RISE at Rutgers

Research Intensive Summer Experience

2019 Summer Research Symposium

July 31, 2019

Featuring Poster Presentations by RISE and REU Summer Scholars

Sponsored by:

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

Wednesday, July 31, 2019

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. Karen Stubaus
Vice President for Academic Affairs

9:40 – 9:50 AM **Winners, 5-Minute Presentation (5MP) Competition**

Emily Mitchell
Presbyterian College
"Machine Learning and Particle Physics"

Syed Shahabuddin
The City College of New York
"Electrochemical Properties of Au and PEDOT-Coated Neural Probe Electrodes for Brain-Computer Interfaces"

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

Thai-Huy Nguyen, Ph.D.
Assistant Professor of Education
Seattle University

"Discovering *Your* Pathway to the PhD: Embracing Family, Detours and Self"

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 at Rutgers Engineering
REU in Green Energy Technology – Undergraduate Program (GET-UP)
Rutgers University Pipeline-Initiative for Maximizing Student Development Program (RUP-IMSD)
Rutgers Raritan River Consortium (R3C)
Ernest Mario School of Pharmacy Summer Undergraduate Research Fellowship Program
INSPIRE Postdoctoral Research and Education Program

PLENARY SPEAKER

Thai-Huy Nguyen, Ph.D.

Assitant Professor of Education
Seattle University

"Discovering *Your* Pathway to the PhD: Embracing Family, Detours and Self"

Thai-Huy Nguyen is an assistant professor of education at Seattle University and a senior research associate for the Center for Minority Serving Institutions. His work clusters around the role of broad access institutions—including community colleges and minority serving institutions—in mitigating racial and social class inequality. Recent projects include exploring the contributions of Historically Black Colleges and Universities in diversifying the STEM and professional health workforce and a five-year ethnographic study on the pathways to a four-year STEM degree for low-income students at community colleges. Thai-Huy is co-author (with Marybeth Gasman) of *Making Black Scientists: A Call to Action*, which is published by Harvard University Press. His work has also been published in the *Review of Research in Education*, *American Educational Research Journal*, *Review of Higher Education*, and *Teachers College Record*. Funding for his research comes from the National Science Foundation, the Spencer Foundation and the Helmsley Charitable Trust. In 2017, Thai-Huy was recognized as an Emerging Scholar by *Diverse Issues in Higher Education*. Thai-Huy earned his PhD from the University of Pennsylvania.

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 and its partner programs are hosting 64 Scholars this summer. These students, selected from over 1,000 applicants, represent 43 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 2019 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 tenth 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. To learn more about the REU in Cellular Bioengineering, visit http://celleng.rutgers.edu.

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 at providing selected undergraduate students the chance to conduct research in advanced materials. A large portion of the student participants are recruited from academic institutions where research opportunities are limited. The impact of this program is to encourage undergraduates to continue their studies and develop their abilities as professionals, which can last for years. The technical goal is development and study of novel advanced materials of structural levels ranging from nano-scale to macro-scale, both theoretical and experimental.

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

Rutgers Raritan River Consortium (R3C)

The Rutgers Raritan River Consortium (R3C) is a collaborative effort at Rutgers University's New Brunswick-Piscataway campus that recognizes the critical value of the Raritan to the social, economic and ecological integrity of the region that Rutgers calls home. Our mission is to utilize Rutgers' proximity to the Raritan to inform university-based education, research and scholarship and to apply our efforts, in collaboration with Raritan partners, to advance improvements in regional planning, policy and decision-making that positively affect the ecology and economy of the Raritan region. The R3C is supported by the Chancellor of Rutgers University-New Brunswick, Deans of the School of Environmental & Biological Sciences and Edward J. Bloustein School of Planning & Public Policy, and the Johnson Family Chair in Water Resources & Watershed Ecology.

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://surf.rutgers.edu.

INSPIRE Postdoctoral Research and Education 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/.

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 Future Scholars

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

Farmingdale State College, State University of New York

Summer Undergraduate Research Fellowship Program

A.W. Mellon Foundation

Big Ten Academic Alliance Graduate School Exploration Fellowship (GSEF)

Society of Toxicology

American Society for Pharmacology and Experimental Therapeutics

National Institute of Environmental Health Sciences (NIEHS)

~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.

We thank the graduate students and post-docs for their 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

Preparing to Become and Early Career Researcher: How Scholars Communicate

Laura Mullen, M.L.S.
Scholarly Communications Librarian
Rutgers University Library of Science and Medicine

The Devil in the Details: Record Keeping and Laboratory Data

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

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

Tariq Bhatti
Ph.D. Candidate in Chemistry & Chemical Biology

Meenakshi Dutt, Ph.D.
Professor and Graduate Admissions Director, Chemical & Biochemical Engineering

Madison Godesky
Ph.D Candidate in Biomedical Engineering

Alan Goldman, Ph.D.
Professor and Graduate Admissions Chair, Chemistry & Chemical Biology

Adam Gormley, Ph.D.
Assistant Professor and Co-Admissions Chair, Biomedical Engineering

Lisa Miller, PhD.
Professor and Acting Graduate Program Director, Political Science

Stephanie Oh, Ph.D.
M.D.-Ph.D. Candidate

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

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

From STEM to STEAM: How Science Meets Humanities and Art

Geeta Govindarajoo, Ph.D.
Teaching Professor, Chemistry & Chemical Biology

Francesca Gianetti, M.S.
Digital Humanities Librarian

LinkedIn and Social Media Networking

Paola Puerta
University Career Services

Fellowships and Funding: Position Yourself for Success

Teresa Delcorso, Director
GradFund, School of Graduate Studies

Learning to Lead

Patricia Irizarry, Ph.D.
Director of Outreach and Assistant Professor of Professional Practice, Office of STEM Education
Associate Director of the Rutgers Geology Museum

SUMMER PROGRAM FACULTY & STAFF

RISE at Rutgers

Evelyn S. Erenrich, Ph.D., Director
Associate Dean and Chief Diversity Officer, 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

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

Lauren Aleksunes, Pharm.D., PhD., Director
Professor, Pharmacology and Toxicology

Debra Laskin, PhD., Director
Distinguished Professor, Pharmacology and Toxicology

INSPIRE Postdoctoral Research and Education Program

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

Rutgers Raritan River Consortium

Carrie Ferraro, Ph.D, Director

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

Linda Johnson, Undergraduate Program Administrator, Department of Biomedical Engineering

Teaching Fellows
Alejandra Laureano-Ruiz, PhD Candidate in Cell Biology & Neuroscience
Laina Lockett, PhD Candidate in Ecology & Evolution
Raevyn Edwards, Masters Candidate in Education

Resident Advisors
Katherine Tuangco, PhD candidate in Sociology
Amin Khalili, PhD candidate in Biomedical Engineering

Admissions Portal
Shamir Khan, SGS

Social Media
Erica Reed, School of Graduate Studies

Photography and Videography
Justin Jajalla
Larry Fried

Photography and Videography
Danielle Allyson Quinto
Jeffery Heckman, SEBS

Contributions to Panels and Teaching
Jonathan Colon Ortiz, PhD, Chemical & Biochemical Engineering
Lorne Joseph, PhD Candidate in Materials Science & Engineering
Caitlyn Tobita, PhD Candidate in Chemistry & Chemical Biology
Alyssa Rodriguez, RISE and RUP-IMSD Alumna

5-minute Presentation Competition Judges

Rachel Dean, PhD Candidate in Microbial Biology
Sara Norton, PhD Candidate in Psychology
Erika Davidoff, PhD Candidate in Biomedical Engineering
Ben Arenger, PhD, Postdoctoral Associate at School of Graduate Studies
Stephanie Brescia, Project Manager, School of Graduate Studies, and PhD Candidate in Higher Education

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm
Even-numbered Posters: 12:00pm – 1:00pm

Ashton M. Aleman *GET-UP*	**Synthesis of modified bixbyite via a cation exchange reaction for the oxygen evolution reaction**	Cove-1
Simona A. Alomary *RUP-IMSD*	**The conservation of IZ-PV interneurons across species and their use in functional recovery after spinal cord injury**	Cove-2
Gloria Awuku *RUP-IMSD*	**The effects of exercise on mitochondrial protein expression**	Cove-3
Steven Ayoub *RISE*	**DNA Sequence Implication on Naturally Occurring Kinks**	Cove-4
Diomara J. Camacho-Orozco *RUP-IMSD*	**The effects of deleting chromodomain helicase DNA-binding protein 4 (CHD4) in auditory neurons**	Cove-5
Zachary M. Clifford *GET-UP*	**Development of photo-switchable metal-organic frameworks (MOFs)**	Cove-6
Jordan E. Cox *Advanced Materials*	**Super-sponges for emerging pollutants: Functionalized mesoporous silicas with high adsorption capacity for triclosan**	Cove-7
Jocelyn E. Dacquel *RUP-IMSD*	**Cumate-inducible system for the conditional expression of σ28 in *Chlamydia trachomatis***	Cove-8
Justin J. Damon *GET-UP*	**Nanoclusters for biofuel generation**	Cove-9
George S. Echeverria *RUP-IMSD*	**The role of the hypovirus, CHV2, in the suppression of RNA silencing in the chestnut blight fungus, *Cryphonectria parasitica***	Cove-10
Jael Estrada *GET-UP, Rutgers Raritan River Consortium*	**Pathogen Monitoring in the Raritan River**	Cove-11
Alexandra Fonseca *GET-UP*	**Biofilms in sewer pipes and biological filters**	Cove-12
Elmer M Gonzalez *GET-UP, Rutgers Raritan River Consortium*	**Comparison of heavy metal concentrations in two New Jersey rivers**	Cove-13
Elani Hillman *RUP-IMSD*	**Development of an antibiotic collagen biomaterial to prevent surgical site infections**	Cove-14
Emanuel Irizarry *Advanced Materials*	**Enhancement of dental adhesives with graphene and hydroxyapatite**	Cove-15

POSTER PRESENTATIONS

The Cove, Fireside Lounge, International Lounge

Odd-numbered Posters: 11:00am – 12:00pm
Even-numbered Posters: 12:00pm – 1:00pm

Kelly J. Kim *Advanced Materials*	**Development of Silicate Inorganic Polymers**	Cove-16
Lanette N. Mantle *RUP-IMSD*	**Role of branched actin in recycling of Cadherin via the Endocytic Recycling Compartment**	Cove-17
Mikis M. Mays *Advanced Materials*	**Mechanical enhancement of carbonate cement with graphene/graphite**	Cove-18
Liam G.E. McDermott *GET-UP*	**Development of an optical tweezers force spectroscopy system to study plant cell wall biosynthesis mechano-chemistry**	Cove-19
Rebecca Mulwa *RUP-IMSD*	**Anti-inflammatory Effectiveness of Moringa Isothiocyanate-1 on Dermal Fibroblast Cells**	Cove-20
Pauli Peralta *RISE*	**Blocking histone deacetylase 3 (HDAC3) during auditory memory consolidation may increase the strength of long-term memory**	Cove-21
Emmanuel F. Rivera Iglesias *RISE*	**Activating ribozymes with self-assembling lipids**	Cove-22
Justin A. Rodriguez *RUP-IMSD*	**Developing a consistent and sufficient model for HIE in postnatal rat pups**	Cove-23
Luis A. Rodriguez-Mendoza *RUP-IMSD*	**Quantifying parasitic species within atlantic coast leopard frog (*rana kauffeldi*)**	Cove-24
Kyrsten McKenzie Ryerson *GET-UP*	**Optimization of liquid medium for EHD capillary bridge thermal oscillator**	Cove-25
Emily B. Sciarrone *Advanced Materials*	**3D Patterns on melting gels: surface enhancement of fracture toughness**	Cove-26
Acacia T. Tam *Advanced Materials*	**Characterization of PAMAM dendron based lipids grafted structure on a DPPC lipid vesicle**	Cove-27
Alexis Torres *Advanced Materials*	**Adsorption of copper through an alginate beads column and chitosan nano particles**	Cove-28
Dana D. Yun *Advanced Materials*	**Infrared spectroscopy of doped conjugated polymer thin films**	Cove-29
Qing Zhu *Advanced Materials*	**Adsorption isotherms of pores in metal-organic frameworks by Monte Carlo simulation**	Cove-30

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The Cove, Fireside Lounge, International Lounge

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Kelly S. Enriquez *RISE*	**The generation of *Arabidopsis* transplastomic lines to select for nuclear regulators of chloroplast gene expression**	Fireside Lounge-1
Nathalie A. Groot *RISE*	**Effect of delayed treatment on cell proliferation and neurogenesis after spinal cord injury**	Fireside Lounge-2
Hana Roz Hassanpourgol *GSEF*	**The binary of the veil: body politics in post-colonial Egypt**	Fireside Lounge-3
Sondra G. Lionetti *RISE*	**Synthesis of 8-chloro-tetrahydrobenzonaphthyridines as novel antimalarials**	Fireside Lounge-4
Emily K. Mitchell *RISE*	**Pushing the Frontiers of Particle Physics Through Unsupervised Machine Learning**	Fireside Lounge-5
Cassiel E. Padilla-Duran *RISE*	**Impact of Interactions Between Temperature and Species Traits on Local Instances of Colonization and Extinction in North American Marine Invertebrates**	Fireside Lounge-6
Valeria F. Peralta *GSEF*	**Pero why?: Significance of semantic and pragmatic presuppositions in code-switching**	Fireside Lounge-7
Santos J. Rivera-Cardona *RISE*	**The Lack of Civic Mobilization in Cuba and Puerto Rico**	Fireside Lounge-8
Gabriela D. Rivera-Cruz *RISE*	**Development of Camptothecin Prodrugs for the Treatment of Lung Cancer by Passive Pulmonary Targeting**	Fireside Lounge-9
Maria G. Sanabria *RISE*	**Improving the pilot scale production of polyphenol-fiber (GP-OB) complex**	Fireside Lounge-10
Erin R. Scheidemann *RISE*	**Determining chemotherapy efficacy for BRAF-mutant MET-amplified colorectal cancer cells**	Fireside Lounge-11
Hardler W. Servius *RISE*	**Rheological Study of Liposomal Hydrogels**	Fireside Lounge-12
Lydia M. Stephney *RISE*	**The impact of ATF4 deletion on the transsulfuration pathway in the liver of mice during sulfur amino acid restriction**	Fireside Lounge-13

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The Cove, Fireside Lounge, International Lounge

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Saul Abreu *INSPIRE*	**Zebrafish tailfin regeneration as a potential anti-metastatic screen**	International Lounge-1
Shabree Z. Anthony *SURF*	**Metal-related proteins and environmental contaminants in human placentas**	International Lounge-2
Juan S. Ayala *Cellular Bioengineering*	**Non-invasive, wide field assessment of oxygen perfusion of tissue through spatial frequency domain imaging**	International Lounge-3
Alyssa A. Brady *Cellular Bioengineering*	**Schwann Cell Mediated Therapies for Neuromuscular Diseases**	International Lounge-4
Naomi Campos *INSPIRE*	**Investigating the role of centromere protein CENP-C in meiosis**	International Lounge-5
Andrea C. Corbin *Cellular Bioengineering*	**The development of a conductive thermoplastic for novel biocompatible muscle scaffolds**	International Lounge-6
Louis M. Durosier *INSPIRE*	**Expression & role of GPCRs in the extracellular vesicle releasing neurons of Caenorhabditis elegans**	International Lounge-7
Mohammad Fauzan *Cellular Bioengineering, INSPIRE*	**Differential gene expression analysis of spinal cord injury**	International Lounge-8
Kristen M. Garcia *Cellular Bioengineering*	**Circadian expression in human skin**	International Lounge-9
Galyna Khramova *RCSB/PDB*	**Controlling the activity profile of a multifunctional enzyme: site-directed mutagenesis of mouse DXO**	International Lounge-10
Nahtalee R. Lomeli *Cellular Bioengineering*	**Biological screening of polymer-peptide mimics of T.R.A.I.L. and BMP-2**	International Lounge-11
Paulina A. Marino *INSPIRE*	**Using tissue-specific protein degradation (degrons) and live imaging to analyze cell migrations.**	International Lounge-12
Oluwalade R. Ogungbesan *Cellular Bioengineering*	**Improving diabetic wound healing with vRAGE-ELP fusion treatment using in vitro scratch wound assay**	International Lounge-13
Gustavo G. Rios-Delgado *Cellular Bioengineering*	**Microscale mixing to enhance the detection of cancer biomarkers**	International Lounge-14
Catherine M. Rojas *SURF*	**Optimizing Nanosuspension Treatments for Nitrogen Mustard Gas Burns on the Skin**	International Lounge-15

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Talia N. Seymore *SURF*	**Effects of anti-TNFα antibody on sulfur mustard-induced lung injury in rats**	International Lounge-16
Syed Shahabuddin *Cellular Bioengineering*	**Electrochemical properties of Au and PEDOT coated neural probe electrodes for brain-computer interfaces**	International Lounge-17
Jitendra Singh *RCSB/PDB*	**Computational Design of a Dinuclear Copper Protein Using Symmetry**	International Lounge-18
Jaylen E. Taylor *SURF*	**Enzyme kinetic parameters for hydrogen peroxide generation (autoxidation) in the P450 related microsomal electron transport chain**	International Lounge-19
Akhila Tetali *Cellular Bioengineering*	**Controlling astrocyte reactivity with electrospun polymer scaffolds**	International Lounge-20

Alphabetical List of Scholars and Presentations

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Steven Ayoub *RISE*	**DNA Sequence Implication on Naturally Occurring Kinks**	Cove-4
Alyssa A. Brady *Cellular Bioengineering*	**Schwann Cell Mediated Therapies for Neuromuscular Diseases**	International Lounge-4
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Mohammad Fauzan *Cellular Bioengineering, INSPIRE*	**Differential gene expression analysis of spinal cord injury**	International Lounge-8
Alexandra Fonseca *GET-UP*	**Biofilms in sewer pipes and biological filters**	Cove-12
Kristen M. Garcia *Cellular Bioengineering*	**Circadian expression in human skin**	International Lounge-9
Elmer M Gonzalez *GET-UP, Rutgers Raritan River Consortium*	**Comparison of heavy metal concentrations in two New Jersey rivers**	Cove-13
Nathalie A. Groot *RISE*	**Effect of delayed treatment on cell proliferation and neurogenesis after spinal cord injury**	Fireside Lounge-2
Hana Roz Hassanpourgol *GSEF*	**The binary of the veil: body politics in post-colonial Egypt**	Fireside Lounge-3
Elani Hillman *RUP-IMSD*	**Development of an antibiotic collagen biomaterial to prevent surgical site infections**	Cove-14
Emanuel Irizarry *Advanced Materials*	**Enhancement of dental adhesives with graphene and hydroxyapatite**	Cove-15
Galyna Khramova *RCSB/PDB*	**Controlling the activity profile of a multifunctional enzyme: site-directed mutagenesis of mouse DXO**	International Lounge-10
Kelly J. Kim *Advanced Materials*	**Development of Silicate Inorganic Polymers**	Cove-16
Sondra G. Lionetti *RISE*	**Synthesis of 8-chloro-tetrahydrobenzonaphthyridines as novel antimalarials**	Fireside Lounge-4
Nahtalee R. Lomeli *Cellular Bioengineering*	**Biological screening of polymer-peptide mimics of T.R.A.I.L. and BMP-2**	International Lounge-11
Lanette N. Mantle *RUP-IMSD*	**Role of branched actin in recycling of Cadherin via the Endocytic Recycling Compartment**	Cove-17

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm
Even-numbered Posters: 12:00pm – 1:00pm

Paulina A. Marino *INSPIRE*	**Using tissue-specific protein degradation (degrons) and live imaging to analyze cell migrations.**	International Lounge-12
Mikis M. Mays *Advanced Materials*	**Mechanical enhancement of carbonate cement with graphene/graphite**	Cove-18
Liam G.E. McDermott *GET-UP*	**Development of an optical tweezers force spectroscopy system to study plant cell wall biosynthesis mechano-chemistry**	Cove-19
Emily K. Mitchell *RISE*	**Pushing the Frontiers of Particle Physics Through Unsupervised Machine Learning**	Fireside Lounge-5
Rebecca Mulwa *RUP-IMSD*	**Anti-inflammatory Effectiveness of Moringa Isothiocyanate-1 on Dermal Fibroblast Cells**	Cove-20
Oluwalade R. Ogungbesan *Cellular Bioengineering*	**Improving diabetic wound healing with vRAGE-ELP fusion treatment using in vitro scratch wound assay**	International Lounge-13
Cassiel E. Padilla-Duran *RISE*	**Impact of Interactions Between Temperature and Species Traits on Local Instances of Colonization and Extinction in North American Marine Invertebrates**	Fireside Lounge-6
Pauli Peralta *RISE*	**Blocking histone deacetylase 3 (HDAC3) during auditory memory consolidation may increase the strength of long-term memory**	Cove-21
Valeria F. Peralta *GSEF*	**Pero why?: Significance of semantic and pragmatic presuppositions in code-switching**	Fireside Lounge-7
Gustavo G. Rios-Delgado *Cellular Bioengineering*	**Microscale mixing to enhance the detection of cancer biomarkers**	International Lounge-14
Emmanuel F. Rivera Iglesias *RISE*	**Activating ribozymes with self-assembling lipids**	Cove-22
Santos J. Rivera-Cardona *RISE*	**The Lack of Civic Mobilization in Cuba and Puerto Rico**	Fireside Lounge-8
Gabriela D. Rivera-Cruz *RISE*	**Development of Camptothecin Prodrugs for the Treatment of Lung Cancer by Passive Pulmonary Targeting**	Fireside Lounge-9
Justin A. Rodriguez *RUP-IMSD*	**Developing a consistent and sufficient model for HIE in postnatal rat pups**	Cove-23
Luis A. Rodriguez-Mendoza *RUP-IMSD*	**Quantifying parasitic species within atlantic coast leopard frog (*Rana kauffeldi*)**	Cove-24
Catherine M. Rojas *SURF*	**Optimizing Nanosuspension Treatments for Nitrogen Mustard Gas Burns on the Skin**	International Lounge-15

Alphabetical List of Scholars and Presentations

Odd-numbered Posters: 11:00am – 12:00pm
Even-numbered Posters: 12:00pm – 1:00pm

Kyrsten McKenzie Ryerson *GET-UP*	**Optimization of liquid medium for EHD capillary bridge thermal oscillator**	Cove-25
Maria G. Sanabria *RISE*	**Improving the pilot scale production of polyphenol-fiber (GP-OB) complex**	Fireside Lounge-10
Erin R. Scheidemann *RISE*	**Determining chemotherapy efficacy for BRAF-mutant MET-amplified colorectal cancer cells**	Fireside Lounge-11
Emily B. Sciarrone *Advanced Materials*	**3D Patterns on melting gels: surface enhancement of fracture toughness**	Cove-26
Hardler W. Servius *RISE*	**Rheological Study of Liposomal Hydrogels**	Fireside Lounge-12
Talia N. Seymore *SURF*	**Effects of anti-TNFα antibody on sulfur mustard-induced lung injury in rats**	International Lounge-16
Syed Shahabuddin *Cellular Bioengineering*	**Electrochemical properties of Au and PEDOT coated neural probe electrodes for brain-computer interfaces**	International Lounge-17
Jitendra Singh *RCSB/PDB*	**Computational Design of a Dinuclear Copper Protein Using Symmetry**	International Lounge-18
Lydia M. Stephney *RISE*	**The impact of ATF4 deletion on the transsulfuration pathway in the liver of mice during sulfur amino acid restriction**	Fireside Lounge-13
Acacia T. Tam *Advanced Materials*	**Characterization of PAMAM dendron based lipids grafted structure on a DPPC lipid vesicle**	Cove-27
Jaylen E. Taylor *SURF*	**Enzyme kinetic parameters for hydrogen peroxide generation (autoxidation) in the P450 related microsomal electron transport chain**	International Lounge-19
Akhila Tetali *Cellular Bioengineering*	**Controlling astrocyte reactivity with electrospun polymer scaffolds**	International Lounge-20
Alexis Torres *Advanced Materials*	**Adsorption of copper through an alginate beads column and chitosan nano particles**	Cove-28
Dana D. Yun *Advanced Materials*	**Infrared spectroscopy of doped conjugated polymer thin films**	Cove-29
Qing Zhu *Advanced Materials*	**Adsorption isotherms of pores in metal-organic frameworks by Monte Carlo simulation**	Cove-30

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:

Cortex - Technology to enable mobility in spinal cord injury patients
Cortex, Inc.: Alyssa Brady, Mohammad Fauzan, Syed Shahabuddin, Akhila Tetali

Rana Ointment - Innovative treatment for diabetic foot ulcers
Derma Sciences, Inc.: Andrea Corbin, Kristen Garcia, Olu Ogungbesan

Acoudec – Lab-on-a-chip technology for prostate cancer screening
Mycrolabs, Inc.: Juan Ayala, Nahtalee Lomeli, and Gustavo Rios

Abstracts and Student Biographies

Ashton M. Aleman **Poster # Cove-1**
University of South Carolina

Mentors:
Krishani Teeluck and G. Charles Dismukes
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Synthesis of modified bixbyite via a cation exchange reaction for the oxygen evolution reaction

In the Environmental Protection Agency's 2017 annual report, 28.9% of greenhouse gas emissions in the United States were due to transportation, which primarily involved usage of petroleum-based fuels. To bypass the production of harmful greenhouse gases, electrochemical water splitting can be used to harvest hydrogen, a promising alternative to traditional fuels that can generate electricity without harmful carbon by-products. Electrochemical water splitting consists of two half-reactions, the hydrogen evolution reaction (HER) and the oxygen evolution reaction (OER). The OER is the bottleneck of the two due to its four intermediates that require a considerable overpotential, limiting the overall reaction. Therefore, the OER activity must be increased through use of an electrocatalyst, specifically bixbyite, which has been found to yield the highest OER activity of all manganese oxides studied. Here, an exchange reaction is conducted to incorporate cobalt into bixbyite, as it is hypothesized that this will increase the OER activity due to Co's higher reduction potential and two empty degenerate eg orbitals that allow multiple waters to bind to the same site, which can significantly increase the kinetics of the OER. Scanning electron microscope (SEM) images reveal that no reaction occurred between the Fe and Co. This is likely due to the methanol not binding strongly enough to the Fe to allow its replacement by Co, thus it might be necessary to find a different binding agent. The particle size of the electrocatalyst can also be varied by varying the calcination temperature (650 - 850℃), as smaller particles will better facilitate the mobility of Fe and Co.

Biography: Ashton Aleman, born in Augusta, GA is a rising junior majoring in chemical engineering and minoring in chemistry at the University of South Carolina (USC). Ashton is an American Chemical Society Scholar, a Palmetto Fellows Scholar, a Capstone Scholar at USC, and an AP Scholar with Distinction. During her time at USC, Ashton has been on the President's and Dean's list each semester. While maintaining a high GPA, Ashton is a member of the engineering honors society, Tau Beta Pi, the marketing chair for the Society of Women Engineers, and one of the fundraising chairs for the International Society for Pharmaceutical Engineering. Outside of the classroom, Ashton is a physics and chemistry tutor and has been a teaching assistant for some engineering courses. Ashton is thinking about pursuing graduate study in either chemical engineering or chemistry.

Abstracts and Student Biographies

Simona A. Alomary **Poster # Cove-2**
Rutgers University (SAS)

Mentors:
Nofar Engelhard, Adin Aoki, Victoria Abraira, Ph.D

The conservation of IZ-PV interneurons across species and their use in functional recovery after spinal cord injury

What do people suffering from spinal cord injury (SCI) most desire? According to patient interviews conducted by Dr. Wise Young, they most miss the ability to touch – precisely the learning aims of this project. Touch is mediated by interneurons that enable communication between the dorsal and ventral horn of the spinal cord. This project studies interneurons known as parvalbumin-positive (PV+) interneurons located in the Intermediate Zone (IZ) of the spinal cord's deep dorsal horn. Previous studies suggest that PV+ neurons in the IZ are important for motor coordination and help integrate sensorimotor information across numerous body parts to modulate locomotion. We hypothesize that these neurons play an integral role in SCI functional recovery, and that this role is conserved across multiple species - mice, rat, and monkey. We therefore ask: (1) Do IZ-PV Interneurons play a role in functional recovery after spinal cord injury? and (2) How conserved are PV+ Interneurons across monkey, rat, and mouse species? By answering these questions, we will not only determine the contribution of IZ-PV interneurons in SCI recovery within animal models, but we will also be able to estimate whether this information can inform our understanding of humans. To answer the first question, we are inhibiting IZ-PV interneurons in mice via intersectional genetics. These mice serve as the experimental group, while another set of mice without inhibited PV+ interneurons are used as controls. After inducing controlled SCI in each mouse, each group is trained on a mouse treadmill to measure stamina, rehabilitation, and also assessed to measure injury severity. To answer the second question, we are analyzing injured and uninjured monkey, rat, and mouse tissue using immunohistochemistry to visualize the presence or absence of PV+ interneurons across each species. Preliminary results indicate the presence of IZ-PV interneurons in all species, suggesting the conserved mammalian importance of this touch-to-locomotor intermediary.

Biography: Simona Alomary is a rising junior at Rutgers University within the School of Arts and Sciences (SAS). She is a Cell Biology and Neuroscience (CBN) major and is an SAS Honors Program student. Since her freshman year, she has been a member of the Abraira lab, which is a neuroscience lab studying touch perception and locomotion. Outside of academics, Simona enjoys learning new skills, teaching and helping others learn, exercising, and cooking international cuisines. After graduation, she hopes to obtain a Fulbright Fellowship to teach English for a year in Europe, and then hopefully will attend medical school afterwards in order to become a MD.

Abstracts and Student Biographies

Gloria Awuku **Poster # Cove-3**
Rutgers University

Mentors:
Harini Sampath, Bhavya Blaze, Natalie Burchat, Emmanuel Marfo
Department of Nutritional Sciences
Rutgers, The State University of New Jersey

The effects of exercise on mitochondrial protein expression

Maintaining skeletal muscle mitochondrial health is important for health and lifespan. During exercise there is increased activity in skeletal muscle that leads to increases in reactive oxygen species (ROS) levels. ROS can cause DNA lesions, the most common of which is the 8-oxo-7,8-dihydroguanine (8-oxoG) lesion. These 8-oxoG lesions are repaired by 8-oxoguanine DNA glycosylase (OGG1), a protein that excises the lesion through the base excision repair (BER) pathway. The aim of this research project is to understand the regulation of key mitochondria and endurance related proteins in skeletal muscle of mice that are either proficient (wild-type WT), deficient ($Ogg1^{-/-}$), or have enhanced expression of OGG1 ($Ogg1^{trangenic}$). The mitochondrial proteins we will examine are cytochrome c oxidase subunit 4 (COX4), voltage-dependent anion channel (VDAC), and heat shock protein 60 (HSP60). Given the crucial function of these proteins in the mitochondria, their quantities are expected to increase with exercise. Therefore, studying the changes in the expression of these proteins is important in answering the research question of what mechanisms may lead to varying exercise endurance due to OGG1 status. The overall approach involves exercising mice and using Western Blotting to detect how the level of expression of these proteins changes in the gastrocnemius skeletal muscle tissue, comparing the WT and $Ogg1^{transgenic}$. The data from this preliminary study will confirm prior research findings as well as explain any potential link between known increases in mitochondrial DNA damage and reductions in exercise capacity associated with aging.

Biography: Gloria Awuku is a rising junior in the Honors College at Rutgers University, New Brunswick, and is majoring in Biological Sciences through the School of Arts and Sciences. She is a Ghanaian pursuing medicine and is part of the Office for Diversity and Academic Success in the Sciences (ODASIS) at Rutgers. She enjoys being a General Chemistry tutor for ODASIS and being on the executive board of Liberated Gospel and First Love Fellowship on campus. Her research interests are in nutrition and health, specifically how gut health is impacted by diet. She enjoys cooking foods from different cultures, singing, and being outdoors. She wants to thank Dr. Harini Sampath and her team at the Institute for Food, Nutrition and Health, Dr. Jerome Langer, Dr. Patricia Irizarry, all the directors of the Research Intensive Summer Experience (RISE), and ODASIS for giving her the opportunity and means to participate in research this summer.

Abstracts and Student Biographies

Steven Ayoub **Poster # Cove-4**
California State University Northridge

Mentors:
Dr.Wilma Olson
Robert T. Young

DNA Sequence Implication on Naturally Occurring Kinks

The deformability of double helical DNA is a critical biophysical property in numerous cellular processes, especially protein binding interactions. Architectural histone-like proteins such as integration host factor (IHF) and Hbb, both create serve kinks once bonded to the DNA. The IHF protein exhibits sequence-specific binding at the 3' kink site but new evidence has shown sequences preferences at the 5' kink region. A study was conducted on the twenty different thirty-five base pair sequences from high affinity binding studies, each varying in composition at the six base pair region that contain the 5' kink site. Computational coarse grain models were generated using sequence-specific dimeric rigid body parameters collected from previously collected and newly acquired protein-DNA crystal structures. The newly acquired structures will also be used to generate a set of tetrameric rigid body parameters to explore the influence of nearest neighbors on a dimer as a possible factor preferential sequence binding.

Biography: Steven Ayoub is a senior majoring in chemistry at California State University Northridge. At his institution he is part of the Maximizing Access Research Careers (MARC) program. Steven conducts research at California State University Northridge with Dr. Tyler Luchko. His project focuses on implementing 3D-RISM implicit simulations in a constant pH "solvent environment" with the goal of accurately determining protonation states of molecules. This summer of 2019, Steven was selected to participate in the RISE 2019 summer program under Dr. Wilma Olson in department of chemistry focusing on DNA sequence implication on naturally occurring kinks. Steven intends on pursuing his Ph.D. in computational chemistry and later enter a career in academia. Steven would like to thank RISE for the support and resources needed to pursue further in scientific research.

Abstracts and Student Biographies

Diomara J. Camacho-Orozco **Poster # Cove-5**
Rutgers University

Mentors:
Alejandra S. Laureano, B.S.
Department of Cell Biology & Neuroscience
Rutgers, The State University of New Jersey

Kelvin Y. Kwan, Ph.D
Rutgers, The State University of New Jersey
Duncan and Nancy MacMillan
Faculty Development Chair in the Life Sciences
Associate Professor of Cell Biology & Neuroscience

The effects of deleting chromodomain helicase DNA-binding protein 4 (CHD4) in auditory neurons

Syndromic hearing loss underlies different conditions such as Sifrim-Hitz-Weiss Syndrome (SIHIWES). SIHIWES is an intellectual disability disorder associated with hearing loss caused by mutations in chromodomain helicase DNA-binding protein 4 (CHD4). CHD4, a chromatin remodeling protein, is involved in maintaining and modifying the structure of the chromosome. CHD4 is expressed in auditory neurons of the cochlea during inner ear development. To identify the molecular underpinnings of CHD4 mutations that lead to hearing loss, it is vital to investigate how inactivation of CHD4 impacts inner ear development. I hypothesize that deletion of CHD4 using a conditional knockout mouse will inhibit auditory neuronal differentiation. To test this hypothesis, the developing cochlea obtained from murine embryos and post-natal animals from wild-type and CHD4 conditional knockout animals will be compared. CHD4 will be inactivated in a tissue and temporal specific manner using an inducible Cre-loxP system. In addition to the presence of the CHD4 condition knockout allele, a red fluorescent protein reporter, tdTomato will be included to report induction of Cre activity and identify auditory neurons. Immunohistochemistry (IHC) on frozen tissue sections from the inner ear will determine the expression of developmental and neuronal markers. By comparing histological differences between the control and conditional knockout groups, we can attribute changes in the development of the cochlea and its morphological characteristics caused by the deletion of CHD4.

Biography: Diomara Camacho-Orozco is a rising senior at Rutgers University in New Brunswick, New Jersey originally from Passaic, New Jersey. Diomara is majoring in Biological Sciences in the School of Arts and Sciences with the intention of attending medical school. She works in the department of cell biology and neuroscience under Dr. Kelvin Kwan studying the molecular role of chromodomain helicase DNA binding-protein 4 during differentiation of spiral ganglion neurons. Outside of the lab, Diomara is an active member of the Douglass Residential College and is involved in various leadership initiatives. She loves to travel and had the unique opportunity to study social sciences and medicine in Bangkok, Thailand. Diomara's undergraduate experiences have allowed her to travel to Miami, Florida multiple times to engage in leadership conferences and share her personal narrative to Rutgers alumni. Ultimately, she hopes to continue to expand her research experiences in order to challenge herself and seize new opportunities.

Abstracts and Student Biographies

Zachary M. Clifford **Poster # Cove-6**
University of Maryland, Baltimore County (UMBC)

Mentors:
Siddhant Warrier, Kate Waldie
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Development of photo-switchable metal-organic frameworks (MOFs)

Metal-Organic Frameworks (MOFs) are a class of porous materials that have been investigated for several applications in green energy, including the separation and storage of gaseous fuels like hydrogen and catalysis for fuel-forming and energy harvesting reactions. The ability to control the electrical conductivity of MOFs using an external stimulus such as light is of great interest for optical switches and optically switchable catalysts. Photochromic molecules undergo light-triggered isomerization between two different isomeric forms that have different physical properties. It has been reported that certain photochromic organic molecules display conductivity changes between the two isomers. However, the integration of such organic photochromic molecules into MOFs in order to gain optical control of conductivity has only recently been reported, and these few examples displayed very small conductivity values (ca. 10^{-7}-10^{-6} $S{\bullet}cm^{-1}$). In order to make photo-switchable MOFs with better conductivities and stabilities, different photochromic molecules that are more amenable to MOF synthesis are needed, as well as a more fundamental understanding into the modes of conductivity in these structures. To this end, we are targeting a modified pyrene molecule to use as a photochromic organic ligand in conductive MOFs. The proposed synthesis of the target ligand is an 8-step procedure based upon literature precedent. Using proton nuclear magnetic resonance spectroscopy (^1H NMR), it was confirmed that the products from the first and second steps were synthesized in high purity. However, the product from step three has only been isolated on a small scale (46 mg), with the preferential formation of other products occurring on larger scales. Thus, it became important to develop more reliable conditions and to better understand this step in the organic synthesis. Current attempts to optimize the third step are underway. Upcoming studies will involve completing the ligand synthesis, integrating the new ligand into MOFs, and studying the optical and conductivity properties of these MOFs. Long term goals of this project include creating a database of photochromic MOF structures.

Biography: Zachary Michael Hieu Clifford was born in Vietnam. He is currently majoring in chemistry at the University of Maryland, Baltimore County (UMBC). In the fall of 2019, he will be a senior. Zachary is a part of the Meyerhoff scholarship program, a program designed to recruit and maintain more under-represented minorities into STEM professions, at UMBC. He has earned a spot on both the Dean's list (3.75 or higher semester GPA) and the President's list (4.0 semester GPA). In addition to his academic success, Zachary has participated in several research experiences, two of which ended with him being listed as a co-author on a paper. For the summer of 2019, Zachary participated in the Green Energy Technology Undergraduate Program (GETUP), a part of the Research Intensive Summer Experience (RISE) program at Rutgers University. He worked in the Department of Chemistry and Chemical Biology under the mentorship of Dr. Kate Waldie. His project focused on the synthesis of photo-switchable metal-organic frameworks. His project could have relevance in areas such as optoelectronics and optically switchable catalysis for fuel forming and fuel storing reactions. After he graduates in the spring of 2020, Zachary intends to pursue graduate study in materials chemistry to become a research scientist.

Abstracts and Student Biographies

Jordan E. Cox **Poster # Cove-7**
Dickinson College

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

Maricely Ramírez-Hernández
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Super-sponges for emerging pollutants: Functionalized mesoporous silicas with high adsorption capacity for triclosan

Triclosan, (2,4,4'-trichloro-2'-hydroxydiphenyl ether, TCS), is a commonly used antibacterial agent found in personal care products, ranging from soaps and detergents to textiles and toothpaste. Like many emerging pollutants, TCS infiltrates aquatic and terrestrial environments through inefficient waste treatment processes. Mesoporous silica nanoparticles are high surface area nanostructured materials whose surfaces can easily be tailored with drug-specific functional groups; this can make them highly suitable materials for the removal of emerging pollutants. In this presentation, I will describe the synthesis of various organic-modified mesoporous silica nanoparticles and the first experimental demonstration of the potential applications of such materials as super-adsorbents for the removal of the emerging pollutant TCS. The nanoparticles are synthesized using the amphiphilic *tri*-block co-polymer Pluronic 123™ template and subsequent functionalization of their surface silanol with various organic groups *via* substitution reactions. Their surface functional groups, coupled with high surface area, make the resulting particles highly efficient adsorbents for TCS, as determined through UV-Vis adsorption studies. In particular, the mesoporous silica nanoparticles possessing organoamine functional groups exhibit almost twice as much adsorption capacity for TCS compared with the non-functionalized counterparts. This, and follow up research works, can lead to efficient "super-sponge" materials for decontamination and remediation of soil and aquatic systems wherein TCS is ubiquitous.

Biography: Jordan Cox is a junior at Dickinson College, pursuing a Bachelor of Science in Chemistry. At Dickinson, she works in Dr. Witter's Analytical Chemistry Laboratory Group, investigating the concentrations of glucosinolates in broccoli microgreens under different growing conditions in order to maximize the health benefits upon consumption with particular interest in Alzheimer's treatment. This summer, she joined Dr. Asefa's Nanomaterials Laboratory and is currently working on the rational design and synthesis of various nanoporous materials with optimized structures, functionals groups and affinities for the recovery of emerging pollutants from the environment. Jordan plans to earn a Ph.D. in Chemistry combining her interests of organic synthesis and nanotechnology.

Abstracts and Student Biographies

Jocelyn E. Dacquel **Poster # Cove-8**
Rutgers University - New Brunswick

Mentors:
Wurihan Wurihan, Ph.D. and Huizhou Fan, M.D., Ph.D.
Department of Pharmacology
Rutgers – Robert Wood Johnson Medical School

Cumate-inducible system for the conditional expression of σ^{28} in *Chlamydia trachomatis*

Chlamydia trachomatis is a species of chlamydia that is known to cause pelvic inflammatory disease (PID), epididymitis, prostate gland infection, and infertility. The inevitable proliferation of this parasitic antibiotic-resistant bacteria necessitates further research to find better solutions for these bacterial infections. This research entails a better understanding of the genes that conduct cellular function. σ^{28} is a subunit of RNA polymerase, but its role in the growth of *C. trachomatis* is uncertain – overexpression for analysis results in cellular death. Introducing a cumate-inducible system to conditionally express σ^{28} in *C. trachomatis* may allow for the study of the genes expressed by σ^{28} RNA polymerase that may be linked to chlamydial growth. A DNA fragment that transcribes for the cumate-inducible system was constructed and inserted into 2 plasmids: pTRL2-NH-σ^{28} that contains the gene for σ^{28} and pTRL2-GFP that contains a fluorescent marker to act as a control. After ensuring transformation success in *E. coli* and that no mutations had occurred, *C. trachomatis* was transformed with these plasmids. We expect that examination of the chlamydia under a fluorescent microscope should show the expression of σ^{28} in *C. trachomatis* given that the cumate-inducible system worked to prevent leaky expression of the gene.

Biography: Jocelyn Dacquel is a rising sophomore at Rutgers University – New Brunswick pursuing a major in Molecular Biology/Biochemistry and minor in Spanish. She is a part of the Rutgers University Honors College, member of the professional pre-medical fraternity Phi Delta Epsilon, and plays for the Women's Ultimate Frisbee club team. As a participant of the RUP-IMSD program, she is interested in studying *Chlamydia trachomatis* to discover better cures for infections by this bacterium. She is performing this research under the guidance of her Principal Investigator, Dr. Fan, and her Post-Graduate mentor, Dr. Wurihan, in the Pharmacology Department at Robert Wood Johnson Medical School. Jocelyn enjoyed her time in the lab and is grateful for this research opportunity. In the future, she plans to attend medical school and possibly continue her education to achieve her Ph.D.

Abstracts and Student Biographies

Justin J. Damon **Poster # Cove-9**
University of Maryland, Baltimore County

Mentors:
Hudifah Rabie, KiBum Lee, Ph.D.

Nanoclusters for biofuel generation

Nanotechnology has an abundance of uses in the green energy field and can help develop biofuels as a source of clean energy. It has been studied that the use of gold nanoclusters as a light absorber can be used in electron transfer in bacteria, thus producing acetic acid, which can then be used in biofuel production. There has been a lack of exploration into other noble metal nanomaterials that exhibit unique electrochemical properties such as silver, silver doped gold, and gold doped silver. To address this issue, we want to examine the other noble metal nanoclusters in a similar process to observe if acetic acid is produced in varying amounts. We found from UV/Vis Spectrometry that the silver doped gold has the best ratio of excitation to emission peaks and should be the most efficient nanocluster for this process.

Biography: Justin Damon, born and raised in Baltimore, Maryland, is a sophomore attending the University of Maryland, Baltimore County (UMBC) as a Meyerhoff Scholar and chemical engineering major. He has also received a scholarship from the CollegeBound Foundation and was on the Dean's List during his freshman year. In the summer of 2019, Justin was accepted into his first research experience at Rutgers University, the Research Intensive Summer Experience (RISE) program as a Green Energy Technology Undergraduate Program (GET-UP) fellow. He is working in Dr. KiBum Lee's group on determining which nanocluster materials can be used to fix carbon dioxide (CO_2) in the most efficient way and create a biofuel from this process. Justin plans to join a sustained research lab in his fall semester and intends to pursue graduate study in the Fall of 2022 in Chemical Engineering or a closely related field.

Abstracts and Student Biographies

George S. Echeverria **Poster # Cove-10**
Rutgers University

Mentors:
Limei Du M.S., Kaitlyn Kasauskas, Alanna Cohen Ph.D. Candidate, Bradley I. Hillman Ph.D.
Department of Plant Biology
Rutgers, The State University of New Jersey

The role of the hypovirus, CHV2, in the suppression of RNA silencing in the chestnut blight fungus, *Cryphonectria parasitica*

Cryphonectria parasitica, the chestnut blight fungus, nearly wiped out the American chestnut tree population after it was introduced from Japanese chestnuts about 100 years ago. Its spread has been contained by infection of fungal viruses that reduce the virulence of *C. parasitica*. The fungus fights off the viruses by utilizing RNA silencing, which destroys viral double-stranded RNA. Key genes involved in RNA silencing are the *dcl2* and *agl2* genes. Some viruses of *C. parasitica* circumvent this with suppressors of RNA silencing that stifle these genes. The mechanism of the suppressor of the fungal virus, Cryphonectria hypovirus 2 (CHV2), is unknown. In addition, the coinfections of CHV2 and mycoreovirus 1 (MyRV1) or mycoreovirus 2 (MyRV2) have not been well characterized. The uninfected reference strain, Ep155, of the fungus *C. parasitica*, was used in this study. In the CHV2/MyRV1 coinfection, we will compare the difference in fungal phenotype, the rate of mycoreovirus replication and transmission, and the presence of genetic reassortment in MyRV2 with the well described CHV1/MyRV1 coinfection. The interactions of CHV1 with MyRV1 and MyRV2 are dependent on CHV1's suppressor, p29, which is related to CHV2's suppressor. MyRV2 is more susceptible to RNA silencing than MyRV1. So, we will be using the CHV2/MyRV2 coinfection by observing changes in fungal phenotype, the stability of MyRV2 in culture, and associating this with the expression of the fungal RNA silencing genes, as well as the CHV1/MyRV2 coinfection. This will resolve the role of CHV2's suppressor of RNA silencing and its relationship with the two mycoreoviruses.

Biography: George Echeverria is a rising senior at Rutgers University studying biochemistry with a focus in microbial systems. Before transferring to Rutgers, he went to Ocean County College and received his A.S. in General Science. He is interested in microbiology, especially in viruses and how they affect our lives. From seeing mathematics as a foe, to becoming a math tutor and teaching himself graphic design, he is always open to new involvements. The varied experiences he ventures through have introduced new focus into his life. Combined with the research he will be carrying out for the rest of his journey, he hopes that his friends, family, and the rest of the world will be in a better place because of it.

Abstracts and Student Biographies

Jael Estrada **Poster # Cove-11**
Drew University

Mentors:
Julie Blum and Richard Lathrop, Ph.D

Pathogen Monitoring in the Raritan River

The Raritan River, located in central Jersey, is the largest river system within New Jersey. The river has a history of neglect stemming from industrial contamination, including over 17,000 contaminated sites and 60 superfund sites within one mile of the Raritan River. Rutgers University and local community groups are advocating restoration of the Raritan River to provide a viable outdoor recreational area for the local community. There is concern, however, about bacterial concentrations in non-bathing recreational sites. In cooperation with the Lower Raritan Watershed Partnership and Rutgers Cooperative Extension of Middlesex County, non-bathing beach sites with primary contact activities will be monitored to provide data and information on water quality. These sites are not regularly monitored by the New Jersey Department of Environmental Protection (NJ DEP) and/or the New Jersey Department of Health and Human Services; they lack water quality data. Water quality data will be obtained by collecting two samples of water in six locations throughout out the Raritan River. Information on conductivity and salinity, temperature, dissolved oxygen, pH, fecal coliform, and Enterococcus were collected to yield data about the health and safety of the waterways.

Biography: Jael Estrada, born and raised in Union City, NJ is a first-generation student who recently graduated from Drew University where she double majored in Environmental Science and Spanish. During her time at Drew University, Jael was part of the Civic Scholars Program, a rigorous honors program designed to build leadership skills through special seminars, community-based learning classes, and at least 100 hours of community service or experiential learning activities. As a Civic Scholar, she focused on pairing her career interests with community engagement. As a result, Jael worked on a spatial analysis for Food Insecurity in Morris County, NJ that helped the Latinx community obtain fresh and nutritious food. In addition, Jael was part of the American Chemical Society Scholars and a Hispanic Scholarship Fund Scholar. In 2019, Jael was selected to participate in a NSF REU: Green Energy Technology Undergraduate Program (GET UP) at Rutgers University. Jael intends to pursue a master's degree in Environmental Engineering.

Abstracts and Student Biographies

Alexandra Fonseca **Poster # Cove-12**
University of Puerto Rico at Mayagüez

Mentors:
William Morales Medina, Dr. Nicole Fahrenfeld

Biofilms in sewer pipes and biological filters

Biofilms in environmental engineered systems can present a risk to human health by harboring pathogens or improve water quality by providing a niche for biodegraders. To better understand environmental biofilms, two studies were performed: Study 1 was in simulated sewer system and Study 2 in a full scale biofiltration demonstration. The objective of Study 1 was to understand antibiotic resistance gene accumulation in and predominance in sewer pipe biofilms. The antibiotic resistance gene *NDM* (a gene encoding for resistance in 'super bugs') and *16s* rRNA were quantified in order to determine growth throughout time on different pipes materials from two simulated sewers, a sewer to study the microbial communities in sewer sediments and another for wastewater. We found that *NDM* was not present in biofilms grown from a wastewater inoculum, but it was present in biofilm grown from a sewer sediment inoculum. *NDM* was present at a higher concentration in the PVC pipe compared to the concrete pipe material. The results for *16s* rRNA genes show that there are significant microbial communities present in both pipe materials grown from both wastewater and sewer sediment and that wastewater biofilms contained more bacteria. The objective of Study 2 was to understand the genes responsible for manganese removal in drinking water biological filters. A literature review was performed and bioinformatic tools used to design primers for *mofA* and *mnxG*, encoding for manganese removal. These primers will be used to quantify genes in samples taken from two biological filters and two chlorinated control filters. In biological filters biofilm manganese and organic carbon removal was achieved as the acclimation period is being completed and we expect to find a higher quantity of the genes responsible for their removal compared to the quantity of genes present in the first months of sampling. Overall these results can provide insight that will help assess disease dispersal and achieve better drinking water quality.

Biography: Alexandra Fonseca Montenegro was born in Bayamon, Puerto Rico. She is currently a rising senior at the University of Puerto Rico Mayaguez campus, majoring in Chemical Engineering. In the fall semester of 2017, Alexandra was elected for the Physics Honor Roll. In January 2019 she initiated her first research experience under Dr. Antonio Estevez mentoring, investigating supercritical fluid technology for oil recovery. The project won an award in the Puerto Rico Louis Stokes Alliance for Minority Participation (PR-LSAMP) conference in May 2019. Alexandra's research experience continued Summer 2019 when she was chosen to participate in Rutgers University program, Research Initiative Summer Experience (RISE), under the Green Energy Technology Undergraduate Program (GET-UP) division. The research focuses on studying the predominance of antibiotic resistance genes in sewer pipes biofilms and the kinematics of manganese and organic matter removal from drinking water in biofilms in biological filters. Her professional aspirations include pursuing a Master's degree in environmental engineering and founding her own company.

Abstracts and Student Biographies

Elmer M. Gonzalez **Poster # Cove-13**
University of Puerto Rico-Mayaguez

Mentors:
Silke Severmann
Department of Marine and Coastal Sciences

Sylvie Bruggmann
Department of Marine and Coastal Sciences

Comparison of heavy metal concentrations in two New Jersey rivers

The Raritan River receives effluent from various contaminated sites such as Brownfield and Superfund sites that pollute the surrounding waters with heavy metals such as chromium (Cr), cadmium (Cd), and tungsten (W). These trace metals most of which are products of common industrial processes pose severe detrimental health risks to any organisms that are exposed to the heavy metals. Previous studies focused on the concentrations within the sediments estuarine mixing zone of the Raritan, where it was found that high metal concentrations were indeed present in localized areas adjacent to closed sites of effluent input. This study measured the trace metal concentrations in the Raritan's river water itself and compared these data to that collected from the Mullica River, a cleaner river that passes through the Pinelands Nature Reserve. Water samples were collected from nine stations from the Raritan river and three stations from the Mullica river. The samples were prepared following the standard addition method to minimize matrix interferences by sea salt. Concentrations were measured with the Inductively Coupled Plasma-Mass Spectrometer (ICP-MS). Dissolved and particulate metal concentrations were plotted as a function of salinity to distinguish between the effects of simple mixing of freshwater with saltwater versus contamination. It was found that the Raritan metal concentrations behaved as expected, but some of the Mullica metal concentrations, specifically the particulate data, were higher than that of the Raritan. With this information at hand, more future work can be done to justify clean up initiatives on the Raritan and to pinpoint what contaminant source is present on the Mullica.

Biography: Elmer Gonzalez was born on November 9th, 1998 in Tallahassee, Florida. He is currently a senior at the University of Puerto Rico-Mayaguez Campus, pursuing a major in Chemistry while taking a minor in Geology. At his home campus, Elmer worked in research involving extraction of heavy metals from contaminated soils using phytoremediation with Sansiviera trisfasciata and extracting anticancer agents in Annona muricate. He is also a member of the American Chemical Society and is part of the Honor Society of the Chemistry Department. Elmer was selected to be part of the NSF REU site: Green Energy Technology Undergraduate Program (GETUP). In the program, he is working under Professor Silke Severmann in determining the concentration of trace metals chromium (Cr), cadmium (Cd), and tungsten (W) in the Raritan River, whilst comparing the trace metal concentrations in the Mullica River. Elmer is considering pursuing a PhD in Environmental Science and Geochemistry and possibly pursuing research in Environment Science.

Abstracts and Student Biographies

Elani Hillman **Poster # Cove-14**
Rutgers, The State University of New Jersey

Mentors:
Yoliem S. Miranda Alarcon, David Shreiber, PhD.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Development of an antibiotic collagen biomaterial to prevent surgical site infections

Type-I collagen is a natural polymer comprising approximately 30% of the total protein in the human body and has been used as a building block in the development of wound healing treatments. Fibrous type-I collagen is comprised of three α-helical subunits packed together side-by-side affording significant tensile strength. The polymerized collagen fibrils are able to perform strenuous functions in the body, such as connecting muscle to bone, without being broken by tension. Collagen can be easily extracted from tissues and has been processed into a variety of forms of scaffolds for applications in regenerative medicine, including for wound healing. As a scaffold, collagen provides a structure that supports the infiltration of different human cells, which can degrade and remodel the scaffold. To improve the potential of collagen as a scaffold material for wound healing applications, this proposal suggests the addition of anti-bacterial properties to resist the spread of bacteria throughout a patient's surgical wound. Due to the complexities of working with collagen monomers in vitro, this proposal includes a proof-of-concept using gelatin, the denatured form of collagen, as a preliminary measure to analyze if synthesis of the antibiotic-bound collagen is possible, and if this protein is effectively bactericidal. Experiments will be conducted to confirm the synthesis, dialysis of unbound antibiotic, and bactericidal activity of our antibiotic-bound gelatin followed by antibiotic-bound collagen.

Biography: Elani Hillman is a rising senior at Rutgers University in New Brunswick, originally from New York City. He is majoring in Genetics with a minor in English. He works in the Rutgers University Biomedical Engineering Department under the guidance of Dr. David I. Shreiber studying the synthesis and application of biomaterials. His project specifically focuses on the creation and testing of an antibacterial type-I collagen polymer which can be used to prevent surgical site infections from occurring in hospital settings. Working in several different labs since his introduction to research during his freshman year of high school, Elani is eager to explore his passion for analysis and look for new ways to view the world through a scientific lens.

Abstracts and Student Biographies

Emanuel Irizarry **Poster # Cove-15**
University of Puerto Rico - Mayaguez

Mentors:
Zinah N. Alabdali, MS., Jennifer K. Lynch, PhD.
Department of Material Science & Engineering
Rutgers University

Enhancement of dental adhesives with graphene and hydroxyapatite

Dental adhesives are one of the key components for many dental repairs, especially for cavities. Adhesives are applied directly to the tooth before the application of the composite filler to create a strong bond. However, in the process of photocuring the composite filler, a gap forms between the tooth and the adhesive. Gap formation increases the chances of a secondary cavity, which is a hazard for the teeth. Helium ion imaging suggests that this gap is due to the inability of current dental adhesive systems to enter tubules in the dentine and enamel when applied to the tooth and cured. This research will explore an alternative adhesive system to address this "gap" problem aiming to decrease viscosity and increase mechanical properties. The monomers used were Methyl methacrylate (MMA) and Urethane dimethacrylate (UDMA), and the enhancing materials were Graphene (G) and Hydroxyapatite (HA). Spectroscopy analysis shows a decrease in the degree of conversion as the G or HA concentration increased. Rheology analysis shows shear thinning behavior. Remarkably, viscosity decreased with increasing G concentration but increased with increasing HA concentration. Imaging results show homogeneity in the sample, and thermography shows radial propagation during the photocuring process. MMA/UDMA blends are a potential alternative adhesive system to fix the gap problem. This will be investigated further using nanoindentation to measure mechanical properties and applying the MMA/UDMA adhesive system to cow teeth for further characterization.

Biography: Emanuel Irizarry, currently a rising sophomore, graduated from High School as a homeschooler and is pursuing a B.S. in Chemistry at the University of Puerto Rico in Mayaguez. He collaborates with Dr. Hernandez's explosive research group, a participant of ALERT DHS Center of Excellence for Explosives Research. He performs research for detection of various explosives with applications in security and for the industry. Emanuel irizarry will graduate from Chemistry with a minor in Music and another in Physics. His plans are to pursue a Ph.D. in Chemistry or Material Sciences.

Kelly J. Kim **Poster # Cove-16**
Rutgers University

Mentors:
M. Kazancioglu, M. Hara -- Department of Chemical and Biochemical Engineering
R. Lehman -- Department of Materials Science and Engineering

Development of Silicate Inorganic Polymers

As sustainability becomes more and more the underlying emphasis of scientific endeavors, we are compelled to discover more eco-friendly alternatives to everyday uses. Carbon, the most highly-utilized element across all industries, is also one of rarest, consisting of only 0.03 weight percent of the Earth's crust. The inevitable depletion of carbon sources forces us to look elsewhere, one of which is silicon. Silicon, making up 28 weight percent of the Earth's crust, has promising properties when combined with oxygen. These silicon-oxygen compounds, silicates, become more flexible after an ionic liquid is added, resulting in a non-toxic, nonflammable, and environmentally sustainable polymer product. If achieved, these polymers could essentially replace many carbon-based polymers used today, eliminating our dependence on carbon. Our research focuses on expanding our breadth of understanding to determine the feasibility of this goal. We have analyzed various combinations of silicate compositions and types of ionic liquid, as well as various methods for mixing the two, to determine which compound shows the most ideal physical properties.

Biography: Kelly Kim is a senior at Rutgers, The State University of New Jersey, majoring in Chemical and Biochemical Engineering. She has been working on the ionic polymers project with Dr. Hara and Dr. Lehman for the past year, having served as an Aresty Research Assistant during the academic year. In her free time, Kelly enjoys hiking, reading, and trying new foods. She hopes to find a career in which she can combine the fields of STEM and the arts.

Abstracts and Student Biographies

Lanette N. Mantle **Poster # Cove-17**
Rutgers University- New Brunswick

Mentors:
Dr. Martha Soto, Dr. Sofya Borinskaya, Dr. Shashikala Sasidharan

Role of branched actin in recycling of Cadherin via the Endocytic Recycling Compartment

Trafficking and junctional accumulation of Cadherin, an essential cell-adhesion molecule, establishes polarity of the cell and is misregulated in cancer. Our lab has shown that Cadherin accumulation and establishment of cell polarity during development depends on branched actin. Previous findings also demonstrate that branched actin regulates levels and turnover of Cadherin at Apical Junctions (AJ), which maintain contact between cells in tissues. Cadherin turnover is regulated, by the transportation and recycling through various membrane vesicles. Two very important membrane vesicles, RAB-10 and RAB-11, are GTPases that control vesicular transport via the Endocytic Recycling Compartment (ERC). Observations in our lab also show that Cadherin colocalizes with RAB-10, and RAB-10 and RAB-11 levels change when branched actin is downregulated. Therefore, I am interested in how Cadherin is recycled and transported through RAB-10 and RAB-11 membrane vesicles to promote proper adhesion and polarity. First, I am investigating if Cadherin levels depend on RAB-10 and RAB-11. Second, I am assessing how dynamics of RAB-10 and RAB-11 vesicles are affected by depletion of branched actin. Because Cadherin is a tumor suppressing gene, we hope this research will have implications for identifying new possible approaches in Cadherin-targeted cancer therapy in the future. More immediately, this will address a poorly understood problem of how f-actin promotes trafficking of an important polarity regulator.

Biography: Lanette Mantle has lived in Piscataway, New Jersey for most of her life. She is currently a fourth-year undergraduate student at Rutgers University-New Brunswick, and a member of the Honors College of the School of Arts and Sciences. She is majoring in Biological Sciences and will be taking classes at Robert Wood Johnson Medical School this fall through the Access-Med Program under ODASIS. In her free time, she likes to read books and mentor her freshman students as a Resident Assistant. She would like to thank her PI, Dr. Martha Soto for giving her the opportunity to be able to work in the lab this summer, as well as her two mentors, Dr. Sofya Borinskaya and Dr. Shashikala Sasidharan for guiding her through this process.

Mikis M. Mays **Poster # Cove-18**
Savannah State University

Mentors:
Dr. Richard E. Riman - Dr. Paul Kim - Dr. Daniel Kopp
Department of Material Sciences and Engineering
Rutgers, The State University of New Jersey

Mechanical enhancement of carbonate cement with graphene/graphite

Usage of additives in hydraulic cement has proved to enhance its strength characteristics and may also improve the aforesaid characteristics in carbonate cement. Mechanical performance of carbonate concrete is comparable to hydraulic concrete but may be increased through the incorporation of additives. Additives such as graphene, graphene oxide, and thin-layer graphite may improve the mechanical performance of carbonate concretes. The herein proposed research will seek to determine the effects that graphene/graphite may have on the mechanical properties of carbonate cements. Research will begin with the fabrication carbonate cement samples made from calcium silicate ($CaSiO_3$, wollastonite) and CO_2. Various graphene/graphite nanostructures (GNS) in differing quantities will be introduced into carbonate cements. It is expected that graphene/graphite additives will enhance mechanical performance of carbonate cement through the bonding of the GNS to the calcite ($CaCO_3$) and silica (SiO_2) found in carbonate cement. This technology may enable cement to have mechanical performance that meet or exceed that of high-strength hydraulic cement.

Biography: Mikis Mays Jr, a senior civil engineering technology student from Savannah State University, strives to combine entrepreneurship and engineering to make revolutionary technologies accessible to markets worldwide. He is infatuated with the research and development of groundbreaking technologies and plans on gaining his Ph. D. in Material Sciences and Engineering.

Abstracts and Student Biographies

Liam G.E. McDermott **Poster # Cove-19**
Iowa State University

Mentors:
Phillip Rechani, Sang-Hyuk Lee

Development of an optical tweezers force spectroscopy system to study plant cell wall biosynthesis mechano-chemistry

Single-molecule manipulation and imaging techniques have allowed for the study of biophysical nature of intracellular processes in unprecedented molecular detail. The unexpected, often counterintuitive dynamics behind the synthesis of biopolymers out of metabolites, revealed by these revolutionary experimental tools, provide enticing new insights and perspectives about the microcosmos inside a single cell. By creating a one-of-a-kind holographic optical tweezers force spectroscopy system, we aim to peer deeper into the inner workings how of biopolymers such as cellulose fibers covering plant cell membrane are made into metabolites by biosynthetic enzyme complexes. By combining optical trapping techniques with a backfocal plane detection scheme, our novel holographic force spectroscopy system will allow for measurements of single-molecule forces at sub-picoNetwon resolution through force calibration using Hooke's law. Through preliminary testing on the stretching and elastic response of lambda-DNA, we have shown not only that our system works, but that it can be used for future planned experiments involving force spectroscopy measurements of cellulose synthesis and crystallization in the plant cell protoplast-membrane interface.

Biography: Liam McDermott is a Physics major in his senior year at Iowa State University. He was born in Brooklyn, New York, attended school in Brick Township, New Jersey, and moved to Gowrie, Iowa at the age of 16. He participated in the 2019 RISE program through the NSF REU Site: Green Energy Technology Undergraduate Program (GET UP) at Rutgers University. His research at Iowa State focuses on nano-photonics of 2-d materials such as graphene. His research at Rutgers focuses on measuring stretching force sustained on various proteins and metabolites on the nanometer scale using dual-trapping techniques. He is currently building a pico-newton force detector for the Sanghyuk Lee Lab at Rutgers University. Liam was selected to present his research on nano-photonic simulations of 2-d materials at the National Conference for Undergraduate Research in 2018. He has been awarded the President's Award four years in a row at Iowa State University, has been awarded the Readers Riding Forward African American Pride Foundation Scholarship. Liam has also been on the Dean's List for Fall 2016, Spring 2017, and Spring 2019, and was awarded the LAS Dean's Theatre Excellence Award. He intends to pursue graduate studies in Physics.

Abstracts and Student Biographies

Rebecca Mulwa **Poster # Cove-20**
Rutgers University

Mentors:
Khea Wolff, Ilya Raskin Ph.D.
Department of Plant Biology
Natural Products and Human Health
Rutgers, The State University of New Jersey

Anti-inflammatory Effectiveness of Moringa Isothiocyanate-1 on Dermal Fibroblast Cells

For centuries, *Moringa oleifera lam.* (Moringa) has been a tree whose leaves and seeds have been used for medicine. Recent studies of this plant have allowed us to substantiate its effectiveness on human health, offering a natural alternative to combat inflammation. Its seeds possess Moringa 4-[(α-L-rhamnosyloxy)-benzyl] isothiocyanate-1 (MIC-1), which has been studied to reduce LPS-induced inflammation on macrophages. The main goal of this research is to study how effective MIC-1 when it comes to preventing the inflammation of human neonatal dermal fibroblasts. In order to do so, the fibroblasts were first treated with MIC-1 and then were induced inflammation with 1ug/ml of Lipopolysaccharide (LPS). The treated fibroblast underwent an MTT and Nitric Oxide assay, in order to determine cell viability and Nitric Oxide concentration. Our research results are geared to prove that Moringa's anti-inflammatory properties can be used to enhance the effectiveness of topical products and bridge the gap in phytopharmacological research.

Biography: Rebecca Mulwa is a current undergraduate student majoring in Biological Sciences and minoring in History and Nutritional Sciences at Rutgers University. She is a student in the School of Arts and Sciences Honors Program as well as the Douglass Residential Women's College. She is passionate about natural products and their ability to prevent, treat, and restore health. This passion led her to work in Dr. Raskin lab with Khea Wolff, a Ph.D. candidate. Rebecca aspires to become a holistic dermatologist and further research alternative and natural avenues of treating dermal and nutritional issues. Rebecca also engages with her community and fellow peers as a tutor, mentor, volunteer, and leader. Outside of the sciences, she enjoys music, art, and history.

Pauli Peralta **Poster # Cove-21**
Rutgers University

Mentors:
Pauli Peralta, Andrea Shang, Kasia M. Bieszczad
Department of Psychology, Behavioral & Systems Neuroscience
Rutgers The State University of New Jersey

Blocking histone deacetylase 3 (HDAC3) during auditory memory consolidation may increase the strength of long-term memory

Gene expression is necessary in order for memory consolidation and the successful formation of long term memory (LTM). Histone deacetylases (HDACs) remove acetyl groups from chromatin, thereby closing chromatin conformation and repressing gene expression, which prevents LTM formation. In rodents, treatment with an HDAC3-selective inhibitor (RGFP966) during auditory associative memory consolidation has been shown to facilitate the formation of LTM that is more sound-specific . Here, we aimed to determine the effects of HDAC3-inhibition (HDAC3i) on the strength of the auditory associative LTM. HDAC3i affects LTM through learning-induced plasticity of the primary auditory cortex (A1). Therefore, we utilized a standard protocol for associative cue-reward learning known to induce A1 plasticity to determine whether the behavioral effects of HDAC3i reveals stronger memory. We trained them to discriminate between two pure-tone frequencies, where one tone (stimulus, S+: 5.0 kHz) led to a reward and the other did not (S-: 11.5 kHz). We called this training two-tone discrimination (2TD) and divided the rats into two groups, one treated with HDAC3i (N=6), and the other with vehicle (N=6). After reaching high levels of asymptotic performance (>85% correct), they all underwent a final "memory test" session where the tone-outcome condition was reversed. If HDAC3i promotes the formation of strong LTM, then HDAC3i-treated rats will fail to reverse their behavior when the association of the tones to rewards are switched. This is expected because their strong memory of the initial associations will interfere with their ability to perform the reversal, compared to vehicle-treated that will be able to reverse their behavior due to weaker original associative memories. While preliminary data from the 2TD reversal test supported the hypothesis for HDAC3 effects on memory strength, the full dataset yielded mixed results that warrant further study. The findings from the preliminary data support that HDAC3i leads to stronger memory formation, which can be used to better understand the molecular mechanisms that underlie memory consolidation.

Biography: Pauli Peralta is a rising sophomore at Rutgers University pursuing a double major in Computer Science and Cognitive Science. Pauli's main interests reside in gaining a better understanding of the human mind and the mechanisms that underlie its complexity.

Abstracts and Student Biographies

Emmanuel F. Rivera Iglesias **Poster # Cove-22**
University of Puerto Rico–Río Piedras

Mentors:
Bryan Gutiérrez, Ruchi Yadav, Enver C. Izgu
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Activating ribozymes with self-assembling lipids

Ribozymes are RNA molecules that exhibit catalytic behavior upon the formation of a tertiary structure. The emergence of ribozymes is critical to the RNA world hypothesis, which states that RNA fulfill the role of protein enzymes in the early stage of Earth by acting as both a catalyst and an information carrier. A critical standing puzzle in explaining the origin of cellular life and transition to modern biology is the following: How did RNA self-replicated to form ribozymes in the first place? RNA scaffolds of less than 10-15 nucleotides are too short of creating tertiary structures that exhibit catalytic function. As a result, there is considerable interest in experimentally demonstrating chemical methods to synthesize RNAs in the absence of proteins. However, designing a model of a primitive cell that contains functional RNA scaffolds is extremely challenging under the chemical conditions of primordial Earth. Here we describe a synthetic lipid that can self-assemble into giant unilamellar vesicles (GUVs) that can anchor oligonucleotides and drive RNA folding activation utilizing lipid self-assembly in an aqueous environment. Anchored oligonucleotides will have enhanced stability, eliminating the need for complete base-paired RNA strands. If successful, the surface of our GUVs will serve as a two-dimensional platform for interaction of RNA sequences, ultimately inducing sufficient molecular crowding for RNA folding. As a proof-of-concept, our target ribozyme system involves Hammerhead ribozyme, a catalytic RNA motif made of two independent strands that, once hybridized with one another, undergoes self-cleavage of the phosphodiester backbone. Our study will lay the foundation for future explorations in finding how small RNA molecules take advantage of lipid self-assembly and give rise to structurally more complex ribozymes.

Biography: Emmanuel F. Rivera Iglesias is from Toa Alta, Puerto Rico and is currently a chemistry major at the University of Puerto Rico, Rio Piedras Campus (UPR-RP). His research interests are organic chemistry and marine natural products. Currently, he does undergraduate research on the discovery of marine natural products with Dr. Abimael Rodríguez at UPR-RP. He is currently a member of the NIH funded program MARC (Maximizing Access to Research Careers). This summer he attended the RISE program at Rutgers where he worked in Dr. Izgu's laboratory under the direction of Bryan Gutierrez and Ruchi Yadav. He worked on the synthesis of lipids to enhance the formation of RNA scaffolds. In the future, Emmanuel plans to pursue a Ph.D. in organic chemistry where he hopes to focus on the total synthesis of natural products.

Abstracts and Student Biographies

Justin A. Rodriguez **Poster # Cove-23**
Rutgers University

Mentors:
Wise Young, Ph.D. / M.D.
Dongming Sun M.D. / Ph.D.

Developing a consistent and sufficient model for HIE in postnatal rat pups

Hypoxic Ischemic Encephalopathy (HIE) is a serious condition in newborn babies which causes cognitive, developmental, and motor deficits as a result of birth complications, specifically a lack of oxygen reaching the brain tissue. The current treatment for HIE, therapeutic hypothermia, is only moderately effective at reversing these deficits and could be significantly improved. The goal of our research is to develop a new rat model for HIE to ensure that new treatment methods can be tested and compared. The severity of the injury caused by our model will be evaluated through histology, immunohistochemistry, behavior tests, and motor tests. These same tests can then be used to compare the various treated groups both to each other and to control groups. The treated groups will consist of intravenous injections of whole human umbilical cord blood (HUCB) as well as individual components of it. The control groups will consist of non-injured, sham surgery, and injured but not treated animals. The first short-term goal of this project is to establish a new model for HIE. The second short-term goal is to prove that intravenous delivery of human umbilical cord blood cells serves as an effective treatment for rats after HIE. The long-term goal of the project is to take this treatment to clinical trial so that it can be applied to human babies born with HIE.

Biography: Justin Rodriguez is a third-year student at Rutgers University studying Cellular Biology and Neuroscience. He has been conducting research at the Keck Center for over a year now and is working on his second research project. Justin is involved with many different clubs and student groups on campus. Justin enjoys driving, hiking, fishing, and especially going to the beach.

Abstracts and Student Biographies

Luis A. Rodriguez-Mendoza **Poster # Cove-24**
Rutgers University

Mentors:
Luis A. Rodriguez-Mendoza, Laina Lockett

Quantifying parasitic species within atlantic coast leopard frog (*Rana kauffeldi*)

Quantifying Parasite Species within Atlantic Coast Leopard Frog
(Rana kauffeldi)
Luis A. Rodriguez-Mendoza, Laina Lockett
John-Alder Lab, Department of Ecology, Evolution and Natural Resources,
Rutgers, The State University of New Jersey

The Atlantic Coast Leopard Frog (*Rana kauffeldi*) is an enigmatic species, discovered in 2012 on Staten Island. Other closely related species such as the Northern Leopard Frog (*Rana pipiens*) and the Southern Leopard Frog (*Rana sphenocephalus*) are infected with parasites which are associated with other diseases such as chytridiomycosis and ranavirus. Like many other amphibian species, leopard frogs have been experiencing population declines since the 1980s. Habitat destruction, pollution, and diseases are suspected drivers of these population declines; however, the true cause remains unknown. Our primary objective was to characterize and quantify parasitism in *R. kauffeldi*. Tadpoles of this species were collected in Mercer County Park in West Windsor, NJ on June 13 and 19, 2019. Tadpoles were transported to Rutgers University-New Brunswick and were dissected for analysis of parasitism. Blood smears were also created for further parasite analysis. Preliminary results indicate that 15 species of parasites use *R. kauffeldi* as an intermediate host, and no individual had a parasite load greater than 6. This evidence suggests that parasitism could be a potential driver of *R. kauffeldi* population declines. Future studies should investigate if there is a direct negative impact of parasitism on this species. By understanding which parasites utilize *R. kauffeldi* as a host, we can create effective and targeted management plans for this leopard frog species.

Biography:
Luis A. Rodriguez-Mendoza is from Newark, NJ. He is currently a rising senior majoring in Ecology, Evolution & Natural Resources with a minor in Biological Sciences at Rutgers University, New Brunswick, NJ. As a RUP-IMSD student at his home institution, he is currently researching with graduate student, Laina Lockett in the John-Alder Lab investigating whether the newly discovered Atlantic Coast Leopard Frog, interacts with the surrounding parasite community. His future research interests revolve around studying organisms in aquatic and or marine habitats. Outside of academia, he enjoys playing volleyball, swimming, and working on his car whenever the sun is shining. After graduating from Rutgers University, Luis plans on pursuing more opportunities or careers relevant to his research interests.

Abstracts and Student Biographies

Kyrsten McKenzie Ryerson **Poster # Cove-25**
Biola University

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

Optimization of liquid medium for EHD capillary bridge thermal oscillator

The U.S. Department of Energy estimates that 20-50% of all energy input into industrial processes is lost as waste heat, releasing 1.68 billion metric tons of carbon dioxide annually and accounting for nearly one-quarter of greenhouse gas emissions in the U.S. Waste heat harvesting and conversion provides a method of recycling this lost energy. Although thermoelectric waste heat harvesters can be applied in a conformal fashion, pyroelectric materials, though less investigated, could theoretically deliver higher efficiency. However, pyroelectric waste heat conversion requires a thermodynamic cycle with a quickly oscillating thermal field, the Olsen cycle, but most waste heat sources only vary slowly with time. Past efforts have explored generation of the Olsen cycle using large mechanical cylinder-and-piston setups and costly micro electronic mechanical systems (MEMS). Our group has proposed a more scalable, cost-efficient model for bulk fabrication using liquid capillary bridge thermal oscillation. A droplet placed between two horizontal electrodes can be made to periodically form and break a capillary bridge by varying a vertical electric field applied in the range of 0.5-5.0 kV, generating an oscillating thermal field. Liquids and dopants of differing thermal, electric, and rheological properties were compared for the optimization of thermal transfer. Through combined electrohydrodynamic (EHD) and thermal experiments, solutions were tested at various applied voltages and electrode distances in the range of 0.3-1.5 mm. Ideal solutions were identified by their 1) capacity to stably oscillate between droplet and bridged phases with the electric field, 2) thermal transfer abilities, and 3) relative chemical and thermal stability. Of the solutions tested, pure canola oil achieved the most consistent, stable oscillation at numerous electrode distances and applied voltages, making it the current most promising liquid medium in the optimization of capillary bridge thermal oscillators.

Biography: Kyrsten McKenzie Ryerson, born in Imperial Valley, CA, is a senior at Biola University in La Mirada, CA with a major in physics. She was a 2015 National Merit Scholarship Program "Commended Student" and a 2016 College Board "AP Scholar with Honor". Throughout her time at Biola, she has remained on the Dean's List and has been awarded both the President's Academic Scholarship and the Department of Chemistry, Physics, and Engineering Honors Scholarship. As a NSF REU Green Energy Technology Undergraduate Program (GET UP) fellow, she assisted in identifying ideal liquid solutions for the application of an oscillating heat source on pyroelectric materials in the harvesting of waste heat of industrial processes. Upon graduation, McKenzie intends to pursue graduate school for engineering.

Abstracts and Student Biographies

Emily B. Sciarrone **Poster # Cove-26**
Clemson University

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

3D Patterns on melting gels: surface enhancement of fracture toughness

Melting gels, a subset of gels made through sol-gel processing, are organically-modified silicates made from precursors with different functionalities. Melting gels are rigid at room temperature but become viscous when heated to 100 ^{o}C due to incomplete crosslinking. Cooling back to room temperature makes them again rigid and this cycle can be repeated many times. After a consolidation treatment at 170-220 ^{o}C, crosslinking is complete and gels can no longer be softened. These gels have many possible applications due to their hermetic nature and low processing temperature. However, for the gels to function properly as a hermetic seal, they should not be easily cracked. Stripe- and dot- patterned coatings on various substrates are being compared to a flat coating to examine the effect on hardness and fracture toughness.

For this study, premade gels containing phenyl substituted alkoxides and tetra-alkoxysilane were used. Phenyltrimethoxysilane (PhTMS) with diphenyldimethoxysilane (DPhDMS) and phenyltriethoxysilane (PhTES) with diphenyldiethoxysilane (DPhDES) were mixed with either tetraethylorthosilicate (TEOS) or tetramethylorthosilicate (TMOS). Gels were softened then poured onto the substrate and spread to form a coating. Patterned Mold Star™ 30 silicone molds were pressed on top of the softened gel. After heating for 24 hours at the consolidation temperature, the molds were carefully removed. The fidelity, hardness, and fracture toughness of resulting surfaces were analyzed using an optical microscope, a profilometer, and a Leco microhardness indenter.

Coatings on stainless steel substrates had the best fidelity and adhesion. However, microcracks that formed during processing prevented the hardness and fracture toughness testing from providing reproducible results. Future studies should continue to perfect these techniques to minimize the number of pre-existing cracks. Once that is achieved, the mechanical properties can be fully evaluated.

Biography: Emily Sciarrone is a senior at Clemson University majoring in Materials Science and Engineering with minors in Mathematical Sciences and French Studies. At Clemson, she conducts research with Dr. Vincent Blouin examining the effectiveness of chemochromic hydrogen sensors. She is in the co-op program and spent the spring semester working in new product development at Ulbrich Specialty Flatwire. As a part of the REU in Advanced Materials this summer, she worked in Dr. Klein's sol-gel lab developing patterning methods for melting gels. After she graduates, she hopes to pursue a PhD in Materials Science and Engineering.

Abstracts and Student Biographies

Acacia T. Tam **Poster # Cove-27**
Cornell University

Mentors:
Mr. Akash Banerjee and Meenakshi Dutt, PhD
Department of Chemical and Biochemical Engineering
Rutgers, The State University of New Jersey

Characterization of PAMAM dendron based lipids grafted structure on a DPPC lipid vesicle

Polyamidoamine (PAMAM) is a highly sought-after hyperbranched polyelectrolyte. Due to its versatility in terminal end groups, PAMAM has a variety of applications in water treatment, drug delivery, and even the collection of radioactive nuclear waste. PAMAM is commonly grafted onto a non-adsorbent surface, immobilized surfaces or are used as dendrimers which form a micelle. However, to form a larger, mobile system, lipid tails have been attached to PAMAM and have been incorporated into lipid vesicles. Our research focuses on analyzing the mushroom to brush configuration of PAMAM and stability of this assembly over a variety of generations and concentrations of PAMAM. A mushroom like regime is contributed to the strong attractive interactions between the phosphate group of the lipid and the terminal amine of PAMAM. In contrast, a brush like regime is caused by the repulsion of the like-charged terminal amines. The Euclidian distances from the grafted point of the dendron to the terminal amines were calculated. Additionally, the maximum and minimum X, Y, and Z values were found to determine the size of the dendron. Our results revealed that G2 and G3 were the optimal sizes for PAMAM on a lipid vesicle providing the most stability as well as a more brush-like structure to adsorb materials. G0 and G1 have very strong interactions with the lipid vesicle creating an undesirable mushroom-like assembly. G4 and G5 were large entities that produced variable outcomes with no specific trends. Additionally, G4 and G5 induced rupture or deformation with fewer terminal amines than G2 and G3.

Biography: Acacia Tam is a junior at Cornell University studying Biomedical Engineering. Acacia is a member of the club gymnastics team, APO (a service fraternity), the Biomedical Engineering Society, Society for Women Engineers, and tutors for general chemistry. In her free time, she likes to hike, make bubble tea, and explore new places. This summer she worked with Dr. Dutt and Mr. Banerjee doing computational analysis to examine the structure of PAMAM on lipid vesicles.

Abstracts and Student Biographies

Alexis Torres **Poster # Cove-28**
University of Puerto Rico at Mayagüez

Mentors:
Shivani Desai, Nina Shapley Ph.D.
Department of Chemical Engineering at Rutgers

Adsorption of copper through an alginate beads column and chitosan nano particles

The industrials water wastes contains a lot of heavy metals. This create an environment problem when the water arrive to the sea or sewer. This problem can be resolve by implemented the using of alginate beads in the industries. The alginate beads can adsorbed heavy metals as copper. With his negative charge in a pH above 3.4, normally water has pH of 7, can catch the metal that has in the water. The alginate beads was performance by precipitated the solution of sodium alginate into a calcium chloride solution from a height of 12 cm and a flux of 0.10 mL/min. The alginate beads was performed in a bed column and passed solutions of sulfate copper of 2 mM with a flux of 0.25 mL/min. Samples were taken at the top of the column at different times. The samples was analyzed by ICP-OES to determine how much copper was adsorbed. Also, the alginate beads can combine with chitosan nano-particles. The chitosan nano-particles was characterized by his zeta potential.

Biography: Alexis Torres is from Yauco, Puerto Rico. Actually, he is in the bachelor degree of Industrial Biotechnology in the University of Puerto Rico at Mayagüez. He has interest in the research of proteins, enzymes, bio-materials and immunology. Is expected to do his industrial practice in a bio-pharmaceutical working in manufacturing or Research & Development. Also, he want to continue graduates studies in the areas mentioned above and work for an industry in Research & Development of products or Safety. The experience at RISE has increase his knowledge and abilities to work in a research laboratory.

Abstracts and Student Biographies

Dana D. Yun **Poster # Cove-29**
University of Illinois at Urbana-Champaign

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

Hemanth Maddali
Department of Chemistry and Chemical Biology
Rutgers, The State University of New Jersey

Infrared spectroscopy of doped conjugated polymer thin films

Infrared (IR) radiation is a region on the electromagnetic spectrum that has frequencies lower than visible light. Instruments that employ IR have enabled for night vision, thermal imaging, and high-speed data communication. Many IR devices employ metal layers due to their high conductivity, which enables reflectance and surface sensing in the infrared. However, polymer layers are much cheaper and easier to manufacture, as the fabrication simply involves dispersing the polymer in a liquid and spin coating it onto a substrate. In this work, the goal is to fabricate metal-like polymers that can exhibit high IR reflectance. In general, a material is reflective and exhibits metallic behavior below its plasma frequency. While most metals have plasma frequencies above the visible region, even conducting (conjugated) polymers have plasma frequencies in the microwave spectral region. We aim to increase the polymer's plasma frequency into the IR through (electro)chemical doping. Higher levels of conductivity have been demonstrated in doped conjugated polymers compared to their respective undoped ones. We show that this is accompanied by changes in the IR transmission, suggesting incorporation of the dopant into the polymer layers. Using a modified reflection module, the reflectance and other metallic properties of doped and undoped conjugated polymers will be investigated in the mid- to near-IR.

Biography: Dana Yun is a sophomore pursuing her Bachelor's in Materials Science and Engineering at the University of Illinois at Urbana-Champaign. There, she works under Dr. Waltraud Kriven researching high-temperature ceramics and is soon starting work in the synthesis and analysis of high-entropy oxides. In the future, Dana hopes to focus on humanitarian research; water treatment, renewable energy, and other methods to make our society more sustainable.

Qing Zhu **Poster # Cove-30**
Rensselaer Polytechnic Institute

Mentors:
Shivam Parashar, Silvio Dantas, Alexander V. Neimark
Department of Chemical and Biochemical Engineering
Rutgers University–New Brunswick

Adsorption isotherms of pores in metal-organic frameworks by Monte Carlo simulation

Metal-organic frameworks (MOF) represent a wide class of nanoporous materials that holds vast potential for applications in chemical and biochemical engineering, energy storage, and nanomedicine due to their exceptional ability to selectively adsorb and retain molecules from gas and liquid. Computational models and simulations can be used to describe the adsorption characteristics of MOFs in conjugation with experiments. This project utilizes the Grand Canonical Monte Carlo method to simulate adsorption isotherms of argon, nitrogen and carbon dioxide at their normal boiling points. Two MOF materials were considered: PCN-224 (Porous Coordination Network) and ZIF-412 (Zeolitic Imidazolate Framework), which contain 2 and 3 different types of pores respectively. The simulated isotherms were decomposed into fingerprint isotherms in individual pores in order to assess the gas uptake capacity and accessible pore volume for these pores. The simulated isotherms were compared with the experimental ones and their close agreement validates the proposed approach. The performed analysis provides physical insight into the adsorption mechanism and can be further used for the pore structure characterization of MOF materials.

Biography: Qing Zhu is currently a physics and applied mathematics rising junior student at Rensselaer Polytechnic Institute. His research interest primarily lies within computational materials science and condensed matter physics. Previously, his research project in environmental science on the correlation of density of cyclodextrin and physical factors was a finalist at the New York City Science and Engineering Fair. He plans to pursue a graduate degree in materials science and engineering.

Abstracts and Student Biographies

Kelly S. Enriquez **Poster # Fireside Lounge-1**
Farmingdale State College

Mentors:
Lisa LaManna, Pal Maliga, Ph.D.
Department of Plant Biology
Rutgers-Waksman Institute of Microbiology

Kerry A. Lutz, Ph.D.
Department of Biology
Farmingdale State College

The generation of *Arabidopsis* transplastomic lines to select for nuclear regulators of chloroplast gene expression

The plastid genome of higher plants is 120-160 kb and encodes genes essential for photosynthesis. Upon a seedling's emergence into light, nuclear genes regulate the expression of many plastid encoded genes. The *psbA* and *rbcL* genes encode subunits of photosystem II and RuBisCO, respectively, yet which nuclear genes control their expression remains elusive. These nuclear genes can be identified by the generation of a positive and negative selection system that allows one to visualize the expression of either psbA or rbcL protein. I will use biolistic delivery to introduce plastid transformation vectors in which a reporter gene is flanked by the regulatory sequences of *psbA and rbcL* into the chloroplast of *Arabidopsis thaliana*. Upon acquiring fertile transplastomic shoots from tissue culture, M1 seeds will be mutagenized with ethyl methanesulfonate (EMS). Once germinated, mutants that do not express the reporter gene will be isolated for further analysis. This selection system will allow scientists to identify candidate nuclear genes that play important roles in the regulation of plastid encoded genes.

Biography: Kelly Enriquez is a senior pursuing a bachelor's degree in Bioscience with a minor in Chemistry at Farmingdale State College. She is a part of the Research Aligned Mentorship (RAM) program and the Collegiate Science and Technology Program (CSTEP), which both help students obtain more opportunities like getting into research. She is also in the Golden Key International Honour Society due to her academic grades. Kelly is part of the RISE program at Rutgers for the summer performing research that involves chloroplast transformation on the model plant called *Arabidopsis thaliana*. She will continue doing research at Farmingdale State College with her genetics professor Dr. Kerry Lutz. Kelly also tutors Statistics during the school year and enjoys going to concerts in her free time.

Abstracts and Student Biographies

Nathalie A. Groot **Poster # Fireside Lounge-2**
Virginia Polytechnic Institute and State University

Mentors:
Sofia Castro-Pedrido, Li Cai, PhD.

Effect of delayed treatment on cell proliferation and neurogenesis after spinal cord injury

Current treatments for spinal cord injuries (SCI) include physical therapy, and maintenance. There are no current therapies that aid in regaining function. Gene therapies have the promise to not only reduce the risk of further injury to the spinal cord by swelling, but may also aid in restoration of function. The gene therapy that has been developed activates a transcription factor, and results in reduced glial scarring, reduced inflammation, and increased connectivity, resulting in functional improvement recovery. The efficacy of the therapy has been evaluated when injected at time of injury, T0, but efficacy at one day after injury (T1) and three days after injury has yet to be examined. The specific objective is to evaluate efficacy at promoting neurogenesis and proliferation at T3. The gene therapy is evaluated in a mouse model, that is injured, the therapy is administered at the proper time, and the spinal cord is harvested. The cord is then sectioned and stained with antibodies that bind against Nestin (a marker for neural stem cells) and Ki67, (a marker for cell proliferation). The data is quantified and then statistically analyzed to determine the efficiency of the therapy at promoting neurogenesis and cell proliferation.

Biography: Nathalie Groot is a rising Junior getting a degree in Biological Sciences, Biomedical focus, at Virginia Polytechnic Institute and State University. She graduates in December 2020. She works in a research lab focused on mouse embryonic stem cells and how metabolites from the gut microbiome effect embryonic development and cardiovascular health.

Abstracts and Student Biographies

Hana Roz Hassanpourgol **Poster # Fireside Lounge-3**
Beloit College

Mentors:
Dr. Julia Stephens
Co-mentors: Dr. Sandra Russell-Jones, Dr. Satyashikha Chakraborty

The binary of the veil: body politics in post-colonial Egypt

Nawal El-Sadaawi's novel, God Dies by the Nile grounds her revolutionary polemics regarding the condition of Muslim women living in Egypt, specifically those residing in rural communities. Women living under these circumstances are often subjected to the violences of patriarchal renditions of Islam, which specifically inhibits and targets their agency and bodily autonomy. Oppressive practices such as female genital mutilation (FGM), child marriage, and forceful veiling violently target Muslim women living in rural communities, while also fortifying [harmful] Western perceptions of Islam as a barbaric and violent faith. Veiling is a highly contentious issue in the Middle East and in the West, as notions of choice, consent, modesty, and agency are called into question in both internal and external debates. Veiling is not explicitly sanctioned by Islamic scripture, which constructs a paradoxical binary of the veil, as Muslim-identifying women and/or women living in Islamic nations are expected to uphold the values of patriarchal interpretations of Islam by adhering to values of modesty; further complicating their ability to reconcile their respective gender and sexual identities with their faith. The construction of such a binary is dependent upon the ways in which the notion of modesty is appropriated within the binary in addition to the practice of veiling posing as a visible and gendered emblem of Islam. This research will provide literary analysis of God Dies by the Nile in conjunction with its thematics of patriarchal influences and how this affects and in most cases obstructs women's embodiment and practice of Islam, especially in regards to the dilemma of veiling.

Biography: Hana Roz Hassanpourgol is a rising senior at Beloit College, double majoring in International Relations and Religious Studies. She enjoys learning languages, cooking, gender studies, poetry, and engaging with academia as a way to inspire social change.

Abstracts and Student Biographies

Sondra G. Lionetti **Poster # Fireside Lounge-4**
The College of New Jersey

Mentors:
Robert Barrows, Spencer Knapp, Ph.D.
Department of Chemistry and Chemical Biology
Rutgers University

Synthesis of 8-chloro-tetrahydrobenzonaphthyridines as novel antimalarials

Malaria is a widespread, parasitic disease prevalent in sub-Saharan Africa and Asia. Recently, there have been more than 200 million cases of malaria and 435,000 deaths per year. Several novel antimalarial agents are currently on the market, but resistances to these drugs are becoming increasingly more prevalent. The development of new antimalarials is therefore crucial to eradicating the disease. In a screening of over 30,000 potential new antimalarial compounds from St. Jude's, a tetrahydrobenzonaphthyridine (TBN) scaffold was shown to be effective against the malaria parasite. Data suggests that the chlorination of the scaffold at the 7 or 8-position may improve the activity of the antimalarial. Several new molecules were successfully synthesized resulting in new TBNs with the chlorine installed at the 8-postion with various carboxanilides. These compounds will be tested to find the optimal combination of functionality for activity.

Biography: Sondra Lionetti is from Clarks Summit, Pennsylvania and currently studies chemistry at The College of New Jersey (TCNJ). She is a member of the Honors Program at TCNJ and also is a member of Gamma Sigma Epsilon National Chemistry Honor Society and Phi Kappa Phi Honor Society. Sondra is also a residential advisor and played on the women's varsity tennis team. At TCNJ, Sondra is involved in an organic chemistry research lab where she studies the feasibility of a Michael Addition reaction with phenylsuccinic anhydride. This summer, she participated in the RISE program under Dr. Spencer Knapp in the chemistry department, synthesizing potential antimalarials. Sondra plans to pursue her Ph.D. in organic chemistry and a career in pharmaceuticals.

Abstracts and Student Biographies

Emily K. Mitchell **Poster # Fireside Lounge-5**
Presbyterian College

Mentors:
Dr. Amit Lath, Dr. David Shih, Dr. Yuichiro Nakai, Abhijith Gandrakota
Department of Physics and Astronomy
Rutgers, The State University of New Jersey

Pushing the Frontiers of Particle Physics Through Unsupervised Machine Learning

Particle physics is the endeavor to better understand the behavior of the universe through the knowledge of its fundamental units and their properties. Historic endeavors brought Dalton's atomic theory, which modeled the atom and laid the foundations of chemistry[2]. Current work is aimed at discovering physics beyond the standard model (SM), which is the most accurate explanation of nature ever created, yet has known deficiencies that point to new physics. New signal detection is the critical means of discovering new physics, but this process has its difficulties as new signatures may be hidden under large amounts of SM background[3]. One new type of machine learning, called "autoencoder," is an "unsupervised" method of sifting new signals from the prolific background in which they so closely resemble. This method takes in data, compresses, uncompresses it back, compares it to the input, and returns a reconstruction error. During the training process, the autoencoder attempts to the minimize reconstruction error for the majority of the data, which allows for anomaly finding in testing. Our preliminary results suggest that the autoencoder works well for detecting anomalies in simplistic data and proves adequate for more realistic data.

Biography: Emily Mitchell is from Chapin, South Carolina and is studying Physics, Applied Mathematics, and French at Presbyterian College. She is the president of the Sigma Pi Sigma, President of the Pi Mu Epsilon, and vice president of the Kappa Alpha chapters on campus. Emily led the International Buddies Program at Presbyterian College for two years and worked within the Physics department researching Tin Whisker Growth under funding from SC INBRE. Currently, she tutors both physics and mathematics at Presbyterian College and is teaching Physical Science to students in the 9th grade at Lauren's Academy. This summer, she took part in the RISE at Rutgers program under Professor Amit Lath in the physics department applying machine learning in particle physics. Emily intends on pursuing her Ph.D. in physics and later teach physics at the college level. She would like to thank Professor Lath and RISE for the abundant resources and aid in pursuing further education and research.

Abstracts and Student Biographies

Cassiel E. Padilla-Duran **Poster # Fireside Lounge-6**
University of Puerto Rico - Aguadilla

Mentors:
Zoe Kitchel, Malin L. Pinsky, PhD
Department of Ecology, Evolution, and Natural Resources
Rutgers, The State University of New Jersey

Impact of Interactions Between Temperature and Species Traits on Local Instances of Colonization and Extinction in North American Marine Invertebrates

Recent increases in global surface temperature have been adversely affecting ecosystems on a worldwide scale over the past 50 years. These changes have forced organisms to expand their historic range limits as a means of ensuring their survival. While many attempts at predicting and explaining these changes in distribution have been conducted, past studies have provided mixed results as to what are viable methods of predicting and explaining observed range shifts. Marine invertebrates in particular have exhibited greater range shifts than any other group of organisms, something which is of concern seeing as invertebrates comprise 97% of species worldwide and play a vital role in the functioning of ecosystems. Our hypothesis is that species traits can be used to determine these shifts in distribution when used in combination with these changes in temperature. We expect that invertebrates possessing characteristics that encourage dispersal such as high fecundity and a wider historic latitudinal range will exhibit greater range shifts than the remaining species. Trait information pertaining to 154 different species of North American marine invertebrates was compiled using data from primary sources. The traits taken into consideration were fecundity, habitat, latitudinal range size, northern range boundary, southern range boundary, average and maximum weight, average and maximum length, and larval development, all of which were incorporated, along with temperature, into statistical models to determine interactions and correlations between variables and to predict local instances of colonization and extinction. With this study, we intend to better the understanding of how these species generally respond to changing temperature patterns and how these interact what these changes mean for the environment. Understanding how species traits impact invertebrates could help us determine how they affect other organisms, such as fish or mammals, by applying similar techniques when predicting these behaviors in different groups.

Biography: Cassiel E. Padilla-Duran is a rising junior at the University of Puerto Rico at Aguadilla where she is majoring in Biology. She gained an interest in ecology and environmental sciences due to her past research experience pertaining to the recovery of post-Hurricane Maria mangrove forests on the coast of Isabela, Puerto Rico, where she was able to supplement her lab skills with field work and statistical analysis. She is currently participating in research in the department of Ecology, Evolution and Natural Resources under the guidance of her PI Malin Pinsky and PhD student Zoe Kitchel. Her research focuses on marine invertebrates surrounding North America and how species traits can be used to explain observed changes in their distribution caused by recent increases in global sea surface temperature. This summer she has developed a database of these species traits which was used to examine patterns between these characteristics and how they interact with annual changes in temperature to drive instances of local colonization and extinction.

Abstracts and Student Biographies

Valeria F. Peralta **Poster # Fireside Lounge-7**
Colorado College

Mentors:
Jose Camacho, Ph.D., Michele Goldin
Department of Spanish and Portuguese

Pero why?: Significance of semantic and pragmatic presuppositions in code-switching

The study of linguistics has a diverse methodological history with scholars of its various sub-fields employing their own and often differing methodologies. Of these sub-fields, semantics and pragmatics are often held at odds despite both branches dealing with the meaning of language. On one hand, semantics studies the meaning of language within a sentence such as its wording (lexical) or logic (formal). On the other, pragmatics considers these meanings while placing more importance on the context of the wording. Presuppositions, briefly defined as implied assumptions, are one phenomena that embody this difference as semantic presuppositions deal exclusively with the internal logic of a sentence while pragmatic presuppositions deal with implied contexts. However, as linguistics research progresses, scholarship blurs the lines between methodologies and fields, particularly in trending and contested topics such as code switching, arbitrarily seen as the alternation of two or more languages in one expression. By specifically looking at the presuppositions of code switching, this study aims to synthesize semantic and pragmatic projects of varying methodologies and scopes in order to make the case for a more interdisciplinary approach to contemporary issues.

Biography: Valeria Peralta is a rising senior at Colorado College majoring in Russian Studies with a minor in Linguistics. With a background in both computer science and anthropology, she hopes to study linguistics in a way that effectively and compassionately engages with minority communities often dismissed in academia and wider society. Because of this, she plans to pursue a Ph.D in Linguistics with a potential focus in Computational Linguistics. RISE provided Valeria the opportunity for independent research under the guidance of Dr. Jose Camacho and Michele Goldin, both mentors who showed immense support and excitement about Valeria's niche topic.

Abstracts and Student Biographies

Santos J. Rivera-Cardona **Poster # Fireside Lounge-8**
University of Puerto Rico - Mayagüez Campus

Mentors:
Jan Kubik, Ph.D.
Department of Political Science
Rutgers, The State University of New Jersey

The Lack of Civic Mobilization in Cuba and Puerto Rico

Cuba and Puerto Rico are two islands in the Caribbean that are under a nondemocratic regime and have a difficult economic situation. While Cuba is a post-totalitarian regime at risk of entering their second special period, Puerto Rico is a bankrupt nonincorporated territory of the United States with a $72 billion-dollar debt. However, these problems do not seem to be a catalyst for people to organize and rebel against the government, demanding freedom, liberty and sovereignty. Therefore, understanding the lack of civic mobilization and the way culture influences how people organize or not, will help us understand what is happening both in Cuba and Puerto Rico. This study uses mainly a qualitative approach, to understand the historical trajectory that has led these countries to where they are now. The second goal is to interpret the images, symbols, performances, words and texts that people are exposed to. This needs to be done to understand how people feel about their country and why they feel that way. Although both countries are in precarious conditions, there are several reasons that help to explain why people do not to protest. According to the preliminary studies the reason for Puerto Ricans not to rebel is that it is easier to migrate to the United States. By contrast, for Cubans it is difficult to migrate, but the closed opportunity structure makes civic mobilization difficult. On the other hand, culture has different effects in both countries. In Cuba the state manipulates culture to mobilize people in their favor, while in Puerto Rico there is no single culture, but rather there are different subcultures. The first drives them to support statehood, the second to maintain the status quo and the third to advocate for independence. Nevertheless, more comprehensive data is needed to better understand the reasons for people not to mobilize both in Cuba and Puerto Rico.

Biography: Santos J. Rivera Cardona is from the west coast of Puerto Rico. Currently, he is a rising senior in the University of Puerto Rico — Mayagüez Campus (UPRM). He majors in Political Science with a curricular sequence in International Relations and is highly interested in politics and culture, social movements and protest. Santos has been part of numerous radio programs in the island and is now a columnist for a newspaper in the west region of Puerto Rico. On his sophomore year, he participated in an exchange program at Cornell University through the Cornell-UPR Interuniversity Relief Program after Hurricane María stroke the island. During that program, he worked on a research paper: "Why Cuba ended up being a sovereign country, but Puerto Rico did not?" for his Comparative Politics class, and published an article in Guac Magazine about the importance of the University of Puerto Rico for the island. Since 2018 he has been part of a Sea Grant funded research project that studies communities vulnerable to flood in the west coast of Puerto Rico and Public Security in the aftermath of Hurricane María, under the mentorship of Dr. Edwin Asencio Pagán. This summer, Santos is working with Dr. Jan Kubik at Rutgers University. Together, they are studying the reasons for demobilization both in Cuba and Puerto Rico. Santos plans to pursue a Ph.D. in Political Science, specializing in Comparative Politics, upon graduation from UPRM.

Gabriela D. Rivera-Cruz **Poster # Fireside Lounge-9**
University of Puerto Rico - Mayagüez Campus

Mentors:

Mrs. Kristia Rivera, Dayuan Gao, Ph.D, Zoltan Szekely, Ph.D., Patrick Sinko, Ph.D.
Department of Pharmaceutics
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Development of Camptothecin Prodrugs for the Treatment of Lung Cancer by Passive Pulmonary Targeting

Development of Camptothecin Prodrugs for the Treatment of Lung Cancer by Passive Pulmonary Targeting

Current chemotherapeutics for lung cancer are administered systemically resulting in the development of adverse side effects. Camptothecin (CPT) is a chemotherapeutic agent that exhibits cytotoxicity against cancer cells but is known to cause severe systemic toxicity. The drug's toxicity is associated with its poor physico-chemical properties which include very low aqueous solubility and low stability in plasma. Significant efforts have been made to modify CPT in order to improve its physico-chemical properties and ultimately its pharmacological characteristics. The aim of this study was to synthetize CPT prodrugs and to evaluate its in vitro cytotoxicity in Non-Small Cell Lung Cancer cell lines, A549. The cytotoxity of four synthetized α-amino acid ester prodrugs of CPT was determined by the 3-(4, 5-dimethylthiazolyl-2)-2, 5-diphenyltetrazolium bromide (MTT) Assay. The parent drug was used as a control. Preliminary results suggested that the drug's cytotoxic potential was not negatively affected by the chemical modification. The cytotoxicity of the prodrugs was similar to that of the parent drug, but prodrugs modified with smaller amino acids presented a slightly higher degree of toxicity. The best prodrug candidate(s) will be selected for further development of a gelatin-based microparticle delivery system for passively targeted delivery to the lung.

Keywords: Cancer, Campotothecin, Prodrugs, Cytotoxicity, Drug delivery

Biography: Gabriela Del Mar was raised in San Lorenzo, Puerto Rico and is a rising senior pursuing a Baccalaureate degree in Chemistry at University of Puerto Rico – Mayagüez Campus. In addition of having an immerse passion for exploring nature and helping people, she enjoys motivating younger generations to discover their interest for science. Gabriela had participated in different American Chemical Society's (ACS) Chemistry Festivals and educational school visits, and these have provided her the opportunity of being an ACS Scholar. Gabriela works as Proctor and Staff in the Center of Pharmaceutical Engineering Development and Learning at University of Puerto Rico, Mayagüez Campus; and last academic year she had the honor of being the 2018-2019 Educational Visits Coordinator of her campus' ACS Student Chapter. In her home institution she is an undergraduate researcher in the Organic Chemistry laboratory of Wildeliz Torres, PhD; where she is synthesizing reactants and developing a tandem Aldol type intermolecular reaction to produce aziridines. This summer, as part of the RISE Program, Gabriela is working in Dr. Patrick Sinko's Laboratory under the supervision of Dr. Zoltan Szekely and Kristia Rivera on the developing of an anticancer drug delivery system utilizing Camptothecin prodrugs to target lung tumors. This experience has expanded her desire to pursue an MD and to keep researching for the prevention, treatment and cure of diseases.

Abstracts and Student Biographies

Maria G. Sanabria **Poster # Fireside Lounge-10**
University of Puerto Rico-Rio Piedras

Mentors:
Mrs. Maria Sanabria
Didactic Program in Dietetics (DPD)
University of Puerto Rico-RIo Piedras

Diana Roopchand, PhD., Rocio Durán. M.S., and Mrs. Fiona Bawagan
Department of Food Science
New Jersey Institute for Food, Nutrition and Health

Improving the pilot scale production of polyphenol-fiber (GP-OB) complex

Dietary polyphenols are bioactive compounds commonly found in fruits such as cranberries, blueberries and grapes. Polyphenols exert anti-inflammatory, antioxidant and prebiotic effects. Grape polyphenols, in particular proanthocyanidins (PACs), have been shown to alleviate symptoms of chronic diseases such as metabolic syndrome (MetS) and type-2 diabetes (T2D). In patients with severe MetS/T2D, the glycemic sugars naturally found in fruits present a limitation. Therefore, a method for delivering polyphenols without fruit sugars would be useful. Our previous studies have used soy protein isolate (SPI) to stabilize the grape polyphenol (GP) extract. In the current study, polyphenols were extracted from grape pomace and stabilized with dietary fiber in the form of oat bran (OB). Bacteria metabolize prebiotic fiber to produce short chain fatty acids, compounds that modulate glucose and lipid metabolism. We hypothesize that a grape polyphenol and oat bran complex (GP-OB) will have synergistic/additive benefits on metabolic health. The polyphenols and PACs in the GP extract were quantified using the Folin-Ciocalteu and 4-dimethylaminocinnamaldehyde (DMAC) assay, respectively. Furthermore, OB was added to produce a GP-OB complex containing 10% GP. We altered our previous drying methods to increase the efficiency in the product development process. Mice will be fed a regular high-fat diet (HFD, 60% kcal fat) or HFD formulated with OB or GP-OB to investigate metabolic phenotypes, gut morphology, and gut microbial community structure.

Biography: Born and raised in Puerto Rico, Maria Sanabria was encouraged to be physically active in her life through sports and dancing. Later after, she incorporated a healthy dietary pattern along with exercising as well as encouraging other friends to follow a healthy lifestyle. It was a matter of time for her to realize how much she cherished helping others through nutrition. Therefore, she decided to pursue a BS in Nutrition and Dietetics at the University of Puerto Rico, Rio Piedras Campus. Maria is currently a rising honors senior with an aspiration to become a Registered Dietitian (RD). She wants to focus on the prevention and treatment of chronic diseases such as diabetes type 2 and cardiovascular disease. In her sophomore year, Maria had the opportunity to participate in the Strengthening Undergraduate and Graduate Learning (SUGS) program funded by NIFA where she focused on studying the different compositions and amounts of fiber in fruits and vegetables native from Puerto Rico. Aligned with her research back home, Maria is currently working on a research project in Dr. Roopchand's Laboratory that focuses on evaluating the effect of grape polyphenol and oat bran fiber supplementation in the growth of beneficial bacteria and alleviation of metabolic syndrome's symptoms in mice. After becoming an RD, she wants to complete a Ph.D. in Nutritional Biochemistry and Metabolic Diseases to further contribute on new ways to improve metabolic health worldwide. In her spare time, Maria works as an organic chemistry tutor in her home institution.

Erin R. Scheidemann **Poster # Fireside Lounge-11**
The College of New Jersey

Mentors:
Andrew Nazha, Atul Kulkarni, Ph.D., Ming Yao, M.D., Ph.D., and Shridar Ganesan, M.D., Ph.D.
Rutgers Cancer Institute of New Jersey

Determining chemotherapy efficacy for BRAF-mutant MET-amplified colorectal cancer cells

There are various mechanisms by which cancers can become resistant to drugs. One of these is gene amplification, which causes cells to bypass the typical way of functioning in order to survive and proliferate. In one case study, a 15-year-old female patient with colorectal cancer containing a BRAFV600E mutation presented to Rutgers Cancer Institute of New Jersey and was treated with combined therapy with a BRAF inhibitor, a MEK inhibitor, and an EGFR-inhibitor. Despite initial response, the tumor became resistant when BRAF mutant cancer cells developed a MET gene amplification. She was then treated with chemotherapy, which was quite effective for a period of 3-4 months before acquiring resistance. Interestingly, the tumor upon acquiring resistance to second line chemotherapy no longer showed evidence of MET amplification. This observation suggests that chemotherapy and targeted therapy may be non-cross resistant in BRAF-mutant colon cancer. Thus, MET amplification may only give relative resistance to targeted therapies aimed at BRAF mutation, but not render the cells resistant to chemotherapy. Therefore, it is expected that chemotherapy could kill these same MET amplified cells in vitro. To see the effectiveness of chemotherapy on both the parental BRAF mutant and BRAF mutant cells harboring a MET amplification, we ran MTS assays with 5-fluorouracil and oxaliplatin, two common chemotherapy agents. Both cell lines respond when treated with either chemotherapy drug. In the future, this experiment will be repeated on organoids to better mimic tumor response to these drugs. Knowing if chemotherapy can effectively reduce tumors that acquire resistance to targeted therapy can aid in designing clinical trials for patients with such tumors. Ideally, this can result in a standard protocol for treating these patients in the future.

Biography: Erin Scheidemann is a rising senior in the Honors Program at The College of New Jersey, where she is pursuing a degree in Biology with minors in Chemistry and Psychology. During the semester, she conducts research in a lab that studies gene expression in yeast. This summer, she is working in the lab of Dr. Shridar Ganesan at the Rutgers Cancer Institute of New Jersey trying to determine the effectiveness of chemotherapy for a particular type of colorectal cancer. Erin plans to obtain a Ph.D. in cancer biology and eventually wants to work toward researching new cancer treatments.

Hardler W. Servius **Poster # Fireside Lounge-12**
Hofstra University

Mentors:
Hardler Servius, Julia Zhang, Anna Froelich, Vinam Puri

Rheological Study of Liposomal Hydrogels

The main focus of the lab is the study of topical, transdermal, and buccal drug delivery. Currently, the common forms of drug application and administration involve pills or injections. While effective, these methods may clash with other parts of the body. The lab is looking to localize the method of treatment by direct application to the afflicted sites as opposed to a systemic approach. By way of hydrogels, we are looking to directly deliver drugs from the gel through the skin. It is hypothesized gels made up of Poloxamer 407 may be more effective for this role as they experience reverse phase transition; the gel itself has a more stable integrity when warmer as opposed to being cool which will be advantageous when in contact with skin. To test this hypothesis, work will be/is currently being conducted to produce several different forms of hydrogels composed of both different compounds, and different concentrations. The lab will then look to measure how effective the integrity of the gel itself is by way of rheology and how efficiently drugs can be held within the gel and permeate skin barriers.

Biography: Senior Hardler Servius (Hofstra University) participated in dermal research during his REU fellowship under the mentorship of Dr. Bozena Michniak-Kohn. His project was the development and understanding of hydrogel formulations for transdermal drug delivery. Mr. Servius is a biochemistry student. His future plans include graduate school in biochemistry. At Hofstra, his research focus with Prof. Scott T. Lefurgy is antimicrobial resistance; studying the structure-function relationships in class C beta-lactamases. Hardler was a part of the team that discovered the first crystal structure of DHA-1, a plasmid-based beta-lactamase that causes antibiotic resistance. He is a member of the Student Members of the American Chemical Society (SMACS) chapter at Hofstra. The American Chemical Society recognized Hardler as an ACS Scholar, an award given to over-achieving students in the sciences. He worked as an undergraduate TA, a peer-mentor in an NSF-funded STEM education project, and is an avid video gamer.

Abstracts and Student Biographies

Lydia M. Stephney **Poster # Fireside Lounge-13**
Atlanta Metropolitan State College

Mentors:
William Jonsson, Ph.D. Student, Dr. Tracy G. Anthony, Professor, Department of Nutritional Sciences
Rutgers University-New Brunswick

The impact of ATF4 deletion on the transsulfuration pathway in the liver of mice during sulfur amino acid restriction

Several studies have shown that dietary restriction of sulfur amino acids (SAAs) may promote leanness, favorable effects on metabolic status, and increased longevity. Deprivation of amino acids activates the integrated stress response (ISR) leading to decreased global protein synthesis and initiates a transcriptional program through activating transcription factor 4 (ATF4) to promote cellular recovery. ATF4 is a transcription factor that upregulates the expression of genes involved in amino acid metabolism. One of the major routes for metabolism of SAAs is the transsulfuration pathway, a metabolic pathway that entails the transfer of sulfur from homocysteine to cysteine. In the transsulfuration pathway, ATF4 is a main regulator of the gene *Cth*. The gene *Cbs*, encoding cystathionine beta-synthase, allows homocysteine to be converted to Cystathionine to produce cysteine. However, not much is known about how genes in the transsulfuration pathway respond to SAA restriction (SAAR) and how loss of ATF4 impacts this. The purpose of the study was to investigate the impact of dietary SAAR and the loss of hepatic ATF4 on the expression of the genes *Cth* (encoding cystathionine gamma-lyase) and *Cbs* (encoding cystathionine beta-synthase). Female mice (n=3/group) aged 8-10 weeks with either hepatic ATF4 deletion or wild-type were fed a diet containing 0.86g methionine per 100g of diet (control diet) or 0.17g methionine per 100g of diet (SAAR diet) ad libitum for a total of 10 weeks. Both diets contained zero cysteine and were isonitrogenous and isocaloric. After 10 weeks, all animal were euthanized and tissues were collected. cDNA derived from flash-frozen livers from the above cohort were used for analysis of gene expression of *Cth* and *Cbs* using qRT-PCR. The ddCt method was used to calculate differences in expression, where a p-value < 0.05 was considered statistically significant. No changes were observed with SAAR on *Cbs* expression in either wild-type or knockout mice. There was also no effect of SAAR on *Cth* expression in either wild-type of knockout mice. In regards to genotype, there were no changes observed between wild-type or knockout mice in either *Cth* or *Cbs* expression. The data from this study indicates that ATF4 is dispensable in the expression of *Cth* and *Cbs*. Future studies should repeat these experiments using larger cohorts.

Biography: Lydia Stephney, born and raised in Atlanta, Georgia, graduated Cum Laude from Georgia State University with a bachelor's degree in Nutrition Science. As an undergraduate student, Lydia served as President of the Nutrition Student Network and was a member of the National Society of Collegiate Scholars. During her senior year, she was recognized as the Outstanding Nutrition Science student by the Department of Nutrition. She is currently enrolled in a post-baccalaureate program at Atlanta Metropolitan State College. Outside of her studies, she volunteers at Winship Cancer Institute in the Department of Radiology. As a participant in the RISE program, she is working under the guidance of Dr. Tracy Anthony in the Department of Nutritional Sciences investigating impact of ATF4 deletion on the transsulfuration pathway in the liver of mice during sulfur amino acid restriction. Lydia intends to further her education and pursue a doctoral degree in Biomedical Science.

Abstracts and Student Biographies

Saul Abreu **Poster # International Lounge-1**
William Paterson University

Mentors:
Brittany Karas, Victoria DiBona, Ph.D, Lori White, Ph.D, Keith Cooper ,Ph.D
Rutgers Department of Biochemistry and Toxicology

Zebrafish tailfin regeneration as a potential anti-metastatic screen

Cancer is a worldwide health issue that claims millions of lives annually. Of these, 90% are a result of metastasis: the migration of malignant cells from the primary tumor to other tissue. As a result, there has been a rapid increase in the number of anti-cancer compounds with anti-metastatic capabilities being synthesized. An efficient throughput model for evaluating these compounds in vivo is vital. The zebrafish model shows promise due to its high fecundity, rapid development and regenerative potential. This study aims to describe a method for evaluating anti-metastatic potential of novel chemotherapeutic compounds using the zebrafish. Metastasis share similar pathways with wound healing. Mechanisms involved in wound healing that promote cell growth, proliferation, and angiogenesis are also implicated in the development of malignant tumors and their progression to metastasis. Therefore, we propose that targeting these pathways can be utilized to disrupt metastasis. We hypothesize that observing tail fin regeneration will serve as an appropriate measure of anti-metastatic potential of anticancer compounds. A tail fin regeneration (TFR) assay was conducted using Cisplatin, a chemotherapeutic in clinical use, as a positive control for antiproliferation. The tail fins of the zebrafish larvae were amputated 3 days post fertilization (dpf) and were treated with dosages of Cisplatin (30 mg/L and 15 mg/L). At 4 dpf, the larvae were sacrificed, fixed with PFA, and immuno-stained and labeled with DAPI and BrdU to quantify cell proliferation. Photographs of tailfins regeneration were taken with a confocal microscope and the length was measured using ImageJ. The reduction in proliferating cells and regrowth of tissue following treatments will help us to verify the anti-proliferative and/or anti-metastatic potential of novel chemotherapeutic compounds and establish zebrafish as a viable and efficient experimental model for other compounds.

Biography:
Saul Abreu is from Nutley, New Jersey and a rising senior at William Paterson University. He is also in the William Paterson Honors college and is pursuing a BS in Biology. He is involved in the Garden State-Louis Stokes Alliance for Minority Participation Scholars Program (GS-LSAMP) and has conducted research with rodents on studying traumatic brain injury and excitotoxicity. As a RISE-INSPIRE student, he does research in Dr.Cooper and Dr. White's toxicology lab. Working alongside graduate students, Saul where he did research with zebrafish and novel chemotherapeutic drugs. Saul aspires to become a medical researcher and to obtain enter a MD/PhD program after obtaining his undergraduate degree. Following participation in the RISE program, he is continuing research on traumatic brain injury and testing out drugs to reduce neurodegeneration.

Abstracts and Student Biographies

Shabree Z. Anthony **Poster # International Lounge-2**
University of the Virgin Islands

Mentors:
Ranran Zhang, Ph.D., Ludwik Gorczyca, Lauren Aleksunes, Pharm.D., Ph.D.
Department of Pharmacology and Toxicology, Rutgers University, Piscataway, New Jersey 08854

Metal-related proteins and environmental contaminants in human placentas

The placenta is a complex organ that is essential for embryonic development into the latter stages of fetal development. Critical functions of the placenta include transporting nutrients from the mother to fetus and protecting the fetus against exposure to chemicals and pathogens. One response mechanism that promotes the reduction or negation of toxic materials in the placenta is upregulation of protective sequestering proteins. Metallothioneins (MTs) are a class of nucleophilic proteins that aid in the cellular detoxification of heavy metals. These proteins are especially important during pregnancy by helping to sequester cadmium (Cd). Cadmium has been shown to cause fetal growth restriction by limiting nutrient transfer from the mother to the fetus. This may predispose the fetus to having a preterm birth or postnatal developmental issues, such as low birth weight. Therefore, the primary aim of this study was to assess relationships between mRNA and protein expression of MTs and human placental concentrations of Cd. We hypothesized that if high Cd levels were present within the placental villous tissue, the MT1A and/or MT2A would be proportionally expressed. Placental heavy metal determination and analysis were performed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Western Blotting and real-time PCR were used to quantify gene expression. Additional heavy metals and nutrients such as zinc will be examined as well. Establishing these relationships will allow us to determine whether placentas exhibit variability in their ability to respond to heavy metal toxicant exposure. This research was funded by NIH grant numbers R01ES029275 and R25ES020721

Biography: Shabree Anthony is an undergraduate student at the University of the Virgin Islands. She is pursuing a Bachelor of Science degree in Chemistry, with a minor in Heath Science. Some of her accolades include being a member of the American Chemical Society and the treasurer of UVI's chemistry club. Shabree's research at her school involves determining the lipid content of five algal species found in her island's marine ecosystem, by comparing three different methods for extraction and purification. Some of her prior research experience includes, studying the effects of Dyzalonshinskii Moriya interactions at the University of Miami (May-August 2017) and viewing the hydrolysis of PIP3 by PTEN using large unilamellar vesicles at Worcester Polytechnic Institute (May-August 2018). She has had the opportunity of presenting her research at conferences like The Leadership Alliance National Symposium (2017), the Emerging Research National Conference in STEM (2018), and the Annual Biomedical Research Conference for Minority Students (2018).

Abstracts and Student Biographies

Juan S. Ayala **Poster # International Lounge-3**
University of Florida

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

Non-invasive, wide field assessment of oxygen perfusion of tissue through spatial frequency domain imaging

Spatial frequency domain imaging (SFDI) is a fully non-invasive, wide-field imaging technique that quantifies tissue oxygen saturation. SFDI may be advantageous in mapping vascular perfusion in applications including diabetic foot ulcers or burn wounds, compared to previous point-measurement techniques like pulse oximetry or ankle and toe-brachial index tests. The goal of this project is to create a self-contained system that can perform all parts of SFDI on human tissue, from spatial pattern creation to quantification of oxy- and deoxyhemoglobin concentrations. Currently, the system can generate absorption coefficients over a 15x10 square centimeter area. In vivo testing on a human arm at 660 nm and 850 nm demonstrate higher absorption coefficients at the site of large blood vessels, validating the methodology up to this point. Future directions include quantifying hemoglobin concentrations in order to create a distribution of oxygen saturation for tissues of varying viability. Additionally, this system should eventually be streamlined by connecting all the individual instruments in the imaging process into one user interface in LabView. This development should allow for SFDI to be used in clinical or hospital settings where other imaging technologies fail to thoroughly analyze tissue oxygen saturation.

Biography: Juan Sebastian Ayala is from Tampa, Florida. He is a fourth-year biomedical engineering major at the University of Florida. At his home institution, he is a member of the Society of Hispanic Professional Engineers and General Relief in Prosthetics. He is also a peer mentor of the biomedical engineering department. As a member of Dr. Pierce's lab, he utilized spatial frequency domain imaging to quantify oxyhemoglobin and reduced hemoglobin and assess oxygen saturation over an area of tissue. Upon graduating, he plans to pursue a professional degree in a specialization of biomedical engineering, such as medical physics or optical imaging. In his free time, Juan likes to play tennis or watch movies.

Abstracts and Student Biographies

Alyssa A. Brady **Poster # International Lounge-4**
Salisbury University

Mentors:
Dr. Maribel Vazquez

Schwann Cell Mediated Therapies for Neuromuscular Diseases

Damage or injury to the neuromuscular junction (NMJ) can result in paralysis and/or motor impairments. The NMJ is a tripartite synapse that connects motor neurons, skeletal muscle, and Schwann cells. The broad goal of this study seeks to find a better cell transplantation therapy utilizing Schwann cells which are currently underrepresented in NMJ models This project aims to understand the characteristics and chemotactic abilities of Schwann cells in a clinical cerebral spinal fluid mimic, Elliots B® Solution. Understanding how adult Schwann cells respond within Elliots B® Solution is a first step towards study of media and matrix to help Schwann cell transplantation studies for stabilization of the damaged synapse. The cells will be cultured in a microdevice to simulate the environment the cells exist in and characterized based on viability, adhesion, morphology, and proliferation through the use of imaging and microscopy. By employing a growth factor, the chemotactic abilities of the Schwann cells can be analyzed. Understanding the chemotic abilities of the Schwann cells will allow for the chemotaxis of Schwann cells to target the neuromuscular junction during cell transplantation therapy.

Biography: Alyssa Brady is a rising senior at Salisbury University. She is a Physics-Engineering major with a mathematics and chemistry minor. She is also a member of the Honors College and other clubs and societies including Student Athlete Advisory Committee, Phi Kappa Phi, Pi Mu Epsilon, and Phi Eta Sigma. Alyssa is a captain for the Varsity Women's Soccer team at her university. This summer, Alyssa has had the opportunity to study Schwann cell behavior in Elliots B® Solution to help cell transplantation studies for neuromuscular diseases under the guidance of Dr. Maribel Vazquez. In the future, Alyssa plans to pursue a Ph.D. in Biomedical Engineering.

Abstracts and Student Biographies

Naomi Campos **Poster # International Lounge-5**
Medgar Evers College

Mentors:
Dr. Jessica E. Fellmeth
Dr. Kim Mckim

Investigating the role of centromere protein CENP-C in meiosis

In meiosis, a type of cellular division, chromosome numbers are reduced by half, producing four reproductive haploid cells. Improper chromosome segregation is a leading cause of infertility in women. We are assessing CENP-C in meiosis. The meiotic process in female Drosophila is not well understood. On the chromosome, localized in the inner kinetochore plates alongside the centromere is CENP-C, a required chromosome protein that maintains proper kinetochore size and a well-timed transition to anaphase. Evidence supports that the inactivation of CENP-C causes mitotic delay during prometaphase, chromosome missegregation, aneuploidy, and apoptosis. We will be determining if chromosome segregation is affected by the loss or overexpression of CENP-C by quantifying fertility and nondisjunction. Overexpression will be observed using the GAL4/UAS system for targeting gene expression. Fertility trials consist of three different overexpressed constructs: full-length CENP-C, CENP-C N-terminus, and CENP-C C-terminus, each crossed with Gal4 drivers (NGTA, Nanos, or Mat α) that contain overexpressed transgenes. The virgin females produced from these crosses will then be crossed with male G63 fly containing a marked Y chromosome to quantify the offspring per female in the F1 generation. The control constructs will have no Gal4 which will have no overexpression. In mutant crosses, CENP-C Z (a mutant with loss of function of CENP-C) will be crossed with a fly containing the 141 or IR35 allele to create transheterozygous offspring. The female virgin offspring will be collected and crossed with G63 males. The controls will be heterozygotes and w- (white-eyed mutation) of all three mutants. Nondisjunction is scored by quantifying the eye shape phenotype in fruit fly which will indicate if meiosis is happening correctly and gametes will produce an abnormal number of chromosomes. This is an early exploration into the functions of CENP-C in meiosis and will be further built on studying molecular phenotypes.

Biography: My name is Naomi Campos. I was born on July 29, 1993, in Brooklyn, New York. I became a parent at the age of sixteen. I graduated with a GED diploma at the age of eighteen. Two years later I set my goal to obtain a degree in biology. It was through my biology advisor that I was able to apply for the C-Step/Bridges program where my research path began. My first summer research was studying horseshoe crabs and their egg density with Dr. Christina Colon of Kingsborough Community College. My next research was studying the effects of manganese on oysters with Dr. Edward Catapane of Medgar Evers College. I then applied and was accepted to the summer RISE program of 2019, where I am doing in-depth research on fruit flies with my mentor Jessica Fellmeth and PI, Dr. Kim McKim.

Abstracts and Student Biographies

Andrea C. Corbin **Poster # International Lounge-6**
Sarah Lawrence College

Mentors:
Brandon Newton, Michael Pellegrini, and Joseph W. Freeman, Ph.D. Department of Biomedical Engineering Rutgers, The State University of New Jersey

The development of a conductive thermoplastic for novel biocompatible muscle scaffolds

Natural healing mechanisms often fail to fully regenerate damaged skeletal muscle tissue, frequently leading to medical interventions to regain function following injury. Working to regenerate skeletal muscles through a scaffold affords patients who have suffered a skeletal muscle injury a massive opportunity to increase their quality of life. Our lab aims to develop a preliminary electrically conductive scaffold composed of silver augmented polymeric PCL (polycaprolactone) and two electroactive hydrogels: PEGDA-MAETAC (poly(ethylene glycol)-diacrylate 2-(methacryloyloxy)ethyl-trimethylammonium chloride) and PEGDA-AA (polyethylene glycol diacrylate-acrylic acid). By arranging hydrogels and conductive thermoplastics in a similar manner to natural sarcomeres, connections can be created such that the electroactive polymers turn inward, mimicking myosin cross-bridging and muscle contraction. Synthetic scaffolds like this mimic the extracellular matrix (ECM) of native muscle cells by providing a microenvironment that expresses physical and chemical cues in addition to providing mechanical support for transplanted cells; matching the composition of the ECM can drive myoblast differentiation. Furthermore, the Freeman lab aims to seed the 3D printed biocompatible muscle scaffold with myoblasts to provide function to an area of massive tissue loss as the myoblasts differentiate into muscle to provide a permanent increase in function.

Biography: Originally from Eugene, Oregon, Andrea Corbin is pursuing a joint BA with a concentration in Chemistry from Sarah Lawrence College and BS in Biomedical Engineering from Columbia University. As a participant in the RISE Cellular Bioengineering REU, she studies conductive muscle scaffolds for regenerative medicine under the direction of Dr. Joseph W. Freeman. Andrea spends her free time volunteering on a medical/surgical unit at New York Presbyterian Lawrence Hospital. As a swimmer for Sarah Lawrence College, she is a school record holder in multiple events. Additionally, she is excited to spend the upcoming academic year studying molecular biology at the University of Leeds in the United Kingdom. After graduating from Columbia University, Andrea intends to complete a graduate degree in biomedical engineering.

Abstracts and Student Biographies

Louis M. Durosier **Poster # International Lounge-7**
Fairleigh Dickinson University

Mentors:
Jonathon Walsh & Maureen Barr, Department of Genetics,
Rutgers, The State University of New Jersey

Expression & role of GPCRs in the extracellular vesicle releasing neurons of *Caenorhabditis elegans*

Many cells secrete extracellular vesicles (EVs), which are sub-microscopic membrane-bound structures involved in intercellular communication, homeostatic and pathological processes. Cilia are cellular antennas that receive environmental signals and also send signals in the form of EVs. In the nematode *C. elegans*, EVs are released from the tips of ciliated EV-releasing neurons (EVNs). In "the worm", EVs can be easily visualized and imaged using fluorescent-tagged cargos, such as the polycystins LOV-1 and PKD-2. In humans, mutations in the polycystins cause Autosomal Dominant Polycystic Kidney Disease (ADPKD). The polycystins localize to cilia and ciliary EVs in an evolutionarily conserved manner, but how the polycystins act in cilia and EVs is unknown. An EVN specific transcriptome revealed an enrichment of G-protein coupled receptors (GPCRs). GPCRs function in signal transduction and behavioral regulation in *C. elegans*. This study sought to characterize the expression patterns of a set of GPCRs highly represented in ciliary EVNs. Fluorescent transcriptional reporter constructs of three of these EVN enriched GPCRs (dop-5, ser-5, and C15A7.2) were generated using Gibson Assembly. These reporters were constructed through PCR amplification of the 5' untranslated (UTR) region, cloned into an sfGFP backbone, and microinjected into young adult hermaphrodites. We used epifluorescent microscopy to examine the in-vivo expression patterns of these GPCRs in EVNs, we will analyze strains with loss of function mutations in these genes. We will examine PKD-2::GFP localization in cilia and EVs using fluorescence microscopy and perform behavioral assays that readout EVN function.

Biography: Louis Durosier is from Jersey City, New Jersey and currently studies Biology with a concentration in Human Physiology at Fairleigh Dickinson University (FDU) and since his sophomore year has been a member of the Louis Stokes Alliance for Minority Participation (LSAMP). At FDU, Louis is involved in a student driven research lab with his biology professor and a cohort of students, studying the neurotransmitter mediated behavior of Cherry Shrimp Neocardina davidii. His summer at RISE was spent working in Dr. Maureen Barr's lab in the genetics department, and under the tutelage of Dr. Johnathon Walsh, studied the role of G-protein coupled receptors (GPCR) in the male mating behavior of *Caenorhabditis elegans* (*C. elegans*) and extracellular vesicle biogenesis. Louis' passion is in medicine but being involved in the Barr lab's study of Human Polycystic Kidney Disease has encouraged him to consider an MD/PhD. RISE has provided Louis with valuable insight as he looks to attune a scientific and medical education. He gives his gratitude to the RISE coordinators, and his mentors, Dr. Johnathon Walsh and Maureen Barr.

Abstracts and Student Biographies

Mohammad Fauzan **Poster # International Lounge-8**
New Jersey City University

Mentors:
Dylan Forenzo, Li Cai
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Differential gene expression analysis of spinal cord injury

Damage to the spinal cord can lead to paralysis of the limbs and loss of body function. There are no known cures for spinal cord injury (SCI). This study aims to identify key genes that are up- or down-regulated in response to SCI, which could help the development of new targets for treatment. Using bioinformatics analysis, we have identified differentially expressed genes in injured and uninjured mouse spinal cord tissues at acute (3 days post injury, DPI) and chronic (35 DPI) stages. Online genome databases and the lab's experimental RNA seq data were used along with Fastq, HiSat2, SAM Tools, & feature-Counts, which are high efficiency software packages for sequence alignment and sequencing tag counts. Then, DESeq2 was used to identify differentially expressed genes, and TCseq was used for time-course analysis of the data. Ingenuity Pathway Analysis, a knowledge-based software, was used to identify relevant pathways and biological functions of significantly expressed genes. Results show that there are more differentially expressed genes in the chronic stage of injury than in the acute stage. A cellular growth pathway in injured mice was identified from 35 genes/molecules. It is interesting to note that there is an increased number of differentially expressed genes in the chronic stage than the acute. This preliminary study may provide a better understanding of what genes/molecules to target in future gene therapies for SCI.

Biography: Mohammad is a rising senior at New Jersey City University (NJCU) Honors Program. He is pursuing a Bachelor of Science in Biology with a Chemistry minor. As a Supplemental Instructor, Mohammad facilities group study sessions for undergraduate students in biology courses and is a peer mentor for the underclassmen at NJCU. During the academic year, Mohammad works in a neuroscience lab, under the guidance of Dr. Reed Carrol. He plans to pursue a Ph.D. in Cellular Biology/ Genetics after graduating.

Abstracts and Student Biographies

Kristen M. Garcia **Poster # International Lounge-9**
Boise State University

Mentors:
Ioannis P. Androulakis, PhD
Biomedical Engineering Department
Rutgers University

Circadian expression in human skin

A multitude of physiological, biochemical, neuroendocrine and behavioral functions exhibit 24 hr (i.e, circadian) periodicity. Robust circadian rhythms are characteristics of health, while disruption of circadian rhythms has detrimental implications and can lead to, and amplify, multifactorial chronic conditions such as arthritis, cancers, cardiovascular diseases and metabolic diseases. Focusing on human skin data, we will investigate the emergence of patterns of expression at the pathway level using longitudinal gene expression data. The analysis is based on the pathway-based analysis framework recently proposed by (Acevedo, Berthel et al., 2019). The human skin microarray data of Wu et al. (Wu, Ruben et al. 2018) consisted of collected epidermal biopsy specimen over 4 time points (every 6 h starting at 12 PM). A meta-data analysis approach, maps the transcriptomic data onto human-specific pathways to identify trends as well as look for unique behaviors of these pathways significant to circadian expression. Out of a total of 332 pathways, 114 were identified to exhibit robust dynamic patterns that will be further analyzed. This approach will allow for a better understanding of human physiology which will advance pharmacological research (i.e. prediction of drug-effects, of disease development, through a detailed molecular understanding of human physiology).

Biography: Kristen Garcia is from Sacramento, California. She is a rising senior at Boise State University majoring in Applied Mathematics with a minor in both Biomedical Engineering and Physics. She is a member of the Academics Committee in her fraternity, Alpha Omicron Pi, and a member of the Phi Kappa Phi Honor Society. In her free time, she enjoys working out, hiking and traveling to different parts of the United States. This summer, Kristen is conducting research at Rutgers University as part of the REU- Cellular Bioengineering Program, under the guidance of Dr. Ioannis Androulakis investigating circadian expression in human skin data. Kristen plans to pursue a Ph.D. in Applied Mathematics upon graduating from Boise State University in Spring of 2020.

Abstracts and Student Biographies

Galyna Khramova **Poster # International Lounge-10**
University of Florida

Mentors:
Xinfu Jiao, Ph.D., Megerditch Kiledjian, Ph.D.
Department of Cell Biology and Neuroscience
Rutgers, The State University of New Jersey

Brian Hudson, Ph.D., Stephen K. Burley, M.D., D.Phil.
RCSB Protein Data Bank
Rutgers, The State University of New Jersey

Controlling the activity profile of a multifunctional enzyme: site-directed mutagenesis of mouse DXO

Per central dogma of biology, DNA contains the instructions for making a protein, which are copied by messenger RNA (mRNA). Before mRNA can be used as a template for protein, it needs to undergo processing, which includes 5'-end capping. Incomplete capping subjects the mRNA to decay, which is carried out by the newly discovered DXO family of enzymes. DXO has four activities – decapping, deNADing, pyrophosphohydrolase, and 5'-3' exoribonuclease activities – supported by a single active site. However, the exact molecular mechanism of each activity is not yet known. Arabidopsis thaliana DXO homolog, DXO1, was shown to have a plant-specific active site modification, which negatively affects 5′-end decapping activity while retaining deNADing activity. This suggests that it is possible to isolate one activity of DXO enzyme from the rest. In this project, we are controlling the activity profile of a multifunctional DXO enzyme by site-directed mutagenesis of residues present in the active site. Sequence- and structure-based analyses using data from Protein Data Bank were carried out to predict residues specifically responsible for the decapping activity. Based on our predictions, mutating these residues will result in a complete loss of decapping activity of DXO enzyme while retaining exonuclease and pyrophosphohydrolase activities. We anticipate these results to provide insight about the precise regulation of mRNA decay as it is critical for normal cellular homeostasis.

Biography: Galyna Khramova was born in Kiev, Ukraine and moved to Daytona Beach, Florida when she was 17 years old. She is currently a rising senior studying Biochemistry with a minor in Bioinformatics at the University of Florida. Prior to University of Florida, Galyna has received an Associates of Arts degree from Daytona State College, where she was a president of the Science Club, and she has been inducted into Daytona State College Hall of Fame. In 2018, she was selected to participate in the Summer Research Opportunities Program at the University of Iowa working on the expression and purification of formate dehydrogenase enzyme. Mentorship received from RISE program and RCSB Protein Data Bank this summer has helped her gain more insight about her interest in pursuing a Ph.D. Outside of academic pursuits, she enjoys drawing, baking and cross-stitching.

Abstracts and Student Biographies

Nahtalee R. Lomeli **Poster # International Lounge-11**
University of California, Irvine

Mentors:
Adam J. Gormley, Ph.D.
Jason DiStefano

Biological screening of polymer-peptide mimics of T.R.A.I.L. and BMP-2

Multiprotien signaling complexes initiate a variety of important cell communication and regulatory pathways such as apoptosis and cellular proliferation. Protein complexes' ability to mediate important cellar functions makes them extremely attractive targets for drug discovery; Unfortunately, little is known about how the structure of these arrangements influences cell signaling. For the past ten years, researchers have been working to develop polymer-peptide conjugates of varied structure that directly interface with multiprotein complexes. Such probes would render more insight into receptor assemblies and can be used to develop more therapies that target these complexes. However, conventional syntheses strategies are time-consuming and severely restrict the ability to screen all possible characteristics. Dr. Gormley and the Gormely Lab have been working on validating a platform of synthesis, called Photoinduced Electron Transfer–Reversible Addition–Fragmentation Chain Transfer (PET-RAFT) Polymerization, that can overcome the current limitations in conventional synthesis strategies. The Gormley Lab has been validating this platform synthesis by first creating large libraries of polymer-peptide conjugates that mimic the structure-activity relationships of the death-inducing signaling complex (DISC) and the bone morphogenic protein-2 (BMP-2), which are of major interest in the development of new cancer and regenerative medicine therapies respectively. These conjugates will then be screened using standard biological assays on W-20-17 and MD-231 cell lines to asses their biological responses. Once the initial series of data is collected, the Gormley Lab will seek to identify the structure-activity relationships that induced the most activity. If these polymer-peptide conjugates can induce a consistent response and be optimized through an iterative PET-RAFT Polymerization platform, this form of synthesis has the potential to accelerate the understanding of multiprotein signaling complexes and the development of new drug therapies that target them.

Biography: Nahtalee Lomeli is a from Southern California and is a recent transfer student at the University of California, Irvine (UCI) where she is pursuing a Bachelor's of Science in Chemical Engineering, a Minor in Material Science, and a Specialization in Biochemical Engineering. She is an Edison STEM Scholar (2015), Tau Beta Pi initiate (2019), as well as the newly elected Vice President External for UCI's chapter of the American Institute of Chemical Engineers (2019-2020). Nahtalee works as an undergraduate researcher at UCI in Dr. Allon Hochbaum's lab in the Department of Material Science and Engineering where she and her mentor, Dr. Mauricio D. Rojas-Andrade, have been researching the chemical cell-cell communication mechanisms in bacterial biofilm development and dispersal. This summer she has been working under the guidance of Dr. Adam Gormley and Jason DiStefano to help establish the biological assays that will be used to screen polymer-peptide conjugates that mimic therapeutic proteins and growth factors used in therapeutics and in regenerative medicine. Her experience in Dr. Gormely's interdisciplinary lab has inspired her to pursue a Ph.D. in the emerging field of molecular engineering.

Abstracts and Student Biographies

Paulina A. Marino **Poster # International Lounge-12**
Fairleigh Dickinson University

Mentors:
Martha Soto, Ph.D, Luigy Cordova
Department of Pathology and Laboratory Medicine
Rutgers, The State University of New Jersey

Using tissue-specific protein degradation (degrons) and live imaging to analyze cell migrations.

Cell migration is a fundamental biological process involved in the maintenance and development of multicellular organisms. It is responsible for processes including tissue repair, immunological responses, and morphogenesis. In *Caenorhabditis elegans*, a multicellular nematode, epidermal morphogenesis is regulated by a small GTPase known as CED-10/Rac1, which helps to activate the WAVE and ARP2/3 complexes. These complexes are involved in the formation of dense branched actin networks, which allow cells to form protrusions and move in a specific direction. CED-10/Rac1 is regulated by two antagonistic proteins known as GAPs (GTPase activating proteins) and GEFs (Guanine exchange factors). CED-10/Rac1 is activated by GEFs, which promotes the exchange of GDP to GTP, and inactivated by GAPs, which hydrolysis GTP. CED-5 is a candidate CED-10 GEFs that regulates epidermal morphogenesis in *C. elegans*. However, how it works with CED-10 to regulate F-actin levels is not clear. Genetics and live imaging will be used to address this. In addition, the GAP, HUM-7, a homolog of human myosin IX, was shown to also regulate cell migrations in the epidermis. However, HUM-7 is mainly expressed in muscle cells. I will use a novel tissue-specific protein degradation technique, degrons, to remove HUM-7 specifically from muscle cells and will monitor effects on cell migration. These studies will allow us to better understand how CED-5 and HUM-7 are involved in branched actin formation during epidermal morphogenesis.

Biography: Paulina Marino is a rising senior at Fairleigh Dickinson University, originally from Ecuador. She is majoring in Biology and to pursue her dream of becoming a Pediatrician. She is a member of The National Society of Collegiate Scholars, the LSAMP Program, and the Honors Program. She works as a Chemistry lab assistant, and as an Organic chemistry tutor at her home institution. Her research experiences as an undergraduate have been diverse. During her sophomore year, she assisted in a research project focused on determining the effects of light and temperature on the single-celled organism, dinoflagellates. During her junior year, her new research project was focused on clarifying the localization of *Caenorhabditis elegans* myosin-IX protein. She was selected to be a RISE/Inspire participant at Rutgers, where she worked under the supervision of Dr. Martha Soto. This experience has helped her develop professional skills and realize what she needs to improve in order to continue growing as a student.

Abstracts and Student Biographies

Oluwalade R. Ogungbesan **Poster # International Lounge-13**
University of Maryland, Baltimore County

Mentors:
Hwan June Kang, PhD Candidate, Department of Biomedical Engineering
Francois Berthiaume PhD, Department of Biomedical Engineering
Rutgers University- New Brunswick

Improving diabetic wound healing with vRAGE-ELP fusion treatment using in vitro scratch wound assay

Due to the worldwide obesity and diabetes epidemic, there is a growing prevalence of medical complications from these conditions. One complication includes diabetic foot ulcers, a type of chronic skin wound where healing is impaired. One diabetes-related mechanism that impairs wound healing involves the glycation of proteins in the high glucose environment to form Advanced Glycation End Products (AGEs). AGEs interact with the receptor for AGEs (RAGE), which triggers a signaling pathway leading to the activation of pro-inflammatory responses. The progression of wound healing requires a transition from pro-inflammatory to proliferative processes; however, AGEs prevent this from happening. Our approach is to introduce a soluble receptor that acts as a competitive inhibitor to AGEs. AGEs will bind to these receptors instead of the RAGE on the cell surfaces, thus preventing the pro-inflammatory pathway from being activated, and allowing for the wound healing to progress. In order to optimize this therapeutic approach, we first created a cell culture model in an environment that mimicked the hyperglycemic conditions found in diabetic patients. Human umbilical vein endothelial cells (HUVECs) were used because they are human cells easily procured, involved in blood vessel formation, a critical aspect of wound healing, and also bear RAGE on their surface. The cells were cultured, scratched to mimic a wound, and imaged over a period of 24 hours. The experimental conditions included various doses of AGE and glucose concentrations, in addition to a control kept under standard nondiabetic conditions used as benchmark. The data show a delay in scratch wound closure in presence of high levels of glucose or AGEs in comparison to the control. With this information, further studies will test the effect of increasing doses of soluble RAGE to determine the concentration required to restore scratch wound closure rate in these cells.

Biography: Oluwalade Ogungbesan is a rising Junior studying at the University of Maryland, Baltimore County (UMBC) and is from Columbia, Maryland. She is a Meyerhoff Scholar and majoring in Chemical Engineering with a focus in Biology. At her home institution, she is a part of various organizations including the American Institute of Chemical Engineers. She was accepted into the Cellular Bioengineering (CB) summer program at Rutgers and working in Dr. Francois Berthiaume's lab where she studies the effects of using an alternative receptor for advanced glycation end products (AGEs) to prevent them from impairing wound healing. In the future, she hopes to use her research experiences to pursue a career in the area of Dermatology.

Abstracts and Student Biographies

Gustavo G. Rios-Delgado **Poster # International Lounge-14**
University of Puerto Rico- Mayaguez

Mentors:
Gustavo Rios-Delgado, Zachary Fritz, Anil Shrirao, Rene Schloss, Martin Yarmush

Microscale mixing to enhance the detection of cancer biomarkers

Current cancer detection methods present some limitations because of their bulk and expensive equipment and their often invasive nature while still lacking effectiveness. Some recent approaches focus on the use of biomarkers found in body fluids to develop screening tests for early cancer malignancy. This is where the field of microfluidic immunoassays presents an alternative which could lead to portable, automated and sensitive devices suitable for point of care detection. Immunoassays rely heavily on proper mixing but sample flows in the miniaturized channels of microfluidic devices only mix through molecular diffusion. We hypothesize that by enhancing the mixing in a microfluidic device with the use of surface acoustic waves (SAW), we can create a lab on a chip capable of detecting low levels of cancer biomarkers. These waves are generated by an interdigitated electrode which requires a resource intensive microfabrication unsuitable for mass production of the device. In this work, we look to generate a device capable of SAW mixing using an electrode fabricated with a novel molten metal injection technique. The microfluidic device was fabricated using soft lithography, the metal injection was used to generate the electrode and using a high frequency generator the electrode was excited to evaluate the mixing capability using two dye solutions. We believe SAW mixing will improve detection sensitivity and specificity and further studies will test how mixing affects binding and see its incorporation into a prototype device suitable to screen fatal diseases at a low cost and increased accessibility.

Biography: Gustavo Rios-Delgado is an Industrial Biotechnology major from the University of Puerto Rico at Mayaguez. He is a MARC scholar and performs research at his home institution with Dr. Latorre-Estevez where he studies the gravitational effect of ZnO nanoparticles on yeast. Gustavo has been an active member of a boy scout troop where he has distinguished himself for his service to the community which led him to obtain the role of Eagle Scout. Noticeably he had an active role as a volunteer during the aftermath of hurricane Maria. During the summer he worked in Dr. Yarmush's lab and under the direction of Drs. Schloss and Shrirao, where he played a leading role in the microfluidic fabrication of an electrode which will be integrated into an early cancer screening device. After graduating Gustavo plans to pursue a Ph.D. in the Immunology and Biochemistry fields.

Abstracts and Student Biographies

Catherine M. Rojas **Poster # International Lounge-15**
Stockton University

Mentors:
Patrick Sinko

Optimizing Nanosuspension Treatments for Nitrogen Mustard Gas Burns on the Skin

The Sinko laboratory conducts research, as part of the CounterACT government initiative, for protection against chemical weapon attacks by optimizing treatments that are needed for medical intervention of mustard gas burns on the skin. The group focuses on an analog of sulfur mustard gas, nitrogen mustard, which is a bifunctional alkylator that damages DNA. Optimization includes studying drug dose escalation, while maintaining adequate stability, and increasing drug release rate so that the gel medication would only have to be applied on the wounds once daily (QD). Formulations are ultrasonicated which results in uniform and stable nanosuspensions that provide immediate release of the drug. Characterizations of the drug include dynamic light scattering, saturation solubility, TEM imaging, and in vitro release studies. Preliminary stress tests showed room temperature refrigerated suspensions were stable during treatment period, however at higher temperatures the drug was more unstable. This impacted the mice model results where the twice daily treated mice exhibited better wound healing than the QD treated mice. This suggests frequency and stability of the drug plays a key role in medical intervention for mustard gas burns. Future studies will include better formulations for QD mice to decrease the risk of infections and exposure.

Biography: Catherine Rojas is completing her Bachelor of Science degree in Biochemistry/Molecular Biology at Stockton University. She will be graduating with honors this fall, with a minor in Women, Gender and Sexuality Studies. Catherine has varying interests, from global health to immunology, which she hopes to integrate into future projects. She is passionate about research and is determined to earn a PhD in Pharmaceutical Science with the hopes to conduct industrial research. She participated in the SURF/RiSE programs this summer, under the mentorship of Dr. Patrick Sinko and his graduate student, Tomas Roldan. Catherine experimented with nanosuspension treatments for mustard gas burns on the skin as part of the CounterACT NIH program. This was a transformative experience that affirmed her unabated interest in pharmaceutical work.

Talia N. Seymore **Poster # International Lounge-16**
Pennsylvania State University

Mentors:
Chenghui Jiang, Rama Malaviya, Debra Laskin
Department of Pharmacology & Toxicology
Rutgers University

Effects of anti-TNFα antibody on sulfur mustard-induced lung injury in rats

Sulfur mustard (SM) is a vesicating chemical warfare agent that causes severe lung injury when inhaled. Acute sulfur mustard-induced toxicity is due, in part, to persistent accumulation of macrophages in the lung and the release of inflammatory mediators including cytokines, chemokines, eicosanoids and growth factors. The proinflammatory cytokine, tumor necrosis alpha (TNFα), is released from activated macrophages; it has been shown to contribute to lung injury by promoting inflammatory cell accumulation in tissues and stimulating the release of other inflammatory mediators. This leads to oxidative and nitrosative stress, airway hyperresponsiveness, and tissue remodeling. Previous studies have shown that SM-induced injury is associated with increased numbers of galectin-3+ macrophages in the tissue, which are involved in tissue remodeling. In this study, we tested the hypothesis that anti-TNFα antibody therapy will mitigate mustard induced lung inflammation and injury, as assessed by expression of TNFα and galectin-3. Male Wistar rats were exposed to SM vapors (0.4 mg/kg) or air control and treated with either monoclonal anti-TNFα antibody or vehicle 15-30 min later. Animals were euthanized 3 days after exposure and lung tissue collected and fixed in paraformaldehyde. Paraffin embedded lung sections were analyzed for expression of TNFα and galectin-3 using immunohistochemistry. Treatment of rats with SM resulted in increased expression of TNFα, relative to lungs from control rats, which had little to no expression. This was reduced by anti-TNFα antibody treatment. SM also caused an increase in galectin-3 expression in the lung. However, anti-TNFα had no effect on this response. Additional studies to assess the effects of anti-TNFα on other markers of lung injury are needed to determine if TNFα targeting agents offer a promising way to attenuate mustard-induced pulmonary injury.

Biography: Talia Seymore is a senior majoring in toxicology at the Pennsylvania State University. At her school she is a part of the Millennium Scholars Program, National Council for Negro Women (NCNW), Gamma Sigma Delta Honorary Society, Vice President of Minorities in Agriculture, Natural Resources, and Related Sciences (MANRRS), and Co-Captain of the Caribbean Student Association Dance Team. Since her first year, Talia has been conducting research in the Department of Food Science at Penn State studying the effect of cocoa powder-derived polyphenols on digestive enzymes. She plans to pursue a PhD in developmental/reproductive toxicology starting Fall 2020 and is looking forward to entering a career in industry studying the effect of environmental chemicals on the human body. This summer she is working under Dr. Debra Laskin in the Department of Pharmacology and Toxicology studying the effect of chemical warfare agents on the lungs.

Abstracts and Student Biographies

Syed Shahabuddin **Poster # International Lounge-17**
City College of New York

Mentors:
Xin Liu, Jeffrey Zahn, Ph.D.
Department of Biomedical Engineering
Rutgers, The State University of New Jersey

Electrochemical properties of Au and PEDOT coated neural probe electrodes for brain-computer interfaces

In the area of Brain Computer Interfaces (BCI's), implantable neural probes have become increasingly popular for recording brain signal Compared to Electroencephalography (EEG) and Electrocorticography (ECoG), intracortical probes offer higher temporal and spatial resolution of motor intent. However, one major issue with implantable probes is chronic signal degradation resulting from immune responses, specifically gliosis. Recent studies have shown that smaller and more compliant intracortical probes produce less damage to the brain and thus mitigates tissue responses. Unfortunately, reducing the size of the probe will inevitably decrease the surface area of the electrodes making their impedance too high to acquire resolvable neural spikes with high signal-to-noise ratio (SNR). This study seeks to characterize the effect of electro-plating Au and poly(3,4-ethylenedioxythiophene) (PEDOT) onto multi-layer patterned recording electrodes on the electrode electrical impedance. The goal is to increase the quality of signal by enhancing electrode conductivity and bringing the surface of the electrode closer to neurons. The electrodes were plated by electrodeposition inside a galvanic solution at current densities of 35 mA/mm^2 and 2.83 mA/mm^2 for PEDOT and Au, respectively. Electrochemical impedance spectroscopy (EIS) was performed to compare the impedance of the electrodes pre and post plating. The samples were also qualitatively analyzed from images captured in a scanning electron microscope (SEM). Comparing the electrical properties of Au-coated probes at various deposition times, it was seen that greater electroplating time yielded thicker coatings as expected. Additionally, the impedance values at 1 kHz decreased as the deposition time increased. Similar results are expected for PEDOT coated electrodes. Characterizing the effects of coated electrodes can bring us one step closer to achieving long term recording capabilities of intracortical probes.

Biography: Syed Shahabuddin was born and raised in New York. He is currently a rising senior at the City College of New York. Syed is majoring in Biomedical Engineering and since his freshman year, has spent time conducting research at a neurotechnology lab in addition to interning at Neuromatters, a neurotechnology research and development company. As part of the RISE program, Syed is working in Dr. Zahn's lab mentored by Xin Liu on developing an intracortical probe for Brain Computer Interfaces. After finishing his undergraduate studies, Syed intends to pursue a PhD. In his free time, he enjoys watching sports and playing the piano.

Abstracts and Student Biographies

Jitendra Singh **Poster # International Lounge-18**
New York City College of Technology

Mentors:
William Hansen, Sagar Khare, PhD, Department of Chemistry & Chemical Biology, Rutgers University
Luigi Di Costanzo, PhD, Stephen Burley, MD, DPhil, RCSB Protein Data Bank, Rutgers University

Computational Design of a Dinuclear Copper Protein Using Symmetry

The need for a renewable and efficient method for energy has long been a recognized challenge, and the oxidation of water to generate free hydrogen as fuel is a promising prospect. The high electrocatalytic water oxidation potential has limited the progress for making this a form of renewable energy. The paradigm Photosystem II (PSII) performs this photochemical reaction with a high turnover in plants, algae, and cyanobacteria utilizing a multinuclear metal cluster containing manganese (Mn) and calcium (Ca) ions. PSII works well within cells, but it is a large insoluble macromolecular machine within a membrane and therefore is not viable for biotechnology. To mimic the water oxidation reaction, a chemically synthesized small molecule copper-bipyridine was shown to function as an electrocatalyst and reportedly split water at high pH (11.8-13.3) with a rather limited efficiency. Inspired by this and other chemical entities, we have undertaken a computational design approach to generate a selective multinuclear Copper (Cu) water soluble protein with the aim to oxidize water in aqueous solution and a more neutral pH. The accurate computational design of a novel metalloprotein depends on existing experimentally-determined structures contained in the Protein Data Bank (PDB) archive. The PDB was queried for a set of search parameters for potential protein scaffolds. Afterwards EPPIC (Evolutionary Protein Protein Interface Classifier), a program which scores structures based on the probability of their actual biological assembly in nature rather than an artifact of the structure observed during the crystallographic experiment, was used to further refine our PDB library of 5000+ down to less than 3000 to be used in the design process. To facilitate computational design, the program SyPRIS (Symmetric Protein Recursive Ion-cofactor Sampling , Hansen et. al.) was used to examine protein interfaces to locate backbone positions our cofactor bound by Cu would align with. SyPRIS matches with a score less than or equal to 0.5 were then processed through the Rosetta protocol which aims to design the first two shells of residues surrounding the cofactor, and also minimizes energies to increase the integrity of the protein interface where our cofactor will be housed. Proteins that have high feasibility after computational design can then be expressed experimentally and screened for incorporation of the cofactor and bound metal-ion. Successful integration of a metal cofactor will demonstrate the practicality of computationally designing a symmetric interface which can sustain a selective dinuclear Cu cofactor which would be used for water oxidation. This work was funded by an NSF REU (DBI-1832184).

Biography: Jitendra Singh is a rising senior at the New York City College of Technology, where he is pursuing a degree in Biomedical Informatics concentrating in Bioinformatics. During the semester, he serves as a biology tutor at City Tech's student learning center. In his previous research, he explored the anti-oxidative properties of synthesized compounds which mimicked the chemical structure of resveratrol, a naturally occurring chemical in grapes. This summer he is working in a collaboration with the RCSB Protein Data Bank (under Professor Stephen K. Burley) and the lab of Dr. Sagar Khare in an NSF-funded REU. With mentors Dr. Luigi Di Costanzo and graduate student Will Hansen, he is computationally designing a dinuclear copper protein. This project will demonstrate the design of a novel metal-ion binding site along a symmetric axis in a homodimer. Jitendra plans to obtain a Ph.D in biochemistry and continue conducting research on protein design.

Abstracts and Student Biographies

Jaylen E. Taylor **Poster # International Lounge-19**
Eastern Michigan University, Ypsilanti, MI

Mentors:
Jeffrey D. Laskin, PhD
Environmental and Occupational Health Sciences Institute,
Department of Pharmacology and Toxicology, Ernest Mario School of Pharmacy,
Rutgers University, Piscataway, NJ

Vladimir Mishin, PhD
Environmental and Occupational Health Sciences Institute,
Rutgers University, Piscataway, NJ

Enzyme kinetic parameters for hydrogen peroxide generation (autoxidation) in the P450 related microsomal electron transport chain

It is well known that a microsomal electron transport chain with terminal oxidase cytochrome P450 (CYP) enzymes generates hydrogen peroxide. This reaction requires NADPH and oxygen, and can proceed with or without metabolizing substrates for the CYP enzymes. Levels of hydrogen peroxide produced by microsomal electron transport in rat liver microsomes (Sprague-Dawley [SD] rats) depend on multiple factors including the specific set of CYP enzymes expressed in the microsomes. The array of P450 enzymes is significantly different in microsomes from female and male rats and in microsomes from drug treated animals. In the present studies the enzyme kinetic parameters of hydrogen peroxide generation was estimated in different types of microsomes in the presence of NADPH using a highly sensitive method of hydrogen peroxide quantification, the Amplex Red/Horseradish Peroxidase Assay. Through the application of this method, low background activity of hydrogen peroxide generation was detected in SD rat liver microsomes. Hydrogen peroxide generation rates in microsomes from female and male rats and drug treated (dexamethasone, DEX) rats showed that the CYP 3A enzymes, CYP3A1 and CYP3A2, are the main factors controlling the rate of hydrogen peroxide formation. Interestingly, the Michaelis-Menten constant (K_m) is similar in microsomes from male rats and DEX treated rats. This may represent a similar affinity of CYP's enzymes for the NADPH-cytochrome P450-reductase during the formation of hydrogen peroxide.

Biography: Jaylen E. Taylor is a rising Senior at Eastern Michigan University, in Ypsilanti, Michigan. She is studying Biochemistry and will be graduating with her Bachelor of Science in the spring of 2020. Jaylen is a Ronald E. McNair Scholar and a member of the EMU Honors College. Her research at EMU as a member of Dr. Deborah Heyl-Clegg's lab has been focused on the anti-cancer potential of antimicrobial peptides. Jaylen has presented her research findings at the Eastern Michigan University Undergraduate Symposium and the University of Maryland National McNair Scholars Conference in College Park, Maryland. She has also published her research in the EMU McNair Journal, in a research article titled, "Cysteine deleted tachyplesin analogs as anticancer agents" (2018). Jaylen has also conducted research over the summer at other institutions, including the University of Michigan, Ann Arbor, MI where she worked on a project tasked with developing a uranium biosensor in the lab of Dr. E. Neil Marsh.

Abstracts and Student Biographies

Akhila Tetali **Poster # International Lounge-20**
The College of New Jersey

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

Controlling astrocyte reactivity with electrospun polymer scaffolds

Astrocytes are a class of central nervous system (CNS) cells that function in homeostasis and in maintaining the blood-brain barrier. After CNS trauma, such as spinal cord injury, these cells become reactive and surround the lesion to aid in the tissue repair process; however, they eventually form a glial scar around the wound. The scarring is one of the main reasons why the CNS has such limited regenerative capabilities. The glial scar prevents axonal regrowth, which limits or eliminates the ability to recover function. We are investigating the potential of biomaterial scaffolds to reduce the glial scar. The reactivity of astrocytes that are cultured on electrospun nanofibrillar scaffolds, which mimic naturally occurring extracellular matrix, is evaluated to determine which properties of the scaffolds can be used to reduce scarring. Nanofiber scaffolds present different sets of properties to the cells what are controlled by the choice and concentration of polymer(s) and electrospinning parameters. These properties include fiber size and density, surface roughness, charge, and stiffness. In the current study, reactivity is assessed in response to nanofibrillar scaffolds prepared from polycaprolactone (PCL) and poly-L-lactic acid (PLLA). Quiescent astrocytes and reactive astrocytes are cultured on the scaffolds for 24h and 48h. Reactivity is evaluated by immunolabeling for glial fibrillary acidic protein (GFAP) and inspecting changes in the number of cells and cell morphology. Scaffolds that minimize cell reactivity will be identified, from which the important properties that control reactivity may be determined. Further understanding of how biomaterials can minimize scarring may lead to a new method of improving axon regeneration and spinal cord functional recovery after spinal cord injury.

Biography: Akhila Tetali is from Bridgewater, NJ and is currently a rising junior at The College of New Jersey studying Biomedical Engineering. She is the president of HOSA-Future Health Professionals and the treasurer of the engineering fraternity, Theta Tau, at her home institution. She enjoys being involved with on-campus activities and working with her peers. In her free time, Akhila volunteers with a hospice to provide care for patients and she also enjoys her work writing for the TCNJ School of Engineering website. During the summer, she worked in Dr. Shreiber's lab on a project to determine the reactivity of astrocytes on different nanofibrillar scaffolds. In the future, she plans on pursuing a graduate degree in biomedical engineering.