. Several procedures illustrate how to create a mechanically strong composite scaffold, but do not follow dimensioning standards, therefore comparing samples would be inefficient. We hypothesis that by adding PVA we can increase the mechanical properties of the scaffolds, and my objective is to create a procedure that can streamline the process of fabricating, measuring, and testing BT-HAp scaffolds. Taking the experimental approach, we will test our hypothesis by changing the ratios or BT to HAp and BT-HAp to PVA until we find our desired ratio. We have found that the addition of PVA increases the mechanical properties of the composite material. We were able to more than double the compressive strength of our scaffolds compared to scaffolds with out a binder. The results are promising and with further experimentation we expect to find a ratio that will maximize the mechanical properties of our scaffolds.

Biography: Francisco Franco was born and raised in Anaheim, California. After dropping out of high school he attended continuation school and worked his way to community college where he held several leadership positions in STEM clubs. He transferred to California Polytechnic State University, Pomona as a junior in Mechanical Engineering, and is now a rising senior. After graduating he plans on working in the alternative energy industry where he can be a part of our transition into alternative energy. Francisco was selected to be a Rutgers RISE undergraduate scholar through GET UP where we studied the mechanical properties of scaffolds for hard tissue. He has been awarded several merit-based scholarships such as the Waltmar Foundation Memorial Scholarship (2016), The Southern California Edison STEM Scholarship (2016), and The Edison Scholars STEM Scholarship (2018). Southern California Edison being a distributor of energy in southern California that embraces renewable energies.

Abstracts and Student Biographies

Christopher J. Kern **Poster # Fireside Lounge-3**
Stockton University

Mentors:
Dr G. Charles Dismukes | Karin Calvinho

Benchmarking an Electrolyzer for Conversion of CO2 into Useful Chemicals

Electrochemical reduction CO_2 addresses two issues faced within green energy technologies. The first is being able to recycle a greenhouse gas responsible for rising global temperatures that cause extreme weather and longer term environmental effects. Secondly, it provides an alternative for energy storage for intermittent energy sources such as solar and wind power. This process uses CO_2, water and electricity energy to produce chemicals traditionally derived from fossil fuels. However, to be fast and energy efficient, CO_2 reduction requires a catalyst that be used on an industrial scale.

Recent research shows that nickel phosphides can reduce CO_2 to specific molecules containing three or four carbon atoms (C3 and C4) which can be used as polymer precursors at high energy efficiency, while also being inexpensive and durable. However, due to the low solubility of CO_2 in water, mass transfer of this reactant limits the reaction rates. In order to improve mass transport, a custom-built electrolyzer based on gas diffusion electrodes was designed. The optimal conditions in which the electrolyzer operates are currently being researched. To detect the reaction products in the headspace of the reactor, a gas chromatogram (GC) was used. A new GC was installed, and a method was developed to allow full separation of the reaction products which is necessary for quantification. We found that by adjusting the temperature and injection timing between three separation materials, quantification accuracy was achieved. In addition, the GC was calibrated with standard gases to determine the concentrations of the gaseous products. Also, the custom-built electrolyzer was thoroughly tested to ensure that the reactor preformed according to specifications. These contributions will aid further research with scalable applications for use in the chemical industry.

Biography: Christopher Kern is a rising honors senior majoring in Chemistry and minoring in mathematics at Stockton University. Chris was accepted in the Green Energy Technology Undergraduate Program at Rutgers and researched material science in CO_2 reduction. He earned the 2018 recognizing his outstanding achievements in the field of Physical Chemistry. Chris holds the position of vice president of the Chemistry Society at Stockton. This club focuses on educating the public about chemistry through outreach programs, K-8th grade, and also provides unique events to the members/students at Stockton. He tutors college level science and math to undergraduates at Stockton. In addition, he is conducting research to explore tin based phosphors in hopes to drive research and development of a cost effective, energy efficient, and a more sustainable light source. He intends to further his education and pursue a PhD in material science and engineering with green energy applications.

Anthony Rodrigues **Poster # Fireside Lounge-4**
Rutgers University

Mentors:
Kimberly Cook-Chennault
Department of Mechanical Engineering
Rutgers University, School of Engineering

Computed analysis of PVDF films subjected to dynamic loadings

As long as people keep breaking bones and our bodies keep deteriorating with age, researchers will always be working towards finding a method to stimulate the growth of cells effectively enough to be used in humans. This would expedite healing processes and lead to the cure for numerous degenerative diseases such as osteoporosis which are caused by a loss in bone density. Past biomedical research done at Rutgers University has shown that the application of polyvinylidene fluoride (PVDF) can cause up to a 400% cell growth. These results were found when the cells were applied to oscillating electric fields generated by the PVDF being vibrated at 50 Hz and 0.3 g. Though others have observed growth of cells due to electrical stimulation, the mechanisms that lead to this growth that is attributed to mechanical and electrical stimulation is not fully understood. In addition, though analytical models to predict the mechanical and electrical performance of cantilevered and curved configured piezoelectric structures subjected to static and dynamic loading exist, less is known about the performance of piezoelectric structures undergoing non-traditional loading conditions and configurations. The focus of this work is to develop a comprehensive set of numerical models to predict the electrical performance, e.g. output voltage, current and surface charge of a polymeric membrane subjected to sinusoidal dynamic loading. In order to compute these complex values, we have created computational models using multi-physical finite element analysis to achieve a deeper understanding of the intricacies of the piezoelectric material loading conditions and cellular adsorption, branching and growth. This form of investigation has not been done before (to our knowledge), wherein our initial work indicates that the inertia of the fluid slows down the vibration of the film, therefore lead to lower frequencies than what has been previously reported in the literature.

Biography: Originating from Warren, New Jersey, Anthony Rodrigues is a rising sophomore studying Mechanical Engineering at the Rutgers University School of Engineering. He has fulfilled the role of Powertrain and Drivetrain Lead for the Rutgers Formula Racing Team, responsible for leading a team in designing and manufacturing an innovative and efficient powertrain and driveline which meshes with other subteams to fabricate a race car which placed 6th out of 80 teams at the international FSAE Lincoln competition. Serving as a key member of the Engineers Without Borders Kenya Project, his team has worked alongside hydrogeologists developing technical reports aiming to provide a reliable water source through maintaining rainwater catchment systems and a creating bore hole based well in Kolunje, Kenya which will be implemented in August of 2018. Most recently, he has been one of the few selected scholars to take part of NSF Funded Green Energy Technology Program and has worked on analyzing the mechanical and electrical properties of piezoelectric material through computational finite element analysis.

Abstracts and Student Biographies

Hannah L. Simerly **Poster # Fireside Lounge-5**
University of Minnesota-Twin Cities

Mentors:
Hannah Simerly, Department of Chemical Engineering and Materials Science at University of Minnesota
Dr. Lisa Klein, Department of Materials Science and Engineering at Rutgers University

Au-doped TiO2-coated mesh for increased efficiency of dye-sensitized solar cells

In 1991, the first dye sensitized solar cell (DSSC) was created and named the "Gratzel Cell" after its main inventor, Dr. Michael Gratzel. The new concept for a solar cell spread quickly through the minds of researchers around the world. Though the original DSSC had only a 7% energy efficiency, its components were durable, easy to manufacture, and costed little in comparison to photovoltaics that have dominated the solar energy market for years. The research done since 1991 has improved the design enough to reach a 14% energy efficiency. Increasing global energy demands drive the need for research into improving all aspects of the cell. The most specific improvement needed for DSSCs is an increased ability to turn photons into electrons. In efforts to meet these needs, a second titanium dioxide-based electrode was added to the original DSSC design. Titania coating techniques, dye adsorption processes and assembly techniques were compared to determine how this electrode can be successfully integrated into the existing design of the cell. The electrode consists of a gold-doped titanium dioxide-coated nickel mesh, connected in series to the original thin-film titanium dioxide electrode. Results of the work show that a connection in series between the existing titanium dioxide electrode and the new mesh electrode increases the voltage output under photo-illumination. Addition of this second electrode increases the energy efficiency per area of a dye sensitized solar cell.

Biography: Hannah Simerly was born and raised in Omaha, Nebraska. She now attends the University of Minnesota in Minneapolis and will be a senior studying materials science and engineering. Hannah is a recipient of the Downtown Omaha Rotary Club Scholar award, and the Presidential Excellence award at Harry A. Burke high school. In 2017, she was elected to receive the Undergraduate Research Opportunies Program scholarship to continue her research in silica-gold nanoparticles for drug delivery. She presented this research at the Minnesota Biomedical Innovation Competition, and was awarded first place by a panel of industry professionals. In 2018, she was chosen to be a Rutgers RISE scholar under the NSF grant for green energy and technology (GET UP). Hannah serves on the Professional Development committee for the University of Minnesota Society of Women Engineers. In 2016, she was deemed Head of Outreach for an organization, Minnovate, that focuses on teaching innovative and technical skills to students. Over the past two years, she's used that position to pilot a K-12 STEM outreach program, connecting Minneapolis public grade schools with college students in a STEM field to share the love of science and engineering. After obtaining her bachelor's degree, Hannah plans to continue her education by attending graduate school for a Ph.D. in materials engineering.

Yadiel Varela **Poster # Fireside Lounge-6**
University of Puerto Rico - Mayaguez

Mentors:
Firas Al-Zubayidi, Patrick Sinko, Ph.D.
Department of Pharmaceutics, Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey

Fabrication of nanoparticles loaded with mebendazole via flash nanoprecipitation

Mebendazole (MBZ), an anthelmintic drug, is known to inhibit cell mitosis by binding to the colchicine-binding domain of tubulin. Due to mebendazole's low water solubility it has poor bioavailability. Encapsulation of drugs in nanoparticles (NP) has previously been used to prolong drug exposure, thus increasing the antitumor efficiency. Nanoparticles loaded with mebendazole via flash nanoprecipitation (FNP) were prepared aiming to increase mebendazole's bioavailability by extending its half-life. The effect of varying the ratios of coprecipitate (CP) Vitamin E, MBZ, diblock copolymer (DBC) polycaprolactone-polyethylene glycol (PCL-PEG), and/or DBC polymer length on nanoparticle size, encapsulation efficiency, and release profile were analyzed. While nanoparticle size increased with increasing DBC concentration, there was no apparent relationship between size and DBC polymer chain length. Nanoparticles prepared with a 1:1 ratio of mebendazole and vitamin E presented an encapsulation efficiency of 84%; however, most other combinations resulted in encapsulation efficiencies between 40% - 55%. All nanoparticles showed similar release rates, reaching around 60% release in 24 hours, followed by a significant slower release of the rest of the sample. Controlled fabrication for nanoparticle size, loading, and release can be achieved by the variation of component ratios. Optimal conditions for nanoparticles loaded with mebendazole will be applied to enhance the in vivo pharmacokinetics of mebendazole.

Biography: Just recently finishing his 3rd year, Yadiel Varela is a Chemical Engineering student from the University of Puerto Rico in Mayaguez. He first began doing research during his high school senior year in the Department of Chemical Engineering creating micro capsules, as drug delivery vehicles, using the "Layer by Layer" assembly technique. It was then, that his interest in Biomedical research sparked, thus, giving way to another year of gratifying experiences by developing novel drug delivery micro capsules by inverse spherification. Shortly after participating in a summer research program at Pennsylvania State University, where he analyzed the bioaccumulation of contaminants in microorganisms and birds due to wastewater disposal on rivers, Yadiel parted to Cornell University for a semester as an exchange student. While there, he worked on a semester long project developing starch biomaterials for surgical applications. During this time Yadiel was accepted into the NIH funded MARC Program at his institution and in the NSF funded Green Energy Technology Undergraduate Program at Rutgers, The State University of New Jersey, for the summer. In 2016 he was chosen to participate in the DOW-MIT ACCESS Program at MIT. Yadiel was also part of the Amgen BioTalents Program at his home institution, where through day long workshops he gained knowledge and skills in biomanufacturing. Yadiel's future plans are to pursue a PhD in Biomedical Engineering and become a Professor.

Abstracts and Student Biographies

Carlos Huang **Poster # Fireside Lounge-7**
University of Puerto Rico – Mayagüez Campus

Mentors:
Carlos Huang
Department of Chemical Engineering
University of Puerto Rico – Mayagüez Campus

Samuel Zhou, Ph.D., Alan Goldman, Ph.D.
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Synthesis of (^{iPr4}PSP)Ru(C_2H_4)$_2$ catalyst and reactivity in olefin isomerization

The process of catalytic alkane metathesis, proceeding through alkane dehydrogenation and olefin metathesis, can rearrange can light hydrocarbons to give longer-chain alkanes which are highly desirable as clean-burning diesel and jet fuel. The ultimate carbon source for such products can be sustainable, including biomass or CO_2 plus renewable energy. However, during alkane metathesis, α-olefins produced as intermediates tend to isomerize into internal alkenes, decreasing the yield of the desired products. A (^{iPr4}PSP)Ru(C_2H_4)$_2$ complex was synthesized and used to study the factors inhibiting dehydrogenation as well as leading to olefin isomerization. Using this complex, reactions were conducted with 1-butene and 1-hexene in which their inactive allyl hydride complexes were produced. We were able to monitor olefin isomerization rates using the 1-hexene allyl hydride complex. Reaction with 1,3-cyclooctadiene also resulted in the formation of its allyl hydride complex. Using cyclohexene, we were unable to produce the allyl hydride. However, NMR data suggests the possible observation of the 14e^- catalytically active species. A key intermediate of this type has never previously been observed. Current focus is on obtaining the crystal structure of this complex and additional data in an attempt to characterize it.

Biography: Carlos Huang was born in San Juan, Puerto Rico. After graduating from high school, he started his bachelor's degree in Chemical Engineering at the University of Puerto Rico – Mayagüez Campus. Since high school, Carlos has been growing as a scientific researcher after being selected for the American Chemical Society's Project SEED I and Project SEED II. Moreover, pursuing his research interests as a Chemical Engineering Major, he was selected as a Reconfigurable & Multifunctional Soft Materials REU Scholar, continuing his Summer Research Project throughout his Junior Year. Currently, he's a rising senior with several awards and honors. He has been awarded a Premios ENDE Finalist Scholarship at the Universidad del Sagrado Corazón from the renowned Puerto Rican Newspaper El Nuevo Día, the Project SEED Scholarship, and he has been an American Chemical Society Scholar since his Sophomore Year. Furthermore, honors at his home University include being part of the Top 5% of his class since Freshman Year, along with being part of the Honor's Roll from the Chemical Engineering Department and of the Phi Lambda Upsilon Honorary Chemical Society ΓΓ Chapter. At the moment, Carlos is working in Dr. Alan Goldman's laboratory as part of the Green Energy Technology Undergraduate Program (GET-UP) at Rutgers University researching the synthesis and reactivity of a pincer metal catalyst that would improve alkane metathesis for fuel production. Moreover, he aims to obtain a Ph.D. in Chemical Engineering to pursue his interest in fuel cells technology and nanomaterials.

Abstracts and Student Biographies

Marcelo A. Almora Rios **Poster # Fireside Lounge-8**
Harvey Mudd College

Mentors:
Sevil Salur and Joel Mazer
Department of Physics and Astronomy
Rutgers, State University of New Jersey

Jet shape analyses in Au+Au collisions at RHIC

Quark-gluon plasma (QGP) is a novel state of matter expected to be produced in relativistic heavy ion collisions. One way we study the properties of this QGP is by observing its "quenching" effects on the products of hard-scattered particles, or jets, interacting with the medium. Inclusive jets are studied in heavy ion collisions using STAR collaboration data taken at the Relativistic Heavy Ion Collider (RHIC). Using Au+Au collisions at $\sqrt{(s\_NN)}$ = 200 GeV, preliminary distributions of jet shapes, the fraction of total transverse momenta from charged particle constituents of a jet to momenta of the jet itself, for all leading jets in the collisions, are studied as a tool to probe these properties of QGP. These jets are reconstructed using the anti-kT algorithm with a resolution parameter of R = 0.3 and with constituent transverse momenta (pT) greater than 0.2 GeV/c. For this analysis, jets with a minimum pT of 10 GeV/c are selected. The jet shapes are constructed using charged particles with a minimum pT of 1 GeV/c, to minimize the contribution from the underlying event. The results of these jet shapes from Au+Au RHIC collisions are then compared to jet shapes from Pb+Pb LHC collisions at collision energy $\sqrt{(s\_NN)}$ = 2.76 TeV to explore the change of jet shapes in a large kinematic range. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Marcelo Almora Rios is a rising junior at Harvey Mudd College where he is a Math-Physics joint major. At school, Marcelo does work in calculating particle number densities for different dark matter models in the early universe. On the math side, he will soon start work in Hurwitz Theory and Riemann Surfaces! After he graduates, Marcelo plans to pursue a Ph.D. in either mathematical physics or particle and high energy nuclear physics - once he figures out where his heart lies...In his free time, Marcelo likes to watch "I'm Here" sung by Cynthia Erivo from the Color Purple, read and write screenplays, whistle, and play ping pong.

Maine I. Christos **Poster # Fireside Lounge-9**
Rutgers University - New Brunswick

Mentors:
Sunil Somalwar

The search for the Type III Seesaw Mechanism with multivariate analysis

The vanishingly small mass of neutrinos continues to be an open problem in high energy physics. A possible solution is the Type III Seesaw Mechanism, a model which predicts a triplet of heavy fermions with high masses that offsets the low masses of neutrinos. We search for evidence of these heavy Seesaw fermions in the data of collisions taken at the CMS detector of the Large Hadron Collider (LHC), restricting our search to include only those events which result in 3 or more leptons in the final state. Past methods involved binning data in kinematic variables of the collisions and comparing to simulations of both standard model backgrounds and the signal of the Seesaw fermions. Previous limits calculated using one-dimensional binning schemes excluded Seesaw up to a mass of 840 GeV with an observed cross section limit of .05 pb but placed an observed cross section limit of .2 pb for the 200 GeV masspoint as the sensitivity of of one-dimension binning schemes declines for low masses. This study considers the application of Boosted Decision Trees (BDTs) as a method to improve sensitivity in the background dominated low mass regime. During training of BDTs, selections are made on the phase space of the kinematic variables which maximize purity in each region of the phase space, producing an output which maximizes the separation between signal and background. This output is coded in the form of a variable which may be used to bin data and compute limits. For data binned in the new BDT variable, the observed cross section limit for the 140 GeV masspoint is reduced by 57%. This project was supported by NSF grant PHY-1560077.

Biography: Maine is a rising senior at Rutgers University where she is working towards degrees in Physics and Mathematics. After graduation, she plans to attend graduate school to pursue a PhD in either computational or theoretical physics. During the academic year, she plans to continue her research in experimental particle physics and her work in the undergraduate physics community as vice president of the Rutgers chapter of Society of Physics Students.

Marcell R. Howard **Poster # Fireside Lounge-10**
Case Western Reserve University

Mentors:
Andrew Baker Ph.D., Mr John Wu
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Probing the Evolution of Galaxies by Stacking Stellar Mass Selected Samples

From the detection of gas and dust in the interstellar medium, one can learn a great deal about the history and evolution of galaxies. Unfortunately, the signal that is detected from any particular galaxy tends to be very faint (i.e., the ratio of signal to noise [S/N] is low). By using image stacking, a technique where one averages the flux densities at the positions (and in some cases redshifts) of sources in a large sample, we can strengthen the overall detection which leads to a higher S/N. By stacking samples that are defined by their stellar mass, redshift, and possibly dust attenuation and galaxy age, we hope to probe the (average) evolution of galaxies across cosmic time. We have conducted a stacking analysis using 2248 galaxies with spectroscopic redshifts of $z \leq 1.4$ in the Multi-wavelength Survey by Yale-Chile (MUSYC) catalog of the well-sampled and well-documented Extended Chandra Deep Field South. We first calculated stellar mass, metallicity, dust attenuation, galaxy age, and exponential star formation time-scale using a Markov Chain Monte Carlo (MCMC) implementation of a stellar population synthesis code, in order to find the maximum posterior probabilities of the given parameters. We stacked samples in the images by the Balloon-borne Large-Area Sub-millimeter Telescope (BLAST) taken at 250, 350, and 500 µm. Future prospects for stacking HI emission will be in the form of data gathered by MeerKAT which will be obtained by the Looking At the Distant Universe with the MeerKAT Array (LADUMA) survey. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Marcell Howard was born and raised in Brooklyn, New York. He is pursuing a B.S. in Mathematics and Physics at Case Western Reserve University. He plans on pursuing a Ph.D. in physics in the hope of becoming a theoretical physicist. For the summer, he is working with Dr. Andrew Baker in the Department of Physics and Astronomy on ``Probing the Evolution of Galaxies by Stacking Stellar Mass Selected Samples."

Zachary B. Huber **Poster # Fireside Lounge-11**
University of Notre Dame

Mentors:
Mr. Wenhan Zhang and Weida Wu, Ph.D.
Department of Physics and Astronomy
Rutgers University

Surface preparation of Weyl semimetal Mn_3Sn

Weyl semimetals are a class of topological materials whose low-energy quasiparticle excitations behaves like Weyl fermions, particles long predicted to exist in high-energy physics. These unique excitations and the underlying topology of the electronic structure of these materials are related to a host of phenomena including transport properties like a large anomalous Hall effect and the chiral anomaly as well as topologically-protected surface states called Fermi arcs. Recently, angle-resolved photoemission spectroscopy (ARPES) studies and first-principle calculations have suggested that Mn_3Sn is a magnetic Weyl semimetal. However, experimental observations of the Weyl nodes and the Fermi arcs remain elusive. One of the bottlenecks is that the naturally cleaved surface of Mn_3Sn is not atomically flat, making it difficult to perform surface-based measurements such as scanning tunneling microscopy and spectroscopy (STM/STS). In order to produce an atomically flat surface, we performed surface treatment processes including in-situ sputtering and annealing. The quality of the surface was characterized by STM and low-energy electron diffraction (LEED). We found that the crucial treatment factors are the annealing temperature and duration, and we used that information to establish a reasonably reproducible recipe that significantly improves the quality of the Mn_3Sn surface. Our findings serve as a stepping stone to exploring the Weyl physics of this material. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Zachary Huber is a rising senior studying physics and in the Program of Liberal Studies at the University of Notre Dame. Outside of the classroom, he serves as a Resident Assistant for his dorm, works for Notre Dame's undergraduate science journal as the physics editor, has served as a Peer Advisor for first-year physics majors, and has worked in a variety of physics and chemistry labs. In his free time, Zach enjoys reading, playing soccer, and both listening to and making music. He intends to pursue a Ph.D. in physics after graduation.

Sean P MacBride **Poster # Fireside Lounge-12**
Wheaton College Massachusetts

Mentors:
Carlton "Tad" Pryor - Rutgers University

A search for tidal tails in the satellite galaxy Carina

We searched for evidence of tidal stripping in the spatial structure of the dwarf satellite galaxy Carina using data from the European Space Agency satellite Gaia. The satellites of our Milky Way Galaxy are remnants of clues to its birth. Carina is intriguing because it has a more extended star formation history than other dwarf satellite galaxies of similar mass. In larger satellite galaxies the gas is retained longer, and this allows star formation to continue. The star formation history of Carina suggests that it was once more massive, and has been truncated by the gravitational forces of the Milky Way or some other satellite.

Gaia data provides precise photometry, proper motions, parallaxes, and positions for over one billion stars. The proper motion and parallax data are especially intriguing, as measurements of such precision were not previously available for most of the stars. We selected potential members of Carina based on proper motion and position in the color-magnitude diagram over an area of the sky ~6.5 degrees across, and used these stars to search for low-surface-density indications of tidal interaction, such as non-axisymmetric distortions of the outer regions of Carina or extended tails along the direction of orbital motion that would indicate tidally-removed stars. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Sean MacBride is a rising junior at Wheaton College in Norton Massachusetts, where he studies physics. Upon graduating, Sean plans to pursue a Phd in Physics. He is mentored at Wheaton College by his advisor John Collins. In his free time, Sean enjoys playing music, playing rugby, and spending time with his friends and family. Sean is motivated by his mother and father, his peers and teammates at Wheaton, and his current and former instructors.

Emma G. McLaughlin **Poster # Fireside Lounge-13**
Providence College

Mentors:
Jacquelyn Noronha-Hostler
Department of Physics and Astronomy
Rutgers University

Shear viscosity to entropy density ratio of the Quark Gluon Plasma at finite baryon densities

The Quark Gluon Plasma, which is measured experimentally in relativistic heavy ion collisions, behaves as a near perfect fluid where the shear viscosity to entropy density (η/s) ratio approaches zero. Relativistic viscous hydrodynamic calculations have been extremely successful in describing the flow of the Quark Gluon Plasma, thus, confirming the nearly perfect fluid paradigm at zero baryon density. Current experiments at the Relativistic Heavy Ion Collider (RHIC) are now probing finite baryon densities where the η/s of the Quark Gluon Plasma remains unknown. In this study, we use the Hadron Resonance Gas (HRG) model to calculate η/s at low temperatures (between T=100-155 MeV) and at finite baryon densities. We use the most state-of-the-art Particle Data Group list (PDG17+) and incorporate interactions by comparing excluded volume corrections and repulsive mean field calculations. We find a suppression of η/s at large baryon densities, which would be expected in the absence of a critical point. This project has been supported by funding from National Science Foundation grant PHY-1560077.

Biography: Emma McLaughlin is a rising junior at Providence College, where she is working towards a major in Applied Physics with minors in Math and Philosophy. Post-graduation, Emma plans to pursue a PhD in theoretical physics. When she is not in class, Emma is usually doing research her school's AMO spectroscopy lab lead by Seth Ashman. Additionally, Emma spends her time tutoring in physics, math and programming and participating in the feminist club, the physics-engineering-technology club and the church choir on campus. Finally, in her spare time, Emma enjoys exploring the city of Providence and practicing music; she has played the bagpipes and piano for about 10 years.

Leonardo Ruales **Poster # Fireside Lounge-14**
Stony Brook University

Mentors:
Catie Raney, Sean Brennan, Charles R. Keeton

Focusing Cosmic Telescopes on the Distant Universe

Massive objects, such as galaxy clusters, distort images through the phenomenon of gravitational lensing by redirecting light rays around bending of spacetime. The Hubble Space Telescope (HST) is limited in its ability to analyze very distant sources because they are small and faint. However, natural telescopes such as Hubble Frontier Fields (HFF) harness the power of gravitational lensing by magnifying dim, small sources, making them larger and brighter. Current research involves looking for other possible fields that can act as natural telescopes, which could produce a high quantity of lensed images. Using Lensmodel to obtain magnification maps of the HFF clusters, we place very distant sources behind the cluster and use ray tracing to compute their images. The images of a source vary according to their position, creating two more images each time a source crosses the magnification lines, or caustics, and merging images into spectacular arcs. We are computing the number of images and quantify how powerful the clusters are as cosmic telescopes.

Biography: Leonardo was born in the Galapagos Islands, Ecuador and immigrated to Queens, NY three years ago. Leonardo just graduated from Essex County College (ECC) with an Associates in Mathematics and is transferring to Stony Brook University. His goal is to obtain a B.S. in physics and astronomy and eventually a Ph.D. in astronomy. His hobbies include cycling, stargazing with his telescope, reading Gabriel Garcia Marquez's books, participating in hackathons, and drawing. During his time at ECC he was involved in the Math Club and the Louis Strokes Alliance for Minority Program to encourage minorities to pursue STEM majors. He is working for the summer with Dr. Charles R. Keeton in gravitational lensing.

Ellis A. Thompson **Poster # Fireside Lounge-15**
Vassar College

Mentors:
Xiaoran Liu, Mikhail Kareev, Fangdi Wen, Jak Chakhalian
Department of Physics and Astronomy
Rutgers, State University of New Jersey

Growth and characterization of pyrochlore thin films

Transition metal oxides with pyrochlore structure, exemplified by $Eu_2Ir_2O_7$(EIO), have recently gained significant attention for their potential to realize novel topological phases with strongly correlated electrons. The proposed mechanism stems from the geometrically frustrated tetrahedral structure of the crystal lattice, occupied by the Ir atoms with strong spin-orbit coupling. Our primary goal is to synthesize high quality epitaxial thin films with the proper chemical phase. For this project, we report on the development of the growth conditions of EIO using Pulsed Laser Deposition (PLD). We monitored the structure of the films in-situ and after the growth using Reflection High Energy Electron Diffraction (RHEED). We verified the quality of the films using Atomic Force Microscopy (AFM) and by measuring the transport properties using a Physical Property Measurement System (PPMS). The resistance versus temperature curve measured with PPMS revealed, for the first time, a clear metal-insulator transition at Tc ~ 105 K, with a distinct thermal hysteresis below the transition temperature. These results provide the first clear evidence on the first-order type nature of the transition, which has been argued for a long time without consensus. This project was supported by funding from National Science Foundation grant PHY-1560077 and G. and B. Moore Foundation.

Biography: Ellis was born and raised in Los Angeles, California. She is a rising junior at Vassar College, where she works as a laboratory teaching assistant, and is majoring in physics with possible minors in astronomy or math. During the summer, she worked in the Laboratory for Artificial Quantum Material under Dr. Jak Chakhalian in the Department of Physics and Astronomy. She plans to eventually receive a Ph.D. in Experimental Physics, specializing in condensed matter or materials physics.

Owen W. Tower **Poster # Fireside Lounge-16**
University of Massachusetts Dartmouth

Mentors:
Amitabh Lath, Abhijith Gandrakota, Rutgers University

Quark-Gluon discrimination at the Large Hadron Collider

Quarks and gluons are part of the Standard Model of particle physics, but cannot be observed directly in high energy physics experiments since they appear as a shower of hadrons called jets. Analyses of jets that includes their substructure is a recent development that holds the promise of being able to differentiate between gluon jets and quark jets. Since quark jets are the main focus for many new physics searches, reduction of background from gluon jets increases the sensitivity to new physics signatures. In order to distinguish between quark and gluon jets, we create a Quark-Gluon Likelihood (QGL) discriminant and apply it to jets from simulated new physics signals as well as background. The QGL discriminator uses neural networks, which take input variables such as the primary vertices and transverse momenta of jets to calculate the QGL discriminator values. We show preliminary results showing improvement in signal sensitivity obtained from simulated new physics samples of supersymmetric gluino and SM background consisting of multiple jets.

Biography: Owen Tower is a rising junior and physics major at the University of Massachusetts Dartmouth in Dartmouth, Massachusetts. At UMass Dartmouth, Owen is Vice President of the Society of Physics Students and is a learning assistant in introductory physics courses. Upon graduating, Owen plans to either attend graduate school to study physics or to enter the workforce. In his spare time, Owen enjoys running and spending time with his friends and family. Owen credits his success to the unconditional support from his friends, family, and past instructors.

Abstracts and Student Biographies

Nickolas Almodovar **Poster # International Lounge-1**
MHC- John Jay College- CUNY

Mentors:
Nada Boustany, PhD, Daniel Sumetsky, Jeremy Stein
Rutgers University

Nicolas Emmanuelli

Calibration of FRET controls in iBMK cells to measure FRET efficiency in a fluorescent vinculin tension-sensing probe

Mechanical forces play a central role in shaping cellular behavior in various conditions including neural development and cancer. To study the role of mechanotransduction, our lab is developing methods to utilize Förster Resonance Energy Transfer (FRET)-based force probes. FRET imaging can be used to assess the proximity of two fluorophores. A force probe consists of inserting an elastic linker module between two such fluorophores. The measured distance between the two fluorophores can then be used to infer the tension across the linker. The method is applied to vinculin, a protein which is responsible for stabilizing adhesion points when under force. By transducing genes which encode for a modified vinculin, a tension sensor consisting of a force probe placed between the head and tail of vinculin, one can view and measure the forces associated with active vinculin in cells. Two other fluorescent protein constructs GGS and TRAF are first used to calibrate the system to accurately measure a large range of FRET efficiencies. By using a calibrated FRET based bio-sensor, one can then look at the adhesion properties in BAX/BAK double knockout iBMK cells vs. BAX/BAK expressing cells and measure the forces experienced by vinculin in systems which promote growth or promote instability at the focal adhesion points. We hypothesize that the absence of Bax and Bak in tumor forming iBMK cells will result in changes in focal adhesion forces compared with cells expressing Bax and Bak. Currently, the lab is calibrating the FRET bio-sensor to ensure accurate measurements.

Biography: Nickolas Almodovar was born and raised in New York City, NY. As a Macaulay Honors scholar at John Jay College, he plans to earn a Bachelor’s degree in Forensic Science with an emphasis in Toxicology. This summer, he examined the role of mechanically induced sub-cellular forces associated with vinculin and the influences of these forces on cell adhesion properties in tumor forming iBMK BAX/BAK double knockout cells by using a FRET vinculin force sensor. His time in the Boustany lab at Rutgers University has diversified his research experience and helped him gain a better sense of his future goals. He believes the mentorship and the professional development opportunities the RISE- Cellular Bioengineering program has offered will bring him closer to his goal of becoming an independent researcher.

Esteban G. Bermúdez **Poster # International Lounge-2**
University of Puerto Rico - Mayagüez

Mentors:
Mollie Davis, Dr. Rene Schloss, Dr. Martin Yarmush
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Release Profile of Liposome-Encapsulated Bupivacaine

Over 100 million people experience pain in the United States. Of those, at least 25 million have chronic pain which can hinder their quality of life and incapacitate them. Some of the most common medications for pain are opioids, steroids, and non-steroidal anti-inflammatory drugs (NSAIDs). However, all the aforementioned medications tend to have harmful side effects, which can ultimately lead to addiction or overdose. In addition, many of them do not last long enough and require multiple doses which may damage organs over time. To address this issue, local anesthetics (LAs) encapsulated in liposomes have been proposed which can be administered via local infiltration. In this study, bupivacaine was encapsulated in liposomes via dehydration-rehydration and the drug concentration was measured via UV spectroscopy at a wavelength of 264nm. After collecting multiple batches of liposomes 1.5mL tubes, it was demonstrated that their encapsulation efficiency fluctuated, with an average of 26.8mM and a standard error of 6.91. Also, the results show that most tubes contained 1-15mM of bupivacaine concentration. However, under optimal conditions it was possible to obtain up to a concentration of 162.8mM. Therefore, the liposomes variability in encapsulation efficiency must be reduced to obtain more reliable and reproducible drug concentrations. In addition, the release profile of bupivacaine must be assessed to determine the necessary concentration for the drug to be effective over a long period of time, preferably more than four days and up to a month.

Biography: Esteban Bermúdez was born and raised in the city of Caguas, Puerto Rico. Since high school he has always been interested in biology, its components, and how they interact to form complex organized systems. With that in mind, he decided to pursue a degree in chemical engineering at the University of Puerto Rico – Mayagüez Campus, focusing in its bioengineering aspects. In addition, he aims to become an interdisciplinary scholar, able to incorporate diverse knowledge to approach problems, design projects and find the best solutions. To achieve this, he has become involved with the IEEE's iGEM Competition team, participated in Alpha Helix Biomedical Society's workshops, conducted research in analytical chemistry, and joined the Engineering Student Council, all at his home institution. All these experiences will serve as his tools for promoting a culture of problem solvers in the future generations. More specifically, he wishes to extend opportunities for Puerto Ricans in the island who want to stay to create a sustainable, fair, and prosperous economy for all its citizens.

Abstracts and Student Biographies

Alexus Cruz **Poster # International Lounge-3**
Simmons College

Mentors:
Dr. Francois Berthiaume, Nuozhou Chen, Gabriel Yarmush
Rutgers, The State University of New Jersey

Dr. Andre Palmer, Donald Belcher
The Ohio State University

The Incorporation of Polymerized Hemoglobin (PolyHb) in a Liver Bioreactor

End Stage Liver Failure is a serious global issue, taking 26,000 lives a year in the US alone. It can be classified either as chronic or acute. Acute Liver Failure is rapid onset, and by the time the disease is detected, the liver has so much damage that the only option is liver transplantation. This process involves the patient being placed on a lengthy donor list. Approximately 2500 patients/year in the US die before a suitable donor is found. One way to bridge patients to a liver transplant is to provide temporary support via an external liver assist device. While none are currently approved for clinical use, those in clinical trials are currently focussed on albumin dialysis which removes excess fluid and some toxins from tissues, but results so far have been disappointing. The preferred design moving forward includes living liver cells that provide detoxification functions of the liver. The challenge with this bioartificial approach is the need for a large cell mass to be properly oxygenated. In the absence of oxygen carriers, this requires high flow rates and oxygen tensions, which is damaging to cells. The purpose of this project is to introduce an oxygen carrier that enables mimicking the oxygen gradient that exists in the liver in vivo. An innovative oxygen carrier, polymerized hemoglobin, will be used. Polymerized hemoglobin is made from hemoglobin of expired blood banks that is chemically crosslinked. The resulting product consists of large aggregates of hemoglobin that are more stable and less toxic than free hemoglobin. Depending on the oxygen tension during cross-linking, a product of different oxygen affinity is generated. Mixing different proportions of the polymerized hemoglobins will allow for proper oxygenation of the cells in the bioreactor. HepG2/C3A cells will be used in our experiments for their advantageous properties of performing liver functions and rapid growth in culture. Our project goals include (1) finding the tolerable concentration of polymerized hemoglobin for the HepG2/C3A cells, (2) measuring HepG2/C3A liver-specific functions under various exposures of polymerized hemoglobin, (3) building a hollow fiber bioreactor containing HepG2/C3A cells under physiological oxygen gradient conditions. Cell viability and function are currently measured using an Alamar Blue Test, and a urea test, respectively. Ultimately, this bioreactor is expected to bridge more patients suffering from liver failure to a successful transplant.

Biography: Alexus Cruz was born in Plainfield New Jersey before eventually moving to Flemington where she graduated from Hunterdon Central Regional High School. She attends Simmons College in Boston, MA, and is a part of the class of 2020. After graduating with a Bachelor's degree in biochemistry, she is looking to apply to an M.D. / Ph.D. program to peruse her passions for both medicine and research. She likes to watch Star Wars, listen to The Beatles, read and cook in her free time. This summer, Alexus studied HepG2/ C3A cells as part of the project to create a bioreactor for patients with end stage liver failure. The Cellular Biomedical Engineering REU has sparked her love for research and has been very beneficial to her career goals, opening a pathway into the engineering field. She would like to thank her PI, Dr. Berthiaume, Ph.D. mentor Nuozhou Chen, and lab staff that have provided guidance throughout the program. In addition, she would like to thank Dr. Shreiber, Dr. Erenrich and everyone who makes the RISE program possible. Finally to her REU/RISE peers, the best of luck in all their future endeavors. We can do it!

Reem Eldabagh **Poster # International Lounge-4**
William Paterson University of New Jersey

Mentors:
Reem Eldabagh, Shashank Kosuri, Rahul Upadhya, and Adam J. Gormley, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Controlled Synthesis and Solubility Characterization of Polymer-Peptide Conjugates for Biomedical Applications

Regenerative medicine entails the regrowth of lost or damaged cells, tissues, or organs. This often occurs in response to proteins known as growth factors. Naturally-derived growth factors are costly, difficult to produce, immunogenic, and may be unstable. Therefore, synthetic peptides are favored over their biological counterparts and those that mimic growth factors are produced for regenerative medicine. These peptides, however, may easily be broken down by proteases or lysosomes, among other intracellular species. Conjugating synthetic peptides to suitable polymers protects these peptides from degradation. The conjugation also allows for multivalency, via the attachment of multiple peptides to a single polymer, enhancing bioactivity and regenerative effectiveness. As such, polymer-peptide conjugates are preferred for the delivery of proteins to their biological targets. Previously in the lab, polymer-peptide conjugates were synthesized and administered to cells, yet no cellular response was observed. Insufficient characterization of the conjugates disabled conclusive structure-activity relationship studies. Thus, controlled methods of synthesis using click chemistry and solid phase support are being developed. The strain-promoted azide alkyne cycloaddition (SPAAC) reaction enables this controlled synthesis. With an azide and an alkyne, polymers bifuctionalized at either end were synthesized. The attachment of the alkyne was successful, but that of the azide was not observed. Instead, an apparent dimerization reaction was observed. On the other hand, a wide range of polymers are able to be conjugated to peptides. Many of these polymers have not been characterized with respect to their aqueous solubility to determine their compatibility with biological systems. Using qualitative and quantitative measures, the aqueous solubility of homopolymers of various monomers was characterized. Polymers were synthesized via the oxygen-tolerant PET-RAFT method and tested in cell media and phosphate-buffered saline (PBS) at several concentrations. Homopolymers of acrylate monomers with more polar groups were expected to be more soluble than others. The solubility tests in cell media contradicted these expectations, with dynamic light scattering (DLS) data supporting the findings. The solubility tests in PBS were closer to the expected results. The characterization of solubility will result in an enriched knowledge base on polymeric aqueous solubility and yield soluble, effective conjugates for regenerative medicine.

Biography: Reem Eldabagh is a visiting student researcher from William Paterson University of New Jersey, where she double majored in biology and chemistry and minored in French. She has previously done research on gene expression in the budding yeast using bioinformatics, physical chemistry, and Python under the mentorship of Dr. James Arnone and Dr. Jay Foley. With a strong scientific background and interests in nanomaterials and medicine, she enjoys working in the Gormley Lab, where she applies her knowledge while chemically synthesizing materials in the lab for biomedical applications. Reem has always been interested in medicine, and as she delved deeper into research, she realized she was engaging in an intellectual pursuit she loved. As such, Reem plans to pursue an MD/PhD dual degree, so that she can engage in the exciting world of research to learn more about the nature of materials and how they may be used and tailored into therapies and cures for her patients.

Abstracts and Student Biographies

Fabian Hernandez **Poster # International Lounge-5**
University of Texas at Austin

Mentors:
Michael Holloway
Department of Biomedical Engineering

Charles Roth
Department of Chemical and Biochemical Engineering, Department of Biomedical Engineering
Rutgers, The State University of New Jersey

David Devore
GRAPLON Technologies

Formulation of polyelectrolyte nanocomplexes for delivery of antimicrobial peptides

Biofilms are a ubiquitous problem within many various medical settings including their presence on wounds and medical implants. Yet due to their complex and heterogeneous nature, there are still limited options found for treating them. In particular, the formation of biofilms allows bacteria to resist antibiotic drugs, which do not penetrate easily through the biofilm's extracellular polymeric substance (EPS). A potential solution is the formulation of surfactant-like polyelectrolyte nanocomplexes, by which a therapeutic, in this case a novel cyclic peptide, is able to be protected and delivered through the EPS to the bacteria that form biofilms. This nanocomplex consists of a copolymer, poly(methacrylic acid) (PMAA), grafted with polyetheramine pendant chains (Jeffamine), and the cationic antimicrobial peptide. The anionic backbone of the PMAA allows for association with the cationic peptide, forming the antimicrobial nanocomplex. Through the formation of a nanocomplex, the polymer should provide a protective barrier to the peptide and allow for controlled release. This complex was tested through performing assays on different *Staphylococcus aureus* strains, in particular methicillin resistant *Staphylococcus aureus* (MRSA). Through a comparison with vancomycin, an existing antibiotic, the efficacy of the new treatment can be assessed. Preliminary data shows a higher concentration of nanocomplex was needed to treat the bacteria compared to the known antibiotic and antimicrobial peptide alone. More conclusive results can be obtained by assessing the treatment on more *Staphylococcus aureus* strains.

Biography: Fabian Hernandez is a rising junior majoring in Chemical Engineering at the University of Texas at Austin. At the University of Texas, Fabian has worked in the field of computational chemistry, particularly with methods of global optimization of nanoparticles. He is also an active member of the Society of Hispanic Professional Engineers, where he participates in outreach and community events. Through the RISE program, Fabian is working in Dr. Roth's lab where he is using nanoparticles for the delivery of antimicrobial peptides. In the future he is interested in working in the fields of renewable energy and sustainability or in improving human health. In his free time Fabian enjoys visiting museums, seeing animals, or learning something new.

Liv M. Kelley **Poster # International Lounge-6**
Franklin W. Olin College of Engineering

Mentors:
Biju Parekkadan, Ph.D, Lauren Timmins, B.S.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

An Integrated Cell Microcapsule to Expand and Genetically Engineer Human Cell Therapeutics

The rapid growth of clinical trials for genetically engineered cell therapies has recently led to breakthrough FDA approval chimeric antigen receptor (CAR) -T therapies, a treatment where patient T cells are engineered ex vivo to target tumors, for previously untreatable large B cell lymphoma and acute lymphoblastic leukemia. Despite this attention, little work has addressed the gap between supply and demand created by low yields from current cellular manufacturing methods. Standard 2D growth techniques are inefficient due to their high resource consumption and subsequent low cellular yield. Recent 3D methods, such as microcarriers, are promising, but are not easily tunable and involve cell damaging shear stresses. To address these issues, we developed and present an integrated growth and viral cell culture substrate system to grow and genetically engineer cells to improve current manufacturing processes of engineered cells.

Biography: Liv Kelley is a bioengineering student at the Olin College of Engineering interested in cellular biology, especially in contexts of neuroscience and genetic engineering. She has a research background in autism, single celled organisms, and bacteria. Post-graduation she hopes to work for a year at a large bioengineering company, obtain a Ph.D. in biomedical engineering, and start a medical device company.

Lauren E. Lisiewski **Poster # International Lounge-7**
The State University of New York-Binghamton

Mentors:
Han Chen, David Shreiber, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Physical properties of electrospun nanofibrillar scaffolds and effect on astrocyte reactivity

Astrocytes are responsible for maintaining homeostasis in the brain. When a central nervous system injury occurs and homeostasis is disrupted, astrocytes are recruited to the site of the injury and become reactive. When astrocytes become reactive, there is both a chemical component and a physical component that involves the extension of astrocyte processes, which leads to astrocytic scarring. Initially the astrocytic scar assists with the healing process; however, when there is excessive scarring, axon regeneration is prevented. This research is interested in studying the effects of the physical environment on astrocyte reactivity. The goal is to determine how the properties of the surface on which the astrocytes are grown affects their reactivity. The surfaces are created using a process called electrospinning that results in a scaffold of randomly aligned nanofibers. The properties of the scaffold, such as the fiber diameter, surface roughness, and elasticity, can be altered by changing different aspects of the electrospinning process. Previously, the effects of fiber diameter on astrocyte reactivity have been studiedusing polylactic acid. However, the other properties altered from the changes in the electrospinning process were not considered. This project aims to expand to two more synthetic polymers: nylon-6 and nylon-12, to maintain fiber size while changing other properties of the electrospun fibers. Through SEM imaging, it was determined that the new polymers followed the same trend of increasing fiber diameter with increasing polymer concentration in the electrospinning solution, as previously electrospun polymers. By comparing different polymers at the same fiber diameter, the effects of other properties, such as elasticity and surface roughness, on astrocyte reactivity can be determined. The goal is to be able to accurately predict astrocyte reactivity for any combination of physical properties in the environment in which the cells are growing.

Biography: Lauren Lisiewski is a rising senior at the State University of New York – Binghamton, originally from Flemington, New Jersey. She is studying biomedical engineering with a concentration in biomaterials and bio-pharmaceutical technology, and is a member of the biomolecular and tissue engineering lab at her home institution. She is also a member of Tau Beta Pi Engineering Honors Society, Alpha Eta Mu Beta Biomedical Engineering Honors Society, and enjoys attending Club Gymnastics practices in her free time. At Rutgers University, Lauren is a coparticipant in the REU in Cellular Bioengineering, and is studying the effects of the physical environment on astrocyte reactivity in Dr. David Shreiber's lab. After finishing her undergraduate degree, she plans to pursue a PhD in biomedical engineering.

Terrence A. Lymon **Poster # International Lounge-8**
Louisiana Tech University

Mentors:
Yoliem S. Miranda Alarcón, Amin Khalili, Joseph W. Freeman, Ph.D., David Shreiber, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Development of an Electroactive and Bioactive Hybrid Hydrogel

Whether large volumes of muscle tissue are lost in accidents or war, better technology must be developed to heal these wounds and increase the quality of life of patients. The key to treating these muscular deficiencies lies in the future of muscle tissue regeneration. Our lab has taken on the challenge by developing a poly ethylene glycol diacrylate-acrylic acid hydrogel scaffold that actuates to provide stimulatory strain to cells while providing structural support for the development of these muscle fibers. We hypothesize that adding collagen to the scaffold will increase its biocompatibility and promote the differentiation of cells responsible for motor function. The hydrogels in this study will be composed of two separate hydrogels: a photo-crosslinked poly ethyl glycol diacrylate and acrylic acid (PegDa-AA) hydrogel and a photo-crosslinked collagen methacrylamide (CMA) hydrogel. PegDa-AA hydrogel electroactive component and the CMA offer a heightened degree of biocompatibility. Following the fabrication of the hybrid hydrogels, retention of their abilities will be tested through actuation and cell viability tests. Data is still being collected to see if the individual properties are retained within the final uniform hybrid hydrogel. Furthermore, cell tests will be conducted to observe how cells differentiate when in contact with the hydrogel.

Biography: Terrence Lymon is a rising junior attending Louisiana Tech University pursuing a Bachelor of Science degree in biomedical engineering while on a pre-medical school track. Although he was born in Houston, Texas he has spent majority of his life in Prairieville, Louisiana. Becoming increasingly more involved with university organizations, Terrence has been a member the Biomedical Engineering Society (BMES) and works for residential life as a residential hall tutor. For the upcoming quarter, he hopes to join a lab to continue research as an undergraduate and eventually job shadow at a local clinic.

Alyson March **Poster # International Lounge-9**
University of Connecticut

Mentors:
Joseph W. Freeman, Ph.D, Christian Buckley
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Development of a 3D printed composite bone scaffold

Researchers have recently turned to tissue-engineered bone grafts to stimulate bone regeneration after significant bone loss due to traumatic injury or disease. These bone scaffolds must be biocompatible, osteoconductive, osteoinductive, and have similar mechanical properties compared to natural bone. The current challenge in bone tissue engineering is achieving appropriate mechanical strength similar to native bone without compromising important scaffold characteristics. Our lab has produced a biocompatible, osteoinductive scaffold that mimics both cortical (compact) bone, and trabecular (cancellous or spongey) bone. Although this scaffold accurately mimics the various structures of bone, the mechanical strength and fabrication methods need to be improved. To optimize this design, our lab has turned to 3D printing. We have designed a 3D bone scaffold that mimics the physical appearance of bone, with an interior mesh that mimics trabecular bone and exterior cylinders that mimic cortical bone. This 3D bone scaffold has been printed with polylactic acid (PLA) at high resolution for a rabbit model. This scaffold will be printed using a PLA and hydroxyapatite (HAp) composite filament, which will improve the scaffold's mechanical properties due to both materials and increase the biocompatibility and bioactivity. After testing different ratios of PLA to HAp, we hope to print the bone scaffold and apply additional fabrication and cell studies to analyze its properties.

Biography: Alyson March was born and raised in Delran, NJ and is a rising senior at the University of Connecticut majoring in Biomedical Engineering with a minor in Material Science and Engineering. She participates in undergraduate research at the UConn Health Center and works as a resident assistant and a supervisor in dining services. After graduating next spring, she plans on going to graduate school and pursuing a PhD in Biomedical Engineering, with a focus in biomaterials and tissue engineering.

Abstracts and Student Biographies

Stephen R. Mut **Poster # International Lounge-10**
Colorado School of Mines

Mentors:
Joseph Sherba, Stephen Hogquist, Jeffrey Zahn, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

An investigation of electroporation of cell suspensions and adherent cells

Electroporation is the process of applying electrical pulses across a cell membrane to make it permeable for molecular delivery of a drug or DNA plasmid. Compared to commonly used viral vectors, electroporation is a safer, faster, and cheaper method for drug delivery. Some key manipulative variables in electroporation are the conductivity and type of electrical buffer used, the electric field, and the pulse length delivered to the cells. An experiment was conducted to test how cell viability and transfection efficiency of HEK cells would compare using an osmotically-balanced HEPES-based buffer using either KCl or MgCl2 to balance the conductivity to 500 µS/cm. We hypothesized that the MgCl2 buffer would contribute to higher cell viability and lower transfection efficiency since Mg2+ is an essential co-factor for ion exchange and DNase enzyme activity. Using a traditional cuvette-based cell suspension technique, electroporation experiments consisting of one control and five variable-pulse trials were conducted, where pulse duration ranged from 63µs–1ms and electric field varied from 1.2-4.8 kV/cm. Phase contrast images were captured 24 hours following experiments with MgCl2 resulting in higher cell viabilities compared to KCl. From these results, we adapted our experiment to a new adhesion method, where cells were cultured and electroporated on a semi-permeable aluminum oxide (AAO) membrane. A COMSOL simulation of the 45% porous AAO membrane was built to model the electric field distribution through the 200nm-diameter pores; the electric field uniformly increased through these pores. We were able to use the parameters modeled by COMSOL and use propidium iodide (PI), a common electroporation indicator, to stain permeabilized cells. The fluorescence of PI showed evidence of cell permeabilization due to electroporation of the cells on the AAO membrane. From here, we hope to verify the trends for viability and transfection efficiencies and improve electroporation in the adherent cell system.

Biography: Stephen Mut is a rising senior in Chemical and Biochemical Engineering at the Colorado School of Mines. He is a co-participant in the RISE Cellular Bioengineering REU who studies the electroporation of human embryonic kidney cells, under direction of Dr. Jeffrey Zahn. He is a part of the TriBeta Biological Honors Society and the American Institute of Chemical Engineers chapters at his home university. In his spare time, Stephen enjoys hiking, biking, snowboarding, and playing the trumpet in his university orchestra. Following his time here at Rutgers, Stephen aims to pursue his PhD in biomedical engineering.

Natalia M. Tumidajski **Poster # International Lounge-11**
Mercy College

Mentors:
Yoliem S. Miranda Alarcón and David I. Shreiber, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Development of collagen type I scaffolds with antibacterial properties for clinical applications

In the area of regenerative medicine, research in biomaterials is of great importance to better develop implantable scaffolds that can closely mimic tissue. Collagen type-I is a natural polymer and is the predominant protein in the body. Due to its versatile structure and bioactivity, collagen is used as a building block to develop biomaterials for clinical applications to scaffolds for meniscus replacement, nerve regeneration, and wound healing. Most of these treatments are implemented during surgical procedures, which generally presents a risk of infection. Here, we aim to develop a collagen biomaterial that maintains the functions of natural collagen but also has antibacterial properties to prevent infection. We leverage from the innate properties of collagen type-I such its fibrillar nature, which allows for significant anisotropic strength, and its bioactivity. The novelty of our project lies in modifying collagen type-I by conjugating antibiotics to inhibit bacterial growth and prevent infection. Control experiments were performed to characterize the effectiveness of the antibiotics at different concentrations, with and without the presence of collagen hydrogels. We have tested a variety of antibiotics such as ampicillin, penicillin G, parbenicillin, and ticarcillin using *E. coli* as a model organism to test their antibacterial abilities. Our preliminary results show that our antibiotics in the presence of a collagen hydrogel can inhibit bacterial growth to the same degree as the soluble antibiotic with no hydrogel. We have also used rheology to confirm that the grafted collagen can self-assemble into a fibrillar hydrogel similar to natural type I collagen. For future directions, we will characterize the inhibition of bacteria from the antibiotic-grafted collagen in comparison to soluble antibiotic.

Biography: Natalia Tumidajski was born and raised in Poland. She is currently a rising senior at Mercy College, NY. Natalia is majoring in biology and since her freshman year she has engaged in environmental microbiology research with Dr. Smyth to characterize antibiotic resistant strains collected at the university campus. As part of the RISE program, Natalia is working in Dr. Shreiber's lab mentored by Yoliem S. Miranda-Alarcón on developing collagen scaffolds with antibacterial properties for clinical applications. Natalia also participates in the Rutgers-Princeton MD-PhD Summer Program while she shadows clinicians at Robert Wood Johnson University Hospital. At Mercy College, Natalia is part of the C-STEP and McNair Scholar programs. She is a member of the American Society for Microbiology (ASM) and the Society for Advancement of Chicanos/Hispanics and Native Americans in Sciences (SACNAS). She feels a strong passion for science, discovery, and helping others. After she finishes her undergraduate studies, Natalia intends to pursue an MD-PhD. In her free time, she enjoys reading books, watching her favorite shows and spending time with her family.

Briana Gipson **Poster # International Lounge-12**
Coe College

'In Land We trust': Black female landowners impact on generational poverty in the cooperative economics movement

This study focuses on how Black women used cooperative land to decrease generational poverty in the cooperative economics movement of the 1960s to 2000s. During the Civil Rights Movement era, Black women such as Ella Jo Baker and Fannie Lou Hamer were doing more than advocating for Blacks' social and political freedom as human rights activists. They were fighting for Blacks' economic freedom in the often-hidden Black cooperative economic movement as described by economist Jessica Nembhard. Yet, Black women's economic leadership is often unnoticed. This study addresses this issue by examining the economic and social impact of three Black female landowners: Hamer, Estelle Witherspoon and Shirley Sherrod. These women were instrumental in creating and developing land communities owned, controlled, and benefited from in the 60s until present. Using a labor managed business economic model, and data collected from oral histories, interviews, transcripts, and dissertations, this study is the first to employ mathematical modeling and visualized data to describe the effect of cooperative Black female landownership on generational poverty. Their impact makes a compelling argument for increasing Black landownership especially black female landownership to address the current racial wealth gap.

Biography: Briana is a first-generation student studying economics, African American studies, and history at Coe College, where she is a community-committed leader on and off campus. For almost three years, Briana has served as a resource for preventing discrimination and segregation in the Cedar Rapids, Iowa community as a civil rights intern and AmeriCorps capacity specialist. On campus, Briana spearheads diversity and inclusion initiatives as the first student Co-Chair of Coe's Committee on Diversity, and serves as an officer of Coe's first Black Greek organization, Zeta Phi Beta Sorority, Incorporated. Briana will continue exercising her devotion to communities by pursing a graduate degree in urban and regional planning. Briana expresses gratitude to Dr. Laura Lawson and Meredith Taylor for providing her with opportunities to be one step closer to her urban planning degree.

Abstracts and Student Biographies

Olivia C. Heck **Poster # International Lounge-13**
Ripon College

Mentors:
Kate Fiske Massey, Ph.D., BCBA-D, Meredith Bamond, M.Ed., BCBA
Douglass Developmental Disabilities Center
Rutgers University, The State University of New Jersey

Impact of complexity of chaining procedures on staff implementation

Prevalence of autism spectrum disorders (ASD) has skyrocketed in the past decade. Research indicates that, in 2014, the United States saw a 15% increase in ASD diagnosis from 2012 (CDC, 2018). The Douglass Developmental Disabilities Center (DDDC) at Rutgers University is an example of a center that uses principles of applied behavior analysis (ABA) to organize their delivery of comprehensive services for individuals with ASD across the lifespan (DDDC, 2018). Research indicates that high levels of staff error in ABA instruction can decrease efficacy of interventions (Carroll, Kodak, & Fisher, 2013). However, little is known about the specific instructional variables that lead to lower treatment integrity (TI) in teaching procedures. My research at the DDDC examines the impact of two different types of prompting procedures on teacher TI and interobserver agreement (IOA) when teaching complex behaviors using total task chaining procedures. In the multi-prompt procedure, each step in the task was taught at different prescribed prompt levels. Using the single-prompt procedure, teachers prompted every step using the most intrusive prompt required on a prior probe trial. It was hypothesized that the multi-prompt procedure would be prone to more human error due to higher complexity of instruction, leading to lower treatment integrity and accuracy than the single-prompt procedure. Three adult clients with ASD were included in the current study. Each client was taught a skill currently targeted for instruction. Staff TI and IOA for both prompting procedures were evaluated in an ABAB reversal design. Across all three clients, no differences in IOA and TI were observed, although multi-prompt procedures led to less intrusive prompting for two clients. This study provides insight into variables that may negatively impact staff implementation of instruction and potentially impact skill acquisition.

Biography: Originally from Waukesha, WI, Olivia is a rising senior at Ripon College in Ripon, WI. She is a psychology major with an education minor, and expects to graduate in May of 2019. Olivia is a co-captain of Ripon College's NCAA DIII volleyball team and the president of Ripon's Psi Chi psychology honor society. She is also a psychology tutor, McNair Scholar, and a member of the Laurel Society. Olivia was awarded the Graduate School Exploration Fellowship through the Associated Colleges of the Midwest in 2017, as well as the American Association of University Women Awards: Mary Eva Webster Junior Award in 2018. Olivia has been Academic All-Conference in the Midwest Conference for the past three years, as well as maintained a spot on Ripon's Dean's List for the last 5 semesters. This summer, Olivia is working at the Douglass Developmental Disabilities Center (DDDC) at Rutgers University. She is focusing on applied behavior analytic research with clients with autism spectrum disorders under the guidance of Dr. Kate Fiske Massey. After graduating from Ripon College, Olivia plans on pursuing a graduate degree in school psychology.

Jessica E. Meis
Cornell College

Poster # International Lounge-14

Women and Latin American Art: Activism from Colonial Religious Imagery to Contemporary Installations

Visual arts have given global mobility to many causes throughout history and are a powerful force in the hands of women. Advocating for themselves and their communities, women have served as patrons and makers of art to bring about social change. This is especially the case in Latin America. A focus on these women and how they adopt an activist position in the arts yields important insights in to the field of Latin American art. My research looks at women patrons and artists from the colonial, modern, and contemporary era, building on the work of respected Latin Americanist scholars, including Ilona Katzew, Gauvin Alexander Bailey, Kellen Kee McIntyre, Edward J. Sullivan, Andrea Giunta and Cecilia Fajardo-Hill. More than ever, Latin American art has generated a diverse interest, with many exhibitions highlighting artworks from the historical to the contemporary, especially in New York. These exhibitions provide the opportunity to assess how women artists are presented through contemporary exhibition practice. By adding to the impressive research in Latin American art so far, this project intends to raise awareness for the many women artists and patrons the world should know more about and to provide a platform for these important voices of Latin America.

Biography: Jessica Meis is a rising senior attending Cornell College in Mount Vernon, Iowa pursing a double major in art history and Latin American studies. She came to the RISE program as a Graduate School Exploration Fellowship Fellow through the Associated Colleges of the Midwest. Her past research dealt with reattributing European fifteenth to eighteenth century drawings owned by her home institution and curating a digital and physical exhibition of those works. This summer, she examined the role of women artists and patrons in Latin America from the colonial to contemporary era, through current exhibitions. Jessica is incredibly grateful to have worked with Profs. Tatiana Flores and Tamara Sears this past summer on this work, and for their help on her path to graduate school.

Joshua P. Randolph **Poster # International Lounge-15**
Beloit College

Mentors:
Dr. Ethel Brooks, Women and Gender Studies and Sociology Departments, Rutgers - The State University of New Jersey

Linguistic institutionalization of anti-Romani racism: etymology, history, and pop culture

The Romani, an ethnic minority from North West India (not to be confused with Romanians), have had a long pernicious history since their emigration from India into the Middle East and across Europe. Briefly, this history includes ostracization, banishment, slavery, and genocide by the hand of European nationalism and imperialism. Today, the Roma's oppression has resulted in the continuation of them being treated as second-class citizens. Some of this may be attributed to the linguistic identification that many European languages imposed onto the Roma. Words like Gypsy and tsigan (seen as G*psy and ts*gan in the future to emphasize their pejorative nature) were used to sanction the institutionalization of anti-Romani racism, emulated through mass Romani slavery and genocide. Many Roma today consider these words as racial slurs, and they will be treated as such in this research. Though in the Americas, our understanding of the word G*psy is different due to a romanticization and bastardization of the word, it still carries the weighted history of Romani marginalization both in Eurasia and in the Americas. This research provides insight and connections between the denotation of the above slurs to describe the Romani, the state demonization of them by Nazi Germany, and modern pop culture's use of the slurs. Through historical and archival research, linguistic etymological records, and dialogue analysis, I have found a direct connection between the RISE of the slurs, Nazi rhetoric, and modern pop culture that continues to demonize and marginalize the Romani population. These nationalist tactics are frequently repurposed to use against other minority identities such as the Jews in Nazi Germany, the African diaspora during slavery and segregation, queer folks during the AIDs epidemic, and today against undocumented immigrants. These tactics have lasting repercussions for minority groups, continuing the cycle of oppression.

Biography: Josh is a rising senior at Beloit College studying Anthropology and Russian. They are apart of the Graduate School Exploration Fellowship through the Associated College's of the Midwest. Their previous research has included work in immigration, linguistics, queer identity, and racial identity. Over the summer, Josh worked on historical research that focused on the linguistics of anti-Romani racism in Europe and the Americas. In the future, Josh plans to pursue a graduate degree. Josh would like to thank their Rutgers mentor Dr. Ethel Brooks for her help and continued support and guidance during their research together.

Savannah L. Dziepak **Poster # International Lounge-16**
William Paterson University

Mentors:
Victoria DiBona, Ph.D

The effect of organophosphates on neurodevelopment in *Danio rerio*

Microglia, the resident immune cells of the brain, are crucial contributors to healthy neurodevelopment, but can have neurotoxic effects when chronically activated. While the toxicity of pesticides on behavior and morphology during neurodevelopment has been an area of interest, their effect on microglia during key developmental time points has yet to be determined. Here, we use Zebrafish, *Danio rerio*, to assess if early developmental exposure to pesticides will result in hyper-activation of microglia and altered neuroimmune development and function. Following treatment for 5 days post-fertilization (dpf) with two organophosphate pesticides, Deltamethrin (DM) and Chlorpyrifos (CPF), measurements of total body length (mm), interocular distance (mm), and yolk sac and pericardial area (mm^2) were obtained. CPF showed significant changes in body length and pericardial sac area, which confirms what is reported in previous literature. Interestingly, DM revealed significant decrease in yolk sac area and body length, and a trend for increased pericardial sac area. Further, 3D reconstructions of microglia branching in fry exposed to either Lipopolysaccharide (LPS), a known microglia activator, or CPF suggest that exposure to pesticides alters microglia morphology. These results indicate that early organophosphate exposure can result in microglia activation. Future studies will focus on understanding the effective adverse dosage range, the critical microglia activation range and aim to uncover how these changes alter neuron-immune interactions during neurodevelopment.

Biography: Savannah L. Dziepak is a rising senior and dual major in Biology and Chemistry at William Paterson University in New Jersey. She earned her A.S. degree in Biology from Mercer County Community College in 2017. Upon arrival at WPU, Savannah made the Dean's list, became a member of Tau Sigma National Transfer Honor Society, chemistry club and Get The Hike Out Of Here hiking club. At WPU, she works on organic synthesis under the guidance of Dr. Yalan Xing. Her future goals include getting a PhD in Biochemistry or Chemical Biology in hopes to further study how natural products work both individually and in the human body. Savannah is extremely grateful for the opportunity to learn and grow during her time with RISE and post-doc mentor Dr. DiBona. In her free time, she works hard as a biology tutor, goes hiking, volunteers at The Watershed Institute and meal packaging events, paints, and practices both nature and architecture photography.

Romina Generali **Poster # International Lounge-17**
New Jersey City University

Mentors:
Drs. Gary Aston-Jones & Jennifer Fragale, Brain Health Institute - Rutgers The State University of New Jersey

Relationship between the number of orexin producing neurons and pathological demand for fentanyl

Opioid addiction is a chronic and relapsing disorder that has become a national epidemic. In the United States, 115 individuals die of an opioid related overdose each day. Excessive motivation for opioids is a core symptom of opioid abuse. The Aston-Jones laboratory models this symptom using the intermittent access (IntA) self-administration model. Compared to traditional short access (ShA) models where rats are given continuous access to a drug for 1 hour, IntA rats are given access for 5 min every 30 mins for 6 hrs. This paradigm produces a robust and persistent increase in motivation. Orexins are neuropeptides solely produced in the hypothalamus that have been implicated in drug abuse. The Aston-Jones laboratory have recently showed that IntA rats receiving cocaine had a greater quantity of orexins-producing neurons. Here, we seek to determine if IntA to an opioid (fentanyl) produces a similar increase in the number of orexins-producing neurons. To test this hypothesis, IntA rats (experimental group) and ShA rats (control group) were sacrificed after 3 months of forced abstinence. Brains tissue was sectioned and stained for the orexin protein using immunohistochemistry. We found that IntA rats had a greater number of orexin-producing neurons compared to control ShA rats. These results are consistent with rats given IntA to cocaine and thus indicate that the orexin system is a potential target for the treatment of addiction across various drugs of abuse.

Biography: Romina Generali is a rising senior at New Jersey City University where she majors in Psychology. This summer, she was matched with an Inspire fellow and worked in the Gary Aston-Jones lab studying the relationship between the orexin system and motivation for opioid abuse. RISE has been Romina's first official research experience and she is thankful for her mentor Dr. Jennifer Fragale for providing her with the skills and knowledge to persue a PhD degree following her graduation.

Jeff B. Martinez **Poster # International Lounge-18**
New Jersey City University

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

Role of formins in morphogenesis and development of the *C. elegans* pharynx

In multicellular organisms actin plays major roles in the developmental processes of cytokinesis, cell polarity establishment, cell migration, and morphogenesis. Actin monomers polymerize to make linear or branched actin. Disruptions of these structures are often found in metastasizing cancers and have implications for human disease. In the *C. elegans* model organism branched actin was shown to play primary roles in ventral enclosure and nuclear migration during morphogenesis. Interestingly, processes such as tail migration, microvilli production and cell-cell fusion can still occur without branched actin, raising the question if these events rely on linear actin. In *C. elegans* there are 7 formins that can regulate linear actin: FOZI-1, INFT-1, DAAM-1, FRL-1, INFT-2, FHOD-1, and CYK-1. Recent studies have shown that by inhibiting these formins, morphogenetic defects have occurred including defects in the formation of the pharynx. Furthermore, I tested two hypotheses about the role of formins in pharyngeal development: formins regulate (1) the fate of pharyngeal cells and (2) the polarity of the pharynx during morphogenesis. I found that in DLG-1::RFP;pha-4::TY1::GFP embryos depleted of CYK-1 and INFT-1, expression of pharyngeal fate marker (pha-4) was significantly decreased. At the same time pharyngeal epithelium did develop indicated by the marker DLG-1. This suggests that CYK-1 and INFT-1 affect pharyngeal fate. CYK-1 depletion also caused a drop in NMY-2::gfp (non-muscle myosin) levels in the apical pharynx indicating that cell polarity was affected. In summary, I have shown that all seven formins cause morphogenesis defects and that CYK-1 and INFT-1 affect pharyngeal fate and cell polarity.

Biography: Jeff Martinez is a native of Jersey City, New Jersey and attends New Jersey City University. He is currently a rising senior pursuing a degree in Biology with a minor in Chemistry. Outside of the classroom he is very active in numerous clubs and organizations which includes mentoring new incoming students, tutoring for several classes, volunteering at the local hospital, and managing executive positions in the Biology, Chemistry, and American Medical Student Association clubs in his school. On his free time Jeff likes to play basketball and videogames as well as draw. This summer he worked with the INSPIRE Post Doctoral Fellow, Sofya Borinskaya in the lab of Martha Soto, who studies morphogenesis and development of *C. elegans*. He would like to thank them greatly for the experience and especially for their kindness.

Tasmiya Moghul **Poster # International Lounge-19**
CUNY Medgar Evers

Mentors:
Pragati Sharma, Eve Riley, and Miguel A. Zaratiegui

Mutations in essential genes by CRISPR-Cas9

Cellular DNA is stored compactly in the nucleus in complex with protein factors. The condensed structure or chromatin is categorized as euchromatin - relatively loose form consisting of frequently transcribed genes, and heterochromatin - a denser, more compact form that covers noncoding genes, transposable elements, and satellite repeats. Some of the functions of heterochromatin are: suppression of recombination of transposable elements, proper segregation of chromosomes and regulation of gene expression. Hence, heterochromatin is vital for maintaining genomic stability. Heterochromatin can be further classified as facultative (assembles and dissembles for gene expression regulation) and constitutive (condensed throughout the cell cycle). Although condensed, heterochromatin has to be unraveled for completion of DNA replication. How does the cell know when to change heterochromatin for replication or when to return to its previous compact state? The overarching goal of this project is to understand the molecular factors that help modulate heterochromatin states to allow replication through silenced regions. Using fission yeast, we conducted a forward genetic screen with Hermes transposon as a random mutagen to obtain Position Effect Variegation (PEV) mutants of heterochromatic *ade6* reporter gene. Using whole genome sequencing, we identified several mutants that showed loss of silencing at the *ade6* reporter; a number of these mutations were found to be in essential genes. The primary aim of my project is to generate mutant alleles of essential genes involved in DNA replication and validate their mutant phenotype. We used CRISPR - Cas9 genome editing to target Cut1, Cut9, Drc1, Orc4 and Vid21, and Dcr1 as a method control.

Biography: Tasmiya Moghul was born and raised in Brooklyn, NY. She is a rising senior at Medgar Evers college pursuing a BS in Biology. In her spare time, she likes to bake, paint, and engage in photography. She would like to give special thanks to my mentor Dr. Pragati Sharma, and Dr. Mikel Zaratiegui for their guidance and support throughout the project. She would also like to thank other members of the Zaratiegui lab for their camarderie and teamwork. Lastly she would like to express gratitude towards the RISE and Inspire program for the enriching experience this summer.

Thaybeth I. Malavé-Méndez **Poster # International Lounge-20**
University of Puerto Rico–Río Piedras

Mentors:
Bryan Gutierrez, Jiayu Zhang, Enver C. Izgu
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Engineering functional nucleic acids through lipid self-assembly

Lipids and nucleic acids are two essential organic biomolecules having distinct structural and functional properties in living cells. Phospholipids and sphingolipids self-assemble to constitute a major part of the bilayer matrix as the cell boundary, while nucleic acids carry the genetic information and can fold into tertiary structures that exhibit catalytic activity. Despite these well-characterized macromolecular features of lipids and nucleic acids, studies exploring their synergistic chemistry has been limited due to experimental challenges. Here we aim to design a proof-of-principle experiment that will demonstrate the contribution of lipid self-assembly to formation of catalytic RNAs. In particular, we focus on lipidating oligoribonucleotides and testing the hypothesis of whether these RNA components can fold into correct 3D structures within a lipid bilayer matrix. Our synthetic route involves the tosylation of thymidine and the substitution of the tosyl group with an azide. Nonetheless, to optimize the reactions we developed an alternative synthetic route which consisted in tosylating propargyl alcohol and attaching thymidine. At last, we mimicked the click reaction for the attachment of the lipid-like tail with the use of 2-phenylethanol. The outcomes of this investigation suggest that the lipidation of nucleic acids its possible and that through the use of a click reaction we will probably be able to attach a hydrocarbon chain to thymidine. These results will work as a roadmap to engineer previously unexplored functionalities present in the lipidation of nucleic acids and have the potential to open a new platform in liposome-based biomedical applications.

Biography: Thaybeth was born and raised in San Juan, Puerto Rico and is currently a Chemistry major undergraduate at the University of Puerto Rico–Río Piedras (UPR–RP). She expects to complete her bachelor's degree in 2021 and go to graduate school to pursue a Ph.D. in Chemical Biology. Thaybeth is also an undergraduate researcher at her home institution where she studies the intestinal regeneration of the sea cucumber Holothuria Glaberrima at Dr. García-Arrarás Developmental Neurobiology laboratory. She is also part of the Research Initiative for Scientific Enhancement (RISE) at her school. Outside the classroom, Thaybeth enjoys volunteering at local charities and outreach to motivate students to pursue higher education. This summer at Rutgers she worked at Dr. Izgu's laboratory under his and Bryan Gutierrez guidance and supervision in the process of lipidating nucleic acids through organic synthesis.

Rocío Rivera Rodríguez **Poster # International Lounge-21**
University of Puerto Rico, Río Piedras Campus

Mentors:
Nallathambi, Rameshprabu Ph.D., Raskin Ilya Ph.D.
Department of Plant Biology
Rutgers, The State University of New Jersey

Determining the Combination Effect of Polyphenols from *Vitis vinifera* and Isothiocyanate from *Moringa oleifera* Extracts on Intestinal Epithelial Cell Dysfunctions

Synthetic drugs' side effects and bacterial resistance to antibiotics are raising awareness within society. Alternatives that cannot produce bacterial resistance and have no side effects are key to solving these problems. Many plant compounds are proven to treat a wide range of ailments, within the requirements mentioned above; hence their importance in research. The most acclaimed plant compounds are polyphenols; but consuming them in high amounts is toxic. For that reason, mixtures of polyphenols and non-polyphenol compounds are being studied. In this project, the antioxidant and anti-inflammatory properties of a mixture of polyphenols from *Vitis vinifera* seeds and isothiocyanates from *Moringa oleifera* seeds were studied. Reactive oxygen species (ROS) were induced with palmitic acid and inflammation with a lipopolysaccharide from E. coli to HT-29 and RAW 264.7. Reactive oxygen species were measured with DCFH-DA dye (ROS) and nitric oxide (NO) with the Griess Reagent (inflammation). *V. vinifera* increased the concentration of NO in HT-29 cells compared to the inducer, whereas M. oleifera didn't show any effects. In RAW 264.7, both extracts reduced NO; but the combination didn't show synergism. Results suggest that *M. oleifera* quenches NO – and possibly reducing inflammation- undistinctive of cell type, but *V. vinifera* doesn't. An increase of ROS was observed in HT-29 cells treated with *V. vinifera*, but data from *M. oleifera* and the combination weren't obtained. RAW 264.7 didn't produce high amounts of ROS, so results were inconclusive. Acquired data suggests that *V. vinifera* contributes in the production of reactive species, and that it may be an anti-cancer agent. Meanwhile, *M. oleifera* reduces the production of reactive species, suggesting that its properties aren't based on cell type. In the assays, the combination of extracts didn't result in synergism, revoking the stated hypothesis. Since the studies were made in cancerous cells, to completely dismiss the hypothesis, the same studies have to be performed in non-cancerous cells. Also, to be certain about the anti-inflammatory and antioxidant characteristics of the extracts, the concentration of inflammation and antioxidant biomarkers has to be measured.

Biography: Rocío Rivera Rodríguez is a rising senior attending the University of Puerto Rico, Río Piedras Campus as a Chemistry major. She wants to pursue a Ph.D. in Plant Biology, so she can study plants' phytochemical compounds and use them with medicinal purposes. She is currently a member of the NIH funded MARC program and was part of the RISE program funded by the same institution. She is also a member of the ACS, ASBMB, SACNAS and the Golden Key International Honour Society. One of her hobbies is learning about other cultures and their history, that is why she plan to do a post-doctoral degree in South Korea where they excel in the research of phytochemicals.

Jordan T. Troutman **Poster # International Lounge-22**
University of Maryland, Baltimore County

Mentors:
Michael Yang
Minerva Schools at KGI

Priyanka Mohandas, Anand Sarwate, PhD
Department of Electrical and Computer Engineering
Rutgers, The State University of New Jersey

Fairness in Machine Learning

Governments and companies are increasingly using machine learning algorithms to predict probable outcomes for the future. While they may appear objective, machine learning algorithms often exhibit somewhat troubling biases when making decisions about people across different protected groups. Recently, researchers have proposed statistical measures that assess how predictive algorithms may impose bias on certain protected groups. For many fairness measures, the predicted outcome and ground truth (intended outcome) are required. But, the ground truth cannot always be determined. Our contribution aimed to determine if bias in machine learning algorithms can can be observed without a ground truth present. Our study focused on observing the covariates (factors) in determining the outcome of a machine learning decision. We looked at data from the Home Mortgage Disclosure Act (HMDA) in 2014, which contains information about a loan applicant's financial status and background information. We trained machine learning algorithms on each individual racial group and compared the weights of the covariates. Preliminary results have observed that the covariates are weighted differently among racial groups. Further studies will seek to clarify if the different weighted factors can contribute to bias.

Biography: Jordan is a rising sophomore at the University of Maryland, Baltimore County (UMBC). He is a Computer Science and Mathematics major, who is part of the Honors College and 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. Jordan has interdisciplinary research interests which utilize machine learning, natural language processing, and probabilistic modeling. Jordan plans to research during the school year and intends to pursue a PhD degree in Computer Science after his undergraduate career.

Natalie R Verdiguel **Poster # International Lounge-23**
University of Central Florida

Mentors:
Zukang Feng Ph.D, Christine Zardecki, Stephen Burley Ph.D
Center for Integrative Proteomics Research
Rutgers, The State University of New Jersey

Data Mining Literature Analysis of Cited Protein Data Bank (PDB) Data

The Protein Data Bank (PDB) was established as the 1st open access digital data resource in biology and medicine. Today, the PDB archive contains over 140,000 atomic-level biomolecular structures determined by crystallography, NMR spectroscopy, and 3D electron microscopy. About 20 new structures are deposited daily. It is managed by the Worldwide Protein Data Bank partnership. PDB data is used in basic and applied research, patent applications, discovery of lifesaving drugs, product innovation, and education. Most structures deposited have a primary citation, which is the first paper to describe the molecule and its structure and function. The scientific literature database, Web of Science, includes a subset of data about the primary citation and their citations, such as the number of times cited, subject category, year published, funding source, key words, etc. About 80% of all PDB structures have a primary citation. An initial analysis by Clarivate Analytics on the Nucleic Acids Research publication demonstrated that PDB data drives high-impact research in diverse scientific fields. We will perform a data mining literary analysis on the top 10 most cited PDB structures, as well citation trends in specific subject categories, mainly focusing on non-biology related fields such as computer science and material science. An data mining program developed by RCSB (Research Collaboratory for Structural Bioinformatics) PDB will used to analyze PDB citation data by individual structures and by categories. With this, we hope to find what PDB structures are of interest in various fields, how they are being used, and what future trends in research we can predict.

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Biography: Natalie Verdiguel is a rising sophomore at the University of Central Florida with a major in Computer Science and a minor in Psychology. She has been involved in two NSF-funded programs at her home institution, most recently completing the Learning Environment Academic Research Network (L.E.A.R.N) program, where she was involved in UCF's Complex Adaptive Systems Laboratory. She is currently a member of the Florida IT Pathways to Success (FLIT-PATH) program. Her current career goals include obtaining her Ph.D and remaining in academia to pursue research. She enjoys cooking, reading, and going to Disney in her free time.

Tanya A. Zubov **Poster # International Lounge-24**
Winston-Salem State University

Mentors:
Nikita Jadav
Rutgers, The State University of New Jersey

Mimi Phan, PhD., Benjamin Samuels, PhD.
Department of Psychology
Rutgers, The State University of New Jersey

The effects of chronic social defeat stress on *EN2* knockout mice

Autism spectrum disorder (ASD) is a pervasive developmental disorder. In 2018, the Centers for Disease Control and Prevention released new data on the prevalence of autism in the United States that identified 1 in 59 children as having ASD. ASD is a complex and heterogeneous developmental disorder with a diverse symptomology. Core symptoms include social-interaction difficulties, communication impairments and a tendency to engage in repetitive behaviors. Compounding these challenges are findings indicating that adults with ASD experienced more stressful life events, greater perceived stress, and increased comorbidity with anxiety disorder and depression. Thus animal models of ASD are needed to better understand the vulnerability to stress in this population. Past studies have shown that a mutation in the Engrailed 2 (*EN2*) gene likely has a correlation autism. Of interest, the *EN2* knockout (EN2-KO) genotype shows behavioral and anatomical abnormalities analogous to some features of ASD. The goal of my study is to use an EN2-KO mouse model of ASD to determine how exposure to stressful situations exacerbate behavioral phenotypes associated with ASD. I hypothesized that exposure to chronic social stress will increase anxiety-like symptoms in the EN2-KO mice as compared to the wild type mice and thus negatively affect performance on a battery of behavioral tests. The results from the novelty suppressed feeding show EN2-KO mice indicated increased signs of anxiety when socially defeated by having a longer latency to feed time. The results support the use of EN2-KO mice as a model to study Autism. This will help advance the possibilities for autism research.

Biography: Tanya Zubov is from Burlington, North Carolina. She is a rising senior at Winston-Salem State University, majoring in Biology, minoring in Chemistry and Psychology. For this summer Tanya worked in the lab of Dr. Benjamin Samuels in the Psychology department here at Rutgers University. After graduation, she plans to begin a PhD program in neuroscience. At her home institution, she is involved in the Beta Beta Beta National Biological Honors Society and is a member of the MARC U* program. In her spare time, Tanya enjoys being around loved ones, knitting, taking road trips, and listening to music.